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A

Postgraduate Educational Programme

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Presentations for which the author(s) have submitted additional material and images to EPOS™ are marked with the also EPOS icon.

Thursday, March 1

12:30 – 13:30 **Room Z**

Molecular Imaging

MC 23 A

Basics in molecular imaging (1)

Moderator:
S. Chatziioannou; Athens/GR

A-001 12:30

A. Introduction to molecular imaging: a challenge for radiologists?

P. Brader; *Vienna/AT (peter@brader.md)*

The rapid technological development of medical imaging over the past few decades has transformed radiology into an essential part of modern medical practice. In parallel with this, the rapid pace of biologic advances has made this the age of molecular medicine. Thanks to the emerging field of molecular imaging, the radiology community has the opportunity to help lead a revolution in modern medicine towards optimisd diagnosis and therapy of individual patients. Molecular imaging is the in vivo characteristion and measurement of biological processes that occur at the cellular and molecular level at a macroscopic level of resolution. This is in contrast to the current conventional, anatomically based radiology. The most widely used molecular imaging modalities include optical (fluorescence, bioluminescence); radionuclide (PET, SPECT); ultrasound; and MRI (spectroscopy, diffusion-weighed imaging). The interaction of several disciplines, including molecular cell biology and chemistry, has demonstrated the advantages of multi-modality, multi-disciplinary approach to molecular imaging. There are three currently used imaging strategies to noninvasively monitor and measure molecular events. They have been broadly defined as "direct", "biomarker" and "indirect" imaging. Although most of these imaging techniques are in the preclinical or early clinical phases, radiology will benefit greatly from these methods in the effort to detect and diagnose these diseases, to target therapies and to monitor results at the molecular level. Molecular imaging is the key technology by which to accomplish these goals. Imaging practitioners should think of themselves primarily as biologists whose task is to image what happens functionally and structurally at the molecular level.

Learning Objectives:
1. To learn about basic concepts, principles and strategies of molecular imaging.
2. To understand the multimodality and multidisciplinary approach of molecular imaging.
3. To become familiar with task of imaging functional and structural events at the molecular level.

A-002 12:50

B. Multiscale imaging: from in vivo to in vitro and back

B. Tavitian, A. Dubois, A. Winkeler; *Orsay/FR (bertrand.tavitian@cea.fr)*

Imaging scientists are similar to the fly floating in a swimming pool described by Richard Feynman: they imagine the real world from the few waves that reach their small niche. Biological time scales range from fractions of seconds to evolutionary ages; biological spatial dimensions from atomic scales to tens of centimeters. Not one single technique can produce images spanning more than three temporal or spatial orders of magnitude. To reach further precision, either a priori information must be introduced in the imaging method, or several imaging techniques must be combined through co-registration. Here we give one example for each approach. Optical reporter genes can be exquisitely addressed to sub-cellular organelles through targeted genetic encoding. A protein emitting light upon abrupt rises of local calcium concentrations is genetically encoded into the mitochondria of a mouse. Providing that the sampling of data acquisition is fast enough, the localistion of the signal is attributed to the mitochondria, roughly one micrometre in size each, even though the detection sensors have a millimetric spatial resolution. In neuroscience research, it is a classical paradigm to superimpose molecular images from PET with anatomical images from MRI. New experimental techniques allow co-registering multimodal images with widely differing spatial resolutions, by rebuilding 3D sets of in vivo PET images of the rat brain with post mortem histological stains of the same brains. Extension of such techniques beyond the artisanal knowhow is bound to become a major experimental tool for translation of molecular information into in vivo clinical applications.

Learning Objectives:
1. To understand the temporal and spatial scales within living animal systems.
2. To become familiar with the temporal and spatial scales imaged by in vivo and in vitro imaging methods.
3. To learn how to bridge temporal and spatial scales between the different imaging methods.

A-003 13:10

C. PET-CT-MRI and radiotracers for MI

L. Martí-Bonmatí; *Valencia/ES (marti_lui@gva.es)*

Medical imaging is achieving greater effectiveness as a tool to make accurate diagnoses, assess biological aggressiveness and monitor treatment response. Molecular imaging represents a group of integrated and complementary methods that evaluate the biological information resolved in time and space in vivo, at high resolution and by using with specific probes, contrast agents or MR methods with a view not only to understand cell biology but also to provide early diagnosis and support emerging therapies. The use of imaging probes based on different tracers with advanced high-resolution equipment allows viewing complex molecular and cellular structures. Implementation and evaluation of multimodality molecular imaging technology producing multiparametric and multivariable techniques is reinforced. Recent developments in CT technology (increased number of detector rows, shorter turnaround times and radiation dose modulation) and PET technology (more efficient scintillation crystals, 3D and 4D detection technology, TOF and iterative reconstruction algorithms) have been spectacular. PET-MR produces images with excellent tissue contrast, dynamic and functional information. The simultaneous acquisition of PET and MR images allows temporary correction of dynamic PET studies. Positron-emitting radionuclides for PET images, created in a cyclotron (18 F, 11C, 15O, 64Cu, 124I, 13N) or in a generator (68Ga), will be described. In this talk, the principal radiotracers and multimodality (PET-CT and PET-MR) devices will be summarised by showing their possible contribution to the early diagnosis, risk stratification and prognosis and treatment monitoring of biological processes and disease-related cell. The main indications for multimodality PET in the field of oncology, neurology and cardiology will be commented.

Learning Objectives:
1. To understand the multimodality approach to MI based on PET-CT-MRI.
2. To learn about the different radiotracers that can be used with multimodality equipment.
3. To be informed about future developments that may potentially be used with these techniques.

14:00 – 15:30 **Room B**

Interactive Teaching Session

E³ 220

Acute abdominal inflammatory disorders

A-004 14:00

A. Colitis and enterocolitis

C. Hohl; *Siegburg/DE (christian.hohl@helios-kliniken.de)*

The clinical picture of acute abdominal inflammatory disorders comprises of a variety of different disease patterns. In daily practice our colleagues are often referring patients with unspecific clinical symptoms such as abdominal pain, elevated inflammation markers and diarrhoea. Depending on the referring department there are always some presumptive diagnoses – if you are holding a hammer everything looks like a nail. Now it is our turn as diagnostic radiologists to choose the appropriate imaging modality as we have a whole toolbox instead of just holding a hammer. The first step is to get clear about the most likely differential diagnoses. In patients with acute abdomen without history of trauma, the most common diagnoses are ischaemia, inflammation and obstruction. The second step is to adapt the diagnostic tools to the individual case. Beside abdominal plain film and ultrasonography (US), computed tomography (CT) and magnetic resonance imaging (MRI) are two new and powerful imaging methods that have basically revolutionised the role of conventional radiology in the evaluation of the acute abdomen. To date, contrast-enhanced CT is the gold standard in the study of acute abdomen. MRI can add crucial additional information with its superior intrinsic contrast and the options of functional-MRI. In specific cases such as ischaemia angiography can complete the diagnostic workup in patients with acute abdomen. In the third step images have to be interpreted and correlated with the clinical findings. In order to successfully solve the case it is of paramount importance to know the appearance of the top differential diagnoses.

Learning Objectives:
1. To know how to choose the appropriate imaging modality.
2. To be familiar with the patterns of distribution and appearance in imaging.
3. To learn how to differentiate ischaemia from inflammation.

A-005 14:45
B. Liver and bile ducts
C.D. Becker; *Geneva/CH (Christoph.Becker@hcuge.ch)*

Obstruction of the extra- or intrahepatic bile ducts may occur in stone disease and a variety of other benign or malignant pathologic conditions and may be complicated by acute cholangitis and pyogenic liver abscess. We review the role of the different radiologic techniques that are used in the context of obstructive jaundice and its complications and discuss the advantages and shortcomings of each modality with regard to the clinical situation and treatment.
Learning Objectives:
1. To know the advantages of each imaging technique.
2. To be familiar with the findings in infrequent infections.
3. To learn how to study obstructive jaundice.

14:30 – 15:30 Room Z

The Beauty of Basic Knowledge: Interpretation of the Chest Radiograph

MC 27 A
The mediastinum

A-006 14:30
The mediastinum
J. Cáceres; *Barcelona/ES (josecac@gmail.com)*

The study of the mediastinum starts with a thorough knowledge of the radiographic anatomy and most common variants. Differentiation of pulmonary from mediastinal masses is easily made by knowing basic semiology (pregnancy sign). To facilitate the differential diagnosis among different pathologies it is convenient to divide the mediastinum into different areas (thoracic outlet, anterior middle and posterior, including supra and infravascular compartments). PA and lateral chest radiograph are very useful as the initial examination to detect mediastinal masses and to suggest the next procedure to perform. The radiographic appearance and location of masses on cross-sectional imaging will contribute to narrow the differential diagnosis.
Learning Objectives:
1. To be able to describe the basic anatomic landmarks.
2. To learn to identify mediastinal masses.
3. To be able to classify mediastinal masses according to their density.

16:00 – 17:30 Room B

Interactive Teaching Session

E³ 320
Musculoskeletal emergencies

A-007 16:00
A. Axial skeleton
E. Llopis, E. Belloch, V. Higueras; *Valencia/ES (ellopis@hospital-ribera.com)*

Acute setting myelopathy should be evaluated with MR imaging. Optimising imaging strategy is needed for efficient and accurate diagnosis. Spine emergencies can be divided into traumatic, non traumatic and postsurgical causes. In the setting on traumatic myelopathy we should rule out primary, and usually only the traumatised region needs to be scanned: 1. Fracture fragment cord compression, 2. acute herniated disc, 3. spinal canal haematoma. Acute non traumatic spinal emergencies have non specific clinical findings and a wide variety of causes. The entire cord should be evaluated in two planes. According to the location can be grouped under intramedullary, intradural-extramedullary and extradural. Depending on the causes can be divided into neoplasic, infectious (spondylodiscitis, epidural abscess), inflammatory, haematomas, vascular. Our objective is to describe MRI technique, to recognise specific imaging features and pitfalls and to discuss the differential diagnosis.
Learning Objectives:
1. To understand the principal indications for emergency spinal imaging.
2. To be able to analyse pros and cons of each imaging modality in spinal trauma: how, why, when?
3. To be familiar with MRI key findings in spinal infection, tumour cord compression and other non-traumatic spine disorders.
4. To be familiar with the main emergency complications after spine surgery.

A-008 16:45
B. Peripheral skeleton
V.N. Cassar-Pullicino; *Oswestry/UK (Victor.Pullicino@rjah.nhs.uk)*

In this interactive session focussing on peripheral musculoskeletal lesions presenting to the Accident and Emergency Department, we will review the strengths and weaknesses of the imaging modalities applied to chosen bone, joint and soft tissue lesions. The imaging-based approach will strengthen the understanding of the different pathological entities which vary from trauma to infection in both the paediatric and adult age groups.
Learning Objectives:
1. To learn when and how to use the different imaging modalities in acute skeletal lesions.
2. To learn the US and MRI findings in infection.
3. To understand the value of MDCT in acute MSK lesions.

16:00 – 17:30 Room C

Abdominal Viscera

RC 301
Abdominal tumour evaluation: from morphology to biology

A-009 16:00
Chairman's introduction
D.J. Lomas; *Cambridge/UK (djl15@radiol.cam.ac.uk)*

The historical role of imaging in the clinical management of abdominal tumours will be reviewed in respect of detection, staging, treatment monitoring and follow-up. The concept of biomarkers will be introduced. Recent developments in tumour therapy, management and the importance of the increased understanding of tumour biology will be outlined and the impact of these on tumour imaging briefly discussed. The questions that oncological imaging will need to address in the future will be speculated upon along with the resulting need for new strategies and imaging concepts. This will set the scene for the following talks.

A-010 16:05
A. Morphological assessment of tumour extension
I. Bargellini; *Pisa/IT (irenebargellini@hotmail.com)*

Evaluation of tumour extension plays a major role in treatment planning and evaluation of tumour response. Multidetector Computed Tomography (MDCT) and Magnetic Resonance (MR) are the most common imaging modalities to evaluate tumour extension. Several studies have demonstrated that MR may provide a more accurate evaluation of tumour extension compared with MDCT; however, costs, availability and patients' tolerance might be major issues when dealing with the follow-up of oncologic patients. Moreover, regardless of the imaging modality adopted, optimisation and standardisation of imaging protocols are essential to guarantee diagnostic accuracy and image reproducibility. The need for established methods of assessing tumour response to therapy has been extensively discussed, as a way to allow consistency in image interpretation and to facilitate communication with oncologists. RECIST (Response Evaluation Criteria in Solid Tumour) criteria are the most widely adopted criteria to define tumour extension before, during and after treatment; they have been updated in year 2009, to improve accuracy and standardisation. However, limitations of RECIST criteria have been pointed out, particularly when dealing with loco-regional (percutaneous ablation and intra-arterial treatments) and molecular-targeted therapies. In this specific scenario, conventional RECIST criteria underestimate the rate of tumour response, and assessment of tumour necrosis and volumetric information need to be incorporated into size-based criteria. Assessment of early response to treatment and non-invasive identification of residual viable tumour might be challenging, particularly in hypo-vascular lesions, and new imaging tools are therefore under investigation.
Learning Objectives:
1. To learn about the commonly applied imaging tools in assessing neoplasm extension.
2. To know the current applied method for quantification of viable tumour tissue.
3. To go through a critical review of criteria actually used in oncologic management.

A-011 16:28

B. Perfusion: a reliable tool for tumour activity assessment

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

At initiation, tumours in a pre-vascular phase are supplied with oxygen and nutrients that diffuse from pre-existing normal vessels. When the tumour reaches a critical size of approximately 1-4 mm diameter, the resultant ischaemia leads to the secretion of angiogenic factors. These factors, such as vascular endothelial growth factor (VEGF), recruit and maintain tumour vessels. „New" vessels (neovasculature) exhibit increased blood volume and permeability compared with normal vessels. Various new specific therapies target tumour vasculature or tumour 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 tumour response assessments. Of newer CT or magnetic resonance imaging (MRI) modalities, perfusion has emerged as valid marker of tumour-induced blood vessels and their function. Perfusion measures the vascularity within a tumour, 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 new targeted therapies and discuss its advantages and disadvantages in comparison with CT perfusion protocols. Ultrasound as an alternate modality for perfusion assessment will be briefly presented. PET strategies for treatment-monitoring will be mentioned, with prospect on the role of combined vascular and metabolic imaging to further optimise non-invasive response assessment in specific anticancer therapies.

Learning Objectives:

1. To know about perfusion imaging protocols, specific advantages and technical challenges.
2. To learn about the latest antiangiogenic/antivascular treatment strategies in oncology.
3. To understand the significance of CT or MR perfusion imaging in the management of oncologic patients.

A-012 16:51

C. Beyond vascularisation: exploring tumour biology

L. Martí-Bonmatí; *Valencia/ES (marti_lui@gva.es)*

Apart from morphology and perfusion characterisitcs, the evaluation of tumor agressiveness is closely related to other components of the tumor biology. Some of these "tumor variables" can be measured by the use of imaging biomarkers of tumour activity and phenotype. Imaging biomarkers are objectively measured characteristics that can be used as indicators of tumour biopathological changes. By using the qualitative and quantitative information of the different imaging modalities (US, CT, MR, PET) imaging specialists may be able to predict tumor prognosis and define the most appropriate therapeutic strategies. In this talk the most relevant components (cell density, cell and vascular heterogeneity, tissular entropy, tumor metabolites, cellular receptors, intracellular and interstitial physiological changes, pH, oxygen and iron concentration, elastic properties, physical quantities as the T1 and T2 relaxation times and biochemical molecular expresions) will be commented together with the different ways to explore them thought imaging parametric and multiparametric maps. These graphic maps characterice imaging biomarkers in two ways. First, they represent quantitative variables that characterize and measure different parameters obtained from medical images that are relevant to the tumour grading. Second, parametric images allow us to analyze the spatial distribution of the biomarker in the tumor through its visual representation. These images are generated to provide a graphical representation of the values of the calculated parameters on the basis of original image by post-processing computing. The use of imaging biomarkers in information-driven decision-making in clinical trials and oncologic clinical care will be simplified and supported through computer-aided diagnosis/quantitative image analysis.

Learning Objectives:

1. To become familiar with the most appropriate imaging biomarkers of tumour activity.
2. To recognise the qualitative and quantitative information of the different modalities.
3. To appreciate the clinical role of these techniques in planning therapeutic strategies.

Panel discussion:
How can you easily implement morphological and functional tools into your clinical practice? 17:14

16:00 – 17:30 **Room D1**

Emergencies in Neuroradiology

CC 319

Ischaemic stroke ('acute neurologic deficit')

Moderator:
R.D. Brüning; Hamburg/DE

A-013 16:00

A. Early diagnosis of ischaemic stroke: CT, MRI or other?

A. van der Lugt; *Rotterdam/NL (a.vanderlugt@erasmusmc.nl)*

In the era of intravenous thrombolysis and intra-arterial thrombolysis/ thrombectomy a fast and accurate diagnosis of acute cerebral ischaemia is mandatory. Several requirements for imaging are relevant: 1) All acute stroke patients should be imaged and treated as fast as emergency trauma patients. 2) Exclusion of other causes of acute stroke. 3) Detection of early signs of acute ischaemic stroke. 4) Assessment of the type of ischaemic stroke. 5) Assessment of the severity and extent of cerebral blood flow impairment. 6) Evaluation of the vasculature for causes of ischaemic stroke. 7) Optimal logistics with continuous interaction between nurses, technicians, radiologists and neurologists. Both structural and functional imaging have to be performed. Both CT and MRI are adequate techniques to deal with the imaging requirements, although CT with CT perfusion and CT angiography has become the standard technique in most hospitals. Nevertheless, MRI has several advantages over CT and should be available as back-up or substitute for CT. Important questions are 1) can CT detect all non-ischaemic causes of stroke? 2) Can CT detect ischaemic stroke in the early phase and make a distinction between the different types of ischaemic stroke? 3) How to interpret CT- and MRI-perfusion images? 4) How to detect distal occlusions? 5) How to differentiate between real and pseudo-occlusions of the internal carotid artery? Finally, a systematic approach in the analysis of the acquired images will facilitate a fast and accurate contribution of radiology to the optimal treatment of patients with acute ischaemic stroke.

Learning Objectives:

1. To learn about the role of CT in acute stroke: advantages, limitations, early signs.
2. To learn about the role of MRI in acute stroke: advantages, limitations, early signs.
3. To understand what the role of CT or MR perfusion imaging is.
4. To become familiar with the best algorithm for the management of stroke patients.

A-014 16:30

B. Which patients are candidates for thrombolysis?

K.-O. Løvblad; *Geneva/CH (karl-olof.lovblad@hcuge.ch)*

Stroke has gained acceptance as a treatable disease due to new developments both in diagnostic and therapeutic tools. The aims of therapy in stroke are to reperfuse hypoperfused areas and to open occluded vessels in the presence of a neurological deficit. Initially after the occlusion there is a sudden decrease in local blood flow. After a sufficient decrease, there is at first a reduction in function that is still associated with viability: this area where the thresholds for irreversible ischemia have not yet been attained is called the penumbra. While initially this was an area with reduced electric function but retained viability and membrane integrity, this area has been defined by diminished blood flow. Additionally a "core" infarct can be detected that is constituted of irreversibly ischaemic tissue. On MRI the penumbra was first delineated as the so-called diffusion-perfusion mismatch. CT-based algorithms also allow defining areas of reduced flow that are not yet necrotic. The ischaemic core can be both seen on DWI MR images or on unenhanced CT images: the addition of perfusion CT and perfusion MR techniques allows us to refine the visualisation of what should be the therapeutic target: the penumbra, since its reversibility should restore function.

Learning Objectives:

1. To understand the physiology of cerebral blood flow.
2. To be familiar with the concept of 'core infarct' and 'penumbra'.
3. To learn how we can identify the penumbra on CT perfusion imaging.
4. To learn how we can identify the penumbra on MR perfusion imaging.

A-015 17:00

C. Interventional neuroradiology for the treatment of ischaemic stroke

I. Szikora, I. Gubucz, M. Marosfoi, Z. Berentei, C. Ovary, D. Varga; *Budapest/HU (h[13424]szi@helka.iif.hu)*

Acute stroke is increasingly being treated by neurointerventional techniques. Intra-arterial recanalisation provides better recanalisation rates and potentially better outcome for large vessel occlusion as compared with systemic thrombolysis. The key to success is to select patients with salvageable brain tissue at the time of intervention. Besides the time window, this largely depends on the collateral circulation provided to the involved tissue. Diffusion-perfusion weighted MRI and perfusion weighted CT scan are being used to demonstrate viable penumbra around the infarct core. Direct injection of thrombolytics (rTPA) provides recanalisation in 50-60% of cases treated with this technique. This is associated with a 9-10% rate of symptomatic parenchymal haemorrhage. Today, mechanical thrombectomy or thrombaspiration is the first choice of interventional treatment. Stent thrombectomy is capable of providing a recanalisation rate of 80-90% on the TICI scale and good clinical outcome (0-2 on the modified Rankin scale) in 45-60% of patients. Results might be improved applying the bridging technique, that is a combination of iv-thrombolysis and local thrombectomy. Faster and more effective recanalisation as well as reduced usage of thrombolytics results in a lower symptomatic haemorrhage rate (4-10%).

Learning Objectives:
1. To learn how to select stroke patients for interventional neuroradiological treatment.
2. To be familiar with the techniques for intra-arterial thrombolysis.
3. To be familiar with the techniques for mechanical thrombectomy.
4. To understand what the advantages, disadvantages, risks and limitations of these methods are.

16:00 – 17:30 Room D2

Head and Neck

RC 308

Temporal bone imaging

Moderator:
C. Czerny; Vienna/AT

A-016 16:00

A. Normal anatomy and congenital malformations of the ear

S. Kösling; *Halle a.d. Saale/DE (sabrina.koesling@medizin.uni-halle.de)*

Quite often radiologists consider the anatomy of the temporal bone (t.b). as difficult. Therefore, the first part of the lecture will give a compressed presentation of radiologically relevant t.b. structures. Optimal findings require the knowledge of normal morphology. This is especially true concerning malformations, which are in the focus of the second part. Malformations are characterised by a deviation from the normal morphology combined with functional disturbance (in t.b. predominantly congenital hearing loss). They count among rare diseases. Most of them are diagnosed in early childhood, but in cases of unilateral hearing loss of lesser degree without deformed auricle the diagnosis may be delayed until adulthood. Due to different tissue of origin and different times of development, typical and less typical combinations of malformed parts of the ear result. Combined external and middle ear malformations (congenital aural atresia) are more common than combined malformations of the middle and inner ear. While in suspicion of middle ear malformations a correlate on images can be found in a high percentage, presumed inner ear malformations show a normal radiological finding in about four-fifths of the cases. Nowadays, middle ear malformations are diagnosed by CT or Cone Beam CT. Both methods can also detect most radiologically discernible inner ear malformations, but MRI delivers more details at this. The radiological appearance of malformations of the external auditory canal, middle and inner ear will be demonstrated by giving examples. Therapeutically relevant points are briefly mentioned at the end.

Learning Objectives:
1. To review the normal anatomy of the temporal bone.
2. To become familiar with congenital malformations of the external and middle ear.
3. To recognise and differentiate the most frequent congenital malformations of the inner ear.

A-017 16:30

B. Cholesteatoma and chronic infection

F. Veillon; *Strasbourg/FR (Francis.Veillon@chru-strasbourg.fr)*

Imaging investigation of cholesteatoma is required before surgery. If no surgery has been performed previously, CT will provide information about the location of the lesion (epi, pro, meso, retro, hypotympanum), the partial or total destruction of the ossicles and possible extension to the inner ear. If there is no doubt about any of these factors CT is sufficient. In doubtful cases an MRI examination is performed to confirm or refute the presence of cholesteatoma using T1 sequences without IV contrast medium, and diffusion-weighted imaging with or without high-resolution T2, depending on the age of the patient. In postoperative recurrent cholesteatoma, MRI is becoming the first choice modality for detecting cholesteatomas, appearing low in signal on T1 sequences and high in signal on diffusion-weighted imaging. However, care is required since performing diffusion-weighted imaging without T1 may lead to false positives. A granuloma with a slightly or markedly increased T1 signal is often associated with a high signal on diffusion. Measurement of ADC is useful for detecting cholesteatomas, infected cholesteatomas or abscess. Finally, whilst MRI is the first examination in the follow-up of postoperative patients, the use of contrast medium is not necessary in most of the cases.

Learning Objectives:
1. To learn about different causes of hearing loss within the external auditory canal and middle ear.
2. To learn to differentiate cholesteatoma from chronic infection.

A-018 17:00

C. Enhancing inner ear structures

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

Inner ear enhancement can only be seen in a reliable way on gadolinium-enhanced MR images. High field MR even allows inner ear screening with sub-millimetric contrast-enhanced T1-weighted images. On these images one can distinguish whether the enhancement is in the scala tympani or scala vestibule of the cochlea. The most frequent causes of inner ear enhancement are intralabyrinthine schwannoma (ILS) and labyrinthitis. Labyrinthitis can be viral, bacterial, autoimmune and luetic. Moderate to strong enhancement will only be seen in the acute phase and when the labyrinthitis is causing an important enough blood-labyrinth barrier rupture. Most often both the cochlea and the vestibular system are involved and the edges of the enhancement are unsharp. Under treatment this enhancement gets weaker and will finally disappear. Schwannomas have a stronger enhancement, the enhancement is better delineated, the lesions are most often restricted to the cochlea or the vestibular labyrinth and they can grow over time. When they grow they follow the pre-existing intralabyrinthine anatomical pathways. Many other less frequent lesions like meningiomas, granulomatous diseases (e.g. tuberculosis), trauma-surgery, cholesteatoma, etc., can also affect the inner ear and cause inner ear enhancement. The most frequent causes of inner ear enhancement, their MR characteristics and their natural behaviour will be discussed in this lecture.

Learning Objectives:
1. To become familiar with different types of enhancing inner ear structures.
2. To learn how to differentiate enhancing inner ear structures.
3. To learn the natural behaviour of different types of enhancing inner ear structures.

16:00 – 17:30 Room E1

Special Focus Session

SF 3

Neuroimaging in neonates, infants and children: when to do what

A-019 16:00

Chairman's introduction

A. Rossi; *Genoa/IT (andrearossi@ospedale-gaslini.ge.it)*

This session will provide the participants with a practical update on the principal indications to pediatric neuroimaging with a discussion of the main study techniques. The first presentation deals with the indications for ultrasound in neonates, where the advantages compared to MRI will be elucidated. The second presentation focuses on the applications of MRI in the study of normal brain development both before and after birth with an emphasis on how to correctly report an MRI study and the main pitfalls in children. The third presentation focuses on advanced MRI applications, and the role of different imaging analyses such as DTI tractography and perfusion MR and the use of quantitative measures of different parameters and their application in children will be presented.

Session Objectives:

1. To describe the indications of US and MRI: when to use what.
2. To stress the role of DTI and tractography in the more detailed evaluation of brain pathology.
3. To discuss the role of voxel-based methods in detecting abnormalities that can be missed by even the most experienced radiological eye.

A-020 16:05

What is the potential and role of brain ultrasound in the MRI era?

M.I. Argyropoulou; *Ioannina/GR (margyrop@cc.uoi.gr)*

Brain ultrasound (US) represents the first line imaging modality for the evaluation of the neonatal brain. The main advantages of the technique are safety, performance at bed side, possibility for serial imaging without sedation, real-time information, coupling with colour Doppler and low cost. Anterior fontanel is the classic acoustic window but mastoid and posterior fontanel approaches are increasingly being used for better evaluation of the occipital lobes and the posterior fossa structures. Tranducers of different frequencies are routinely used to optimise imaging and increase lesion detectability. Intubated ventilated preterm babies are examined in the incubator and ischaemic-haemorrhagic brain disease can be detected at very early stages. Early periventricular leukomalacia (PVL) appearing as periventricular hyperchogenicity with sharp or hazy speculated margins and early periventricular venous infarct appearing as fan-shaped paraventricular echogenicity associated with flow disappearance in the terminal vein are important US and colour Doppler findings appearing before detection of any abnormality on MRI. Infectious haemorrhagic infarcts appearing initially as punctuate hyperechogenic lesions and progressing into microcystic lesions are almost never detected by MRI. Increased echogenicity is detected at the early stages of less common acquired lesions such as gangliothalamic ischaemia and cortical necrosis. Intraventricular haemorrhage can be easily detected by US. Colour Doppler by depicting moving echoes in the aqueduct of Sylvius is very helpful in the detection of haemorrhage at its very early stages and in the differential diagnosis between intraventricular and subependymal haemmorhage. Brain maturation-myelination and long-term follow-up of perinatal lesions should be performed with MRI.

Learning Objectives:

1. To learn about the role of US in diagnosing the encephalopathy of prematurity.
2. To become familiar with US patterns of periventricular leukomalacia and brain haemorrhagic disease.
3. To understand the role of US in diagnosing hypoxic-ischaemic disease in full term babies.

A-021 16:28

When is MRI of the brain indicated?

P.D. Griffiths; *Sheffield/UK (p.griffiths@sheffield.ac.uk)*

In this presentation I will concentrate on normal development of the white matter in the cerebral hemispheres. I will use images of tissue sections and foetal brain MR examinations to highlight the important changes occurring in the cerebral hemispheres of the second and third trimester foetus and their relationship with developmental abnormalities. I will then move onto the normal post-natal development of the hemispheric myelin detailing the minimum knowledge required in order to report MR brain examinations of the neonate and infant. A number of potential interpretive pitfalls will be discussed.

Learning Objectives:

1. To understand the changes in MR signal characteristics found in the foetal, neonatal and paediatric brain as myelination progresses.
2. To understand why different approaches need to be made when performing MR imaging of the brain in those groups.
3. To appreciate the effects that myelination has on the ability to detect the more common brain malformations.

A-022 16:51

What is the role of advanced post-processing of MRI images?

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

Region-of-interest based morphometric diffusion tensor imaging analysis has been used for the assessment of age-related changes in human brain, and to visualise eloquent white matter bundles with relationship to brain tumours, cerebral infarctions and other lesions. The technique is limited to two dimensions while diffusion tensor tractography has the possibility to an overall view of individual fibre bundle in three-dimensional spaces for study brain maturation and reveal abnormalities in so-called normal appearing white matter. Dynamic susceptibility-weighted contrast-enhanced perfusion MR imaging provides haemodynamic information that complements traditional structural MR imaging and is being increasingly used in clinical practice to diagnose, manage and understand brain tumours in the paediatric patient group. Clinical studies of today involve multidimensional high-resolution images containing a substantial amount of structural and functional information. The role of quantitative imaging and the parameters measured have become more and more important to evaluate severity of a disease, disease progression and response to therapy, to mention a few examples. Increasing number of different quantitative image analysis techniques that can be used both in adult and children have been described in the recent years. Different imaging analyses like region-of-interest analysis, intra-individual voxel-based analysis and inter-voxel based analysis are a few examples all with different limitations and drawbacks as will be discussed in this lecture. The role of different imaging analyses such as DTI tractography and perfusion MR and the use of quantitative measures of different parameters and their application in children will be presented.

Learning Objectives:

1. To become familiar with the principles of tractography and discuss advantages and limitations.
2. To appreciate the applications of susceptibility-weighted contrast-enhanced MRI.
3. To learn about the indications of voxel-based methods and the advantages over ROI techniques.

Panel discussion:
Paediatric neuroimaging: what should the general radiologist know? 17:14

16:00 – 17:30 Room E2

Multidisciplinary Session: Managing Patients with Cancer

MS 3

Pancreatic tumours

A-023 16:00

Chairman's introduction

R. Manfredi; *Verona/IT (riccardo.manfredi@univr.it)*

Pancreatic neoplasms have a very different prognosis and treatment. In order to illustrate the experiences of a multidisciplinary group at the University of Verona, the participants (surgeon, pathologist and radiologist) will discuss some of the issues that are critical in the diagnosis, differential diagnosis and management of pancreatic cancer patients.

Session Objectives:

1. To understand the role of a multidisciplinary approach.
2. To learn about the goal of each medical specialty in pancreatic tumours.

A-024 16:05

What the surgeon needs to know

C. Bassi; *Verona/IT (claudio.bassi@univr.it)*

The third issue that will be collegially discussed is as to whether there are any liver metastases. The surgeon will illustrate that the presence of liver metastases will contraindicate surgical treatment, especially depicting small liver metastases may avoid unnecessary laparotomies that are always associated with a different level of morbidity and mortality. The pathologist will show us the criteria to diagnose a liver metastases and the importance of histological subtyping (i.e. adenocarcinoma vs. endocrine neoplasm).The radiologist will illustrate the sensitivity of different imaging modalities in detecting liver metastases and the improvement in sensitivity after the administration of liver-specific contrast agents. Furthermore, the diagnostic imaging criteria for the differential diagnosis of focal liver lesions will be illustrated. The fourth issue that will be collegially discussed is whether there are there positive lymph nodes. The surgeon will illustrate that the lymph nodes are a marginal surgical problem. The pathologist will illustrate the lymph nodes more frequently involved in pancreatic cancer and the criteria for a pathological diagnosis. The radiologist will illustrate the strength and especially the limitation in characterising lymph nodes. The fifth issue that will be collegially discussed is whether the tumor is locally advanced. The surgeon will illustrate the criteria that may contraindicate the surgical procedure, namely which are the vessel of interest in planning a surgical procedure that a radiologist should take care of. The pathologist will illustrate the criteria for vessel wall infiltration and the pattern of peri-vessel infiltration. The radiologist will illustrate which are the diagnostic imaging criteria to define vessel wall infiltration and their relative accuracies.

Learning Objectives:
1. To understand the criteria for resectable and non-resectable pancreatic adenocarcinoma.
2. To learn about treatment planning of neuroendocrine tumours.
3. To be aware of surgical indications in cystic pancreatic tumours.

A-025 16:25

Complete or incomplete resection: the added value of the pathologist

G. Zamboni; *Verona/IT (giuseppe.zamboni@sacrocuore.it)*

Although all pancreatic neoplasia, including ductal carcinoma (PDC), may clinically appear as a cystic lesion due to degenerative changes in a solid tumour, the most typical cystic neoplasms of the pancreas are cysts lined by different epithelium. The cystic neoplasms are classified into benign, borderline and malignant. Non-neoplastic mimickers of PDC mostly fall into the category of inflammatory and fibrotic conditions correlated in various ways with chronic pancreatitis and autoimmune pancreatitis. PDC must be differentiated from other malignancies such as acinar or endocrine carcinomas. It is essential to identify mucinous-cystic tumours and intraductal-papillary tumours because of their incomparably better prognosis. The 'cystic' variant of ductal adenocarcinoma, due either to degeneration changes or to ectatic changes of the duct system, can mimic the former two neoplasms. The ideal diagnostic test for liver metastasis should be the tissue diagnosis with a trucut biopsy, since the tissue can be also used for ancillary studies. The pathological criteria and the importance of histological subtyping will be presented. The surgically removed lymph nodes are classified and numbered according to their topography, considering that part of them are dissected with a radical pancreaticoduodenectomy and others are dissected by the surgeon and submitted separately. Because the most frequent site of local recurrence of PDCA involves the retroperitoneal posterior bed of the pancreas, the most important tissue to study is the peripancreatic fibrous and adipose tissue that runs behind the head of the pancreas and dorsally and laterally to the superior mesenteric artery.

Learning Objectives:
1. To understand the pathologic features of different pancreatic neoplasms.
2. To learn about distinct histo-pathologic findings that enable tumour characterisation.
3. To be aware of histo-pathologic findings that show prognostic relevance.

A-026 16:45

Imaging of pancreatic tumours

R. Manfredi; *Verona/IT (riccardo.manfredi@univr.it)*

The first issue that we will discuss as a group is whether it is a solid or a cystic lesion of the pancreas that we are dealing with. In this topic the surgeon will underline the importance in this differential diagnosis, since a solid lesion must be resected, if possible, where some cystic lesion could be followed up. In this settings, the pathologist will illustrate us the different pathological patterns of pancreatic neoplasms, cystic and solid, their immunohistochemistry and the possible progression from benign to malignant pancreatic tumour. According to the different pathological patterns, the radiologist will illustrate the appearance on the different pancreatic tumours on the different diagnostic imaging modalities. The second issue that we will collegially discuss is whether we are sure that it is a neoplasm. The surgeon will illustrate the different surgical procedures that he/she is able to perform and the relative indication and the different questions that each procedure need to be answered by the pathologist and the radiologist. The pathologist will show the different pathological patterns that are useful for the differential diagnosis among different pancreatic tumours and especially the criteria useful for the differential diagnosis with tumour-like conditions that do not require surgery but medical therapy instead. The radiologist will illustrate the diagnostic imaging signs that are helpful to make a differential diagnosis in patients with a mass in the pancreas.

Learning Objectives:
1. To know the diagnostic imaging findings in different pancreatic neoplasms.
2. To learn about the role of imaging in surgical planning.
3. To be familiar with the strengths and weaknesses of imaging in patient management.

A-027 17:05

Case presentation and discussion

R. Manfredi; *Verona/IT (riccardo.manfredi@univr.it)*

The session is aimed to have the experts guide the general radiologists, present in the Auditorium, in the interpretation of a case in which they are well-known experts and to show the tricks and the sign to narrow down the differential diagnosis and to achieve the correct diagnosis.

16:00 – 17:30 Room F1

Organs from A to Z: Lung

MC 322

Technical and anatomical fundamentals for imaging the lung

Moderator:
F. Molinari; Rome/IT

A-028 16:00

A. Examination protocols for imaging the lung: CT and MRI

C.M. Schaefer-Prokop; *Amersfoort/NL (cornelia.schaeferprokop@gmail.com)*

CT remains the primary cross-sectional imaging modality in the chest. Recently, however, MR has established itself as an alternative, even for lung imaging, whenever radiation dose is a limiting factor. Multidetector CT with at least 16 detector rows is the prerequisite for consistently good image quality: isotropic data acquisition with < 1 mm sections is possible within scan times of less than 10 seconds, thus allowing for breath-hold imaging even in dyspnoeic patients. Only in extremely dyspnoeic individuals is continuous shallow breathing to be advised. Due to the isotropic resolution, every chest CT can now provide HRCT information. Coronary (and sagittal) MPR should be part of the routine protocol. MIP and mIP can be added for analysis of nodular parenchymal disease, peripheral vessels and the airways. This course will briefly discuss current issues of contrast injection, including timing, Valsalva manoeuvres, pregnancy, ECG synchronisation and "triple rule-out" protocols. Imaging of the lung parenchyma alone requires less dosage than imaging of the mediastinal soft tissues. Low-dose techniques are especially helpful for imaging of infection, cystic fibrosis or follow-up of pulmonary nodules. Low-kV techniques should become standard for contrast-enhanced scans. The effective doses range from 1-2mSv for a low-dose protocol to 4-8 mSv for a standard chest CT. Further dose reduction can be expected with iterative reconstruction techniques. The most suitable MR techniques for imaging of the lungs, mediastinum and chest wall will be described, with special emphasis on issues like susceptibility artefacts and breathing.

Learning Objectives:
1. To understand the technical and clinical basis for appropriate protocol planning of thoracic CT and MRI examinations.
2. To learn the characteristics of diagnostically meaningful examination protocols.
3. To become familiar with the tips and tricks for appropriate contrast material administration.

A-029 16:25

B. Radiation dose in lung imaging: issues and practical solutions

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

The most frequent imaging techniques of the chest are projection radiographs (CXR) and Computed Tomography (CT). Trends in their respective use show decrease in CRX and constant increase in CT, addressing the problem of the corresponding collective radiation dose to the populations. For an average patient, the range of radiation dose is of 0.02-0.3 mSv for CXR and of 1-10 mSv for CT. For both techniques, recent technical advances have the potential to minimise these doses. In CT, optimisation of acquisition and reconstruction parameters is able to lower the radiation dose to 0.5-1 mSv for volumetric acquisitions and down to 0.2 mSv for sequential acquisitions. There is no doubt that in the near future, chest CT will be obtained at the dose of CRX, solving at least in part the challenge of radiation for chest examinations. This presentation aims to review theses evolutions and challenges.

Learning Objectives:
1. To become familiar with the clinical, technical, and epidemiological challenges of radiation delivery and dose reduction specific to lung imaging.
2. To understand the technical methods currently available for reducing dose when imaging the lung.
3. To become familiar with tailored approaches to lung imaging according to the ALARA (as low as reasonably achievable) principle.

A-030 16:50

C. Anatomy: the hinterland of normal on HRCT

S.J. Copley; *London/UK (suecopley@hotmail.com)*

The recognition of pathological disease versus physiological normal variants is crucial in radiological diagnosis. There are several HRCT features (including ground glass opacity, air trapping and reticular pattern) which have been recognised in asymptomatic healthy subjects. The appearances in normal older individuals (such as large airway abnormalities, a subpleural reticular pattern and cysts) will be highlighted.

Learning Objectives:
1. To become familiar with the particular HRCT findings that occupy the gray area between unequivocal health and definite disease.
2. To become familiar with these findings, with a particular focus on the effects of cigarette smoking and ageing.
3. To understand the dilemma between the increased sensitivity of HRCT to detect preclinical disease and the potential risk of overdiagnosis.

Discussion 17:15

16:00 – 17:30 **Room F2**

Breast

RC 302
Functional imaging of the breast

Moderator:
K. Pinker; Vienna/AT

A-031 16:00

A. Contrast-enhanced mammography

C.S. Balleyguier, S. Canale, M.-C. Mathieu, C. Dromain; *Villejuif/FR (balleyguier@igr.fr)*

Contrast-Enhanced Mammography (CEM) is a new imaging technique combining Digital Mammography and injection of iodinated contrast. Mammography images are acquired at two (high and low) energy levels. Based on different attenuation characteristics between iodine and soft tissue, parametric images showing enhancement are reconstructed. There is some mandatory hardware adaptation, for instance adding a copper filter and a dedicated software is required. However, interpretation of images is based on morphological criteria. Two sets of images are acquired (CC and MLO). Obtained images compete with subtraction images obtained after dynamic contrast-enhanced MRI. Radiation dose is 1.2 that of a normal Digital Mammogram. Indications for CEM are quite similar to that of MRI. CEM significantly improves characterisation of breast lesions as compared with mammography. For breast cancer staging, as compared with MRI, CME carries a slightly lower sensitivity, but conversely a better specificity, cutting down the number of false positives. Some false negatives were observed in case of Infiltrative Lobular carcinoma and DCIS. CEM might become a very practical, cost-saving, alternative to Breast MRI in specific clinical situations.

Learning Objectives:
1. To learn the underlying physical principles of CEM.
2. To understand the different protocols that have been proposed.
3. To appreciate the potential impact of CEM on everyday clinical practice.

A-032 16:30

B. Ultrasound elastography

A. Athanasiou; *Paris/FR (alex_athanasiou@hotmail.com)*

Breast clinical examination provides information of tissue elasticity Young modulus $E = \sigma / \varepsilon$, where σ is the compression (stress) and ε is the deformation (strain) of the tissue. Cancers tend to be stiffer than benign lesions. Breast ultrasound elastography provides a mapping of lesion stiffness, independent of its morphologic features, displayed in real-time as a color overlay of the lesion and surrounding tissue. Two techniques are available: 1. Strain imaging, where an external compression is gradually applied to the lesion by means of the ultrasound probe, thus deforming the lesion. Results are qualitative or semi-quantitative. 2. Shear wave imaging (no external compression applied) where the ultrasound system induces mechanical vibration by using shear wave imaging. Quantitative values of Young modulus are provided. Combining elastography with B-mode can improve specificity and accuracy for BIRADS four lesions and potentially reduce breast biopsy rates. For BIRADS 3 lesions, elastography can help identifying complicated cysts and reduce FNA rates. It can also indicate a biopsy instead of follow-up in case of BIRADS 3 lesions with suspicious elastography findings. Elastography can improve delimitation of iso-echoic lesions such as infiltrating lobular carcinomas. Further applications include lymph node characterisation and monitoring neoadjuvant treatment. 3D elastography is actually in progress.

Learning Objectives:
1. To understand the basic principles of elastography.
2. To learn about the difference between strain and shear wave US elastography and their respective results.
3. To appreciate the additional value of US elastography to B-mode US.

A-033 17:00

C. MRI diffusion, perfusion and spectroscopy

P.A.T. Baltzer, M. Dietzel, W.A. Kaiser;
Jena/DE (pascal.baltzer@med.uni-jena.de)

Dynamic contrast-enhanced MR-mammography is the most sensitive method for detection of breast cancer. Diagnostic results using this technique may vary due to reader experience as image interpretation is to some degree a subjective task. In the past years, further, more or less quantitative MRI techniques have been investigated. While pharmacokinetic modelling of high temporal resolution dynamic contrast-enhanced imaging (perfusion imaging) promises further, quantitative insights into the pathological characteristics of neoplastic vasculature, diffusion-weighted imaging (DWI) and MR-spectroscopy (MRS) are based on entirely different concepts. While MRS is a molecular imaging technique able to quantify biochemical tissue properties, DWI is influenced by microstructural tissue changes. This talk aims to outline the concepts of perfusion, DWI and MRS, provide knowledge to implement these techniques into clinical practice and critically discusses the possible diagnostic benefit of doing so.

Learning Objectives:
1. To understand the diagnostic value of diffusion weighted imaging (DWI) in its present clinical applications.
2. To learn about the technical basics and potential uses of MRI perfusion in the breast.
3. To understand the promise and challenges of MR spectroscopy in clinical practice.

16:00 – 17:30 **Room G/H**

Genitourinary

RC 307
Imaging the female pelvis

Moderator:
M. Secil; Izmir/TR

A-034 16:00

A. Imaging for pelvic pain in pregnancy

G. Masselli; *Rome/IT (gabrielemasselli@libero.it)*

Acute pelvic pain in pregnant women may be the manifestation of various gynaecological and non-gynaecological conditions. The correct diagnosis of the causes of acute pain during pregnancy is critical to minimise maternal-foetal morbidity and mortality. Although ultrasound (US) is the primary imaging investigation in the diagnostic evaluation of the pregnant patient, the role of magnetic resonance (MR) imaging in the evaluation of foetal and maternal diseases in pregnant patients continues to expand. MR imaging offers different potential advantages in comparison with US for evaluating acute abdominal and pelvic pain; these include multiplanar imaging capabilities, a higher soft tissue contrast and the ability to detect and distinguish blood from other fluid collections. When US is equivocal or nondiagnostic, MR imaging is a valuable complement to determine the exact aetiology of acute abdominal pain. The intrinsic safety and the accuracy of MRI in diagnosing abdominal and pelvic diseases make it an excellent choice for triage of pregnant patients with acute pelvic pain. MRI provides important information that influences the appropriate management and it is important for the radiologists to recognise the MR findings of the common causes of acute abdominal and pelvic pain. This lecture will discuss the use of MR imaging for maternal diseases that cause acute pelvic pain during pregnancy. Moreover, this lecture will discuss the different MR imaging techniques to use, and will show how to detect and to differentiate the gynaecological and non-gynaecological causes of acute pelvic pain during pregnancy.

Learning Objectives:
1. To become familiar with the most common causes of pelvic pain in pregnancy.
2. To understand how to diagnose non-gynaecological causes of pain in pregnancy.

A-035 16:30

B. Imaging gynaecological emergencies

A.G. Rockall; *London/UK (andrea.rockall@bartsandthelondon.nhs.uk)*

In this lecture, the role of imaging in the evaluation of gynaecological emergencies will be presented. A combined approach using both clinical findings and imaging features is necessary. Accurate evaluation is important as failure to make a diagnosis may lead to serious consequences. Presenting symptoms, such as pelvic pain or vaginal bleeding or discharge, may overlap with pregnancy-related emergencies and with non-gynaecological abdominal emergencies. The range of conditions to be considered includes ovarian cyst emergencies (cyst rupture, haemorrhage or torsion), infective conditions (Bartholins' or vulval abcess, pelvic inflammatory disease or tubo-ovarian abcess) and acute bleeding (from inflammation, neoplasm, or trauma). Pain may be related to the menstrual cycle, as in endometriosis or ruptured corpus luteum, or may be unrelated, such as in fibroid or ovarian torsion or pelvic inflammatory disease. The imaging features of these acute abnormalities will be reviewed and discussed in the context of the differential diagnoses.

Learning Objectives:

1. To recognise the causes of common gynaecological emergencies.
2. To understand the diagnostic imaging of common gynaecological emergencies.

A-036 17:00

C. Imaging for non-gynaecological emergencies

R.F. El Sayed; *Cairo/EG (rania729@hotmail.com)*

Acute pelvic pain in women is a routine situation in an emergency unit. It can be secondary to a variety of disorders. Clinical setting often indicates an obstetric or gynaecological origin of acute pelvic pain, but sometimes it is not easy to distinguish if the primary cause is related to genitourinary system or gastrointestinal tract or to other unusual conditions. Diagnostic imaging can be very valuable in this situation. Ultrasonography is usually the first choice imaging modality for diagnosis of acute pelvic pain- and, for the most part, the only one needed for the diagnosis. MRI is the preferred technique in young women, also in pregnancy in second or third trimester. CT is more valuable for assessing non-gynaecological disorders or post-operative infections. The radiologist should know how to investigate the patient with regards to history and clinical findings as certain contexts can encourage specific diagnoses. The purpose of this lecture is to highlight the contribution of different imaging modalities in emergency radiology as a useful diagnostic tool in management of acute female pelvic disease of non-gynaecological origin and to describe key radiologic signs to improve differential diagnosis.

Learning Objectives:

1. To become familiar with the causes and diagnostic findings of common non-gynaecological emergencies.
2. To know how to investigate patients with reference to history and clinical findings.
3. To learn how to approach pelvic pain using multimodality imaging techniques in different clinical contexts.

16:00 – 17:30 **Room I/K**

Cardiac

RC 303

Cardiac imaging: the cutting edge

Moderator:
J. Vymazal; Prague/CZ

A-037 16:00

A. Cardiac MRI: high fields vs 1.5 T

B.J. Wintersperger; *Toronto, ON/CA (Bernd.Wintersperger@uhn.on.ca)*

High-field scanning is more commonly used in cardiac MRI. Pushed by physical principles, B0 increase results in a proportional increase in SNR theoretically being as high as 100% when doubling from 1.5 to 3 T. B0 changes also come along with changes of tissue properties, increase of RF energy deposit and imaging artefacts potentially related to changes in resonance frequency/wavelength. The latter may partly be addressed by proper sequence and hardware design but may also necessitate specific coil design. Off-resonance artefacts in SSFP techniques may be addressed by advanced shimming techniques and frequency adjustments while SAR limitations often result in lower flip angles and therefore may have impact on CNR. R1 value changes of applied Gd-compounds also may affect protocol planning. Remaining SNR/CNR gains provide unique opportunity for higher spatial resolution or faster imaging but balancing competing constraints is most important. Parallel imaging with acquisitions with acceleration factors of 2- to 4-fold acceleration for 2D and potentially even higher for 3D applications facilitates faster data sampling. In some aspects 3 T starts only to overcome SNR limits at 1.5 T (e.g. myocardial perfusion). Users though have to be aware of potential limitations like artefacts, noise inhomogeneity or even severe image degradation with inappropriate use. Further efforts for even higher data undersampling are underway likely leading to substantial further speed up of acquisitions. From a clinical workflow perspective 3 T cardiac MRI is not limited in the clinical environment except from general contraindications. Advantages, developments and tricks for HQ cardiac MR at 3 T will be discussed.

Learning Objectives:

1. To learn about the latest technical developments in high-field cardiac MRI.
2. To know about results of clinical application of high-field cardiac MRI.
3. To become familiar with potential advantages and drawbacks of high-field cardiac MRI.

A-038 16:30

B. Cardiac CT: tubes, rows and what else?

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

In recent years, technical advances and improvements in cardiac computed tomography (CT) have provoked increasing interest in the potential clinical role of this technique in the non-invasive work-up of patients with various cardiac diseases – most importantly in patients with suspected coronary artery disease (CAD) – and have initiated discussions on correct patient selection for this emerging imaging technology. A huge number of publications have abounded evaluating the diagnostic performance of CT coronary angiography in detecting significant coronary artery disease. With continuous development in CT system generations, the diagnostic accuracy increased steadily. During the first years of cardiac CT, technical improvements focused on the increase of detector rows, enabling faster scans with less contrast agent volume and improved robustness of the technique. In recent years, with the introduction of wide detectors with 256 or even 320 detector rows, as well as with the advent of Dual-Source CT scanners, scanning of the heart within one or two heart beats became feasible, as well as new options such as dual energy imaging of the heart or highly radiation dose-efficient protocols, e.g. applying high-pitch scanning protocols. These options can broaden the clinical applications of cardiac CT, such as the depiction of myocardial changes, e.g. myocardial infarctions or perfusion defects, or – due to scanning options with less than 1mSv equivalent dose – including younger patients, even infants, e.g. with congenital heart disease.

Learning Objectives:

1. To learn about the latest technical developments in cardiac CT.
2. To understand how the technical characteristics of CT scanners influence results of cardiac CTA.
3. To know about the optimal combination of scanning parameters to get the most out of CT scanners in cardiac examinations.

A-039 17:00

C. Cardiac hybrid imaging

P.A. Kaufmann; *Zurich/CH*

Recent data using SPECT and CT suggest that hybrid imaging provides added diagnostic clinical value beyond that of either technique alone or that of side-by-side analysis. The value of non-invasive hybrid imaging lies far beyond the simple addition of a further diagnostic test as it allows accurate spatial association of perfusion defects to their subtending coronary stenoses providing key information for evidence-driven intervention targeting relevant lesion only. While a negative coronary computerised tomography angiography (CCTA) has high negative predictive value to rule out relevant coronary artery disease (CAD), an abnormal CCTA – like an abnormal conventional angiography study – is a poor predictor of ischaemia, and further perfusion imaging testing is mandatory for decision-making towards revascularisation. Conversely, a normal MPI result does not exclude the presence of subclinical CAD requiring risk modification. The incongruence of CCTA and MPI is inherent to the duality of morphologic versus functional testing. However, no matter how accurate CCTA will possibly get with future advances in technology, the two pieces of information obtained with MPI versus morphology are difficult to compare, as they are complementary. Hybrid images offer superior diagnostic information with regard to identification of the culprit vessel with the haemodynamic relevant lesion providing added diagnostic information not obtained on side-by-side analysis. However, it remains uncertain at this point whether hybrid scanners offer advantages over software fusion of data sets obtained from different scanners, as by either way one can obtain hybrid images.

Learning Objectives:
1. To understand the principles of cardiac hybrid imaging.
2. To learn about the added diagnostic value of hybrid imaging.
3. To know about possible indications for performing hybrid imaging.

16:00 – 17:30 **Room L/M**

Professional Challenges Session

PC 3
Diagnosis of inflammatory conditions

A-040 16:00
Chairmen's introduction
P. Bourguet[1], A. Palkó[2]; [1]*Rennes/FR*, [2]*Szeged/HU*

The session is aimed at clarifying the role of radiological imaging diagnostics and the contribution of nuclear medicine methods in the diagnosis and differential diagnosis of inflammatory conditions. Obviously the number of these conditions is endless, therefore we decided to focus on two areas where both specialties contribute to the evaluation of the clinical situation: vascular graft infections and inflammation and inflammatory bowel diseases. Speakers from both disciplines reveal the most up-to-date information, including the role of hybrid imaging techniques in order to give a comprehensive overview of the morphological and functional diagnostic algorithm and define the most appropriate examination protocols. The panel discussion following the presentations will provide the opportunity to further deepen consensual knowledge leading to an integrated diagnostic approach to these clinically challenging conditions.

Session Objectives:
1. To understand the importance of functional and morphological imaging evaluation of inflammatory conditions in certain inflammatory conditions.
2. To evaluate the specific role and the proper diagnostic algorithm of nuclear medicine and radiological techniques.
3. To highlight potential avenues of future development for functional and morphological imaging in the diagnostics of these conditions.

A-041 16:05
Imaging inflammatory bowel disease: the nuclear medicine perspective
A. Signore; *Rome/IT (alberto.signore@uniroma1.it)*

Nuclear Medicine offers several possibilities for the imaging of inflammatory bowel diseases (IBD). Most data available in the literature concern the use of radiolabelled autologous white blood cells (WBC). With this method it is possible to evaluate with a single scan the whole body and, therefore, depict the extent of pathological gut wall infiltration by leucocytes: a sign of disease activity. The method of WBC has been criticised for its long preparation time and lack of anatomical accuracy. However, there are now available several kits for easy labelling of WBC with 99mTc and the possibility to use hybrid SPECT/CT cameras that improve accuracy and anatomical localisation of lesions. These kits can also use 18 F and 64Cu for WBC labelling, two positron-emitting isotopes, that allow PET/CT imaging with further improvement of image detail and possibility to quantify uptake in lesions for early therapy follow-up. But the availability of new SPECT and PET radiopharmaceutical for molecular imaging and for in vivo histological characterisation of lesions has recently opened a new indication for IBD that is therapy decision making. We can quantify the presence of activated T-cells or lymphokines (such as TNFa) in gut wall lesions, thus providing the clinician with important information for starting the appropriate treatment and to early assess (within weeks) the efficacy of the treatment. Since MRI and Nuclear Medicine are complementary for the study of IBD, we aim at clarifying what is the role of both methods and how to integrate them in the diagnostic flow-chart of patients. The future will probably be a single scan with PET/MRI hybrid cameras, recently available.

Learning Objectives:
1. To highlight available imaging methods, imaging techniques and diagnostic algorithms for the evaluation of inflammatory bowel lesions.
2. To learn more about the specificity of nuclear medicine techniques and their clinical role.
3. To understand the role of nuclear medicine imaging in the evaluation of disease activity and extent, therapy decision making and early therapy follow-up.

A-042 16:23
Imaging inflammatory bowel disease: the radiology perspective
F. Maccioni; *Rome/IT (francesca.maccioni@uniroma1.it)*

Inflammatory Bowel Disease refers both to Crohn's disease (CD) and Ulcerative colitis (UC). The main feature is a chronic, uncontrolled inflammation of the intestinal wall, which affects different segments of the small and large bowel in CD, and predominantly the colon in UC. Cross-sectional imaging plays a central role in the diagnosis and characterisation of these diseases, mainly CD. High-Resolution US (HRUS), with color Doppler or specific intravenous contrast agents (Contrast-Enhanced-US), allows a detailed morphological evaluation of the affected bowel wall and the assessment of disease activity. Major limits include strong operator-dependence and lack of panoramicity. The introduction of multi-detector technology has significantly increased the diagnostic capabilities of CT. Nowadays, CT Enterography or Enteroclysis provides an accurate morphological assessment of CD, comparable to conventional enteroclysis, with the added possibility of evaluating mural and mesenteric changes and vascularity. The major drawback is the relevant radiation dose that allows only an occasional clinical use. MRI links the major advantages of both US and CT, being a radiation-free modality with multiplanar capability, wide field-of-view and high tissue contrast. MR Enterography or Enteroclysis has shown high accuracy in evaluating the morphological changes and complications of CD. Different imaging parameters, T1 and T2-weighted, allow bowel wall characterisation and assessment of disease activity. MRI limits include technology dependence, low availability and complexity of imaging parameters. The main findings of CD and UC will be shown at US, CT and MRI; differential signs between CD and UC will be described. Diagnostic algorithms will be discussed.

Learning Objectives:
1. To highlight available imaging methods, imaging techniques and diagnostic algorithms for the evaluation of inflammatory bowel lesions.
2. To learn more about the specific imaging symptoms related to inflammatory bowel disease.
3. To understand the role of radiological imaging in the differential diagnosis and classification of different inflammatory bowel conditions.

A-043 16:41
Vascular graft infections and inflammation: the nuclear medicine perspective
O. Israel; *Haifa/IL (o_israel@rambam.health.gov.il)*

Vascular grafts replace occluded vessels to maintain patency. Although rare (1-6%), graft infections are severe surgical complications, with poor prognosis. Optimal treatment of infected grafts is surgical removal. The challenging question affecting management is whether the graft or only adjacent soft tissue wound is infected. False positives lead to unnecessary surgery while false negatives are associated with high morbidity. SPECT and PET radiopharmaceuticals are used for diagnosis of vascular graft infection. Labelled leucocytes (Tc-99m, In-111) are SPECT agents of choice, accumulate by diapedesis, chemotaxis and vascular permeability. False-negative studies are related to antibiotherapy or duration of symptoms, and false positives occur with lymphocelle, haematoma, thrombosis, and physiologic uptake in recent grafts. FDG, the main PET tracer, is taken up by infections with high cellular metabolism. Advantages of PET over SPECT imaging include lower background activity, shorter duration of studies and no handling of blood of potentially infected patients. False positives due to increased uptake in native vessels, early grafts or healing scars can be differentiated by pattern and intensity of uptake. Size and proximity of structures and positional changes can lead to inaccurate localisation of tracer-avid foci and faulty diagnosis. Combining anatomic CT landmarks with functional SPECT changes or increased metabolism on PET decrease the false-positive rate. Uptake foci are accurately localised to graft or soft tissues improving specificity and diagnostic accuracy. SPECT/CT provided accurate data for diagnosis and localisation in 67% of patients and accuracy of FDG-PET/CT was above 95% for diagnosis of vascular graft infection.

Learning Objectives:
1. To understand the potential value of nuclear medicine procedures in suspected vascular graft infection.
2. To understand the specific incremental role of hybrid imaging in suspected vascular graft infection.
3. To recognise patterns of true and false positive findings in infected vascular grafts and to know the referral criteria for the best utilisation of hybrid imaging in vascular graft infection.

A-044 16:59

Vascular graft infections and inflammation: the radiology perspective

A. Romero Jaramillo; *Barcelona/ES*

Vascular graft infection (VGI) is a serious complication, prognosis and treatment depend on early diagnosis. Current imaging methods have different applications and value in VGI. Plain film does not have a major role for diagnosis of VGI. It is suspected when perigraft gas is present. Ultrasound (US) is used for basic diagnostic due to availability, costs and rapid use. Evaluates graft morphology, anastomosis, native vessels, surrounding tissues and fluid collections. DopplerUS determines flow disturbances. Computed Tomography (CT) is currently the choice imaging method. Examines all anatomic regions. Grafts are visualised to full extension. Detects perigraft fluid, perigraft soft-tissue attenuation, ectopic gas and pseudoaneurysms. In low-grade infection, sensitivity decreases as morphological changes are difficult to distinguish from postoperatory changes. CT examines vascular and perivascular masses, ectopic gas and fluid collections, native adjacent arteries, arterial grafts and their lumen, venous system and other pathologies that can explain graft infection. CT detects aortoenteric fistulas, can distinguish between enteric loops and interenteric abscess and bleeding after graft infection. Provides image guidance for aspiration of fluid collections and percutaneous drainage placement. Magnetic Resonance Imaging (MRI) has proven accuracy in diagnosis of aortic VGI. Some disadvantages compared with CT are higher costs, less availability and more time spending procedure. It Is superior to CT for detection of perivascular inflammatory changes and small amounts of periprosthetic fluid MRI evaluation. Angiography has limited value for VGI diagnosis but is used for complications of VGI as pseudoaneurysms, rupture or graft thrombosis in order to perform endovascular treatment.

Learning Objectives:
1. To understand the importance and role of radiological imaging in the detection, evaluation and therapy planning of vascular graft infections and inflammations.
2. To know more about available imaging methods, imaging techniques and diagnostic algorithms for the evaluation of vascular graft complications.
3. To learn more about the specific imaging symptoms and differential diagnostic considerations in vascular graft infections and inflammation.

Panel discussion:
What is seen in the crystal ball: the future role of nuclear medicine and radiology in the evaluation of inflammatory conditions 17:17

16:00 – 17:30 **Room N/O**

Interventional Radiology

RC 309

The trauma patient

A-045 16:00

Chairman's introduction

A. Watkinson[1], D.O. Kessel[2]; [1]*Exeter/UK,* [2]*Leeds/UK*

The management of trauma in a modern hospital setting has changed significantly with increased access to fast, modern dynamic imaging and the increasing array and availability of interventional techniques to treat vascular and solid organ injury. The key to successful outcome and saving lives is speed of diagnosis and access to best treatments with high-quality clinical care throughout. This workshop focuses on how to effectively deliver this care and will end with a discussion focusing on whether in order to achieve this IR techniques should be available in an ER department.

A-046 16:05

A. Imaging modalities and logistics

D.O. Kessel; *Leeds/UK (David.Kessel@leedsth.nhs.uk)*

Immediate care focuses on treatment of life-threatening injuries. The advent of fast multislice CT scanners has revolutionised how these injuries should be diagnosed. Some patients are so unstable that they require immediate surgery to control haemorrhage. In this group anything which delays imaging is inappropriate. All other severely injured patients and those with appropriate mechanisms of injury should have a trauma protocol CT. In a well-integrated service all but the most unstable patients can be scanned with a total body scan taking less than 10 minutes to acquire. The patient can be resuscitated throughout. A trauma CT scan covering brain, spine, thorax, abdomen and pelvis extending to mid thigh replaces the majority of other imaging studies. Imaging of the appendicular skeleton is not an immediate priority and can wait until life-threatening injuries have been treated. What is becoming universally accepted is that early CT scanning allows rapid diagnosis of major injuries in all body areas and it seems likely that this influences outcome. The information allows damage control treatment to be targeted to the most severe injuries and also allows management strategy to be decided. Key signs for interventional radiologists to recognise are the presence of blood/haematoma in the chest abdomen and pelvis; sentinel clot indicating the likely site of bleed; active contrast extravasation from vessels/solid organs; acute aortic injury/transection. Optimal care requires diagnostic and interventional radiology to be integrated into trauma teams and to be able to react in a timely fashion 24 hours a day.

Learning Objectives:
1. To understand the appropriate triage of trauma patients to imaging.
2. To learn about the most appropriate imaging techniques.
3. To be familiar with imaging findings.

A-047 16:28

B. Management of arterial trauma

J. Urbano; *Madrid/ES (jurbano@fjd.es)*

The arterial trauma occurs in different scenarios such as politrauma, stab and gunshot wounds and iatrogenic. Surgical vessels ligation was the common method of bleeding control in World War II with an amputation rate of 50%. Surgical vessels reconstruction is currently considered the first option; however, this is no longer necessary in many cases. There are different mechanisms of arterial injury ranging between intimal flap and spasm to AV fistula and complete transection with or without arterial destruction. The amount and speed of bleeding after arterial trauma are the main factors to decide if an invasive treatment is necessary and when and how to treat it. Embolisation is a smarter, less invasive and safer method of ligation with similar results than surgery in terms of bleeding control. Vessel reconstruction is now also possible with endovascular devices. In general we will choose embolisation for small and peripheral arteries and vessel reconstruction with stent grafts for injuries in central and large arteries. In pseudoaneurysm and AV fistula there is no active bleeding and endovascular treatment can be done either by embolisation or stent graft. Coils are widespread as embolisation material but sometimes do not achieve a complete bleeding control mainly if patients suffer coagulopathy. Liquid embolics like cyanoacrylate and onix are less used but have some advantages over the coils. Many aortic injuries can be treated with stent graft and with less morbidity and mortality than surgery. The follow-up is mainly clinic with Doppler ultrasound and CTA as ancillary tools.

Learning Objectives:
1. To understand potential treatment options and when to treat and when not to treat.
2. To be familiar with different embolisations and other treatments.
3. To learn about the results and appropriate follow-up strategies.

A-048 16:51

C. Solid organ trauma

L. Lonn; *Copenhagen/DK (lonn.lars@gmail.com)*

Trauma is a serious global health problem, accounting for approximately one in ten deaths worldwide. Injuries of CNS and great vessels are responsible for death at the site of accident while visceral haemorrhage is the principal cause of mortality during the first following hours after a trauma. The role of the interventional radiologist (IR) has changed dramatically during the past decades. It is now possible to temporise or definitively treat polytrauma with endovascular techniques. Imaging in the evaluation of patients with blunt abdominal trauma is fundamental in order to "Control the Uncontrollable bleedings" which is the main role of interventional radiology in damage control. Based on the spectrum of injury, interventional techniques are a solid alternative not only in spleen, liver, kidneys, pancreas and adrenal injuries, but also in pelvic fractures. Patient selection for treatment and follow-up is mainly governed by vascular imaging focused on MDCT, especially 3-D CT reconstructions. CT is a good predictor of the need for endovascular management or conservative treatment, based on key findings. Key images that may alter management will be discussed. The role of IR depends on local practice and carries broad applications where getting the patient to IR-angiosuite/hybrid-room is the first challenge. Finally, IR can control most haemorrhages and this is done in a multidisciplinary approach with proactive management to reduce haemorrhage and allow appropriate surgery. Various angiographic techniques have the potential of definite treatment even in case of marginal haemodynamic instability.

Learning Objectives:
1. To know about the causes and the imaging appearances of solid organ trauma.
2. To understand various methods of IR treatment.
3. To learn about the results and appropriate follow-up strategies.

Panel discussion:
Do we need IR in the ER? 17:14

16:00 – 17:30 **Room P**

Vascular

RC 315

How I report

Moderator:
C. Loewe; Vienna/AT

A-049 16:00

A. CTA and MRA of supra-aortic arteries

J.H. Gillard; *Cambridge/UK (jhg21@cam.ac.uk)*

There have been considerable advances in the imaging tools available for imaging the supra aortic vessels, specifically the carotid arteries. Developments ranging from rotational DSA (allowing for accurate delineation of vascular disease) to improvements in CTA and MRA (particularly Gadolinium enhanced studies) have greatly improved our diagnostic armamentarium. In addition there is increased understanding that atheromatous disease localised to the carotid bifurcation is only part of the problem with cerebrovascular disease. Increased coverage of the arch and intracranial circulation are becoming increasingly important requiring greater spatial coverage. In the future imaging of the wall components may become important. For the moment, however, management remains dependent on the accurate assessment of luminal stenosis. The greatest evidence suggests that contrast-enhanced MRA is the investigation of choice. However, CTA is extremely popular especially with clinicians, particularly as it allows algorithms for including or excluding calcification. There is a lesser evidence base, although the relentless progress of technology such as dual beam techniques makes it difficult to provide timely evidence. There are pros and cons for all methodologies, which will be addressed.

Learning Objectives:

1. To learn about structured reporting in angiographic studies of supra-aortic arteries.
2. To understand the role of post-processing techniques and quantitative analysis of arterial stenosis.
3. To be able to answer specific clinical questions in supra-aortic arterial occlusive diseases.

A-050 16:30

B. CTA and MRA of thoracic and abdominal aorta

H.J. Michaely; *Mannheim/DE (henrik.michaely@umm.de)*

This presentation focuses on technical backgrounds and requirements for successful acquisiton of angiographic MR and CT data to a minor extent. Apart from conventional techniques also functional imaging approaches for quantifying disease severity will be presented such as MR-flow measurements and time-resolved phase-contrast MRA. The main focus of this presentation is the display of typical disease entities that can be encountered in the thoracic and abdominal aorta. The topics covered will include atherosclerosis, congenital vessel diseases and inflammatory vessel diseases such as Takaysu's diseaes or pseudoaneursyms. Special emphasis will be put on the implications for therapy that can be deducted from the MRA and CTA data. Finally, MRA and CTA will be compared with regard to their diagnostic capabilities and their optimal applications.

Learning Objectives:

1. To learn about structured reporting of aneurysmal and obstructive diseases.
2. To learn classifications for aneurysmatic aortic diseases.
3. To understand the role of postprocessing techniques in aortic diseases.
4. To be able to answer specific clinical questions in aortic diseases.

A-051 17:00

C. CTA and MRA of peripheral arteries

T. Leiner; *Utrecht/NL (t.leiner@umcutrecht.nl)*

This part of the refresher course will focus on: 1) the role of CTA and MRA in the diagnostic and interventional pathway of patients with suspected peripheral arterial occlusive disease, i.e. indications for imaging. 2) The most commonly used imaging protocols. 3) The role of advanced postprocessing techniques to visualize relevant features. 4) How to report findings in a coherent and structured fashion for the referring clinician.

Learning Objectives:

1. To learn about structured reporting in peripheral arterial obstructive diseases.
2. To understand the importance of quantitative analysis of peripheral arterial obstructions and how to report these analyses.
3. To be able to answer specific clinical questions in peripheral arterial diseases.

16:00 – 17:30 **Room Q**

Computer Applications

RC 305

Image processing and computer-aided diagnosis (CAD)

A-052 16:00

Chairman's introduction

O. Ratib; *Geneva/CH (osman.ratib@hcuge.ch)*

The constant evolution of functional imaging techniques is leading towards an increasing demand for quantitative analysis tools and computer-assisted diagnosis (CAD). Most imaging modalities provide specific parameters that can be used for feature extraction that can assist radiologist's interpretation beyond morphological and anatomical considerations. Optimal use of this additional information requires adequate training and understanding of these new analysis and data extraction techniques. Also, additional analysis and processing tasks will significantly impact the workflow and performance of image interpretation and reporting. The goal of this special refresher course is to review some of the basic concepts of image processing and CAD and how they are applicable in clinical routine: from basic understanding of the process itself and its requirement to the impact of performing some specific analysis tasks as part of routine image interpretation. Technical specifications of clinical protocols as well as practical examples will help better understand these new tasks of diagnostic radiology.

Session Objectives:

1. To discuss what the radiologist should know about image processing and CAD.
2. To understand the intrinsic of digital image reconstruction techniques.
3. To present some basic concepts of quantitative image analysis.
4. To discuss the impact on radiological practice.

A-053 16:05

A. The link between image reconstruction and image analysis

A. Todd-Pokropek; *London/UK*

Learning Objectives:

1. To review the basics and updates on tomographic image reconstruction techniques.
2. To become familiar with some basic quantitative image analysis techniques.
3. To understand the link between quantitative analysis and CAD.
4. To learn about potential future applications of quantitative analysis in clinical practice.

A-054 16:28

B. Semantic web technologies for sharing and reuse of imaging-related information

B. Gibaud; *Rennes/FR (bernard.gibaud@univ-rennes1.fr)*

Generally, using precise semantics is fundamental to guarantee the reliability of automated data processing, as well as the consistency of information recorded in databases, and their meaningful statistical exploitation. In medicine, this issue has been addressed for many years using standard terminologies such as MeSH or SNOMED. In medical imaging, and especially in the field of Computer Assisted Detection (CAD), information semantics is defined through DICOM Structured Reports that organise relevant information in reference to terminological resources specified in the DICOM standard (DICOM Part 16). This course explains the limitations of this approach, as well as the added value that could be brought in the future by semantic web technologies and especially ontologies. This added value concerns primarily: (1) more effective decision support, thanks to the more precise definition of involved information, e.g. the quantitative markers extracted from the images, (2) enhanced possibilities regarding integration of data from various institutions, e.g. in the context of large clinical trials, or for data mining in the context of translational research and (3) enhanced possibilities in terms of database querying, thanks to the use of the knowledge embedded in referred ontologies (e.g. properties of „is-a" and „part-of" relationships). The presentation will introduce the basic ideas underlying the representation of conceptual knowledge in ontologies and illustrate their added value in the context of medical imaging and CAD. The issue of the development of ontologies and of their adoption by the medical imaging community will also be briefly discussed.

Learning Objectives:
1. To learn new concepts in distributed image management.
2. To become familiar with perspectives in translational medicine.
3. To learn about semantics of imaging data.
4. To understand new concepts of medical ontology.

A-055 16:51

C. Image processing and CAD: workflow in clinical practice

E. Neri; *Pisa/IT (emanuele.neri@med.unipi.it)*

The radiological workflow transits through advanced workstations for review and reporting, where many image processing tools are available. Radiologists should be aware about the availability of these tools and make the best use of them in the diagnostic workflow. In many cases these tools are customised for clinical problems such as cancer detection and characterisation, quantification of abdominal aortic aneurysm, etc. In other situations image processing is used occasionally. However in all cases, to make the best use of image processing, adequately trained radiologists or technicians are required, and in reality there is still a gap from availability of advanced tools to the diagnostic application. The aim of the lecture is to review the current advanced tools for image viewing and processing and describe the evidence-based clinical applications. Among image processing/analysis tools also CAD (Computer Aided Diagnosis) is nowadays available on most workstations for detection of colon, lung and breast cancer. However, even if CAD is at an advanced stage of the technical development, its definitive clinical implementation is still far from reality. In most clinical studies available in the literature it is clear that CAD improves sensitivity of readers but in the meantime produces false positives that increase the recall rate and have an impact on patient's management and healthcare costs.

Learning Objectives:
1. To understand the new concepts in image processing (3D, virtual navigation, image-guided interventions etc).
2. To review the principles of current CAD systems in the detection of lung, breast and colon cancer.
3. To learn the impact of these new processing tasks in clinical practice.
4. To understand the future role of radiologists in supporting tasks beyond image interpretation.

Panel discussion:
How do image processing and CAD impact radiological daily practice? 17:14

1. The increasing role of quantitative analysis in diagnostic tasks.
2. Rapid changes in image processing technology and workstations.
3. Role of radiologists in image post-processing and analysis.
4. Cost effectiveness and economic impact of image processing in clinical routine.

18:30 – 18:50 **Room A**

Plenary Session

OL

Presiding:
L. Bonomo; Rome/IT

A-056 18:30

Arcimboldo in the service of natural sciences

S. Ferino-Pagden; *Vienna/AT (Sylvia.Ferino@khm.at)*

Arcimboldo, a late Renaissance Lombard artist, who lived from 1526 to 1593, is best known for his composite heads, which were based on fruits, vegetables, fish and other objects from nature, depending on what they were supposed to represent: the elements, the seasons, individual personalities, allegories etc. In the 1930s, he was rediscovered by the Surrealists, who appreciated his 'surrealist' construction of a human head out of inhuman objects. Only recently, the study of the individual parts of plants, fruits and vegetables as well as mammals and fish, which took place in Arcimboldo's time, was linked to the widespread interest in the natural sciences, which became popular throughout the courts of Europe as a result of the new species brought back from the New World. The news of these unknown species revolutionised the study of plants and herbs and led to fierce competition between the ruling courts of Europe to acquire the first, the best and the most stunning kind of new natural artefact. In 1562, Arcimboldo left Milan for Vienna to become court painter to Maximilian II, who like his father, Ferdinand I, was particularly interested in medicine and the natural sciences and had made his court a major centre of scientific exchange. The renowned physician Pietro Andrea Mattioli from Siena had already worked for the court of Ferdinand I, and both of his sons, Maximilian II and Ferdinand II, and had earned fame for his commentaries on the materia medica of Dioscurides, which were published in many languages. Arcimboldo became engaged in the illustration of various species of plants and animals, which the Emperor housed in his botanical and zoological gardens, most of which were particularly rare or came from the New World. As a result of his interaction with Italian physicians at royal courts in both Vienna and Bohemia his drawings were sent to a renowned natural scientist in Bologna, Ulisse Aldrovandi. He had Arcimboldo's drawings carved into wooden blocks in order to use them as illustrations in his books on quadrupeds and birds. Thus, Arcimboldo's artistic drawings came to be used as scientific illustrations.

Friday, March 2

08:30 – 10:00 **Room A**

New Horizons Session

NH 4

Liver imaging: reality and virtuality

A-057 08:30

Chairman's introduction

C. Bartolozzi; *Pisa/IT (carlo.bartolozzi@med.unipi.it)*

As imaging modalities and computers have reached unmatched levels of precision, radiologists can now acquire very detailed information that they can use in 3D models within minutes after the examination, speeding up treatment planning. The co-called virtual imaging is proving to improve therapy outcome manifold, and its role might only increase in the future. This session will review all the progresses made from the detection and characterisation of liver disease to treatment planning. Knowing the latest advances in detecting and characterising liver disease has thus become mandatory to all radiologists, since an increasing number of molecular tools are currently being developed, and contrast media products targeting specific cells are multiplying. Biomarkers to assess liver functions or tumour activity/response have also become available. These spectacular computer science contributions to medicine will not require that the radiologist or the surgeon will eventually have to become computer experts themselves. The future will rather be based on a multidisciplinary integration which will allow surgery to be increasingly assisted by advanced imaging and computer technology.

Session Objectives:

1. To learn how to image and display the real liver.
2. To learn how to create virtual models.
3. To learn how to exploit these data in clinical practice.

A-058 08:33

Acquisition and display of liver 'reality'

L. Martí-Bonmatí; *Valencia/ES (marti_lui@gva.es)*

To develop virtual models of the liver that can serve as clinically useful imaging biomarkers, both the magnitude and the spatial distribution of the different objective measurements must be displayed. To be properly done, it is necessary to validate the relationship of the biomarkers with the reality of the organ and to check its technical and clinical usefulness. This process includes defining tests for the concepts and mechanisms; obtaining standardised and optimised anatomical, functional, and molecular images; analysing the data with computer models; displaying data appropriately; obtaining the appropriate statistic measures; and conducting tests on the principle, efficacy, and effectiveness. The development, standardisation, and optimisation of the different imaging acquisition protocols (for US, CT, MR and PET) and data analyses (physiological and biochemical computing, fusion of modalities, adequate measurements) will change some clinical research and patient care scenarios. In multimodality imaging, the need to combine morphofunctional and biological information can be approached by either acquiring images at different times (asynchronous) and fusing them through digital image manipulation techniques or simultaneously acquiring or computing images (synchronous) and merging them automatically. MR diffusion-weighted, MR and US contrast-enhanced pharmacokinetic imaging, cellular imaging, chemical quantitative imaging and PET tracers will be co-registered and merged to further increase molecular and functional imaging as a relevant medical discipline in hepatology. Multimodality imaging models will be displayed as parametric or multiparametric graphs of the liver reality associated with the DICOM Structured Reporting initiative as the standardisation of structured data and clinical observations in the liver imaging environment.

Learning Objectives:

1. To review new multimodality imaging strategies.
2. To become familiar with new contrast-enhanced studies of the liver.
3. To learn about liver biomarkers.

A-059 08:51

Postprocessing and modelling

D. Caramella; *Pisa/IT (davide.caramella@med.unipi.it)*

Imaging the liver can still be a complex exercise, starting with the difficulty of isolating this organ from surrounding structures. On the other hand, liver imaging has never been that accessible to all radiologists, as every modality can be usefully employed for diagnostic and interventional purposes. Once the imaging data have been collected during the examination, post processing can begin. Using advanced segmentation tools, every tissue may be highlighted or displayed in the background, thus providing additional information and helping to analyse liver anatomy. Virtual models can be ideally used in interventional procedures. Radiologists have to know the size and volume of the lesion to treat, as well as its precise location and relationship with the surrounding tissues. For a percutaneous approach such as radiofrequency ablation, the intervention can be planned and simulated by introducing, on screen, a "virtual" needle in the liver to reduce potential damage to the vessels and other organs when the "real" procedure will take place. These models may help not only interventional radiologists but also surgeons, who need to know the size and precise location of the lesion before operating on a patient. Laparoscopy is a typical example of how imaging can help to guide surgery. With this approach, the problem is that the field of view surgeons have is very limited because of the small size of the laparoscopic camera. A very good solution is to have a combination of both the live laparoscopic view and the preoperative or intraoperative processed images and models.

Learning Objectives:

1. To be informed about advanced presentation of imaging information.
2. To review segmentation and classification.
3. To become familiar with a model-based approach to describing liver pathology.

A-060 09:09

Planning and simulation

O. Ratib; *Geneva/CH (osman.ratib@hcuge.ch)*

Hepatic surgery requires detailed pre-operative evaluation of anatomical and structural analysis of each patient anatomical variation and topological distribution of anomalous structures and tumours. This includes a three-dimensional assessment of the liver segments based on vascular and biliary tree distribution. Furthermore, endoscopic and robotic surgeries rely on pre-operative planning and modelling of minimally invasive procedures that do not provide visual navigation that open surgery provides. Advanced image rendering and visualisation techniques are now available for surgeons to prepare their surgical interventions by extracting appropriate anatomical features from cross-section imaging techniques such as CT and MRI. These software programs that were initially expensive and only accessible to computer-savvy experts are becoming more widely accessible on personal computers and portable devices. Example of such software distributed for free under Open-Source licensing is the OsiriX software that allows 3D and 4D image manipulation and visualisation on standard personal computers. This software will be used to demonstrate the feasibility and practical usefulness of 3D rendering techniques for planning and modelling of surgical interventions. In addition to illustrating the different segmentation techniques, we will also review the different technical solutions available for accessing and manipulating three-dimensional images in the operating rooms. Different settings are applicable for different types of surgical interventions from endoscopic imaging to virtual reality rendering of images that can be used in the OR to the latest generation of "augmented-reality" techniques allowing real-time fusion of 3D rendered images with patient's physical anatomy.

Learning Objectives:

1. To learn how to provide the interventionalist and the surgeon with necessary information before the procedure.
2. To learn how to implement environments for training interventionalists and surgeons.

A-061 09:27

Intraoperative functional imaging: visualisation and navigation for liver surgery

N. Navab, T. Wendler; *Munich/DE (navab@cs.tum.edu)*

In the past decades x-ray fluoroscopy, ultrasound and endoscopic/laparoscopic imaging systems have been successfully used for intra-operative 2D and rarely 3D anatomical imaging. However, in the functional field only gamma probes were used as „1D" tools within surgical suites. In this presentation, the focus is on a novel imaging approach which allows the surgeon to acquire required functional 3D imaging information within the operating room with minimum interruption of the surgical workflow. We present the first success of this approach in terms of 3D intra-operative imaging using navigated low-energy gamma probes called freehand SPECT. We provide many examples of its successful deployment for different clinical applications based on diverse SPECT tracers. We will then discuss the possible application of similar technologies for intra-operative liver imaging. In this case, higher energy probes are needed as most liver tracers are PET tracers. We present the challenges that need to be overcome to finalise such solutions and discuss a few possible solutions. We will also demonstrate the possibility of then complementing such functional information with real-time 2D or 3D ultrasound imaging, and intra-operative 4D ultrasound-driven models of liver. In conjunction with advance

CT-US registration methods we also present such solutions could smoothly integrate pre-operative planning data. Throughout presentation, concepts and solutions are illustrated with many images and videos of phantom experiments, ex-vivo as well as patient validation. We also present a detailed study of the use of VR and AR for acquiring and analysing 3D functional images within the surgical suites.
Learning Objectives:
1. To learn how to provide the interventionalist and the surgeon with necessary information during the procedure.
2. To learn how to implement intraoperative assistance.

Panel discussion:
The ultimate challenge: virtual technology for real medicine 09:45

08:30 – 10:00 **Room B**

Interactive Teaching Session

E³ 420a
Thoracic infections: what the radiologist must report

A-062 08:30
A. Pulmonary infections
L.R. Goodman; *Milwaukee, WI/US (lgoodman@mcw.edu)*

The radiologist has three roles in the evaluation of pulmonary infection: 1) detection and description; 2) differential diagnosis; and 3) evaluation of complications. We will approach these through unknown cases and audience participation. Detection and description: In everyday practice, if the chest X-ray is negative, it is assumed, clinically, that the patient has no pneumonia. Unfortunately, this is not the case for immunocompromised patients, such as AIDS patients, bone marrow patients, etc. If there is strong clinical suspicion of pneumonia, a CT is often revealing when the chest X-ray was negative. Descriptors of pneumonia patterns are often confusing, because some descriptors are clinical, some are pathological, and many are based on early X-ray descriptions. These confusing, and often conflicting terminology issues will be addressed. Differential diagnosis: Imaging is not a substitute for microbiology. However, certain patterns are characteristic of certain types of infection and are often helpful in the initial clinical management of patients until cultures are available. The imaging appearance, combined with basic clinical information (white blood count, fever, and duration of illness) can often lead to the correct or narrowed differential diagnosis. Complications: The majority of pneumonias show imaging and clinical improvement within several days and complete resolution within four to six weeks. Deviation from this pattern suggests a complication, such as abscess, empyema, resistant organisms, a structural problem in the lung, or noninfectious diagnosis. These complications and the role of CT will be emphasised.
Learning Objective:
1. To learn how to recognise pulmonary infections in immunocompetent and immunodepressed patients.

A-063 09:15
B. Non-pulmonary chest infections
C.M. Schaefer-Prokop; *Amersfoort/NL (cornelia.schaeferprokop@gmail.com)*

Non-pulmonary infections may involve mediastinum, heart and vessels, chest wall and pleura. This course will focus on mediastinal, pleural and chest wall disease. Acute mediastinitis is a potentially life-threatening condition that is rare but requires prompt diagnosis and treatment. Spontaneous or iatrogenic esophageal rupture is the by far most common cause. Other causes include post-surgical mediastinitis and extension of infection from adjacent spaces (neck, pharynx, pleura or retroperitoneum). This course uses typical cases to discuss important differential diagnoses and the sensitivity and specificity of various radiologic findings for diagnosis of acute mediastinitis. The distinction between a parapneumonic pleural effusion and an empyema based on radiologic findings may be impossible. Features will be discussed hat suggest a “complicated” course that may requires interventional or even surgical treatment. Features that differentiate empyema from lung abscess at CT will be presented. An empyema necessitatis describes a chronic empyema that attempts to decompress through the chest wall. Underlying infectious agents include tuberculosis, actinomyces, staphylococcus and various types of fungi. It has to be differentiated from other mostly neoplastic diseases that tend to cross fascial planes such as lymphoma or Pancoast tumor.
Learning Objectives:
1. To learn about the most common conditions and infectious agents that cause non-pulmonary thoracic infections.
2. To understand the relative role of ultrasound, CT and MRI for the assessment of infections of the chest wall, pleura or mediastinum.
3. To learn imaging features helpful for the differential diagnosis of non-pulmonary chest infections.

08:30 – 10:00 **Room C**

Contrast Media

RC 406
Contrast media and tracers: always as safe as we wish?

A-064 08:30
Chairman’s introduction
S.K. Morcos; *Sheffield/UK (morcsk²@aol.com)*

Extracellular water-soluble contrast media (CM) are either iodine (I) or gadolinium (Gd) based. They have similar pharmacokinetics and excreted mainly by the kidneys with biological half-life around 90 minutes. They do not cross intact blood brain barrier, minimal cell penetration and are not metabolised inside the body. Iodinated CM are classified into high-osmolar, low-osmolar and iso-osmolar contrast agents. Osmolality, iconicity and viscosity are important physicochemical factors which influence the safety of these agents. Gd-CM are either linear or macrocyclic and available as ionic or non-ionic preparations. The stability of the Gd-CA is an important safety feature of these agents particularly in patients with reduced renal function. The macrocyclic agents have high kinetic stability, whereas the non-ionic linear preparations have low kinetic and thermodynamic stability. Contrast media adverse effects can be divided into acute and delayed reactions. Acute reactions are allergic like and usually develop within one hour of CM administration. Delayed reactions develop after an hour and within a week of CM administration. Acute reduction in renal function referred to as contrast-induced nephropathy (CIN) may develop after contrast administration in patients with pre-existing risk factors. Patients with advanced reduction in renal function may develop the complication of nephrogenic systemic fibrosis (NSF) after administration of low-stability Gd-CM. In this session contrast-induced nephropathy and nephrogenic systemic fibrosis will be discussed. Measures to reduce the incidence these adverse effects will also be presented.
Session Objectives:
1. To provide an understanding of the bio-distribution of extra cellular water soluble contrast agents after intravenous administration.
2. To highlight the physico-chemical properties that influence the safety of iodine-based and gadolinium-based contrast agents.
3. To provide a summary of the different adverse effects that might occur with the use of contrast agents including an approach to minimising the risk of these adverse events.

A-065 08:35
A. Iodinated CM: whether CIN is a SIN, and how to avoid it
R.W.F. Geenen; *Alkmaar/NL (r.w.f.geenen@mca.nl)*

The pharmacokinetics of iodinated contrast media are quite simple. They distribute evenly in the extravascular space and are excreted by glomerular filtration. No metabolisation occurs. The pathophysiology of CIN is complex and not well understood. Basically, a misbalance between vasodilatation and vasoconstriction takes place inside the kidney after intra arterial or intravenous CM administration. Furthermore, increased oxygen demand of tubular cells due to increased reabsorbtion of sodium and water is a second mechanism, leading to transient medullar ischaemia. The third mechanism is the increased production of reactive oxygen species (ROS) due to the developed ischaemia. ROS lead to more cellular injury and increased misbalance between vasodilatative and vasoconstrictive mediators. Identifying the patient at risk is the first step in prevention. Knowledge of the patient's medical record and a recent basic kidney function are mandatory. High-risk patients should receive prevention. Two major topics in CIN prevention are the questions whether iso-osmolar CM cause significantly less CIN than low-osmolar CM and whether hydration schedules with NaHCO3 give significantly less CIN than hydration schedules with NaCl 0.9%.
Learning Objectives:
1. To understand the pharmacokinetics of iodinated contrast media.
2. To understand CIN mechanisms.
3. To learn about pertinent safety issues.

A-066 08:58

B. MR contrast agents: rumble in the jungle

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

Currently, up to 50% of all MRI examinations worldwide are performed using contrast agents, either an extracellular agent or an organ-specific agent. The extracellular MRI contrast agents are chelates that contain the paramagnetic ion gadolinium which strongly affects the relaxation properties of water protons, leading to changes in tissue contrast. Gd-DTPA was the first extracellular agent to be introduced in clinical practice. Since the introduction of Gd-DTPA in 1988, various gadolinium chelates with different chemical properties became available for clinical use. For many years, it was believed that gadolinium-based contrast agents (GBCA) were nearly a 100% safe which led to a liberal and off label use of these agents. The condition that came to be known as nephrogenic systemic fibrosis (NSF) was first identified in 1997, but reported in the peer-reviewed literature in 2000. Since then, NSF has been the subject of a wide-ranging multidisciplinary medical investigation that has proven an indisputable link to renal disease and a compelling association with the increasing use of GBCA in the renally impaired. NSF is a severely disabling complication of renal disease with some features that overlap with those of other conditions. Accurate diagnosis of NSF requires careful clinicopathological correlation. US- and European authorities have confirmed the categorisation of GBCAs in three risk categories in view of NSF. The number of new NSF cases has been dramatically reduced since the introduction of these risk categories. In this talk also an update of NSF reports will be given.

Learning Objectives:

1. To understand the spectrum and mechanisms of MR contrast agents.
2. To understand the pathophysiology behind NSF.
3. To learn about clinical safety issues to consider beyond NSF.

A-067 09:21

C. PET tracers: established tracers and those on the horizon

B. Tavitian; *Orsay/FR (bertrand.tavitian@cea.fr)*

Wider access to cameras, practitioners' demand and awareness and distribution networks are rapidly increasing the portfolio of clinically available PET radiopharmaceuticals. Imaging of the dopaminergic terminals in basal ganglia with [18F] FDOPA is a robust indicator of Parkinson's disease. PET tracers are also available for benzodiazepine, serotonin, acetylcholine (nicotinic and muscarinic), TSPO, a hallmark of microglial activation during neuroinflammation and the cannabinoid receptor CB1. The detection of amyloid plaques, a hallmark of Alzheimer's disease, with [11C]PIB was a recent success story. Combined PET-MRI may allow anatomical and molecular imaging of arterial diseases. Oncology is the main application of clinical PET tracers addressing tumour metabolism using the glucose analogue [18F] Fluorodeoxyglucose (FDG); DNA synthesis using nucleotide analogues; hypoxia using imidazole derivatives; angiogenesis using peptides based on the RGD motif; apoptosis using substrates of caspases; bone metastases with [18F]FNa, etc¼ More recently, tracers specific for cancer locations, i.e. prostate, brain, melanoma, neuroendocrine and others, based on the metabolic characteristics of the tissue of origin, have been proposed. Also in high demand and rapid development are tracers that identify the expression and/or the drug occupancy of molecular drug targets such as isoforms of tyrosine kinases or carbonic anhydrases. PET shows how basic research in specialised centres delivers clinically useful diagnostic tools, several decades later. The recent launching of "universal" labelling kits for macromolecules, as well as the new prototypes of miniaturised cyclotrons may push the use of PET tracers even further towards a popular imaging method for the general hospital practitioner.

Learning Objectives:

1. To understand the working mechanism and radiation of current clinical tracers.
2. To become familiar with the potential clinical indications and applications.
3. To learn about potential new tracers.

Panel discussion:

What specific precautions are mandatory in order to guarantee contrast media safety to patients and healthcare professionals? 09:44

08:30 – 10:00 Room D1

Controversies in Abdominal Imaging

MC 424

Small bowel examination: CT vs MRI

Moderator:
B. Marincek; Cleveland, OH/US
Teaser:
B. Gallix; Montpellier/FR

A-068 08:30

A. Why I prefer CT

G.A. Rollandi, E. Biscaldi; *Genoa/IT (gianandrea.rollandi@galliera.it)*

Multislice CT (MSCT) is a well-established technique to evaluate vascular, neoplastic and inflammatory diseases of the gastrointestinal tract. MSCT-enteroclysis, particularly, is a validated tool in small bowel investigations. The intestinal distension can be performed using either a positive or a neutral contrast material. The whole abdominal cavity can be explored evaluating both intestinal and extraintestinal findings. CT-enterography may be performed without using a nasojejunal tube: the radiation dose must be reduced. New detector technologies and new softwares cooperate to reduce x-ray dose: today MSCT is less invasive and more competitive with MRI. The greater availability of the scanner increases MSCT use as a main tool in abdominal and thoracic pathology investigation. Essential principles of MSCT examination technique are established: thin collimation, tight gap in image reconstruction to obtain an hysotropic voxel and high-quality processed views. Spatial resolution in multiplanar images and in post processed reconstructions is extraordinary; physicians are more confident with CT images than with MRI. Actually high-field magnets are not so diffused and MR examination's availability is inferior to MSCT. In emergency, in doubtful abdominal situations and in oncological follow-up the MSCT is performed as a main evaluation, the MRI is a 'second-level' technique in diagnostic process. In clinical strategy the MSCT is an important tool in the lack of established diagnosis, whereas the MRI is allowed during the follow-up of diseases, in young patients' evaluation and in case of reiterative examinations.

A-069 08:55

B. Why MRI is the best

S. Gourtsoyianni; *Athens/GR (sgty76@gmail.com)*

Advances in MRI hardware and software have rendered rapid acquisition of high-resolution images of the GI tract possible, thus upgrading the diagnostic role of MRI for imaging evaluation of patients with small bowel (SB) disease, when adequate luminal distension is achieved. Major advantages of MRI are absence of radiation exposure, ability for both morphological and functional imaging, 3D imaging capabilities and rich soft tissue contrast. Combination of ultrafast MR sequences with duodenal intubation is referred to as MR Enteroclysis, while when contrast is administered per os, is called MREnterography. MR Enteroclysis allows for better consistency of imaging findings, accurate wall thickness measurements and depiction of subtle bowel mucosa changes. Monitoring of distension of SB provides superior results in proximal bowel assessment, thus suited for identification of polyposis syndromes and neoplasms, and in absence of stenotic lesions. MR Enteroclysis tends to be used for comprehensive baseline assessment of Crohn's disease (CD), detailed preoperative mapping required in cases of SB neoplasms, while MREnterography for follow-up imaging of patients with inflammatory bowel disease. Various MR- related tools such as multiple contrast mechanisms and cine true FISP sequences, also used for identification of adhesions, allow for accurate CD subtype classification based on morphology and motility imaging features. Stenotic lesions may be further characterized since differentiation between oedema and fibrosis is feasible with T2 weighted images. In addition CD disease activity may be assessed based on different enhancement patterns after gadolinium administration. MRI examination allows also for identification of intraperitoneal extension of disease or extaintestinal manifestations.

A-070 09:20

Discussion

B. Marincek[1], B. Gallix[2]; [1]*Cleveland, OH/US*, [2]*Montpellier/FR*

The discussion will address the following issues:
1. Technique: enteroclysis or no enteroclysis?
2. Can we define a strategy according to the clinical situation?
3. What is the optimal examination in case of intestinal bleeding (chronic/acute)?

4. Can we reliably assess activity in IBD?
5. Will the capsule preclude the need for imaging?
6. Have we forgotten ultrasound?

08:30 – 10:00 **Room D2**

State of the Art Symposium

SA 4
Imaging during pregnancy

A-071 08:30
Chairman's introduction
M. Bekiesinska-Figatowska; *Warsaw/PL (m.figatowska@mp.pl)*

Pregnancy is a specific time during which special care must be taken of a mother and foetus whenever diagnostic imaging is necessary. Ultrasonography (US) and magnetic resonance imaging (MRI) are the safest imaging methods as they do not involve ionising radiation. They are not completely adverse effect free, i.e. both can cause tissue heating, which is potentially harmful to the foetus. Nevertheless, they should be considered as the methods of choice when maternal problems require diagnostic imaging, both preferentially without the use of contrast media. There are however clinical problems which cannot be solved without the use of ionising radiation. Two main clinical settings will be discussed during this session: polytrauma and pulmonary embolism (PE), both requiring computed tomography (CT) in most cases. In cases of polytrauma, saving the mother's life is a priority, and radiation protection of the foetus is a secondary problem. When CT angiography is performed to confirm or rule out PE, the protocols are optimised as far as the radiation dose and contrast medium volume are concerned (i.e. 100 or even 80 kV instead of 140 kV). The use of CT is considered to be quite safe in terms of foetus safety if the examination covers the region of the head, neck and thorax of the mother. However even with the use of CT in the region of the abdomen and pelvis, the threshold of 100 mGy is rarely exceeded.
Session Objectives:
1. To become familiar with the risk of using radiological modalities in pregnant woman.
2. To consolidate knowledge of the pros and cons of the different imaging techniques.
3. To learn about the indications requiring the use of imaging in pregnancy.

A-072 08:33
What are the real risks of radiation and contrast media to the mother and the foetus?
D. Prayer; *Vienna/AT (daniela.prayer@meduniwien.ac.at)*

Contrast media (CM) that might be considered for use during pregnancy comprise mainly iodinated CM and gadolinium derivates. Iodinated contrast media should be avoided during pregnancy, as the iodine will be stored in the foetal thyroid gland, but a single dosage is unlikely to have a negative effect. Systemic cystic fibrosis has not been described in pregnant women or foetuses; however, no human data proving the safety of gadolinium during pregnancy are available. Gadolinium may be used in maternal conditions unrelated to pregnancy, such as suspect appendicitis or pregnancy-related problems of the placenta, and foetal indications. The latter ones have not been studied yet in larger groups. The greatest risk for radiation-associated damage of developing tissues lies in the embryonic period: at a dosage of > 100 mSV, an embryo might die during the preimplantation phase, and the threshold dose that puts the embryo at risk for malformations or mental retardation lies from 100 mSV onwards. CT may be used during pregnancy for diagnosis of skeletal malformations. Low-dose fast protocols, for instance using a dual source system, are currently under investigation. In conclusion, MRI without contrast administration should be the first choice in case of insufficient ultrasound information. Gadolinium. compounds may provide additional information in selected indications. Low-dose CT may be helpful in the management of skeletal malformations.
Learning Objectives:
1. To understand indications for CM administration during pregnancy.
2. To learn about the potential use of CT.
3. To be informed about potential risks of radiation and CM for mother and fetus.

A-073 08:51
What are the real risks of US and MRI to the foetus?
M. Wozniak; *Lublin/PL (mwozniak@hoga.pl)*

Both ultrasound (US) and magnetic resonance imaging (MRI) are recognised as generally safe imaging modalities and thus appropriate for use in the diagnostics of pregnant females and foetuses. However, to some extent both techniques may carry some risks when used during pregnancy which every radiologist must be aware of. Ultrasound may induce adverse effects by either thermal or non-thermal means. The risk of inducing thermal effects is greater in the second and third trimesters, when foetal bone is intercepted by the ultrasound beam. Non-thermal mechanisms include acoustic cavitation, radiation force and acoustic streaming and may be more significant in early gestation, when the relatively loosely tethered embryonic tissues are exposed to an ultrasound beam in a liquid path. The likelihood of producing cavitation-type non-thermal effects is enhanced by the presence in the sound field of gas-encapsulated echo-contrast media. There is no scientific evidence in humans to suggest that the risk to the foetus from a routine MRI imaging examination is significantly increased during pregnancy. The radiofrequency radiation pulses used in MRI imaging although nonionizing, result in energy deposition and can potentially lead to tissue heating. However, the use of single-shot echo train spin-echo sequences is commonplace in foetal imaging and unlikely to result in significant temperature changes. Another potential risk of MRI to the foetus is connected to intravenous application of gadolinium-based contrast agents, which are not recommended during pregnancy. Yet, available evidence suggests it is unlikely that these compounds have an adverse effect on the developing foetus.
Learning Objectives:
1. To learn about the risks of US and MRI.
2. To become familiar with the underlying mechanisms.
3. To learn how to avoid or minimise the potential risks to the foetus.

A-074 09:09
Polytrauma
A. Palkó; *Szeged/HU (palkoand@gmail.com)*

Patients suffering polytrauma require to be handled with a special approach and attitude of the medical personnel from the on-site primary care through the emergency room, diagnostic and life support measures to the operation theatre and the intensive care unit, because of the complexity and the life-threatening nature of the multiple injuries causing unique clinical consequences. The survival of these patients is greatly dependent on the duration of time elapsing between the injury and the start of definitive therapy. The role of imaging diagnostics is, on the one hand, essential to explore the lesions of key importance and, on the other hand, is limited by time constraint and urgency. A clear understanding of the task and an ability to work under pressure are required of the imaging diagnostic team. Suffering polytrauma in pregnancy is a very uncommon situation, which typically may occur as a result of motor vehicle accident or interpersonal (usually domestic) violence. In these cases, the absolute priority is the preservation of the life of the mother; therefore, the usual concerns regarding the use of ionising radiation and contrast media are of less importance. At the same time, the radiologist has to be aware of the special risks caused by potential injuries and their consequences on the pregnant uterus, placenta and foetus. The altered anatomical situation may also hinder the proper imaging evaluation of the situation.
Learning Objectives:
1. To understand the indications, technical requirements and risks of the application of imaging modalities in the evaluation of pregnant polytrauma patients.
2. To learn more about the types of injuries and their clinical consequences prevalent in pregnancy.
3. To explore the typical imaging findings and role of specific expertise in their evaluation in this unusual clinical setting.

A-075 09:27
Pulmonary embolism
A.R. Larici; *Rome/IT (anna.larici@rm.unicatt.it)*

The risk for venous thromboembolism is increased by a factor of four during pregnancy. In developed countries, pulmonary embolism (PE) is the leading cause of maternal death. Currently, there is no specific diagnostic algorithm for PE suspected in pregnancy. Clinical probability scores have not been validated in pregnant patients and D-dimer values are often elevated during pregnancy. Lower limb ultrasonography (US) has been proposed as the first-line imaging modality, because the finding of proximal deep venous thrombosis validates the diagnosis of venous thromboembolism. However, because only a small proportion of US studies are positive, it has been recommended to perform US as first-line exam only if

Friday

symptoms of deep venous thrombosis are present. The use of lung scintigraphy and pulmonary angiography with computed tomography (CTA) as second-line imaging modality is still debated. Lung scintigraphy and CTA have comparable performances in terms of positive, negative and indeterminate results for the diagnosis of PE in pregnancy. Nevertheless, both modalities have drawbacks. Maternal radiation dose is higher with CTA, but CTA has advantages over lung scintigraphy in terms of better interobserver agreement and identification of alternative diagnoses unsuspected at chest radiography. Moreover, lung scintigraphy is less available than CTA in emergency. Several physiologic changes during pregnancy may account for indeterminate CTA results, such as the increase in blood volume that may determine poor arterial opacification. Radiologists should be aware that protocols have to be optimized in terms of contrast medium injection and radiation dose, when CTA is performed for suspected PE in pregnancy.

Learning Objectives:
1. To appreciate the accuracy of various testing options in the diagnosis of PE in pregnancy.
2. To learn how to adapt CT protocols in pregnant patients to adequately rule out PE.
3. To become familiar with a diagnostic imaging algorithm for the evaluation of pregnant patients with suspected PE.

Panel discussion:
Pregnant women and imaging – how far can we go? 09:45

08:30 – 10:00 **Room E1**

Emergency Radiology

RC 417
ER: basic principles

Moderator:
O. Chan; London/UK

A-076 08:30
A. Logistics, ergonomics and organisation of an emergency radiology department
I. Arkhipova; *Moscow/RU (iarkhipova77@mail.ru)*

A radiology department (RD) providing emergency services remains a core part of hospital emergency care. Modern imaging has become the key diagnostic tool that determines whether a patient will be discharged home or will have to be admitted for further treatment from the accident and emergency department (ED). The most important factor remains the professionalism of the medical and nursing staff in the radiology department. Prompt image interpretation of any imaging can be achieved by the use of Teleradiology. The interpretation of images used outside receiving hospitals in emergency transfers can be very useful. It can help bridge the gap in communication between transferring and receiving institutions and to reduce interpretational discrepancies. The next important issue is the location of the RD. The RD should be built adjacent to or within the ED. It is worthwhile to mention that the benefit-risk ratio of each individual procedure should be considered; the responsibility of this decision lies not only with the radiologist but on the medical community as a whole. Organisation of radiology department in the ED is most important issue. Last but no means the least, we should always remember that one day we might find ourselves having an accident – what kind of service would we like to get?

Learning Objectives:
1. To understand how an emergency radiology department should be built.
2. To be familiar with the logistics of the whole organisation, from the technology to 24-hour staffing.

A-077 09:00
B. Advanced trauma life support: ABCDE from a radiological point of view
D.R. Kool; *Nijmegen/NL*

Advanced trauma life support® (ATLS®) is an established systematic approach assessing trauma patients prioritising the most life-threatening injuries. The term ‘golden hour’ is used to emphasise a sense of urgency, not to define a time frame. The assessment is divided in a primary and a secondary survey. In the primary survey the mnemonic ABCDE (Airway, Breathing, Circulation, Disability, Exposure and Environment) is used to guide the order of assessment. Although imaging should not postpone treatment, chest and pelvis radiographs and abdominal US can influence treatment decisions and should be performed in the primary survey. In the secondary survey the patient is examined from head to toe and appropriate additional radiographs are performed. According to ATLS® and contrary to literature evidence, CT plays a minor role in the evaluation of trauma victims and indicated CT scans should be done in the secondary survey. Although improved in the most recent edition, the ATLS® is neither evidence-based nor up-to -date concerning imaging in trauma settings. However, surgeons use the ATLS® recommendations routinely to support indications for diagnostic imaging. In addition, surgeons refer to ATLS® in error with indications for imaging that are not supported by the present ATLS® guideline or radiological literature. In this refresher course the rationale and indications of imaging will be assessed where it pertains to the ATLS® protocol. The principles of ATLS® and discrepancies between the radiological literature, ATLS® and day-to-day practice will be addressed.

Learning Objectives:
1. To understand the relationship between advanced trauma life support and emergency radiology.
2. To know more about the rational use of x-rays, US and MDCT according to patient priorities in the emergency settings.
3. To become familiar with the most important findings to report.

A-078 09:30
C. Mechanism of injury and MDCT protocols: choosing the right protocol for the patient
M. Stajgis; *Poznan/PL (stajgis@o2.pl)*

The extent of patient’s injuries depends mostly on the mechanisms of injury and magnitude of energy which is absorbed by human body. Knowledge of Mechanism’s details provides valuable information for appropriate management of patients. Although there is still controversy on direct whole-body multi detector computed tomography versus stepwise imaging starting with plain x-rays of the cervical spine and chest, followed by FAST Ultrasound and regional CT, MDCT is an accepted routine method in evaluation of trauma patients. However, there is no existing one and the only standard trauma protocol of examination. A lot of factors must be taken into account by choosing the optimal way of conducting CT examination: patient’s state of consciousness, penetrating wounds, stable/unstable haemodynamics, presence of visible instabilities, general medical condition, etc. One of the first “Musts” is to clear the emergency head and cervical spine injuries; MDCT protocols without contrast media are sufficient in such cases. Thoracic injuries like tension pneumothorax, open pneumothorax, flail chest or massive haemothorax must be excluded/confirm almost immediately. Intra-thoracic and intra-abdominal bleeding must be considered in every hypotensive patient; this requires the use of contrast media MDCT protocol. In evaluation of liver and spleen injuries, 5-minute delay in scanning after contrast media administration can be very helpful. Arterial and late venous phases are of extreme importance in appropriate diagnosis of the extent pelvic injuries. One must not forget about the possible fatal consequences of undiagnosed injuries of extremities, resulting in huge loss of blood.

Learning Objectives:
1. To understand the mechanism of traumatic injuries in trauma patients.
2. To be familiar with the MDCT protocols according to the mechanisms.
3. To know the impact of MDCT findings on patient management.

08:30 – 10:00 **Room E2**

Foundation Course: More About Ultrasound

E³ 420b
Understand recent issues in US technology

Moderator:
M. Bachmann Nielsen; Copenhagen/DK

A-079 08:30
A. Recent advances in US technology
M. Claudon; *Vandoeuvre-les-Nancy/FR (m.claudon@chu-nancy.fr)*

Ultrasound (US) remains an essential part of clinical imaging with the advantage of the lack of irradiation and the wide availability of the method. Imaging organs and dealing with specific physiologic processes required development of better US probes and adaptation of imaging protocols, leading to a more successful contribution to the management of patients. The objectives of this lecture are to review the main technical advances that have been recently introduced, to discuss their advantages and limits and to present future perspectives to be considered by the radiological community. In the past decade, new techniques and modes have brought a further contribution to the ever-expanding applications of US in a ever wider spectrum of diseases and allow to improve the 2D greyscale image quality,

to move to 3D and 4D imaging, to deal with contrast-enhanced techniques and to consider ultrafast imaging, high-resolution imaging technology and elastographic imaging, The integration of ultrasound in a multimodality approach, with modalities such as fusion, will be exposed mainly for interventional applications. Questions regarding safety in these new developments will finally be discussed.
Learning Objectives:
1. To understand basic technical principles of sonography.
2. To appreciate advantages and limitations of diagnostic US.
3. To present the most significant advances in key fields of diagnostic US.

A-080 09:00

B. Portable machines: the future of US?
G.H. Mostbeck; *Vienna/AT (gerhard.mostbeck@wienkav.at)*

Portable ultrasound (US) machines arrived in the 1980s and battery-supported machines in the late 1990s. Today, portable machines from many vendors are available and range in size from laptop-like units to pocket-sized machines. With the latest technical developments, these machines offer very good real-time image quality, color Doppler capabilities and soft-ware applications for echocardiography, gynecology/obstetrics, et al and support various US-heads. Basically developed for military and combat medical purposes, these units are used outside a radiology department from many medical subspecialities in cases where mobility of the patient is limited or in the pre-hospital trauma setting. Applications of these units in the field, in remote areas and on expeditions (Mt. Everest) have been reported. Accordingly, focused US in the pre-hospital trauma setting (pneumothorax, fractures, free abdominal fluid), indications for US at the ICU and in emergency medicine, vascular access under US-guidance and interventional procedures (e.g. lumbar puncture, thoracocentesis et al) have been successfully performed using portable US machines. In addition, screening for abdominal aneurysms in an out-hospital setting has been reported. For radiologists performing US, these machines (which can be integrated in the RIS/PACS environment) are important for interventional procedures on the ward and on the ICU and in the emergency room and allow on-site US information after unclear findings on XR, CT and MR. It has to be expected that further technical developments will provide portable "US stethoscopes", probably having the same distribution as stethoscopes and used for focused, fast and first-line US imaging in many clinical situations.
Learning Objectives:
1. To learn about the technical aspects of portable machines compared to standard US equipment.
2. To consider US performed with portable machines as a problem-solving tool in cases of unclear CT and MR findings.
3. To learn about bedside applications of portable US in the ICU/IMC and trauma/emergency patient.

A-081 09:30

C. How to choose your equipment
J.-M. Correas; *Paris/FR (jean-michel.correas@nck.aphp.fr)*

The choice of the US equipment is always a dilemma. The precise definition of the true needs is a difficult task, including ergonomics, cleaning, B-mode, basic functions, Doppler imaging, overall imaging quality, networking, advanced capabilities and general and specific transducers. None of the existing system provides an optimal image quality for all applications, so it is necessary to prioritise the most important ones. The ideal situation is to evaluate the candidate systems in your routine practice and eventually compare the systems with each other with side by side evaluations. Of course, the price of the acquisition is playing an important role, but it is necessary to take into account the additional cost of the set of transducers, the advanced imaging options and the maintenance (that can include the transducers and the delay of intervention). It is necessary to distinguish the truly portable systems and the transportable systems (for dedicated applications, general-purpose applications or high-end imaging) from the larger and heavier systems.
Learning Objectives:
1. To learn how radiologists and sonographers should select a US system.
2. To recognise the main technical features that affect the choice of a US system.
3. To become familiar with the non-technical issues in the selection of a US system.

08:30 – 10:00 **Room F1**

Organs from A to Z: Lung

MC 422

Anatomy-based imaging review of lung disease

Moderator:
N. Sverzellati; Parma/IT

A-082 08:30

A. Around and between the lungs: pleura, mediastinum, and hila
A. Oikonomou; *Alexandroupolis/GR (aoikonom@med.duth.gr)*

The main manifestations of disease in the pleura include pneumothorax, pleural effusion including haemothorax and chylothorax, benign pleural thickening with or without calcifications and benign and malignant pleural neoplasms. Pleura is the most common site of a solitary fibrous tumour and mesothelioma is the most common primary malignant pleural tumour. However, metastastic pleural disease is the most common malignant neoplasm of the pleura. In general most pleural diseases are secondary menifestations to disease processes in other organs or systemic diseases. A wide spectrum of focal and diffuse abnormalities occurs in the mediastinum including pneumomediastinum, acute and chronic mediastinitis, mediastinal abscesses and haemomediastinum. To reach a confident and narrow differential diagnosis in interpreting a mediastinal mass one should detect and describe the abnormality based on its internal characteristics and specific CT features and place it into the appropriate anatomic division (anterior, middle and posterior or paravertebral). The diseases affecting pulmonary hila are directly related to the hilar anatomic components: lymph nodes, bronchi, pulmonary and systemic arteries and veins and autonomic nerves. Enlarged hila may either represent lymphadenopathy due to chronic granulomatous disease, lymphoma or metastatic disease, or primary central bronchogenic carcinoma, endobronchial carcinoid, pulmonary aneurysm or congenital vascular anomalies. Very rarely an enlarged hilum will have a neurogenic aetiology.
Learning Objectives:
1. To learn about the imaging spectrum of pleural diseases.
2. To be aware of the imaging spectrum of mediastinal diseases.
3. To get more information about the imaging spectrum of hilar diseases.

A-083 08:55

B. Large airways, small airways, and alveoli
M. Zompatori; *Bologna/IT (maurizio.zompatori@unibo.it)*

Familiarity with the normal anatomic appearance of the airways is the essential pre-condition to fully exploit the potential of modern technology and especially of volumetric CT. Besides, the importance of correctly phenotyping the chronic obstructive pulmonary disease (COPD), both from a prognostic and therapeutic viewpoint, is now well established. From the trachea to the alveolar spaces, derangement of normal anatomy can give us the explanation of a large number of CT signs and patterns commonly found in the different phenotypes and sub-phenotypes of COPD, such as saber sheath trachea, tracheo-bronchial dynamic instability (tracheo-bronchomalacia) and bronchial outpouchings diverticula. Moving further along the bronchial tree towards the periphery, a sound knowledge of the borderlands between normal and abnormal anatomy is also of paramount importance to detect early bronchiectasis, bronchial remodelling and the signs of infectious bronchiolitis (centrilobular nodules, tree in bud opacities), more rare inflammatory conditions (Respiratory bronchiolitis, for example), areas of mosaic oligoemia with expiratory air trapping (another possible manifestation of small airways disease), and, finally, the irreversible destruction of the respiratory spaces (particularly, centrilobular emphysema). COPD is a very heterogeneous disease. Different patterns can overlap and the same patient can present with a number of different findings, co-morbidities and complications. A little stroll through the airway anatomy, from the trachea to the alveolar sacs, can help us to understand and remind what COPD is, what we know and the large amount of things that remain to be discovered and clarified.
Learning Objectives:
1. To understand the imaging characteristics of large airways, small airways, and alveoli.
2. To understand the imaging characteristics of the pathological entities contributing to the development of the clinical COPD.
3. To be able to describe the potential continuum between these components, as clinically manifested in the spectrum of chronic obstructive pulmonary disease (COPD).

A-084 09:20

C. Pulmonary vessels

M. Rémy-Jardin; *Lille/FR (martine.remy@chru-lille.fr)*

Radiologists need to have a basic knowledge of the radiological anatomy of the organs imaged within the thorax, among which the pulmonary circulation plays an important role as it can provide morphologic but also functional information useful for the management of numerous thoracic disorders. This new trends in evaluating the pulmonary circulation is driven by the technological developments of multidetector-row CT (MDCT) technology which offers the possibility not only to search for morphological abnormalities at the level of central and peripheral pulmonary vessels with single-source MDCT but also to integrate the evaluation of the capillary level by means of dual-energy CT. Detection of morphological abnormalities at the level of central and peripheral pulmonary vessels in congenital and acquired chest disorders requires the knowledge of the prevailing arterial and venous patterns whose analysis can now benefit from the development of computer-aided-diagnosis tools. The analysis of the most distal portion of the pulmonary circulation, sometime referred to as "pulmonary perfusion", is now available in routine clinical practice and requires, for proper interpretation of images, a basic knowledge of the anatomical relationships between the pulmonary and systemic circulations of the chest. CT can also participate in the noninvasive approach of pulmonary hypertension by means of the analysis of the degree of distensibility of central pulmonary arteries. All these pieces of information are accessible to radiologists providing the selection of the adequate scanning protocol. The purpose of this lecture is to review these anatomical and physiological perspectives offered by MDCT in 2012.

Learning Objectives:

1. To be able to interpret pulmonary vascular imaging studies.
2. To become familiar with the current approach to pulmonary embolic disease according to the latest guidelines and recommendations.
3. To understand the involvement of the pulmonary vasculature in non-embolic disease, including diseases of the heart.

Discussion 09:45

08:30 – 10:00 **Room F2**

Special Focus Session

SF 4a

Controversies in breast imaging

A-085 08:30

Chairman's introduction

M.G. Wallis; *Cambridge/UK (matthewwallis492@btinternet.com)*

While the three controversies covered in this session are apparently disparate they do have a clear common theme relating to the risks (in particular the false-positive test) and benefits of breast imaging and our perceptions of these. Perceptions of risk (and benefits) are complex and are determined by an interaction of our personal past experience, information provided and our current point of observation. A woman with a newly diagnosed breast cancer will have a very different perspective to a public health doctor, or for that matter a politician, commissioning a service for their population in financially difficult times. This is compounded by the general population's woefully inadequate grasp of statistics used to provide evidence which is not helped by our own presentation of the facts which some claim is based entirely on vested interest. In our drive to find every cancer (or perhaps our anxiety not to miss any) regardless of its biological potential it is easy to forget the need for specificity. The false-positive result (abnormal test in a normal patient) can have both short- and long-term physical and psycho-social consequences for the individual and definitely has significant financial costs to the health economy. The three talks start with populations, move seamlessly to individuals and finally provide help and advice on reducing the number of false-positive results.

Session Objectives:

1. To appreciate that there are risks and benefits to breast imaging.
2. To learn the magnitude of these risks and benefits.
3. To become familiar with the methods to manage these risks.

A-086 08:35

Should we screen women under 50?

A. Evans; *Dundee/UK (a.z.evans@dundee.ac.uk)*

A recent meta-analysis of randomised controlled trials (RCT) of mammographic screening of women aged 40-49 has indicated a reduction in breast-cancer mortality (relative risk (RR) 0.81 [95% CI 0.71-0.93] p < 0.01). Furthermore, when the RCTs included were grouped according to their mean time interval between mammograms, there was a definite increase of statistical significance in favour of those RCTs with shorter interval times (RR 0.76 [95% CI 0.64-0.89] p < 0.01). Both the Malmö and the Gothenberg trials demonstrated a statistically significant mortality reduction in women in this age group (RR 0.64 [0.45-0.89]; p = 0.009 and RR 0.56 [0.32-0.98]; p = 0.035 respectively); both studies incorporated short screening intervals and multiple screening rounds. Critics of mammographic screening have commented that many of the women in these RCTs aged 40 to 49 years at the time of randomisation received many of their screening episodes after the age of 50 years. The UK Age Trial was the only RCT to perform all screening episodes before age of 50 years. The RR of breast cancer death in this study group was 0.83 (0.66-1.04). Several problems are encountered during screening of women younger than 50, including relatively high numbers of false-positive screening results and screening-provoked benign surgical biopsies. There is a modest reduction in mammographic sensitivity when comparing women in their 40s with women in their 50s; however, the widespread introduction of digital mammography should ameliorate this problem, according to the results of the DMIST study.

Learning Objectives:

1. To learn about the evidence for screening women under 50.
2. To understand the benefits to the population of screening under 50.
3. To appreciate the risks to individual women of offering screening to women under 50.

A-087 08:58

How to image the dense breast

C. Van Ongeval; *Leuven/BE (chantal.vanongeval@uz.kuleuven.ac.be)*

The mammographic image of the breast reflects the tissue composition of the breast, i.e. epithelial, connective and adipose tissue. Different methods are used to assess the mammographic density: Wolfe (1976) described four densities (N1, P1, P2, DY) and the Breast Imaging Reporting and Data System described four categories. As risk calculation is related with the percentage of mammographic density (PMD) rather than with "density", more adequate measurements are necessary. Attempts on computer-assisted methods based on interactive thresholding were developed. Due to the introduction of digital mammography, information of the digital data can be used for the quantification of the density of the breast. Several studies concluded that PMD is associated with a higher risk of breast cancer: 6 to 8 times higher than for women with primarily adipose breasts. This association was stronger in studies in the general population than in symptomatic patients and stronger for quantitative measurements than for qualitative measurements. Although high density is associated with an increased risk of breast cancer, it also makes the detection of breast cancer with mammography more difficult. The DIMST trial already showed a higher accuracy of digital mammography for dense breasts. Additional breast ultrasound in women with mammographically dense breasts permits detection of small, occult breast cancers, but is also correlated with a significantly higher biopsy rate. Recent reports on tomosynthesis showed improved lesion conspicuity of masses and stellate lesions, which are often masked in dense breasts. Implementation of newer techniques such as dual energy mammography has just started.

Learning Objectives:

1. To learn about the methods of calculation of breast density and the cancer risks associated with dense breasts.
2. To understand problems related to the interpretation of dense breasts.
3. To learn about the advantages and disadvantages of other current and new imaging techniques.

A-088 09:21

What to do with false positive MR imaging

L. Martincich; *Candiolo/IT (laura.martincich@ircc.it)*

Breast MRI represents the most sensitive modality in the identification of breast cancer. Even if its use is increasing, the main concern on a wider use of this examination in clinical practice still remains its sub-optimal specificity and false-positive rate. Several systematic reviews evaluating the diagnostic performance of contrast-enhanced MR imaging in patients with breast lesions showed a specificity ranging between 67% and 72%. The reported false-positive rate of the examination ranged, in Literature, between 3.5% and 7%. However, any parameter of diagnostic performance should consider the clinical context. For example, the specificity of breast MRI in the identification of cancer in high-risk population resulted in different multicentre trials > 90% while its positive predictive value in characterising occult malignant lesions in the local staging of breast cancer reached 66%. Besides, the false-positive findings of preoperative MRI have been showed to reach 24%. Clinical indications, technical requirements, contrast agents and expertise of the readers play a key role in the definition of the diagnostic performance of breast MRI. The correct management of potential false-positive cases, including correlation with mammography findings, ultrasound second look and MR-guided biopsy, are mandatory in the work up of MR additional lesions that might modify the already planned treatment. New MR techniques, such as diffusion-weighted imaging, are showing potentials in improving both specificity and positive predictive value of breast MRI. However, this approach even if promising requires further evaluation for the routine application in clinical setting.

Learning Objectives:
1. To learn about the magnitude of the risks of false positive MRI.
2. To become familiar with more common findings of false positives.
3. To learn about the techniques to reduce the false positive rate and to manage the 'false positive' lesion.

Panel discussion:
How do we manage/minimise the consequences of our uncertainties? 09:44

08:30 – 10:00 **Room G/H**

Neuro

RC 411

General neuroradiology: introduction to the brain

Moderator:
E.-M.B. Larsson; Uppsala/SE

A-089 08:30

A. Brain anatomy made easy: the language system

T.A. Yousry; *London/UK (t.yousry@ion.ucl.ac.uk)*

The anatomy of the brain is often perceived as being complicated. Especially the cortex is seen as an irregular arrangement of variable structures, which are difficult to differentiate and to identify. We will review the overall subdivision of the brain into lobes and describe their boundaries and their major gyri and sulci. We will then describe the location of areas specific to language in terms of their cortical anatomy as well as their cytoarchitectonic structure: 1. areas of speech production, most importantly Broca's area, which is centred on the pars opercularis of the 3rd frontal convolution; we will discuss the identification of this area and its variability; 2. areas of language comprehension, with special attention to Wernicke's area, its definition and variability; and 3. areas related to hearing, mainly the primary auditory cortex (A1), centred on the postero-medial part of Heschl's gyrus (HG), we will present simple landmarks in each of the three planes: a) axial: adhaesio interthalamica, b) sagittal: omega/heart shape of HG and c) coronal: omega shape of HG. We will discuss the most important tracts connecting these areas, mainly the uncinate and the arcuate fascicles. At the end of this lecture, you will know the general subdivision of the cortex and will have a basic understanding of the functional anatomy of language.

Learning Objectives:
1. To learn about the general brain cortical anatomy.
2. To be able to identify the most important cortical anatomy involved in the language system and its imaging representation.
3. To be able to recognise the most import white matter tracts involved in the language system and its imaging representation.
4. To get a glimpse into the relevant anatomical and clinical insights coming from MR microscopy.

A-090 09:00

B. Brain haemorrhage: from microbleeds to lobar haematomas

M.A. van Buchem; *Leiden/NL (m.a.van_buchem@lumc.nl)*

MRI is an imaging technique that is particularly sensitive to haemorrhages in the brain. Apart from large haematomas and recent subarachnoid haemorrhages, that are also visible on CT, using MRI minute haemorrhages (microbleeds) can be detected within the brain and subtle remote haemorrhages in the subarachnoid space (superficial siderosis) can be detected. In addition, MRI allows for assessment of the age of cerebral haemorrhages, based on signal characteristics. The location of cerebral haemorrhages allows for an estimation of the underlying pathology. For example, haematomas with a lobar distribution are suggestive of cerebral amyloid angiopathy, those located in the basal ganglia in a patient with hypertension are suggestive of hypertensive microangiopathy, and blood in the subarachnoid space is suggestive of a ruptured aneurysm. A comprehensive MRI protocol (comprising T2*-weighted images, post-gadolinium images, and MRA techniques) also allows for detection of the cause of a given haemorrhage. It is recommended to develop such a protocol and to embed it in the diagnostic workup of every patient with a haemorrhagic stroke.

Learning Objectives:
1. To learn about the MR imaging features of brain haemorrhage in the different haemorrhage stages and different sequences.
2. To be able to identify and make the differential diagnosis of the most common causes of microbleeds.
3. To be able to identify and make the differential diagnosis of the most common causes of parenchymal haemorrhage.

A-091 09:30

C. Differential diagnosis of multiple brain lesions: tumour and tumour-like lesions

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

Conventional MR imaging (T2-weighted and contrast-enhanced T1-weighted sequences) is the standard modality for the initial visualisation and characterisation of CNS lesions, with superior sensitivity compared with alternative imaging modalities. However, advanced MR techniques such as perfusion-weighted imaging (PWI), diffusion-weighted imaging (DWI) and MR spectroscopy (MRS) are increasingly incorporated into imaging protocols to provide not only better specificity, but also physiological information that complements the morphological detail of conventional MR studies. DWI provides useful information for providing an accurate differential diagnosis between pyogenic abscesses and necrotic tumoural lesions (both metastasis and high- grade gliomas), although it cannot distinguish between necrotic CNS tumours from inflammatory pseudotumoural cystic lesions. Data on the literature regarding the diagnostic value of MRS for differentiating pseudotumoural lesions from brain tumours have yielded conflicting results. Some authors have shown that there are not enough spectral differences that allow a precise diagnosis in individual cases, while others demonstrated that this discrimination can be achieved based on metabolite ratios obtained at short TE and long TE. PWI can also be helpful in differentiating pseudotumoural inflammatory lesions and high-grade gliomas, as only the latter show a significantly increase in cerebral blood volume. Accurate characterisation of brain lesions with conventional and advanced MRI techniques is feasible in clinical practice and might be helpful in distinguishing between tumoural from pseudotumoural lesions. This will have a clear impact on patient management as unnecessary aggressive diagnostic or therapeutic procedures could be avoided.

Learning Objectives:
1. To become familiar with the most common causes of multiple brain lesions caused by primary and secondary brain tumours.
2. To learn about the most common causes of multiple non-neoplastic brain lesions that mimic tumours.
3. To learn the characteristic neuroimaging findings that may be useful in establishing differential diagnoses.
4. To be aware of the importance of advanced neuroimaging techniques for evaluation of multiple brain lesions.

08:30 – 10:00 **Room I/K**

Joint Course of ESR and RSNA (Radiological Society of North America)

MC 428

Essentials in oncologic imaging: what radiologists need to know (part 1)

Moderator:
D.M. Panicek; New York, NY/US

A-092 08:30

A. Principles of oncologic imaging and reporting

D.M. Panicek; *New York, NY/US (panicekd@mskcc.org)*

Oncologic imaging examinations are often complex, and specialised knowledge is required to interpret them in a clinically relevant manner. The radiologist needs to be aware of the details of the staging system and pattern of spread for a given tumour; the strengths and limitations of available imaging modalities in specific oncologic applications, especially in assessing tumour response to different conventional and newer therapies; and various pitfalls in the overall approach to interpretation and reporting of oncologic imaging examinations. Because a radiologic study is only a "snapshot" taken during a brief moment of a patient's medical timeline, meaningful interpretation (the radiologist's "added value") requires integration of current

Friday

imaging findings with results from various prior radiologic studies and pertinent clinical information. The frequently numerous findings visible on an imaging study need to be distilled into a focused, clinically relevant report; otherwise, the radiologist functions simply as a “film reader” (rather than as a true consultant), and the resultant radiology report may be technically accurate but clinically unhelpful---or even misleading. Better reports can be produced by using standardised report templates, integrated imaging summaries and consistent lexicons.

Learning Objectives:

1. To review general principles of oncologic imaging.
2. To understand the critical importance of clinical context during interpretation of oncologic exams.
3. To evaluate ways to ensure that our reports provide added value and reflect the radiologist’s role as consultant.

A-093 08:55

B. Lung cancers (primary, metastases)

C.J. Herold; *Vienna/AT (Christian.Herold@meduniwien.ac.at)*

Lung cancer is among the most common malignancies worldwide, and accounts for up to 30% of all lung cancer death annually. In the US, approximately 220.000 new cases are diagnosed every year. Accurate staging of non small cell lung cancers (NSCLC) and small cell lung cancers (SCLC) is of utmost importance for selecting those patients, who benefit from attempted curative surgery versus those who may undergo palliative treatment. Recently, a new TNM staging system (7th edition) for lung cancer was introduced by the International Union against cancer and the American Joint Committee on Cancer and should now be uniformly used for lung cancer staging worldwide. This staging classification was based on the analysis of a large data base of approximately 70.000 cases of NSCLC and 13.000 cases of SCLC sampled in a multi institutional effort containing detailed information from 46 institutions in 19 countries. The most important parameter for the developing of the subgroups was overall survival based on disease stage. The major changes involve the T and M categories, resulting in subgroups that would more accurately be associated with prognosis of a patient with defined descriptors. In this course, the new TNM staging classification will be demonstrated, and case examples will be used to interactively enhance the learning experience of attendees. Also, the role of imaging methods in evaluating standard and innovative therapy regimen will be discussed, and typical findings and pitfalls will be presented.

Learning Objectives:

1. To review the strengths and limitations of radiologic techniques suitable for detecting and characterising primary and metastatic lesions in the lungs.
2. To understand the imaging findings relevant for lung cancer T, N and M staging, and appraise the implications of the new IASLC lung cancer staging system.
3. To evaluate the imaging findings used to assess response to conventional and new therapies for lung cancers.

A-094 09:25

C. Colon cancer

R.M. Gore; *Evanston, IL/US (rgore@uchicago.edu)*

Over the past decade, the treatment of colorectal cancer has become increasingly individualised with therapeutic options ranging from neoadjuvant therapy with FOLFOX and radiation therapy, to transanal mucosal resection, to robotic surgery with low anterior resection and surgical extirpation including APR. This lecture reviews the role of CT, MR, transrectal ultrasound and PET-CT in guiding the increasingly sophisticated process of staging and managing patients with colorectal cancer. Guidelines concerning the most efficacious use of the DWI MR imaging and perfusion and diffusion CT and MR with a view towards optimising patient management are also presented.

Learning Objectives:

1. To get an overview of current recommendations for the diagnosis of colorectal cancer.
2. To understand the specific role of MDCT, MR imaging, endoscopic ultrasound, and PET/CT in the staging of colorectal cancer in optimising patient management.
3. To learn the utility of imaging in assessing tumour response to therapy and in the general follow-up of patients with colorectal cancer.

Questions 09:50

08:30 – 10:00 Room L/M

Multidisciplinary Session: Managing Patients with Cancer

MS 4
Lymphoma

A-095 08:30

Chairman’s introduction

E. de Kerviler; *Paris/FR (eric.de-kerviler@sls.aphp.fr)*

Major progresses have been made in the past decade in the management of lymphomas. The subclassification and categorisation of the most common lymphoma subtypes were altered over time to enhance diagnostic accuracy and aid in clinical management. Image-guided biopsies have dramatically changed patients’ management, providing accurate subtyping at diagnosis and relapse according to the new 2008 classification. Also, new tools such as molecular analyses and early assessment using integrated PET-CT predict response and patients’ outcome. This session will highlight the results of the successful partnership among pathologists, biologists, clinicians and radiologists.

Session Objectives:

1. To understand to what extent an optimal subtyping of lymphoma is necessary at diagnosis and relapse.
2. To become familiar with molecular analyses, beyond morphology and immunochemistry.
3. To understand why, when and how therapy efficacy should be monitored.
4. To understand why a multidisciplinary approach is mandatory in lymphomas.

A-096 08:35

The pathologist’s view point on lymphomas

J. Brière; *Paris/FR (josette.briere@sls.aphp.fr)*

Complexity and heterogeneity of the lymphomas and especially the DLBCL (Diffuse large B- cell lymphoma) have been demonstrated over the past 10 years, first by the most recent WHO classification that includes no less than 50 different subentities, and second by the gene expression profiling analyses leading to a molecular classification in the most common form of adult non Hodgkin’s lymphoma, the DLBCL entity. The prognosis has been demonstrated to be variable according to the morphological, immunophenotypic and molecular classification. The therapeutic approach is different according to the classification. So the importance of the material obtained by different techniques is crucial: excisional lymph node biopsy or core needle biopsy (which is increasingly replacing chirurgical techniques) must be properly used in order to obtain a good morphology and frozen material dedicated to molecular analysis.

Learning Objectives:

1. To learn about the evolution of the successive classifications of lymphomas according to new molecular prognostic markers.
2. To understand the limitations of image-guided biopsies in some peculiar entities.
3. To appreciate to what extent molecular analyses can predict outcome.

A-097 08:55

What the haematologist needs to know

P. Brice; *Paris/FR (pauline.brice@sls.aphp.fr)*

Lymphomas are a heterogenous group of malignant disease ranging from very aggressive clinical course like Burkitt lymphoma to indolent diseases which do not need to be treated. Histological diagnosis is crucial to define treatment and to target it (Rituximab is only given to B-cell lymphoma expressing CD20 antigen). Unless refractory or very early relapses, patients with recurrent disease should have a radiological non-invasive biopsy to detect histological modifications: a) histological transformation from low- to high-grade B-cell lymphoma, b) Hodgkin lymphoma recurring with non-Hodgkin lymphomas (NHL), c) loss of CD20 antigen expression in relapsing B-cell lymphoma and d) second solid tumour. Before treatment radiological evaluation must be planned with CT or PET-CT and criteria of response must be defined if PET-Ct is used as an interim response and not only at the end of treatment (Juweid JCO 2007). Physicians must define their therapeutic goals: a) complete remission leading to long-term cure, b) prolongation of survival and c) quality of life in elderly or incurable disease. Response with radiological evaluation may guide therapeutic options. 1. good responders: limit the treatment and avoid long-term toxicities (mostly for Hodgkin lymphoma), 2. slow responders: give the optimal amount of treatment and radiation therapy in some localised cases and 3. bad responders: increase the treatment and proceed to high-dose therapy. In conclusion, the management of lymphoma patients needs non-invasive biopsies and multiple (PET)-CT evaluation for optimal care.

Learning Objectives:
1. To understand why histological modifications during relapses of lymphomas justify re-biopsy.
2. To become familiar with the integrated PET-CT criteria for evaluating therapeutic response.
3. To appreciate how response can guide future therapeutics.

A-098 09:15
How modern imaging can influence therapy in lymphomas
E. de Kerviler; *Paris/FR (eric.de-kerviler@sls.aphp.fr)*

Imaging plays now a major role at every step in the management of lymphomas: initial staging, response assessment, follow-up and investigation of suspected relapse. Beyond conventional cross-sectional imaging, molecular imaging has changed dramatically the management of routinely FDG-avid lymphomas in the past decade. Recommendations for the use of PET-CT have been published in 2007 for standardisation of the technique, optimal timing and a better understanding of false positives and negatives, providing uniform endpoints for clinical trials. Depending on the type and course of lymphoma, and on protocol inclusion, CT, PET of both will be done at any step in the course of the disease. This exhaustive workup better assesses therapeutic response but raises new questions. Occult lesions or new events are early detected, prompting image-guided biopsy for histological confirmation. The aim of this presentation is to consolidate knowledge of the imaging workup in lymphoma and illustrate how imaging strongly influences patients' management.
Learning Objectives:
1. To become familiar with the relevant points in the imaging workup at diagnosis in lymphoma patients.
2. To consolidate knowledge of the use of PET and CT for patient re-evaluation.
3. To learn about the technique of biopsy when lymphoma is suspected.

A-099 09:35
Case presentation and discussion
E. de Kerviler; *Paris/FR (eric.de-kerviler@sls.aphp.fr)*

08:30 – 10:00 Room P

Cardiac

RC 403
How I report
Moderator:
E. Mershina; Moscow/RU

A-100 08:30
A. Chest x-ray in cardiac disease
L. Natale; *Sesto Fiorentino/IT (luigi.natale@lacittadellasalute.it)*

Chest x-ray still remains a first line examination in almost every patient with cardiac diseases. It can give many morphologic information, especially if echocardiography is not immediately available. Cardiac anatomy at postero-anterior and lateral views is based, respectively, on right and left and anterior and posterior heart contour segmentation. For this reason, cardiac anatomy changes detectable by chest x-ray indirectly reflect functional status of the heart, both chambers and myocardium. These changes cause cardiac rotation along chest long axis, with consequent modification of the above-mentioned cardiac contours. Finally, chest x-ray is still unique in assessment of pathophysiology of pulmonary circulation; as well known, pulmonary capillary and vein pressures reflect Left Atrial Pressure that equals Left Ventricle End-Diastolic Pressure. Consequently, any change in LVEDP causes vessel size and vessel distribution modifications in the lung, up to cause pulmonary oedema. There is a strong correlation between left ventricular end diastolic pressure value and pattern of pulmonary vasculature that allows its non-invasive quantitative assessment. Furthermore, chest x-ray can show non cardiac signs of any disease simulating cardiac symptoms (medastinal, pulmonary, pleural and chest wall diseases). A correct and complete radiological report should include cardiac morphology modifications, pulmonary vasculature assessment and finally extra-cardiac findings.
Learning Objectives:
1. To know about major indications for performing chest x-ray in cardiac patients.
2. To be familiar with the most important chest x-ray findings that are relevant for diagnosis and treatment of cardiac diseases.
3. To learn how to write a chest x-ray report for cardiac patients.

A-101 09:00
B. Coronary CTA
H. Alkadhi; *Zurich/CH (hatem.alkadhi@usz.ch)*

Over the past years, the number of coronary CTA studies performed has been steadily growing. To perform a coronary CTA study using appropriate protocols in a correct manner is mandatory in order to obtain a diagnostic image quality. Beyond that, there is a lot more to a coronary CTA study than acquiring the data. Correct interpretation required knowledge of the advantages and disadvantages of various post-processing methods in order to avoid false-positive and false-negative findings regarding coronary artery disease. In addition, a standardised approach for interpreting the CT data and for reporting the imaging findings to the referring clinician is reasonable. The presentation illustrates a practical approach to the post-processing and interpretation of data acquired during a coronary CTA study, including the reporting of the relevant imaging findings to the referring clinician.
Learning Objectives:
1. To know the scope of information needed by a referring physician from a coronary CTA examination.
2. To be familiar with possible sources of mistakes in the interpretation of cardiac CT.
3. To learn how to write a report on coronary CTA.

A-102 09:30
C. Cardiac MRI in ischaemic heart disease
J. Bogaert; *Leuven/BE (Jan.Bogaert@uz.kuleuven.ac.be)*

The reporting part is probably the most important step in a radiological exam because the radiologist's expertise comes into play. Radiologists in training learn the pecularities of reporting during their training. For novel domains in medical imaging, such cardiac MRI (eg in patients of with ischemic heart disease), experience is often limited. Moreover, reporting of these exams differs from 'traditional' radiological exams, since it necessitates (extensive) image analysis (eg, contouring of endo- and epicardial myocardial contours), interpretation of dynamic sequences (myocardial contractility, myocardial perfusion), and multisequence imaging (e.g. imaging of acute myocardial infarct patients). All the information needs to be interpreted together, to achieve an idea about the status of the heart. In some patients these studies are (or need to be) performed during stress conditions to evaluate the impact on stress on myocardial perfusion and function. To streamline the interpretation of MRI study results with other information obtained with other modalities (eg echocardiography, nuclear medicine), standardized reporting is required, otherwise the referring clinician risks to get lost in the abundance of information. In this lecture, the focus is how to practically approach and report a cardiac MRI exam in ischemic heart disease patients starting from several clinical cases.
Learning Objectives:
1. To understand the major indications for performing cardiac MRI in ischaemic heart disease.
2. To be familiar with protocols of cardiac MRI and image processing.
3. To learn how to write a report on cardiac MRI.

08:30 – 10:00 Room Q

Special Focus Session

SF 4b
Diagnosis and management of acute vascular abdominal problems

A-103 08:30
Chairman's introduction
A. Nicholson; *Leeds/UK (tonynick@tonynick.karoo.co.uk)*

Mesenteric vascular disease is often the last diagnosis thought of by clinicians and few have any idea about treatment options. Interventional and diagnostic radiologists are best placed to manage and diagnose the various pathologies that lead to mesenteric ischaemia. These talks will provide a valuable reminder to all radiologists of their role and responsibilities in this interesting area.
Session Objectives:
1. To understand the development of minimally invasive damage control.
2. To understand the requirement for 24/7 IR service.
3. To consider other options.

A-104 08:35

Acute arterial and venous ischaemia-presentation, management and outcome

L. Boyer; *Clermont-Ferrand/FR (lboyer@chu-clermontferrand.fr)*

Acute mesenteric ischemia (AMI) is a life threatening diagnosis and a therapeutic emergency with high mortality rates (50-95%). Its diagnosis and management are challenging issues. It is due to arterial thrombosis in 20-30% of cases, emboli in 40-50%, and venous obstruction in 5-20%; non occlusive mesenteric ischemia accounts for 20-30% of cases. Clinical presentation includes severe abdominal pain which contrasts with poor clinical findings, and depends also on the cause. Quick AngioMDCT is the cornerstone of diagnosis, with a reliability of 95.6%: it detects vascular obstruction as well as signs of intestinal ischemia (reduced wall enhancement) or necrosis (pneumatosis intestinalis and/or portal gas) and peritoneal irritation signs. There are no randomized or controlled trials of AMI therapy. Therapeutic options include surgery, with an important morbi-mortality, but also increasingly endovascular procedures such as: – administration of vasodilatators to treat NOMI, – local thromboaspiration and thrombolysis for arterial emboli, – balloon angioplasty ± stenting ± thrombolysis to treat arterial thrombosis and mesenteric complications of aortic dissection, – in situ thrombolysis ± mechanical disobliteration of mesenteric venous thrombosis. Percutaneous endovascular techniques may be valuable alternatives to surgery in selected patients, and can be helpful in limiting bowel resection.

Learning Objectives:

1. To be aware of the main etiologies, the severe prognosis, and emergency case selection.
2. To learn about presentation, the imaging findings, and the key role of CT.
3. To become familiar with the role of endovascular procedures, their results and their place in the treatment algorithms.

A-105 08:58

Acute non variceal upper gastrointestinal haemorrhage: the evidence base for and role of intervention

S. McPherson; *Leeds/UK (Simon.McPherson@leedsth.nhs.uk)*

Endoscopy is the primary diagnostic and treatment modality in non-variceal upper gastrointestinal haemorrhage (NVUGH). When endoscopy fails to control bleeding embolisation or surgery are the haemostatic options. Placing endoscopic clips at the site of endoscopically uncontrollable haemorrhage facilitates successful embolisation. CT angiography sensitivity in acute bleeding is 90% but this depends on careful case selection. CT is particularly useful when endoscopy fails to identify the site haemorrhage or there is a history of aortic reconstruction or pancreaticobiliary procedure or disease (ACR Appropriateness Criteria 2010). In transpapillary (bile or pancreatic duct) haemorrhage embolisation is the first line intervention. In known site life-threatening post-surgical haemorrhage (e.g. surgical drain bleeding) proceeding directly to angiography expedites haemostasis. The decision making process when endoscopy fails to control NVUGH depends on the available evidence but also on the 24/7 availability of services and/or the speed of response. A recent systematic analysis of embolisation in NVGUH reported pooled mean technical and clinical success rates in primary UGI haemorrhage only, trans-papillary haemorrhage only, and mixed studies were 84% and 67%, 93% and 89%, and 93% and 64%, respectively. The evidence comparing surgery and embolisation is limited to six single-centre cohort studies. Despite decision making bias, with more elderly patients, coagulopathy and other adverse co-morbidities in the embolisation group: mortality, clinical success and re-bleeding were equivalent. Large-volume resuscitation, particularly when clotting derangement or multi-organ failure results, is associated with increased mortality. This reinforces the need for rapid control haemorrhage and has implications for service organisation and delivery.

Learning Objectives:

1. To be aware of the integration of endoscopy and radiological intervention in non-variceal upper gastrointestinal haemorrhage.
2. To appreciate the different diagnostic and management pathways for primary upper gastrointestinal tract, transpapillary and post-surgical haemorrhage.
3. To understand the available evidence comparing surgical and radiological intervention when endoscopy fails to control UGI haemorrhage.
4. To learn about the patient factors that affect clinical success and mortality after embolisation.

A-106 09:21

Management of abdominal haemorrhage in the severely injured trauma patient

O.M. van Delden, J.A. Reekers; *Amsterdam/NL*

Proper imaging strategies are of paramount importance for selecting patients for interventional radiological treatment in the setting of abdominal trauma. Contrast-enhanced CT should be performed whenever possible in the severely injured trauma patient as it accurately grades injury to parenchymal abdominal organs, identifies active bleeding or the presence of other vascular injuries that require treatment and also assesses the presence of concomitant injuries such as pelvic fracture with bleeding. Angiography and embolisation is performed to treat ongoing bleeding or to prevent delayed bleeding from false aneurysms or traumatically dissected vessels, thus rendering non-operative management safer. Depending on the location and the nature of the vascular abnormalities coils and /or gelfoam are the most commonly used embolisation materials. The most frequently involved organs / vessels amenable to embolisation are the spleen, the liver, the internal iliac arteries due to pelvic fracture and the kidneys. Rarely a covered stent can be used to treat the vascular injury while maintaining patency of the treated vessel. Results are good with haemostasis being obtained in more than 90% of cases and non-operative management succeeding in more than 80-90% of cases treated with embolisation. Embolisation may also be used as an adjunct to operative treatment. Complications include contrast-enhanced nefropathy, splenic infarct, renal infarct, liver abscess and buttock claudication (after bilateral internal iliac artery occlusion). A proper trauma management infrastructure with rapid access to CT-scanning and a 24/7 interventional radiology service should be present in all centres dealing with severely injured trauma patients.

Learning Objectives:

1. To understand imaging algorithms and strategies for patients with abdominal trauma.
2. To learn about indications for endovascular treatment for traumatic abdominal haemorrhage.
3. To become familiar with basic techniques for endovascular treatment of traumatic abdominal haemorrhage.
4. To learn about results and complications of endovascular treatment of traumatic abdominal haemorrhage.

Panel discussion:
Is there sufficient evidence to favour image-guided intervention over open surgery in abdominal vascular emergencies and other questions? 09:44

10:30 – 12:00 **Room A**

ESR meets Italy

EM 1

From morphology to function

Presiding:
L. Bonomo; Rome/IT
A. Rotondo; Naples/IT

A-107 10:30

Introduction: Italian Society of Radiology (SIRM) in the third millennium

A. Rotondo; *Naples/IT (antonio.rotondo@unina2.it)*

It is a great honour for me to open this session with the ECR President Prof. L. Bonomo. Prof. Bonomo, SIRM past President, is the third Italian President of ECR after Prof. Passariello (1999) and Prof.Chiesa (2005). The SIRM was born in 1913 and is the seventh Radiologic society founded in the world. Currently is the largest medical society in Italy with over nine thousand members and provides the main framework for presenting and exchanging the scientific experience of different hospital- and university-based working group. At present SIRM is the national member of the European Society of Radiology with the largest number of both institutional and individual affiliated radiologist. Our Society manages its activity through two organising structures: study sections and regional groups that work together, representing the real scientific and professional core of the society. Each section has one president and four councillors and its aim is to promote the radiological advancement and also to organise the Continual Medical Education (ECM) for our members. Regional groups are based on the geographical division of our Country. The Society has two main seats: the first one, the Headquarters in Milan, and the other one House of Radiologic Area in Rome where E-learning, research and development take place. This venue hosts also inter-society meetings as Italian Association of Neuroradiology (AINR), Italian Association of Oncologic Radiotherapy (AIRO) and National Radiological Union (SNR). The great scientific activity of SIRM is proved by the Official Scientific Journal, "La Radiologia Medica", with an impact factor of 1.698.

Session Objectives:
1. To review the current MRI and MDCT possibilities in functional imaging.
2. To consolidate knowledge of clinicians expectations of functional information.
3. To learn about the most recent MRI and MDCT applications enabling integration of morphology and function from the same examination.

A-108 10:35

Outlook and clinical perspectives of MDCT coronary angiography

M. Galia; *Palermo/IT (mgalia@yahoo.com)*

In the past decade Multislice CT Coronary Angiography (MSCT-CA) achieved excellent results in the diagnosis of coronary artery disease (CAD) with improving spatial and temporal resolution. High sensitivity and negative predictive value were elicited for the detection/exclusion of coronary artery stenoses in patients with suspected CAD. MSCT-CA may be employed in the emergency setting to perform the work-up of acute chest pain, including a one-stop-shop imaging of main thoracic killers: coronary syndrome without ST elevation at the ECG, pulmonary embolism and aorta dissection. Another relevant application is coronary plaque imaging which provides findings and clues of plaque vulnerability (i.e. composition and wall remodeling). MSCT-CA may address a paradigm shift from demonstration of ischaemia to the assessment of pure atherosclerosis. Recent studies pointed out the excellent prognostic value of the technique. Other potential applications of MSCT-CA are the assessment of revascularised patients (with stenting or coronary artery by-pass grafts), and the depiction of coronary anomalies. Radiation dose concerns triggered technical innovations such as higher spatial resolution with larger and novel detectors, faster data acquisition, modulation dose systems, and prospectively ECG-triggered high-pitch acquisition. New scanners may provide excellent image quality at a dose below 1 mSv, to levels lower than conventional angiography. MSCT-CA may also provide useful information of cardiac functional assessment (left and right ventricular function, evaluation of valves). In this context, the fusion imaging of hybrid scanners (CT and SPECT/PET) could represent a promising technological solution able to assess morphology and function at the same time.

Learning Objectives:
1. To review the performance of MDCT for diagnosis of coronary artery disease.
2. To highlight the importance of non-invasive imaging of coronary plaques.
3. To define the current and future role of MDCT for coronary artery disease and cardiac functional assessment.

A-109 10:55

Interlude: Imaging of the skeletal muscle pathology after the 2006 Winter Olympic Games

C. Faletti; *Turin/IT (carlo.faletti@cto.to.it)*

The winter Olympic Games held in Torino in 2006 were testimonial a very hard challenge which took on the form of the following motto: Passion Lives Here. This was also held dear in the organisation and set up of the diagnostic imaging, which was developed in three separate sites, at varying altitudes, reaching 2,000 metres high up in the Alps, in Sestriere. The most complete of diagnostic equipment was to be found there, including Ultrasound Diagnostic Equipment, C.T. Scans and Magnetic Resonance. Moreover, for the first time, all of these diagnostic techniques were pooled into a network that allowed for real-time visualisation/consultation between one site and another. The results gave credit to the organisational efforts, allowing for examinations and diagnosis to be made in the shortest possible time lapses. The pathologies diagnosed in the field of musculoskeletal imaging enabled the most suitable of surgical and/or therapeutic solutions to be chosen, as well as the possibility to programme the athletes' participation in the forthcoming competitions. Ultrasound examinations were carried out "on the field" for real-time interventions and the CT scans were done in dedicated containers at an altitude of 2,000 metres. It was for the first time that high field resolution Magnetic Resonance, both total body and those dedicated to new concepts, were executed at such an altitude, but, above all, the technology available was applied to this specific sports sector. Thanks to the excellent results obtained, satisfaction rates ran high for the athlete and medical teams alike.

A-110 11:00

Experimental study with 7T-micro MRI: in vivo rat model of intestinal infarction

R. Grassi; *Naples/IT (roberto.grassi@unina2.it)*

Acute Mesenteric ischaemia (AMI) is a life-threatening vascular emergency due to acute decrease of small bowel blood supply that may present occlusive (arterial/venous) or non-occlusive ethiopathogenesis. It has been estimated that the majority of cases (65%) are caused by arterial embolism or thrombosis, 25% by non-occlusive aetiology and the remaining 10% from venous thrombotic aetiology. Despite the advances in imaging techniques and, consequently, in therapeutic approaches, the overall mortality rate of this condition still ranges from 60 to 100%. An early diagnosis is important for a correct therapeutic approach able to reduce the mortality. Till now the best imaging method in diagnosis of mesenteric ischaemia/ infarction is enhanced CT even if some authors are considering a role for MRI in the evaluation of these disorders. Moreover, in available literature, there exists no systematic evaluation of the radiological findings related to different ethiopathogenesis of AMI and their chronological evolution. The aim of our studies was to identify the macroscopic, microscopic and µ-MRI findings of each aetiology of AMI and to document their chronological evolution in rat models. The progression of the ischaemic disease, observed in these experimental models, appears in line with the human pathology and so it could represent a useful tool to evaluate the role of MRI as an alternative technique in the diagnosis of intestinal infarction.

Learning Objectives:
1. To understand the chronological evolution of findings in mesenteric ischemia and infarction studying the damage either with a 7T-micro MR or by macro-microscopic observation.
2. To be able to attribute each finding to one or more of the three etiological types of mesenteric ischaemia (arterial, venous, ischaemia/reperfusion).
3. To appreciate the efficacy of MRI, as an alternative tool in the early detection of this pathology.

A-111 11:20

Interlude: Reasons to come to the 45th SIRM National Congress

C. Faletti; *Turin/IT (carlo.faletti@cto.to.it)*

From 1st to 5th June, 2012, Torino, will be the venue for the 45th National Congress of the "Società italiana di Radiologia Medica" (Italian Society for Medical Radiology). The society will unite 12,000 Radiologists. In fact, all those involved in the field of diagnostic imaging consider the radiologist a protagonist in the numerous pathological fields. This congress will offer not only the possibility of aggregation, but also the chance to compare oneself with others and the state-of-the-art-technology at our disposal nowadays both as to research and technological aspects, all of which enriched with numerous dedicated workshops, symposiums and monothematic courses. Although this year's congress will have a central theme of vascular alterations, no pathological field will be left out. The venue is one of International prestige, i.e. the "Centro Congressi Lingotto", a multi-complex of easy reach with all facilities which include an underground railway, surface buses and taxis as well as the most comfortable and modern of hotels. It is easily reached by road through a network of motorways and by airport. Torino is a city rich in history and culture, with monuments that include the Mole Antonelliana (housing the Cinema Museum), The Royal Palace and The Palace in Venaria, the famous Egyptian Museum and the automobile museum. Torino is at the foot of the mountains (Piedmont), situated between two hills, rich in enogastronomic culture, surrounded by some of the most famous wine countries in Italy, adding a "taste" for tourism to that of scientific culture.

A-112 11:25

MR contrast agents for liver imaging

A. Giovagnoni; *Ancona/IT (a.giovagnoni@univpm.it)*

Hepatobiliary-specific Gd-based contrast agents (Gadobenate dimeglumine : Gd-BOPTA and Gadoxetic acid: Gd-EOB-DTPA) are one of several classes of contrast agents presently available for MRI of the liver. These agents are taken up by functioning hepatocytes and excreted in the bile, and their paramagnetic properties cause a selected enhancement of the liver and biliary tree. This results in an increased contrast-to-noise ratio for nonhepatocellular lesions compared with that of the background liver, thereby increasing lesion conspicuity on delayed T1-weighted images. However, due to their pharmaco-dynamic properties, Gd-BOPTA and Gd-EOB-DTPA are sometimes described as "combination agents" because of their dual capability for imaging in the dynamic and delayed hepatocyte-specific phases of enhancement. These two agents potentially allow comprehensive non-invasive imaging assessment of the liver parenchyma, intrahepatic lesions, hepatic vessels, and the biliary tree in one examination. These MR contrast agents vary

Friday

in mode of administration and dose, mechanism of cellular up-take, degree of excretion through the biliary pathway, and imaging characteristics. In the liver, hepatobiliary-specific agents can be used to improve lesion detection, to characterise lesions as hepatocellular or nonhepatocellular, and to specifically characterise some hepatocellular lesions, notably focal nodular hyperplasia. Biliary excretion of these agents can be used to evaluate the anatomic structure and function of the biliary tree. Hepatobiliary-specific contrast agents may have wider applications, such as grading of cirrhosis and quantification of liver function in patients with liver trasplantation. Clinical applications, advantages, pitfalls, and problems with different contrast agents will be described and discussed.

Learning Objectives:
1. To learn about the functional aspect of hepatobiliary-specific contrast agents currently in clinical use in MRI evaluation of hepatocarcinogenesis.
2. To understand the functional aspect of hepatobiliary-specific contrast agents in MRI pre-surgical planning of liver malignancy.
3. To consolidate knowledge of use of hepatobiliary-specific contrast agents in characterisation of FLL.

Panel discussion 11:45

10:30 – 12:00 **Room C**

Interactive Teaching Session

E³ 520a
Abdominal emergencies

A-113 10:30
A. Non-traumatic (acute abdomen)
R. Basilico; *Chieti/IT (r.basilico@radiol.unich.it)*

Acute abdomen refers to any clinical condition characterised by severe abdominal pain that develops over a period of hours. This is a great challenge to the radiologist because differential diagnoses of acute abdomen include a wide spectrum of disorders, ranging from life-threatening diseases to benign self-limiting conditions. Rapid, accurate diagnosis is essential if morbidity and mortality have to be significantly decreased. The diagnostic work-up of patients admitted with acute abdomen is based on various imaging modalities such as abdominal plain film, ultrasound, CT and MRI: the topographic classification of acute abdominal pain (pain in one of the four abdominal quadrants, diffuse abdominal pain, flank or epigastric pain) facilitates the choice of the imaging technique and allows to narrow the range of possible diagnoses. A practical approach to acute abdomen is to confirm or to exclude the most common disease and to look for general signs of pathology such as inflamed fat, bowel wall thickening, ileus, free fluid, free air, etc: the role of US, CT and MRI in achieving these goals will be discussed. The common and more unusual causes of acute abdomen, with reference to the site of pain, will be also discussed in an interactive fashion. Findings useful for differential diagnoses will be presented in order to obtain the correct diagnosis beginning from the imaging sign.

Learning Objectives:
1. To understand the role of US, CT and MRI in acute abdomen.
2. To be familiar with the main differential diagnoses in acute abdomen, with reference to the site of abdominal pain.
3. To be able to recognise common and unusual findings in acute abdominal disorders.

A-114 11:15
B. Traumatic
D.R. Kool; *Nijmegen/NL*

In imaging of abdominal trauma ultrasound and CT are used, but in this interactive session we will especially focus on CT findings of abdominal injury. For an accurate interpretation of abdominal CT findings it is important to use a systematic approach. Different grading systems for organ injury are used that can facilitate their communication. When a haemoperitoneum is present a 'sentinel clot' can help to locate the bleeding site. However, in a third of patients with intra-abdominal injury free intraperitoneal fluid is absent. In hepatic, splenic and renal injury subcapsular and parenchymal haematomas, lacerations, contusions and infarcts may occur. In addition, extravasation of intra-vascular contrast and other signs of vascular injury (pseudo-aneurysm, arterio-venous fistulae, cut-off arteries and occlusion) should be looked for. When renal or ureter injury is suspected in the portal venous phase an additional delayed phase (more than 5 minutes) should be performed to exclude urinary contrast extravasation. In suspected bladder injury a retrograde (CT) cystography and for urethral injury a retrograde urethrogram should be considered to exclude extra-luminal contrast. Mesenteric injury presents with a mesenteric haematoma with or without contrast extravasation. Associated traumatic or ischaemic bowel injury should be looked for. Bowel injury is often difficult to diagnose. Thickening or discontinuity of the bowel wall and extraluminal air or bowel content are the signs to look for. However, haemodynamic shock and extensive fluid resuscitation can also result in bowel wall changes, which may complicate interpretation. Multiple examples of each of the above will be discussed.

Learning Objectives:
1. To understand the imaging features of liver and splenic trauma.
2. To be familiar with the imaging features of urological trauma.
3. To be familiar with the imaging features of intestinal and mesenteric trauma.

10:30 – 12:00 **Room E2**

Foundation Course: More About Ultrasound

E³ 520b
Vascular imaging: Doppler and contrast-enhanced US

Moderator:
L. Steyaert; Bruges/BE

A-115 10:30
A. Imaging superficial vessels
P. Landwehr; *Hannover/DE (peter.landwehr@ddh-gruppe.de)*

Greyscale and colour duplex ultrasound are the first main imaging tools in non-invasive diagnostic work-up of superficial arteries and veins. Combined demonstration of morphology and haemodynamics leads to therapeutic decision in many cases without the further need of MRA, CTA or DSA. In extracranial carotid artery disease, colour duplex helps to identify early disease as well as relevant stenoses. Quantification of carotid stenoses is done by colour duplex with a high degree of confidence. Follow-up during conservative management, after stenting or open surgery of carotid artery obstructions can be achieved as well. In peripheral arterial occlusive disease (PAOD), ankle-brachial Doppler index (ABI) is the basis for setting diagnosis. In addition, ABI is an excellent marker for the individual cardiovascular risk. Colour duplex helps to stratify PAOD patients to further imaging (e.g. MRA), arterial DSA with immediate intervention or conservative treatment. Results of invasive treatment like PTA or bypass surgery can be demonstrated quite well by colour duplex ultrasound. Ultrasound can guide minimally invasive interventions like image-guided thrombin injection or compression repair of postpuncture pseudonaneurysms. Deep and superficial venous thrombosis can be demonstrated with a high accuracy by greyscale compression ultrasound. Colour duplex is an adjunct for the detection of thrombosis, but not an essential tool. From the iliac veins down to the knee, ultrasound is sufficient in most patients to decide on the presence of acute deep vein thrombosis. If a recurrent thrombosis is suspected in a post thrombotic situation, ultrasound has significant limitations.

Learning Objectives:
1. To become familiar with the main indications and US signs in pathology of the carotids, peripheral arterial occlusive disease and venous thrombosis.
2. To learn how to set your US system properly in superficial vessel US and to optimise your examination protocols and imaging strategy.
3. To learn about the clinical role of vascular US as a part of diagnostic work-up of vascular disease.

A-116 11:00
B. Imaging deep vessels
D.K. Tsetis; *Iraklion/GR (tsetis@med.uoc.gr)*

The evolution of ultrasound technology has allowed the wide application of colour-flow duplex scanning (CFDS) in the imaging of abdominal arteries. Duplex criteria have been set to identify renal artery stenoses (RAS) that are haemodynamically significant. Threshold values for PSV consistent with a 60% or greater diameter reduction of the renal artery obtained in most studies are 180 to 190 cm/sec. In some cases it is useful to use the ratio between the velocity of the renal artery and the aorta. Threshold values of this ratio diagnostic of a 60% or greater RAS vary in different studies from 3 to 3.5. Renal hilar duplex scanning from a flank or translumbar approach has been suggested as a simplified alternative for screening, especially in those patients in whom conventional renal duplex examination is difficult to perform. Contrast-enhanced US (CEUS) seems promising in diminishing the rate of technically inadequate renal artery examinations. Regarding the mesenteric arteries, with adequate patient preparation, the CA and SMA can be identified and the bloodflow velocity within these vessels measured. CA PSVs of 200 cm/sec and SMA PSVs of 275 cm/sec or greater are suggestive of high-grade stenoses within these vessels. CFDS with the advantages of low cost and risk can accurately monitor abdominal aortic aneurysm size, detect endoleak, and provide dynamic and haemodynamic information not available with other imaging methods. As far as detection of endoleaks is concerned, recent meta-analyses show a sensitivity of 66-77% for CFDS and 81-98% for CEUS.

Learning Objectives:

1. To learn about haemodynamic considerations and correlation with spectral analysis in abdominal arteries.
2. To learn about US features of normal and abnormal abdominal aorta.
3. To learn about US features of normal and abnormal renal arteries, celiac trunk and mesenteric arteries.

A-117 11:30

C. The role of contrast US

D. Clevert; *Munich/DE (Dirk.Clevert@med.uni-muenchen.de)*

Abnormalities of the abdominal aorta and the visceral vessels may represent a diagnostic challenge in patients with acute or chronic clinical symptoms. In addition to the primary diagnosis in b-scan, colour-coded duplex ultrasound, contrast-enhanced ultrasound (CEUS) with low mechanical index (low MI) is a new promising method in the diagnosis and follow-up of pathological aortic lesions. These pathology findings were compared with b-scan, colour-coded duplex ultrasound, CEUS and multislice computed tomography angiography (MS-CTA). Pathologies of the abdominal aorta will be often treated with an endovascular aneurysm repair (EVAR). Endoleaks following endovascular aneurysm repair (EVAR) are common and present a diagnostic challenge in the follow-up after EVAR. CEUS with SonoVue® allows a more rapid and noninvasive diagnosis in the follow-up after EVAR. This course will describe the aetiology, classification and importance of pathologies of the abdominal aorta and the different types of endoleaks allowing the participants to appreciate the usefulness of CEUS in this clinical situation.

Learning Objectives:

1. To become familiar with the use of contrast-enhanced ultrasound in abdominal aortic disorders.
2. To understand the pros and cons of different diagnostic modalities with regard to cost effectiveness.
3. To learn about risks and contraindications for EVAR and to discuss optimised imaging strategies in follow-up after EVAR.

10:30 – 12:00 **Room I/K**

Joint Course of ESR and RSNA (Radiological Society of North America)

MC 528

Essentials in oncologic imaging: what radiologists need to know (part 2)

Moderator:
D.M. Panicek; New York, NY/US

A-118 10:30

A. Pancreatic cancer

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

Despite advances in cross-sectional techniques imaging still has difficulties on assessing pancreatic tumours and in particular adenocarcinoma. The main problems remain the early detection of small tumours and the clearcut definition of patients that are amenable to curative surgery. After reviewing current concepts in the classification of pancreatic tumours including the role of molecular biomarkers, the lecture will address the strategies that may be used to maximise tumour conspicuity in a multi modality perspective that also encompasses uprising techniques such as dual energy CT, perfusion CT/MR and diffusion-weighted MRI. The concept of borderline resectable pancreatic cancer will be explained as well the key points for image interpretation in the setting of clinical decisions for patient management. Also, the current role of adjuvant or neoadjuvant therapy will be shortly addressed especially concerning its imaging implications, as well as the new concepts on pancreatic adenocarcinoma oncogenesis and possible imaging strategies that may be used for earlier detection.

Learning Objectives:

1. To understand current pathologic concepts for the classification of pancreatic tumours.
2. To learn about imaging findings used for tumour detection, staging, and restaging after adjuvant therapy.
3. To understand the role of functional and molecular information provided by PET/CT, DWI and perfusion imaging when assessing pancreatic tumours.

A-119 10:55

B. Kidney cancer

E.K. Fishman; *Baltimore, MD/US*

58,240 Americans were diagnosed with renal cancer in 2010 and an estimated 13,040 will die from renal carcinoma in 2010. Deaths worldwide are over 100,000 annually making renal cancer one of the leading causes of cancer death. With the advent of cross sectional imaging modalities like CT and ultrasound over two thirds of cases of renal cell carcinoma are detected as incidental findings. Classic presentations like hematuria only occur in up to 40% of cases and so many of these patients are diagnosed with larger tumors. In this presentation we will focus on the role of state of the art CT for the detection, staging and management of the patient with known or suspected renal carcinoma. We will look at some of the challenges in diagnosis focusing on optimising scan protocols as well as the role of 3D mapping in staging and pre-operative planning. The role of imaging in patient management be it partial nephrectomy, ablation therapy or nephrectomy will be discussed. Potential pitfalls and limitations of study technique will be addressed. Finally we will also focus on some of the newer discoveries showing that enhancement patterns on CT can not only differentiate in most cases between papillary and clear cell RCC but enhancement patterns can also predict genetic errors which may impact on therapy for drug selection. Trends for future innovation will also be discussed.

Learning Objectives:

1. To understand the diagnostic implications of minimally invasive treatments of renal cancer.
2. To review the genetic causes of renal cancer and the radiologic appearances of specific histologic subtypes.
3. To review the potential role of molecular imaging in the management of advanced renal cancer.

A-120 11:20

C. Ovarian cancer

H. Hricak; *New York, NY/US*

Global epidemiological statistics demonstrate that mortality from ovarian cancer has not changed in half a century. Advances in molecular medicine and biomedical imaging are poised to make a difference. Early ovarian cancer is treated with comprehensive staging laparotomy. For advanced disease deemed nonresectable, neoadjuvant chemotherapy followed by surgical debulking is recommended. In the management of ovarian cancer, cross-sectional imaging is now essential in (1) tumour detection and characterisation; (2) treatment selection and planning (identifying difficult-to-reach tumour deposits or inoperable disease for which neoadjuvant chemotherapy is indicated); (3) monitoring treatment response; (4) detecting recurrent disease, and, depending on tumour size and location, choosing between secondary cytoreduction and chemotherapy. Ultrasound is the primary modality for detecting and characterising adnexal masses. MRI is useful for characterising sonographically indeterminate adnexal masses, and contrast-enhanced CT is the modality of choice for preoperative staging. FDG PET-CT is valuable for detecting recurrent disease, particularly in the mesentery, bowel serosa and normal-sized lymph nodes. We are witnessing a paradigm shift in cancer care, as imaging permeates all facets of cancer diagnosis, treatment and follow-up. The opportunities for biomedical imaging have never been greater. Our role is to understand the key clinical questions and, using imaging, serve as essential physician consultants.

Learning Objectives:

1. To get an overview of the essential imaging findings in characterisation and staging of ovarian cancer.
2. To learn the key imaging findings that affect management of ovarian cancer.
3. To understand the changes in imaging armamentarium in ovarian cancer, and learn the best practice in proper image utilisation.

Questions 11:50

12:30 – 13:30 **Room Z**

Molecular Imaging

MC 23B

Basics in molecular imaging (2)

Moderator:
J. Dijkstra; Leiden/NL

A-121 12:30

A. MR contrast agents for targeted MR imaging
S. Aime; *Turin/IT (silvio.aime@unito.it)*

The possibility of carrying out Molecular Imaging protocols by means of MRI is very attractive for the superb anatomical resolution that is attainable by this technique. However, MRI suffers from an intrinsic insensitivity with respect to the competing imaging modalities that has to be overcome by designing suitable amplification procedures based on the development of reporting units endowed with an enhanced sensitivity and on the identification of efficient routes of accumulation of the imaging probes at the sites of interest. Now, the need of targeting molecules that are present at very low concentrations requires the development of novel classes of contrast agents characterised by enhanced contrasting ability and improved targeting capabilities. The possibility of delivering a high number of imaging agents at the target of interest appears the solution of choice to overcome the drawback associated with the low sensitivity of the MRI approach. Currently much attention is devoted to the design and use of self-assembled systems based on lipophilic molecules, where the imaging reporters are represented by highly stable paramagnetic Gd (III) complexes. Moreover, nano-sized carriers for Gd-complexes based on naturally occurring systems (e.g. lipoproteins) have also been considered for targeting specific epitopes on diseased cells. Besides paramagnetic agents much attention is currently devoted to the new class of frequency-encoding probes, the CEST agents (CEST= Chemical Exchange Saturation Transfer). The use of frequency-encoding agents opens the interesting perspective of detecting more than one agent in the same anatomical region.
Learning Objectives:
1. To learn how to tackle the sensitivity issues of MRI probes.
2. To learn about available strategies for visualising cellular targets with MRI probes.
3. To be introduced to the use of nano-sized carriers for MR imaging-guided therapies.

A-122 12:50

B. Sonographic and photo acoustic techniques for MI
F.M.A. Kiessling; *Aachen/DE (fkiessling@ukaachen.de)*

Ultrasound is one of the workhorses in clinical diagnosis. In this context, the diagnostic power of ultrasound can be increased when using microbubbles as contrast agents providing information about tissue vascularisation and perfusion. By conjugating biomolecules to the microbubble surface even intravascular molecular ultrasound imaging becomes feasible. In this context, for the discrimination of low- and high-aggressive breast cancers it has been shown that the assessment of the VEGFR2-expression by molecular ultrasound is superior to the functional information about tumour vascularisation. First targeted ultrasound contrast agents are currently evaluated in clinical trials. Potential clinical indications are characterisation of tumours, improvement of ultrasound guided biopsy, personalised tumour therapy, the characterisation of atherosclerotic plaques and the diagnosis of other diseases that go along with vascular remodelling and inflammation. Unfortunately, microbubble-based imaging is restricted to the endovascular compartment. Here, photoacoustic imaging may be helpful, which bases on the ultrasound acquisition of the thermoelastic expansion of nanoparticles after laser excitation. Haemoglobin, gold nanoparticles, dyes, fluorescent proteins and other light-absorbing materials can sensitively be imaged by this technique. In this talk, the composition of molecular ultrasound contrast agents and their measurement techniques will be explained and illustrated. In addition, the mechanistic principle of photoacoustic imaging will be explained intending to exemplify both emerging diagnostic technologies to the clinical radiologists.
Learning Objectives:
1. To understand the principles of photo acoustic imaging.
2. To learn about the most common quantitative detection techniques for targeted US contrast agents.
3. To be informed about applications of functional and molecular ultrasound and photo acoustic imaging in preclinical and clinical research.

A-123 13:10

C. Potential of optical imaging in vivo
V. Ntziachristos; *Munich/DE*

Optical imaging is unequivocally the most versatile and widespread visualisation modality in the life sciences. Yet it is significantly limited by photon scattering, which complicates imaging beyond a few hundred microns. Recently, however, there has been an emergence of powerful new optical imaging methods that offer high-resolution imaging beyond the penetration limits of microscopic procedures. Of particular importance is the development of multi-spectral opto-acoustic tomography (MSOT) methods that bring unprecedented imaging performance in visualising anatomical, physiological and molecular imaging biomarkers through several millimetres to centimetres of tissue. Its attractive features include the ability to offer 10-100 micron resolution and real-time imaging. In parallel, we have achieved the first in-human clinical translation of targeted fluorescent probes which opens the way for advanced surgical and endoscopy procedures and personalised theranostics and screening. MSOT can enable exceptional insights to cellular and sub-cellular processes through entire small animals, embryos, fish and insects. This talk describes current progress with instruments, methods and applications for in-vivo optical- and opto-acoustic tomography of whole intact animals and model biological organisms. We show how new opto-acoustic and fluorescence imaging concepts are necessary for accurate and quantitative molecular investigations in tissues and why it could be a valuable tool for accelerated research of therapeutic efficacy and outcome. We further demonstrate that cellular functions and bio-chemical changes can be detected in-vivo, through intact tissues at high sensitivity and molecular specificity. Pre-clinical and clinical results are presented and advantages and limitations of these methods along with future directions are discussed.
Learning Objectives:
1. To learn about benefits and limitations of optical and fluorescence imaging.
2. To appreciate potent biological and clinical applications.
3. To become familiar with future direction for clinical photonic imaging.

12:40 – 13:10 **Room A**

Plenary Session

HL 1

Josef Lissner Honorary Lecture

Presiding:
L. Bonomo; Rome/IT

A-124 12:40

The pulmonary nodule: old and new challenges
C.M. Schaefer-Prokop; *Amersfoort/NL (cornelia.schaeferprokop@gmail.com)*

Pulmonary nodules are one of the classic challenges in radiology: detection and lesion characterisation are constant sources of trouble, be it in the form of unnecessary workup or missed lesions and ensuing lawsuits. This presentation will review the progress that has been made on these issues and also discuss current limitations of radiological techniques. Human observers are notoriously inaccurate when it comes to detection and characterisation of nodules. Like the development in chess computers, computer programs (computer-aided diagnosis, CAD) now start to outperform humans. Rib suppression or temporal subtraction techniques on chest radiographs aid in lesion detection. New CAD techniques combine algorithms and can detect, quantify and characterise pulmonary lesions. However, while radiologists are still able to detect lesions missed by CAD, they also dismiss true-positive and accept false-positive CAD markers. CAD development has been stimulated by the large image databases from lung cancer screening trials. These trials provide new information about prevalence and prognosis of various nodule phenotypes: small solid nodules are extremely common but have a low cancer risk, persistent part solid and ground glass nodules (GGN) have a high malignancy rate and GNN grow slowly. Volume and mass doubling times are more accurate measures than nodule diameter. Form and location allow for identifying benign perifissural nodules. Dynamic-contrast-enhanced imaging with CT or MR as well as PET so far only plays a role in larger lesions. Still, however, the role of CT screening is not fully defined: false positives and radiation dose remain important issues.
Learning Objectives:
1. To understand options but also limitations of new computer supported tools to detect and characterise nodules in radiographs and CT.
2. To learn about study results so far and ongoing research to overcome these limitations.
3. To learn about the potential of low dose chest CT to move from nodule screening to thoracic disease screening.

14:00 – 15:30 Room E2

Foundation Course: More About Ultrasound

E³ 620

US and contrast-enhanced US for focal lesions

Moderator:
D.O. Cosgrove; London/UK

A-125 14:00

A. Evaluation of focal liver lesions

T. Albrecht; *Berlin/DE (thomas.albrecht@vivantes.de)*

In the past decade, contrast-enhanced ultrasound (CEUS) of the liver has been firmly established as an excellent imaging modality for focal lesions. Its strong points include high spatial and contrast resolution as well as its unparalleled temporal resolution, enabling dynamic imaging after contrast injection in real time. Disadvantages are poor sonographic access in some patients (mainly obese) and operator dependence. All common liver lesions display characteristic dynamic enhancement patterns on CEUS in the arterial, portal venous and delayed phase. This is used for lesion classification and characterisation. Furthermore, the fact that the vast majority of malignant lesions appear hypoenhancing on delayed phase imaging is exploited to improve detection of malignant lesions. Typical features of common benign and malignant lesions as well as clinical indications for CEUS of the liver will be discussed.

Learning Objectives:

1. To learn the contrast enhancement patterns of common benign and malignant focal liver lesions.
2. To realise the importance of delayed phase imaging for differentiation of benign vs malignant lesions and detection of metastases.
3. To understand the clinical role of CEUS of the liver including strengths and limitations as defined by the EFSUMB guidelines.

A-126 14:30

B. Evaluation of kidney lesions

C. Nicolau; *Barcelona/ES (cnicolau@clinic.ub.es)*

Detection of focal renal lesions is very common in the clinical practice. Most renal lesions are non specific on baseline ultrasound (US) and require further examination with imaging modalities after the intravenous administration of a contrast agent. US contrast agents are strictly intravascular and unlike CT and MR contrast agents, US contrast agents are not eliminated by the urinary system and can be used in patients with renal failure. The main indication of contrast-enhanced ultrasound (CEUS) in the kidney is the characterisation of complex cysts. The detection of enhancing thickened irregular wall or septa or the presence of soft-tissue enhancing mass independent of the wall is the most specific sign suggesting malignancy. Characterisation of complex cysts with CEUS is also very useful when complex masses do not show a conclusive CT/MR diagnosis. CEUS may also help in the characterisation of pseudotumours such as prominent Bertin columns and dromedary hungs. Regarding solid renal tumours, there is an overlap of the enhancement pattern between benign and malignant lesions. For this reason, CEUS is not routinely recommended to detect and characterise solid masses. However, it can help in the differentiation of subtypes of renal cell carcinomas based on tumour vascularity since non clear-cell carcinomas, such as the papillary type, are usually more hypovascular than clear-cell carcinomas. CEUS has also a role in the evaluation of renal perfusion including ischaemia, trauma and complicated pyelonephritis that may in some cases show a focal appearance that mimics a renal tumour.

Learning Objectives:

1. To become familiar with the physiology and features of the US contrast uptake of the kidneys.
2. To discuss the role of US and CEUS in the diagnosis and characterisation of focal solid and cystic renal lesions.
3. To describe the role of CEUS in the differential diagnosis of true renal tumours with pseudotumours and other renal diseases.

A-127 15:00

C. Intraoperative and therapeutic applications

L. Solbiati; *Busto Arsizio/IT (lusolbia@tin.it)*

Sonography (US) is the most commonly used imaging modality for the guidance of percutaneous ablative treatments, but both US and color Doppler cannot differentiate coagulative necrosis from viable tumour. Accordingly, both immediate and long-term assessment of therapeutic result is usually achieved by contrast-enhanced CT (CECT) or MRI (CEMRI) which can be performed only at the end of the treatment session. In addition, the possibility of achieving local tumour control with percutaneous ablation is largely related to tumour size. Consequently, there is an increased need to detect and treat small tumours that are often clearly visualised on CT or MRI, but not on US. Contrast-enhanced sonography (CEUS) is helpful for guiding electrode insertions into targets hardly visible with US. However, the most important role of CEUS is the immediate post-ablation control. The sensitivity of CEUS for the detection of residual tumour is almost equivalent to that of CECT and CEMRI. Cost-effectiveness and reduction of patients' discomfort related to the need of re-treatment are the two main advantages of CEUS in RFA of liver malignancies. The use of CEUS during liver surgical resections is gaining more and more importance since it can allow to detect small additional neoplastic lesions not visualised in the pre-surgical staging with imaging modalities and to depict with great accuracy liver vascularity, thus allowing to perform precise liver-sparing anatomical resections.

Learning Objectives:

1. To understand the potential and advantages of US in intraoperative and therapeutic applications.
2. To learn how to use US to guide therapeutic procedures.
3. To learn useful tricks for planning and performing treatments.

14:00 – 15:30 Room I/K

Joint Course of ESR and RSNA (Radiological Society of North America)

MC 628

Essentials in oncologic imaging: what radiologists need to know (part 3)

Moderator:
H.-U. Kauczor; Heidelberg/DE

A-128 14:00

A. Oncologic imaging: terminology, definitions and buzzwords

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

The routine practice of oncologic imaging requires standardisation, which means that we need to harmonise technical protocols and agree on the meaning of selected words for the radiological report. The words "Response, "Progression" and "Stable disease" are precisely defined according to internationally accepted thresholds and criteria. Although the rules are quite simple and rather easy to apply, they are very efficient in the classification of the response to treatment, and therefore for the medical decisions. However, the role of the radiologist is not limited to measurements and calculation. The detection of new lesions may be challenging and requires experience. The differential between cancer progression and complications of the treatment might be very difficult and requires an adequate communication with the referring clinician. Overall, most of the decisions taken by the clinician will be related to imaging results, stressing the importance of adequate protocols and reports.

Learning Objectives:

1. To get an overview and precise explanation of current cancer-related terminology, definitions and "buzz" words used in everyday practice.
2. To understand why and how this terminology should ensure and simplify communication with all specialists involved in cancer management, including clinicians, researchers as well as other radiologists.
3. To learn common tricks and traps in providing a radiology report, illustrated with clinical cases.

A-129 14:20

B. Liver cancers (primary, metastases)

R.L. Baron; *Chicago, IL/US (rbaron@uchicago.edu)*

Hepatocellular carcinoma (HCC) is the most common primary tumour (approximately 90% of primary tumours), with cholangiocarcinoma comprising 5--10% and rare other primary tumours. HCC is most commonly associated with chronic liver disease (alcohol or hepatitis B or C). Nodular changes inherent in cirrhosis simulate tumours and obscures tumour when present, emphasising the key role of contrast enhancement characteristics and MR signal intensity changes. Proper evaluation of contrast enhancement characteristics has resulted in the nonbiopsy imaging criteria for HCC diagnosis that is the standard of care for patient management. Staging and treatment decisions are then based on lesion size and number as in the TNM tumour staging system. False-positive diagnoses in cirrhosis will be discussed. Cholangiocarcinoma

has a varied imaging appearance based on the underlying histologic stroma (from glandular mucin producing to dense fibrous). The contrast enhancement characteristics that vary with the stroma are key to detecting and characterising these lesions. There is no effective chemotherapy or interventional cure, and treatment options are limited to aggressive surgical approaches and the imaging assessment of extent of disease is critical in planning. Metastatic liver disease most often has very nonspecific imaging features that preclude diagnosis on imaging characteristics alone. Certain contrast enhancement characteristics, however, allow for characterisation and more importantly, assessment of response to treatment, particularly in vascular metastatic lesions such as GIST tumours. Detection of small lesions that can be critical for staging can be optimised with MR liver-specific imaging agents and with diffusion-weighted imaging.
Learning Objectives:
1. To get an overview of the AASLD/EASL imaging criteria for noninvasive diagnosis of hepatocellular carcinoma.
2. To learn about best practice CT/MR/US imaging techniques that optimise characterisation, detection and staging of primary and metastatic liver tumours.
3. To understand the key role specific findings reported by radiologists have in determining patient treatment options for hepatocellular carcinoma.

A-130 14:55
C. Prostate cancer
J.O. Barentsz; *Nijmegen/NL (J.Barentsz@rad.umcn.nl)*

This presentation provides guidelines for how to be successful in prostate MRI and convince urologists to use MRI. It is important that radiologists performing prostate MRI speak the same language as their referring physicians. They should know as to what is important for the patient. Therefore, this presentation provides guidelines for prostate MRI, assessed by prostate MRI experts from the European Society of Urogenital Radiology (ESUR). The proposed MRI protocols for “detection”, “staging” and “node and bone” will be shown. The use of endorectal coil versus pelvic phased array coil and 1.5 versus 3 T will be discussed. And most importantly, clinical indications are provided. Finally, the ESUR PiRADS classification and a reporting system will be presented.
Learning Objectives:
1. To learn the key clinical indications for MR imaging in prostate cancer.
2. To get an overview of essential MR imaging techniques in detection, characterisation, localisation and staging of prostate cancer.
3. To understand how MR imaging influences therapeutic decisions and how best to provide a value added MR report.

Questions 15:20

14:00 – 15:30 **Room Q**

RTF – Radiology Trainees Forum

TF 1
Highlighted Lectures
Moderators:
D. Bulja; Sarajevo/BA
M. Edjlali-Goujon; Paris/FR

A-131 14:00
Molecular imaging: principles and potential applications
N. Grenier; *Bordeaux/FR (nicolas.grenier@chu-bordeaux.fr)*

Molecular imaging (MI) appears as a great challenge for the future of imaging, because it is able to characterise cellular and molecular processes and will serve as a guide for new targeted or personalised therapies. MI is already part of clinical practice using PET and targeted probes, due to the very low doses of tracers used. Introduction of MI into radiological techniques will take more time because our techniques are lacking sensitivity. The main issues of MI are targeting of cells, receptors and gene expression. Cell targeting has already been used in patients using MRI and iron oxide particles: these are phagocytized by macrophages in deep tissues making it possible to target inflammation into brain, bone, kidney and arterial wall. Ex vivo labelling of cell progenitors is also promising to monitor cell therapies with imaging. Targeting receptors has a great potential to identify molecular processes involved during cancer development, inflammation, apoptosis, extracellular matrix changes¼ but it requires to validate the specificity of targets, the stability of the agent and to obtain enough sensitivity with our clinical imaging techniques. Imaging gene expression is more challenging.
Learning Objectives:
1. To become familiar with the basic principles of molecular imaging.
2. To become aware of it’s future possibilities.

A-132 14:30
Vascular ultrasound: technique and clinical applications
B. Brkljacic; *Zagreb/HR*

Ultrasound is used for visualisation of vascular pathology in various areas. It is used to evaluate peripheral arterial disease, carotid and vertebral arteries disease, diseases of aorta and its visceral branches and pathology of deep and superficial veins. Although ultrasound is often neglected in imaging of blood vessels accuracy of ultrasound in most areas is comparable with CTA and MRA. Ultrasound has numerous advantages to CTA and MRA, since it is cheap, widely and easily available, non-invasive, safe, with no exposure to ionising radiation, mostly does not require administration of contrast media and can be performed at the patient’s bedside. It demonstrates not only morphology of the vessel but also provides important haemodynamic information in real-time. Role of vascular ultrasound is very important in planning of surgical and/or endovascular therapy, in evaluation of immediate success and long-term follow-up after the treatment. Ultrasound is very useful in angio-suite during endovascular procedures, and several cases will be presented to demonstrate usefulness of ultrasound in vascular interventions. Thorough understanding of haemodynamic changes and Doppler physics is needed for adequate interpretation of Doppler findings. Basic technique of vascular US exam will be presented in the lecture, as well as factors that influence morphology of Doppler spectra. Doppler artefacts will be discussed. Various types of normal and pathological Doppler waveforms will be presented. Criteria to establish the diagnosis of stenosis in various arteries will be discussed. Use of ultrasound to diagnose deep venous thrombosis and alternative findings that mimic DVT will be presented.
Learning Objectives:
1. To understand the technique of vascular ultrasound.
2. To know how to structurally assess vascular structures.

A-133 15:00
Chest x-ray in children
S. Ryan; *Dublin/IE (stephanie.ryan@cuh.ie)*

Interpretation of the chest radiograph in children is quite different to the adult CXR. It requires knowledge of the normal appearance of the paediatric CXR and an understanding of the diseases that affect children. I shall first present the normal appearance with an emphasis on the appearance of the thymus in the paediatric CXR. Four patterns of disease will be described: airway obstruction, interstitial pattern, cardiomegaly and atelectasis. I shall then present two main diagnoses in each of four categories: neonatal medical chest disease, congenital lung abnormalities, cyanotic and non-cyanotic heart disease, and common and less common respiratory infection in children. Four miscellaneous conditions, diaphragmatic hernias, cystic fibrosis, non-accidental injury and foreign body aspiration will complete this whirlwind review of a vast and very important topic.
Learning Objectives:
1. To comprehend the differences between paediatric and adult chest x-rays.
2. To learn the characteristics of the most important paediatric chest x-rays diagnoses.

14:30 – 15:30 **Room Z**

The Beauty of Basic Knowledge: Interpretation of the Chest Radiograph

MC 27B
The heart

A-134 14:30
The heart
J. Cáceres; *Barcelona/ES (josecac@gmail.com)*

PA and lateral chest radiographs are the initial step in evaluating cardiac diseases. Although its importance has diminished, it can still be useful, especially in cases in which cardiac pathology is simulated, avoiding unnecessary additional examinations. Findings easily interpreted in the CXR are the increased size of the cardiac silhouette, analysing cardiac calcifications and evaluating the displaced heart.
Learning Objectives:
1. To review the causes of an enlarged cardiac silhouette.
2. To recognise the different causes of dextrocardia.
3. To learn the significance of cardiac calcifications.

16:00 – 17:30 **Room A**

GI Tract

RC 701
How I report

Moderator:
M.M. Maher; Cork/IE

A-135 16:00
A. MRI in a patient with rectal cancer
D.J.M. Tolan; *Leeds/UK (djmtolan@doctors.org.uk)*

MRI provides critical information for preoperative decision making in rectal cancer. High-resolution T2 sequences covering the whole tumour, inclined to the tumour axis are required in axial, coronal and sagittal planes. An accurate assessment allows the surgical and oncology team to decide whether the patients should proceed straight to surgery or if they require neoadjuvant radiotherapy alone (short course) or chemoradiotherapy (long course). The radiologist must therefore report the following tumour features that predict adverse outcome or suitability for radiotherapy: precise tumour location in the rectum and relationship to the peritoneal reflection; presence and extent of tumour penetration thorough the rectal wall (T3 or more); presence of tumour within 1 mm of the Circumferential Resection Margin (CRM) (corresponding to the mesorectal fascia); invasion of the peritoneum; invasion of the anal sphincters; presence of vascular invasion; malignant lymphadenopathy; mucinous differentiation. The role of diffusion-weighted imaging is yet to be defined in clinical practice in terms of initial tumour assessment and predicting response to therapy. In addition to MRI, accurate staging requires MDCT evaluation for distant metastasis to liver, lung, retroperitoneal nodes and peritoneum. The optimal imaging report provides a comprehensive radiological staging to compare with final histology (Tumour, Nodes, Vascular Invasion, Involvement of CRM and distant Metastasis). This is essential for audit of clinical practice and service development. There is a potential role for structured clinical reports to ensure that all of this information is provided in a reproducible way to facilitate multidisciplinary team decision making.
Learning Objectives:
1. To learn about MRI protocols for staging rectal cancer.
2. To become familiar with TMN staging of rectal cancer and its relevance to imaging.
3. To learn a structured approach to the reporting of rectal cancer MRI.

A-136 16:30
B. CT in a patient with bowel obstruction
P. Taourel; *Montpellier/FR (p-taourel@chu-montpellier.fr)*

The questions regarding the CT diagnosis of bowel obstructions are as follows: is there an obstruction? What is the level and the cause? Are there findings of closed loop obstruction and of strangulation? What is the treatment recommended: surgery or follow-up, laparoscopy or laporotomy? To answer these questions, the CT semiology is based on findings validated in the literature that will be described in this lecture, by underlining the potential pitfalls in interpretating a CT exam in bowel obstruction. The technical modalities of the CT will be detailed: thickness of the slices, role of acquisition without contrast and reformatting
Learning Objectives:
1. To understand a simple classification for the causes of bowel obstruction.
2. To become familiar with CT protocols used in the diagnosis of suspected bowel obstruction.
3. To learn a structured approach to the reporting of CT with suspected bowel obstruction, including relevant positive and negative findings.
4. To understand the accuracy of the various radiological signs of bowel obstruction and how the radiologist may formulate a level of diagnostic confidence in their report.

A-137 17:00
C. CT in a patient with a solid mass of the pancreas
C. Valls; *Barcelona/ES (carlosvalls@csub.scs.es)*

Radiological staging of adenocarcinoma of the pancreas is critical for adequate management of these patients because treatment depends on the stage of the disease. If pancreatic cancer is limited radical surgery can be performed whereas only palliative treatment with chemotherapy and radiotherapy can be offered in patients with locoregional or distant extension of the disease. There are many diagnostic techniques for studying the pancreas, but most authors agree that multidetector CT is the technique of choice because of its accessibility and excellent diagnostic results. The aim of this presentation is to show the key radiological features for an adequate diagnosis and staging of pancreatic cancer. In addition specific guidelines for the radiological report in these patients will be discussed in order to convey all the necessary information to the referring physician. Unresectability criteria with CT include liver metastases, distant locoregional lymph nodes, peritoneal carcinomatosis or tumour invasion of superior mesenteric artery, celiac axis or hepatic artery. The presence of direct contiguity between the tumour and arterial vessel, regardless of the degree of contact between them is a sign of tumour invasion. In general arterial invasion is always considered a criterion of unresectability and no patients with arterial involvement should be operated on. Venous invasion is generally not considered a contraindication for radical resection. Recently a small subgroup of patients with marginally resectable adenocarcinoma of the pancreas has been described. These are patients with arterial tumoural infiltration less than 50% who respond to aggressive neoadjuvant chemotherapy and radiotherapy.
Learning Objectives:
1. To become familiar with a simple classification of the causes of a solid pancreatic mass, with emphasis on malignancy.
2. To understand CT acquisition protocols tailored to the assessment of a pancreatic mass.
3. To learn about the diagnostic performance of the various CT observations in assessing a solid pancreatic mass, focusing on characterisation and subsequent assessment of resectability if appropriate.
4. To learn a final structured approach to the reporting of CT in a patient with a solid mass of the pancreas.

16:00 – 17:30 **Room B**

Interactive Teaching Session

E³ 720a
Neurological emergencies

A-138 16:00
also EPOS

A. Non-traumatic
C. Ozdoba; *Berne/CH (christoph.ozdoba@insel.ch)*

Neurological emergencies, i.e., the sudden loss of motor, sensory, or cognitive functions up to coma, have numerous causes. The probably most important neurological emergency, both in absolute number of affected patients as in socio-economic impact, is stroke. With recent advances in devices and techniques for interventional neuroradiology, such as microcatheters and 3D DSA, neuroendovascular surgery is playing an increasing role in the treatment of acute stroke. Early diagnosis with a complete imaging work-up, either by CT or MRI, is mandatory before these therapies can be applied, and although the time span for a successful therapy has increased to 4.5 hours for i.v.-thrombolysis and up to eight hours for intraarterial therapy, an efficient time-saving algorithm in the management of stroke patients remains crucial. Other causes besides stroke, however, must not be forgotten. This talk focuses on CNS pathology; conditions like coma due to metabolic causes or intoxication will not be covered. A wide range of possible etiologies remains, ranging from vascular pathology (e.g., cervical artery dissection or venous sinus thrombosis) to epilepsy, metastatic disease, and inflammation. As in stroke, imaging studies today are an essential component of early diagnosis. MRI is the method of choice for nearly all of the above mentioned conditions; at least in tertiary care centers, indications for MR in a neurological emergency should be seen generously – around the clock (24/7). In an emergency situation, structural imaging should routinely be complemented by special techniques like diffusion- and susceptibility-weighted imaging and perfusion studies. Examples will be shown and recommendations for optimized emergency study protocols are given.
Learning Objectives:
1. To learn which imaging modality and which imaging protocols to use.
2. To understand how to identify early ischemia.
3. To be able to select candidates for endovascular stroke treatment.

A-139 16:45
B. Traumatic
M. Stajgis; *Poznan/PL (stajgis@o².pl)*

Traumatic brain injury (TBI) encompasses a wide, heterogeneous group of intracranial injuries that includes acute primary insults that occurred at the time of impact and secondary ones such as cerebral swelling or herniation. Imaging is critical for diagnosis and proper management in all patients with TBI. Noncontrast CT is still the "gold standard" imaging modality in acute setting, because it identifies extravasation immediately. Epidural, subdural and subarachnoid haemorrhage (extra-axial)

Friday

as well as cortical contusion, intraparenchymal haematoma and diffuse axonal injury (intra-axial hemorrhage) will be discussed. Conventional MRI sequences are less sensitive than CT in detection of hyperacute intracranial bleeding. However, FLAIR techniques are capable to detect even small amount of extravasated blood. Susceptibility-weighted imaging (SWI) is mandatory in evaluation of microhaemorrhages; together with DWI they play an important role in diagnosis of axonal injury. Traumatic injury of spinal cord (SCI) in majority of cases results with devastating medical and social consequences. MR examination is the imaging modality of choice in such patients. It enables the clear assessment of lesion morphology, extent and severity of trauma. To interpret MR images properly, we have to be familiar with mechanisms of spinal cord injury which are presented in this lecture. For optimal characterisation of SCI one has to start with estimation of canal compromise and the degree of spinal cord compression. Then qualitative intramedullary changes like cord swelling, oedema, contusive haemorrhage, haematomyelia, partial or complete laceration should be evaluated. Protocols for routine MRI of the patients SCI are proposed and discussed.

Learning Objectives:
1. To understand the proper imaging protocols in trauma patients.
2. To be familiar with imaging findings in acute head trauma.
3. To learn about the imaging findings in spinal cord trauma.

16:00 – 17:30 **Room C**

ESR meets Radiation Oncologists

EM 2

Imaging and tailored radiation therapy in rectal cancer

Presiding:
L. Bonomo; Rome/IT
V. Valentini; Rome/IT

A-140 16:00

Chairmen's introduction

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

This Session, jointly organised with ESTRO (European Society of Radiotherapy and Oncology), aims at promoting an integrated approach between specialists involved in multidisciplinary tumour boards to tailor the best treatment for each individual patient by exploiting the use of imaging. New advanced imaging technology provides not only morphological information on tumour extension, but also information on tumour function and biology. It allows not only a good evaluation of tumour response during and after treatment, but also an early detection of tumour recurrence. Radiation oncologists increasingly use hybrid equipment in which diagnostic imaging technology is incorporated within the radiation treatment machines to allow continuous adaptation of radiation treatment according to the daily response of the tumour, the surrounding organs and their movement. Thus, it is our interest to enhance the collaboration between imaging specialists and to optimise and adapt the different use of imaging to the comprehensive clinical management of the oncological patient. By dedicating a combination of Radiology and Radiotherapy lectures to rectal cancer model, the Session aims at offering a programme focusing on the use of imaging in a truly multidisciplinary environment, in order to support understanding between specialists belonging to different disciplines, yet using a common language.

Session Objectives:
1. To become familiar with an integrated approach between radiologists and radiation oncologists in multidisciplinary tumour boards to tailor the best treatment for each individual patient with rectal cancer.
2. To understand how to evaluate the tumour response during and after treatment, as well as the early detection of tumour recurrence.
3. To appreciate the benefit for radiation oncologists in using hybrid equipment to allow continuous adaptation of radiation treatment according to the daily response of tumour, the surrounding organs and their movement.

A-141 16:05

Treatment-oriented staging

G. Brown; *Sutton/UK (gina.brown@rmh.nhs.uk)*

In rectal cancer, the development of specialised multidisciplinary teams comprising dedicated radiologists, oncologists, surgeons and histopathologists has been shown to improve outcomes for patients with rectal cancer. Careful imaging assessment of tumours enables the staging of tumours into distinct prognostic groups. The presence or absence of specific features predicts the risks for local recurrence, distant metastatic disease or both. This information thus determines the best of use of the many preoperative treatment strategies available. The initial preoperative assessment enables selection of patients for local therapies including non surgical and less radical therapy options when appropriate and identification of patients that require preoperative downsizing and downstaging in order to achieve the best results. Defining a robust preoperative strategy for patients with rectal cancer relies on consistent and reliable definitions of the risk factors by detailed imaging assessment that incorporates an understanding of surgical and oncological therapeutic limits.

Learning Objectives:
1. To understand precise definitions of a resection margin at risk.
2. To learn about the prognostic relevance of nodal stage, vascular invasion and depth of extramural spread, and pelvic sidewall lymphadenopathy.
3. To appreciate strategies for low rectal cancers and tumours beyond the TME plane.

A-142 16:23

Treatment tailored according to staging

K. Haustermans; *Leuven/BE (karin.haustermans@uzleuven.be)*

A patient presenting with an adenocarcinoma of the rectum should be staged according the TNM staging system using different imaging modalities. Next to these classical clinical factors also circumferential margin involvement, size of the primary tumour and location of the primary tumour in relation to the anal sphincter are important factors in the treatment decision. The goals of preoperative treatment in rectal cancer are to reduce the risk of local relapse, to enable R0-resection and to preserve the anal sphincter in low-lying tumours. Radiotherapy can be administered either as a short course (5 fractions of 5 Gy, one fraction a day, overall treatment time of one week) or as a long course (25 fractions of 1.8 Gy, one fraction a day, overall treatment time of five weeks combined with chemotherapy eventually followed by an extra dose of radiation to the macroscopic tumor). In case of a short course of radiation total mesorectal excision (TME) is performed in the week following the end of radiation. In case of a long course of chemoradiation TME surgery is performed after an interval of 6 to 8 weeks. When immediate surgery is performed no tumour downstaging or downsizing can occur while after a long course of chemoradiation followed by a long interval before surgery up to 20% of patients have no tumour left in the resection specimen. Currently it is not known whether aiming for sphincter preservation after a good response to preoperative chemoradiation increases the risk of local recurrence.

Learning Objectives:
1. To understand that the initial staging of rectal cancer determines the treatment approach (patient tailored treatment).
2. To understand the difference in approach between a short course of radiation and a long course of chemoradiation.
3. To become familiar with the concept of “the good, the bad and the ugly” in rectal cancer.

A-143 16:41

Response evaluation by imaging

R.G.H. Beets-Tan; *Maastricht/NL (r.beets.tan@mumc.nl)*

The standard treatment for advanced rectal cancer is preoperative chemoradiotherapy (CRT) followed by standard resection of the rectum. Neoadjuvant CRT allows downsizing and downstaging of the tumour, leading to improved resectability and local control. The clinical question is what to do with good response after CRT. Most surgeons advocate performing a resection on the basis of the status before CRT disregarding the response. However, major pelvic surgery is associated with a high postoperative morbidity rate of 40%-50%. The paradigm shift in treatment is further tailoring of treatment for the good responders after CRT aiming at organ saving treatment options with less morbidity, such as local excision. Although still controversial, a wait-and-see-policy (omission of surgery under close monitoring) is being advocated for the complete responders. This shift in treatment has consequences for radiologists. Our major challenge will be to provide tools that can help in precise selection of these patients. The challenge will not only restrict to an accurate evaluation of the local tumour response but also extend to an accurate evaluation of the nodal response. This lecture will focus on the evidence-based role of EUS and MRI for response evaluation after CRT. Accuracy and limitations of each method will be discussed. The lecture will dwell on potential new techniques (diffusion and perfusion MRI, lymph node-specific contrast enhanced MRI, PET/CT) that can overcome the limitations of standard imaging.

Learning Objectives:
1. To understand the evidence based role of imaging for re-staging locally advanced rectal cancer after chemoradiotherapy.

2. To understand the pitfalls and problems in interpreting post chemoradiation MRI and to learn about the MR protocol.
3. To learn about potential new imaging techniques for precise selection of good responding patients for further tailoring of treatment.

A-144 16:59
Treatment of rectum cancer tailored according to longitudinal imaging and multifactorial predictors

P. Lambin[1], R.G.P.M. van Stiphout[1], H.J.W.L. Aerts[1], J. Buijsen[1], G. Lammering[1], R.G.H. Beets-Tan[1], G.L. Beets[1], V. Valentini[2]; [1]*Maastricht/NL*, [2]*Rome/IT*

For locally advanced rectal cancer (LARC) an early accurate prediction of tumour response, more specifically pathological complete response (pCR), after preoperative chemoradiotherapy (CRT) is valuable to tailor treatment. Accurate prediction could enable more individualised surgical approaches, including less extensive resection or even a wait-and-see policy on one hand and possibly an intensification of pre-operative treatment in selected patients on the other hand. In our research groups several response prediction models for LARC have been developed mainly based on longitudinal PET-imaging, and specifically SUVmax on MR imaging, and on multifactorial nomograms including clinical parameters; see also (www.predictcancer.org). An innovative method consists in adding CT-based features for pre-treatment response prediction in LARC, the so-called "radiomics" approach. We conclude that imaging-based models and the nomogram developed based on clinical and sequential imaging data can accurately predict pCR and can be used as a decision support tool for surgery after prospective validation.

Learning Objectives:
1. To understand the concept of multifactorial predictive nomograms.
2. To appreciate the value of 'longitudinal' imaging.
3. To become familiar with the concept of 'RADIOMICS'.

Panel discussion 17:17

16:00 – 17:30 Room D1

Controversies in Abdominal Imaging

MC 724
Liver imaging: always MR, or still a role for CT?

Moderator:
G. Brancatelli; Palermo/IT
Teaser:
W. Schima; Vienna/AT

A-145 16:00
A. Why CT is the work horse

P. Rogalla; *Toronto, ON/CA (Patrik.Rogalla@uhn.on.ca)*

Echoes, trains, fiesta and grappa – radiologist's life is complex. Why not make our professional life easy and simple? Just attention! Computed tomography is straightforward, crisp and clear and offers high spatial resolution within milliseconds. Admitted that physics in CT is complex, too, but available at our fingertips, in a single breath hold, during a single heartbeat. But hold on: the ones who like complexity in the liver are offered a myriad of new applications involving multiple parameters such as perfusion imaging, tissue decomposition or multiphasic data acquisition. Reality counts: CT is reliable, robust with virtually no contra indications and of foremost importance: applicable to all. Artefacts? Only a few. CT is the work horse. Be smart, saddle up!

A-146 16:25
B. Why MR is the ultimate tool

C. Ayuso; *Barcelona/ES (cayuso@clinic.ub.es)*

MRI, a problem-solving imaging modality a few years ago, has become a first-line imaging technique in the diagnosis of focal liver lesions. Technological improvements lead to high-quality images and fast sequences improving its diagnostic accuracy. The contribution of the new cellular-specific contrast agents has been crucial in selected situations. Diffusion-weighted images are nowadays routinely included in the liver study protocol and its role in the detection and characterisation of the focal liver lesions will be discussed. 3D dynamic fat saturation protocols allow to obtain multiphasic high-quality studies and contrast bolus timing can be carefully assessed with the development of techniques such as fluorotriggered contrast-enhanced MRI. The newer imaging protocols and the typical imaging features of the focal liver lesions using different MRI contrast agents will be discussed.

A-147 16:50
Discussion

G. Brancatelli[1], W. Schima[2]; [1]*Palermo/IT*, [2]*Vienna/AT*

The discussion will address the following issues:
1. Is CT or MR the best method for the detection of small HCC?
2. Can MRI really compete with CT in oncology patients?
3. What is the exact role of liver-specific MR contrast media?
4. Which method should be done when US detects an unexpected focal liver lesion?
5. Is guided biopsy of focal liver lesions dead or alive?
6. Could DWI be a substitute to T2W and contrast-enhanced series in order to speed up the workflow in MRI?

16:00 – 17:30 Room D2

Head and Neck

RC 708
Paranasal sinus imaging

A-148 16:00
Chairman's introduction

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

The common cold is one of the most frequent illnesses in Europe and the United States. Although most cold are mild and resolve within a short time period, colds cost billions of dollars per year, mostly due to lost time at work and school. The common cold is a group of symptoms caused by one of a large number of viruses. Rhinoviruses cause the greatest number of colds; there are more than 100 different varieties of rhinovirus. The average adult experiences two to three colds per year, while children average 8 to 12 colds per year. In most cases, colds do not cause serious illness. Most colds last for three to seven days, although many people continue to have symptoms (coughing, sneezing, congestion) for up to two weeks. Some viruses that cause the common cold can also depress the immune system or cause swelling in the lining of the nose or airways; this can lead to bacterial infection. One of the more common complications is sinusitis, which is usually caused by viruses and rarely (about 2 per cent of the time) by bacteria. However, it can be difficult to distinguish bacterial sinusitis from sinusitis caused by a cold because the signs and symptoms can be similar. However, due to the fact that a runny nose can also result from inflammation, trauma, foreign body and other abnormal processes, including tumors, an excellent diagnostic workup is necessary.

Session Objectives:
1. To discuss the epidemiology.
2. To discuss the pathophysiology.
3. To become familiar with facts concerning economic aspects.

A-149 16:05
A. Anatomy and anatomic variants

T. Beale; *London/UK (timothy.beale@nhs.net)*

It is important for the radiologist to understand the anatomy of the drainage pathways and the frequent anatomical variants in this region in order to guide the surgeon. These variants may impair the functional drainage pathways, increase the risk of endoscopic surgery and make access to sites of disease extremely diffcult. This lecture will highlight the clinical relevant sinonasal anatomy (osteometal unit (OMU), frontal and sphenoethmoidal recesses) and variants (frontal ethmoidal, infraorbital and sphenoethmoidal air cells, ethmoid roof and anterior skull base). By the end of the lecture I hope that you will have learnt a logical approach to assessing the sinonasal anatomy and variants and an ability to review and understand the sinonasal region in all three orthogonal planes in order to accurately assess this region.

Learning Objectives:
1. To become familiar with the normal anatomy.
2. To become familiar with surgically relevant anatomic variants.
3. To learn about the functional anatomy and patterns of disease.

A-150 16:28
B. Sinusitis: imaging findings before and after treatment

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

In the era of cross-sectional imaging, no role is left for conventional radiography in patients with rhinosinusitis. Computed tomography may be helpful in acute rhinosinusitis, though only when sign and symptoms suggest complications. In this scenario orbits, skull base, anterior and central skull base require even more meticulous assessment than sinus cavities; contrast administration is mandatory, particularly to detect intracranial lesions. On the other hand, the role of CT is much more extensive in chronic rhinosinusitis, both to indicate the need for endoscopic sinus surgery and to plan the most proper strategy. Thorough knowledge of the anatomy of sinuses and mucus drainage pathways is the key to interpret CT findings. A centrifugal approach is normally used in reporting, assessing nasal fossae and drainage conduits first, and only ultimately moving to the periphery, i.e. sinus cavities, the involvement of which is quite often only a secondary effect. After surgery, CT scan may be indicated if major signs and symptoms (nasal obstruction, pus drainage, facial pain) persist. Sinus anatomy may be significantly altered, although – as a general rule – it is simplified; however, interpretation of CT images is relatively easy if the main (and most commonly used) procedures performed are known by the radiologist. The main goals of imaging are the detection of any residual sign of mucosal inflammation along the surgically widened mucus drainage pathways, as well as the identification of retention mucocele or infectious complications.

Learning Objectives:

1. To understand the value of different imaging techniques.
2. To review imaging findings in acute infections and chronic inflammatory disease.
3. To become familiar with postoperative changes.

A-151 16:51

C. Sinonasal tumours

B. Verbist; *Leiden/NL (b.m.verbist@lumc.nl)*

There is a great variety of sinonasal tumours due to the many different tissue types present within the maxillofacial complex. Benign lesions may be of epithelial origin, but also fibro-osseous or vascular lesions do occur. Squamous cell carcinoma is the most common malignancy of the sinonasal area, but other tumours may originate from glandular tissue (e.g. adenocarcinoma) or neural crest cells (e.g. aesthesioneuroblastoma or melanoma). Only few of them show typical imaging features. The main goal of imaging is to evaluate tumour extent and guide treatment planning. In this lecture, imaging patterns of sinonasal tumours will be shown. The current TNM classification for malignant tumours will be discussed and illustrated.

Learning Objectives:

1. To understand the value of different imaging techniques.
2. To review imaging findings in benign and malignant disease.
3. To become familiar with TNM staging of sinonasal neoplasms.

Panel discussion:

How do we recognise important findings? 17:14

16:00 – 17:30 **Room E1**

Musculoskeletal

RC 710

How I report

Moderator:
C. Glaser; Munich/DE

A-152 16:00

A. Soft tissue mass: US/MR

C. van Rijswijk; *Leiden/NL (C.S.P.van_rijswijk@lumc.nl)*

Ultrasonography (US) is a readily available non-invasive technique that can be used for the detection of a soft tissue mass. It gives a first impression of the size, location in relation to the fascia and consistency of soft tissue lesions. An important ability of US is the potential to differentiate between cystic and solid lesions; however, specificity in further characterising a soft tissue mass is low. MR is the next imaging modality to perform for the evaluation of soft tissue lesions. MR is accurate in determining size, confinement to or extension beyond the anatomic compartment of origin and the relationship to the neurovascular bundle and adjacent bone and joints. Although histopathological examination remains the gold standard, differentiation between malignant and benign soft tissue masses, indication of the grade of malignancy and prediction of the histological diagnosis are challenging goals of MR imaging. As such, characterisation of soft tissue masses starts with interpretation of signal characteristics on T1- and T2-weighted sequences. Combinations of signal intensities reveal the different tumour components (e.g. fat, water, and blood), and thus provide indirect information about the nature of soft tissue masses. Additional imaging parameters combined with clinical parameters such as age, gender, etc. should be evaluated for defining a differential diagnosis, such as multiplicity, location, origin (e.g. subcutaneous, intramuscular), size, shape, margins, peritumoral oedema, bone involvement and rate of growth.

Learning Objectives:

1. To be familiar with the strenghts/weaknesses of US/MRI in assessing soft tissue tumours.
2. To understand the US/MRI specific findings that aid diagnosis.

A-153 16:30

B. MR of vertebral body collapse

R. Lalam; *Oswestry/UK (radhesh.lalam@rjah.nhs.uk)*

It is not uncommon for a reporting radiologist to come across vertebral body collapse in day to day practice. A number of imaging options are available to the radiologist to assess the nature of the vertebral body collapse. Vertebral body collapses are broadly divided into benign and malignant depending on the aetiology. Benign collapses are most often due to metabolic diseases such as osteoporosis and trauma. It is vital to be able to differentiate these two categories of vertebral involvement to initiate appropriate therapy. Radiographs have a low sensitivity and specificity in differentiating these categories of vertebral body collapse. MRI on the other hand is excellent at differentiating between benign and malignant lesions on standard imaging sequences. A number of features including retropulsion, T1 signal characteristics, clefts, soft tissue abnormalities, posterior element involvement and contrast enhancement help in this differentiation. Advanced imaging protocols including diffusion and in/out of phase imaging are rarely needed. In some clinical circumstances where the differentiation is not possible despite all these measures, CT scan, follow-up imaging and/or a biopsy may be necessary.

Learning Objectives:

1. To be able to differentiate benign/malignant causes.
2. To learn about the changes of the vertebral body with time, disease progression and therapy.

A-154 17:00

C. MR of the unstable shoulder

M. Zanetti; *Zurich/CH (marco.zanetti@hirslanden.ch)*

Static instabilities are defined by the absence of classic symptoms of instability and are associated with rotator cuff or degenerative joint disease. Dynamic instabilities are subdivided in two main categories. The first category is traumatic unidirectional Bankart surgery (TUBS), which is characterised by a history of trauma resulting in unidirectional anteroinferior instability, commonly associated with a fibrous or osseous Bankart lesion that requires surgical repair. The second category is known as atraumatic multidirectional bilateral rehabilitation inferior capsular shift (AMBRI). This pattern of multidirectional instability is believed to be the result of atraumatic ligamentous and capsular laxity. Treatment is rehabilitation initially, followed by inferior capsular shift if indicated. The anterior instability is characterised by avulsion of the labroligamentous complex from the anteroinferior aspect of the glenoid, which, with complete disruption of the scapular periosteum, is termed a fibrous Bankart lesion. The presence of an associated adjacent glenoid rim fracture is referred to as an osseous Bankart lesion. Osseous Bankart lesions can easily be missed on MR images; therefore, CT arthrography is preferred by some authorities. In posttraumatic posterior dislocation, tears occurring in the posterior labrum are referred to as a reverse Bankart lesion and impaction of the anterosuperior humeral head are called reverse Hill-Sachs defect. Recurrent (atraumatic) posterior shoulder instability has to be distinguished from acute and chronic (locked) posterior dislocation. Recurrent (atraumatic) posterior instability is not related to trauma, but rather to laxity of supporting capsular and muscular structures and/or to the shape of the bony glenoid or the labrum.

Learning Objectives:

1. To learn about the specific imaging findings of instability.
2. To be familiar with the different types of shoulder instability.

16:00 – 17:30 **Room E2**

Foundation Course: More About Ultrasound

E³ 720b

Emergency radiology: where does US fit in?

Moderator:
Y. Menu; Paris/FR

A-155 16:00

A. Acute abdomen in adults: US vs CT

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

Although CT is commonly regarded as the best imaging method in patients with acute abdominal symptoms, the rapid growth of its use in emergency medicine has raised concern about increasing radiation exposure to population. There is a need for strategies using a non-ionising radiation technique such as US as first approach in this clinical setting, with CT used in equivocal or negative US results. Furthermore, US may be the preferred choice to approach patients with renal impairment, since it does not need the use of potentially nephrotoxic contrast media. In addition, it must be stressed that US is clearly the first imaging approach to the pregnant patient with acute symptoms. This presentation deals with the comparison of the results of these two imaging techniques in emergency patients with acute abdomen. Their sensitivity and specificity is compared, and special attention is given to the need of a standardised complete protocol of US examination of the whole abdomen. Since the results of US are considered to be highly dependent on the level of expertise of the examiner, such protocol could possibly allow a more standardised level of results. In some cases, US may be also requested as integration to emergency CT. For instance, presence of thin septations or small echoes within fluid collections can provide clues to their nature, while small parenchymal lesions can be easily recognised as either cystic or solid without the need of dedicated CT scanning protocols. Examples are provided of the many possibilities of US in this field.
Learning Objectives:
1. To know the US findings in the most common conditions leading to acute abdomen in adult patients.
2. To learn the examination tricks that allow the diagnosis to be reached.
3. To understand the advantages and disadvantages of US vs CT in adult patients with acute abdomen.

A-156 16:30

B. Acute abdomen in children: US vs CT

R.R. van Rijn; *Amsterdam/NL (r.r.vanrijn@amc.uva.nl)*

In paediatric radiology abdominal ultrasonography plays an important role in day-to-day clinical practice. The well-known advantages of ultrasonography in children are the lack of ionising radiation, the bed-side applicability, the potential to perform the study without sedation, and the relative low costs of the examinations. The body composition of most children, in contrast to adults, yields an exquisite depiction of anatomical structures which makes US the paediatric abdominal imaging modality of first choice. However, CT is being increasingly used for the diagnosis of patients presenting with an acute abdomen. Overall the number of CT exams, more so in adults compared with children, has shown a steady increase over the past decades. In this session the application of both US and CT, based on clinical paediatric cases, will be discussed and compared. Both gastrointestinal as well as non gastrointestinal causes of the paediatric acute abdomen will be presented.
Learning Objectives:
1. To understand the value of FAST in the paediatric population, in light of the current non-operative management.
2. To learn the value of US in the child with intussusception.
3. To understand the comparative merits of US and CT in children with acute appendicitis.

A-157 17:00

C. Abdominal trauma: US or not US?

M. Valentino; *Parma/IT (mvalentino@ao.pr.it)*

Trauma is one of the leading causes of morbidity and mortality in young patients. Despite the high number of victims, trauma remains a challenge. Physical examination is not accurate because of the altered mental status of the patients and the presence of multiple fractures. Computed Tomography continues to be the gold standard for imaging the traumatic patients, but it requires transportation of the patients outside the emergency room to the radiology unit. Ultrasound is a rapid, portable and reliable method for screening of patients with abdominal trauma. Emergency sonography is performed bedside and simultaneously with physical assessment, resuscitation and stabilisation within the first minutes of the patient's arrival. Focused assessment with sonography for trauma (FAST) is now part of the Advanced Trauma Life Support (ATLS) protocol, while becoming the standard of care in the management of adult and children trauma patient for the detection of intraperitoneal, intrathoraic and pericardial fluid. The primary goal of this examination is to determine the need for immediate laparotomy. Recently, FAST has been extended to evaluation of pneumothorax and vascular filling (extended FAST or EFAST). Limitations of FAST include its inability to detect the injuries, and the possibility that the initial bedside ultrasound results negative because fluids are too less to be identified or they have not yet accumulated in the peritoneal pouches.
Learning Objectives:
1. To discuss the role of US in the unstable trauma patient.
2. To understand the role of US in the stable trauma patient.
3. To evaluate what to trust and what not to trust US for in trauma.

16:00 – 17:30 **Room F1**

Special Focus Session

SF 7a

My most beautiful mistakes

A-158 16:00

Chairman's introduction

M. Zins; *Paris/FR (mzins@hpsj.fr)*

Interpreting the results of imaging studies is more and more challenging and time consuming due to the large volume of data to evaluate, compare and post-process. Radiological errors are inevitable, affect all radiologists and may be defined as a mistake that has management implications for the patient. Errors can be broadly classified into technical errors, active errors (errors in perception, judgment or knowledge) and errors of communication. The majority of errors are false-negative interpretations and occur during interpretation of CT examinations. Good communication between the referring physician and the radiologist is essential. Unfortunately, only a small minority of radiologists keep a personal record of their errors. Patient safety should benefit from the repeat organisation of "error meetings" through the act of collective learning. Radiologists and radiology departments must continue to improve the process of recording and addressing errors.
Session Objectives:
1. To understand the potential pitfalls that may be encountered in interpreting imaging exams with emphasis on oncologic and emergency cases.
2. To describe the different types of errors: technical or active errors.
3. To learn about methods to facilitate identification of errors in order to minimise their occurrence.

A-159 16:05

Breast

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

Breast cancer remains a major cause of cancer death among women worldwide. Imaging plays a key role in the early detection of breast cancer. Mammography is an accepted screening modality. Ultrasound and MR imaging of the breast can significantly improve cancer detection and characterisation and are used as an adjunct to mammography. Misinterpretation due to technical and human errors has a significant impact on mortality and morbidity of breast tumour/ cancer patients. The potential harm caused by breast imaging includes the creation of unnecessary anxiety, morbidity, costs and the use of ionising radiation. It is for this reason that the strongest possible emphasis on quality control and assurance is required. These start with the identification of eligible women, with the commitment that breast imaging of the highest possible standard is performed, that films are read by proper trained radiologists, that prompt and further effective investigations are provided, that outcomes are monitored and evaluated regularly, that regular audits are performed, and that training of the staff is ensured. During this session the auditorium will learn about the spectrum and factors that contribute to errors in the interpretation by breast imaging exams highlighted by case studies.

Learning Objectives:
1. To learn about the potential pitfalls that may be encountered in interpreting breast imaging exams.
2. To understand the technical errors in the realisation of breast imaging exams that contribute to misinterpretation.
3. To be aware of the spectrum of factors that contribute to active errors (detection, characterisation) in interpretation of breast imaging exams.

A-160 16:28
MSK

B. Vande Berg; *Brussels/BE*

Imaging of the musculoskeletal system differs from that of other organs by many features: limited specificity of presenting symptoms (pain), variable qualification of referring physicians, high frequency of trauma-related lesions and relative rarity of non-traumatic life-threatening conditions, frequent anatomic variants, possibility of successive imaging procedures with unsatisfactory communication of previous imaging or clinical findings. These features may contribute to numerous pitfalls and errors at MSK imaging. During this lecture, we will focus on common causes of errors. For lesion detection, we will emphasise the limitations of ultrasound, the inappropriate use of which may lead to significant difficulties. For lesion characterisation, we will focus on a several causes of misinterpretation at MR imaging including the lack of recognition of air, gas and calcium at MR imaging and the inappropriate use of fat-saturation. We will also remind the audience of the underestimation of septic disorders with inappropriate management of percutaneous biopsies. Finally, we will also draw the attention to mistakes that are related to the patients, including unconscious patients, relatives or VIP patients.
Learning Objectives:
1. To learn about the potential pitfalls that may be encountered in interpreting MSK imaging exams.
2. To understand the technical errors in the realisation of MSK imaging exams that contribute to misinterpretation.
3. To be aware of the spectrum of factors that contribute to active errors (detection, characterisation) in interpretation of MSK imaging exams.

A-161 16:51
Neuro

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

The reasons for mistakes in the interpretation of neuro-imaging examinations are similar to those in radiology in general, i.e. poor technique, artefacts, failure in perception, lack of knowledge and misjudgment. The reader may commit so-called scanning errors (overlook the primary or additional lesion), recognition errors or decision-making errors. Factors like misleading- or even correct clinical history, presence or absence of previous studies, knowledge and experience of the reader, etc, may lie behind an incorrect interpretation. Although experience increases the accuracy, marked differences have been reported between the most experienced readers. In neuro-imaging there is an increased risk of errors due to the large (and increasing) number of images to be reviewed per case, the complexity of some of the images and of the analysis. The risk of errors is increased also due to artefacts, especially in the interpretation of MRI, or due to poor imaging quality, for example in MRA or CTA. In the present lecture different causes for mistakes, such as artefacts, misdiagnosis due to lack of- or comparison to wrong previous studies, poor imaging technique and wrong clinical information will be addressed.
Learning Objectives:
1. To learn about the potential pitfalls that may be encountered in interpreting neuro imaging exams.
2. To understand the technical errors in the realisation of neuro imaging exams that contribute to misinterpretation.
3. To be aware of the spectrum of factors that contribute to active errors (detection, characterisation) in interpretation of neuro exams.

Panel discussion:
What have we learned from our mistakes? 17:14

16:00 – 17:30 **Room F2**

Breast

RC 702
Breast MRI today

A-162 16:00
Chairman's introduction

C.K. Kuhl; *Aachen/DE*

Breast MRI has become a powerful tool in everyday clinical situations. Technological requirements must be met in order to guarantee diagnostic examinations. Besides being the most sensitive technique in breast cancer staging, the technique has been proven to have a prognostic value and can also be of help in regional and distant staging. Clinical applications of breast MRI are well established, although the consolidation of breast MRI in the preoperative scenario has not been fully achieved due to concerns about harm caused by overdiagnosis. The aim of this integrated RC is to review the current status of breast MRI seen from different angles: the basic technological requirements, other possible uses of BMRI and the eternal controversy about overdiagnosis.

A-163 16:05
A. How to set up a high quality breast MRI unit

M.L.A. Van Goethem, I. Verslegers, L. Hufkens, I. Biltjes, P. Parizel; *Antwerp/BE (Mireille_Van_Goethem@hotmail.com)*

MR mammography has become an important imaging technique, but because of low specificity, controversies remain, especially in the field of preoperative staging and screening. Some multicentre studies showed disappointing results due to inexperienced participating centres. Lack of standardisation also can be a reason of inferior results. To have the best results, MR units ≥ 1 T are necessary, with double dedicated breast coils, preferably multichannel. Regular checks using standardised quality control are recommended. Gentle pressure of the breasts must be performed to avoid motion, but this should not result in compression of vascular structures. A T2 weighted series must be done, followed by a dynamic contrast-enhanced examination with slice thickness ≤ 3 mm, spatial in-plane resolution ≤ 1.5 mm2 and temporal resolution ≤ 120 s. Reporting must contain description of lesion morphology, per cent enhancement versus time curves, number and location of lesions and extent of disease. The use of a standardised interpretation system, such as the BI-RADS lexicon, is recommended. Clinical examination, mammography, ultrasound and earlier MR must be included in the interpretation. To reduce false positives, MR mammography must be performed between day 7 and 12 of the menstrual cycle or at least 4 weeks after stop of hormone substitution therapy, except in urgent cases. To optimise specificity, techniques as diffusion, spectroscopy and ultra fast scanning have been studied and new signs are described. But of utmost importance to make MR mammography a useful examination is to reserve it only for good indications.
Learning Objectives:
1. To understand the necessary technical and training level prerequisites for a high quality breast MRI unit.
2. To understand how to maintain optimal quality and performance.
3. To appreciate the importance of auditing.

A-164 16:28
B. Beyond differential diagnosis and local staging: prognosis and distant staging

J. Veltman; *Almelo/NL (j.veltman@zgt.nl)*

Contrast-enhanced MRI has proven to be superior in the detection and staging of breast cancer. Besides the primary tumour stage the lymph node (LN) status and the presence of distant metastases have significant impact on treatment planning and overall prognosis. Even small LN metastases can already have a negative impact on the disease-free and overall survival of patients. Sentinel LN biopsy or complete axillary LN dissection remains the standard of care in spite of the associated morbidity. Diagnostic imaging strategies using ultrasound (with FNA), MRI or FDG/PET can be used in the preoperative LN evaluation. Due to the limited accuracy of these strategies they are so far not able to overcome the surgical standard and reduce the patient's morbidity. The presence of distant metastases results in a stage IV breast cancer and is considered non curable with a 10-year survival of about 10%. For the detection of distant metastases a chest x-ray, liver ultrasound and bone scintigraphy (BS) are commonly used. PET/CT or whole body

MRI can also be used for the detection of distant metastases. Earlier detection of for instance bone metastases is needed to optimise treatment and reduce or delay skeletal-related events. Diffusion weighted whole body imaging with background suppression (DWIBS) was found to be equally sensitive with respect to staging. However, DWIBS was able to detect more lesions in cases with many bone lesions. In this presentation imaging techniques that can be used in the evaluation of axillary lymph nodes and distant metastases are discussed.

Learning Objectives:
1. To learn about the value of breast MRI in breast cancer prognosis.
2. To become familiar with the use of breast MRI in regional staging.
3. To consolidate knowledge of the present use and results of MRI in distant staging.

A-165 16:51

C. Evidence-based controversies

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

Breast MRI (b-MRI), increasingly used in clinical practice, is placed in the context of breast cancer (BC) care, characterised by high disease prevalence; screening mammography experience; standardised therapy protocols aimed at a maximal rate of breast-conserving treatment; and tendency towards "breast units" according EU regulations. This explains the reasons for which b-MRI, differently from other MRI applications, undergoes a careful evidence-based evaluation. A discussion is open about indications, due to the lack of unequivocal evidence in terms of patient outcome. However, a substantial consensus among breast cancer specialists exists for non-contrast b-MRI for evaluating suspected breast implant ruptures and for contrast-enhanced CE b-MRI for evaluating the response to neoadjuvant chemotherapy, searching for occult primary BC, and screening high-risk women. Regarding the last indication, individual risk modelling and calculation outside proven BRCA mutation carriers as well as the level of risk sufficiently high to deserve annual CE b-MRI are matter of debate. Moreover, recent studies opened a perspective for using only MRI for high-risk screening. A hot controversy concerns CE b-MRI for ipsi/contra-lateral staging before treatment, refuelled by the recent publication of the results of two randomised controlled trials (COMICE, MONET), both of them not in favour of the use of CE b-MRI but also burdened by relevant problems and limitations. While the risk of overdiagnosis/overtreatment being relatively low for high-risk MRI screening, it could be substantial for MRI staging, requiring a strict relationship between radiologists and surgeons. Further high-quality research is needed to clarify this issue.

Learning Objectives:
1. To become familiar with current controversies in clinical applications of breast MRI.
2. To review literature on the role of MRI in breast cancer staging and screening in high risk patients.
3. To be aware of the potential impact of overdiagnosis in breast MRI.

Panel discussion:
Do we find too many cancers with MRI? 17:14

16:00 – 17:30 **Room G/H**

Genitourinary

RC 707

Diagnosis and management of GU tract trauma

Moderator:
A. Magnusson; Uppsala/SE

A-166 16:00

A. Imaging the kidney and ureter

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

Urinary tract injuries occur in approximately 10% of all abdominal trauma patients, the kidney being the most commonly injured organ. The spectrum of renal injuries ranges from minor trauma requiring no treatment to major life-threatening renal injuries that require surgical intervention. There is a growing trend towards conservative management of renal trauma. To help predict the outcome and to guide management of renal trauma, the American Association for Surgery of Trauma has created a renal injury grading system, which is based on the appearance of the kidney at surgery. Indications for renal imaging include penetrating trauma and haematuria; blunt trauma, shock, and haematuria; and gross haematuria. Contrast-enhanced MDCT is currently the test of choice for assessing renal injury, since it provides, with short examination times, both anatomical and functional data. It is helpful to assess the type and extent of parenchymal injuries. It can help detect active extravasation of contrast and is of great help in guiding transcatheter embolisation. It may also demonstrate urine leakage, preexisting abormalities with increased risk of injury from blunt trauma, and associated abdominal and retroperitoneal injuries. The volumetric data acquired can be used to obtain high-resolution MPR, MIP and 3D images that help display complex injuries. The wide availability of MDCT in major trauma patients has reduced the use of other imaging modalities: IVU in unstable patients already in the operative room, and ultrasonography.

Learning Objectives:
1. To learn the indications, advantages and disadvantages of imaging modalities in evaluating the kidney and ureter after trauma.
2. To learn the appropriate diagnostic imaging studies and imaging findings of different types of kidney and ureteral trauma.
3. To be able to identify a kidney that is in danger after trauma.

A-167 16:30

B. Imaging the bladder and urethra

U.G. Mueller-Lisse; *Munich/DE*

Trauma to the bladder and urethra is seldom an isolated injury, such as in self-inserted urethral foreign objects in men. Often, the lower urinary tract (LUT) is one site of a more complex trauma injury process involving the pelvis and abdomen. Trauma scan (TS) protocols for computed tomography (CT) have been widely applied in emergency radiology since the advent of multidetector-row CT (MDCT). Acute LUT injury has thus become subject to TS as the primary imaging modality, with intravenous contrast media being used in various phases of its distribution, potentially including arterial, venous and excretory, as in CT-urography (CTU). Delayed diagnosis appears to rarely affect LUT in TS patients. Cystography and urethrography may play a complimentary role and remain useful modalities in the initial evaluation and follow-up of LUT trauma that may determine urological management. Complications of LUT trauma, such as urine leaks, urinomas and fistulas, are increasingly being diagnosed by means of MDCT. However, particularly in LUT fistulas, voiding cystourethrography and urethrography are still important. Complications of LUT injury may require imaging-guided interventional procedures, whether by means of fluoroscopy, ultrasonography or CT.

Learning Objectives:
1. To be able to identify patients at risk of bladder and urethral trauma and those requiring urgent urethrography.
2. To recognise the imaging findings identifying bladder and urethral injury.
3. To learn the imaging techniques necessary for accurate initial evaluation of the urethra in cases of complicated pelvic trauma.

A-168 17:00

C. Interventional radiology for GU trauma

B. Peynircioglu; *Ankara/TR (borapeynir@gmail.com)*

GU trauma can easily be missed when associated with other abdominal/pelvic injuries. The type/mechanism of the trauma is the key for both imaging and treatment. Iatrogenic injuries of the GU tract are getting more and more common as a result of increasing numbers of percutaneous procedures (e.g. nephrolithotomies, biopsies). In general, renals are the most common injured part of the tract; however, by increasing numbers of renal transplantation, ureteral injuries are now common as well. Timing of the intervention is as important as taking the decision of percutaneous approach for optimal management of injury. Multiphasic CT imaging with contrast injection via both IV line and trans-urethral catheter (if possible) can demonstrate most of the injured sites with high sensitivity. CT is also useful in predicting which haemodynamically stable patients may benefit from percutaneous (non-operative) management. Vascular injury of the GU tract almost always involves renals, and bleeding and/or ischaemia is the problem. Unless the patient is at unresponsive haemodynamic shock, or has complete vascular avulsion, endovascular treatment may always be the choice. The American Association for the Surgery of Trauma system for grading injury to the kidney is also helpful in making a decision whether surgical or endovascular intervention is used. Embolisation of a bleeding artery/pseudoaneurysm or stenting of an intimal dissection are the most common cases. Although the vascular injuries of the GU results in retroperitoneal haemorrhages, non-vascular injuries leading urine leaks may present with intra or extra peritoneal urinomas. Nonvascular percutaneous intervention may be applied to urinoma, urine leak, ureteral laceration and transection injuries. These interventions include percutaneous nephrostomy for urine diversion, ureteral stent placement for ureteral injuries and drainage tube placement for urinoma formation.

Learning Objectives:
1. To be able to determine which cases deserve management by interventional radiology.

Friday

2. To understand the techniques to manage fistulas and ruptures of the ureter and urethra.
3. To appreciate the vascular and non-vascular interventional techniques in kidney trauma.

16:00 – 17:30 **Room I/K**

Joint Course of ESR and RSNA (Radiological Society of North America)

MC 728

Essentials in oncologic imaging: what radiologists need to know (part 4)

Moderator:
H.-U. Kauczor; Heidelberg/DE

A-169 16:00

A. Lymphoma

H. Schoder; *New York, NY/US (schoderh@MSKCC.org)*

PET/CT with FDG is useful for staging, response assessment and follow-up of Hodgkin and Non Hodgkin lymphoma (HL, NHL). Most HL and NHL show FDG uptake higher than local background; disease sites are therefore easily recognised. Some entities (e.g., follicular lymphoma I) have low FDG uptake, reflecting their less aggressive nature. For staging, combined CT and PET define the disease better than either test alone. For instance, PET can better show involvement of spleen and bone marrow, but CT remains necessary for anatomic detail, detection of disease with low FDG uptake and size measurements. FDG PET is more accurate than morphologic criteria in assessing response early (decline in FDG uptake correlates with rapidity of response and often predicts ultimate outcome) and also at the end of treatment (lack of FDG in residual masses reliably indicates lack of residual viable tumour). A negative PET after 2 or 4 cycles of chemotherapy predicts excellent outcome. In contrast, up to 50% of positive interim scans are false-positive, and hence cure may still be possible. Persistent FDG uptake after end of treatment indicates a worse prognosis, even when treated with radiotherapy. Recurrent disease is well detected on CT and PET, but there is no proof that prolonged routine imaging after end of therapy is necessary or advantageous (possible exception: poor prognosis aggressive NHL). Follow-up imaging can probably be avoided entirely in patients with early-stage HL and negative end of treatment FDG PET/CT. Recent data with the agent 18 F fluorothymidine will be discussed.

Learning Objectives:
1. To get a practical, clinically relevant summary of key imaging issues in Hodgkin and non-Hodgkin lymphoma.
2. To learn how imaging, especially PET and PET-CT can optimally assess and measure tumour treatment response, providing a value-added radiology report.

A-170 16:30

B. Musculoskeletal neoplasms

M.F. Reiser; *Munich/DE (Maximilian.Reiser@med.uni-muenchen.de)*

Diagnosis, staging and follow-up of musculoskeletal tumours are most important for selection of adequate therapeutic measures and prognosis of patients. Modern imaging technologies have greatly contributed to improvement. With modern MRI systems high contrast of neoplastic tissue vs. normal uninvolved structures is achieved. This allows for adequate delineation of intraosseous and soft tissue extension and thereby facilitating high precision in staging. Compartmental infiltration is readily detected. Dynamic, contrast enhanced studies allow for assessment of vascularity and perfusion, which provides valuable information concerning malignancy and benign character of a particular tumour. With diffusion weighted imaging and diffusion tensor imaging, microstructural information can be obtained, which correlates with response to chemotherapy and viability of the tissue. Malignant bone tumours may spread within the bone or to distant organs. Therefore, whole body imaging modalities hold great potential for comprehensive assessment. In computer tomography major advances have been achieved recently. The combination of CT and PET in hybrid systems allows to assess function and morphology within one session. With FDG-PET the metabolic activity of a particular lesion can be analyzed. The standard uptake value (SUV) can be utilized for differentiation of benign malignant lesions. However, there are various benign lesions, such as NOF, fibrous dysplasia, eosinophilic granuloma and aneuysmal bone cysts as well as inflammation and infection. False negative results in FDG-PET may be found in low grade chondrosarcoma, multiple myeloma, low grade osteosarcoma, Ewing´s sarcoma and low grade soft tissue sarcomas.

Learning Objectives:
1. To become familiar with the imaging modalities which enable to detect and differentiate benign and malignant bone neoplasms.
2. To consolidate knowledge of radiographic, CT and MRI findings which enable to classify and stage bone tumours.
3. To understand the potential role of PET-CT and whole body MRI.
4. To learn the signs indicative of favourable and poor response to preoperative chemotherapy and for recurrence of malignant bone tumours.

A-171 16:55

C. Chemo- and radiation therapy-induced toxicity

H.-U. Kauczor; *Heidelberg/DE (Hans-Ulrich.Kauczor@med.uni-heidelberg.de)*

Multimodal cancer therapy, including chemotherapy, biologicals and radiotherapy, is frequently associated with adverse, toxic effects. Depending on the specific agent different organs, such as brain, lung, liver, bowel, bone and heart might be affected. Inflammatory „ reactions“ will occur. These will be detected on imaging as white matter lesions in the brain, reticular changes and consolidations in the lung (fibrosis, cryptogenic organizing pneumonia), diffuse liver disease, colitis, bone necrosis, or cardiomyopathy. These direct toxic effects have to be differentiated from infectious complications due to chemotherapy-induced neutropenia. These infections mainly affect the lung and are caused by fungi or viruses. Angioinvasive aspergillosis of the lung is the most frequent, but sinusitis, abscesses in brain and liver as well as sepsis with haematogeneous foci are also encountered. Toxic effects of radiotherapy will mainly occur within the planned target volume and result from application of high doses to radiosensitive normal tissue leading to inflammation, fibrosis and necrosis. As imaging is routinely performed for therapy response monitoring or surveillance, in patients suffering from cancer toxic effects have to be differentiated from infectious complications, postsurgical or postradiation scar tissue or tumour recurrence. Specific patterns of toxic effects of cancer therapy in brain, lung, liver, pelvis and their differential diagnoses will be reviewed.

Learning Objectives:
1. To get an overview of organ-specific toxicity and other adverse effects of chemo- and radiotherapy.
2. To review the key imaging findings of therapy-induced organ toxicity and adverse effects.
3. To understand how to differentiate inflammatory, infectious, fibrotic, and necrotic changes from tumour recurrence.

Questions 17:20

16:00 – 17:30 **Room L/M**

Special Focus Session

SF 7b

Assessing novel technology: applications, performance and quality issues

A-172 16:00

Chairmen's introduction

C. Vandulek[1], M. Maas[2]; [1]*Kaposvár/HU*, [2]*Amsterdam/NL*
(cvandulek@gmail.com)

One of the major characteristics of medical imaging in the 2 1st Century is the dramatic influx of novel technology. The impact of new technology and techniques is experienced in all modalities. The continuous development and implementation of highly sophisticated medical products and devices is key to the evolution of medical imaging leading to the improvement of patient care in terms of quality and positive outcomes. Radiographers have an important role in responding to changes in medical imaging in respect to novel technology. The impact of novel technology has increased the responsibility of radiographers apparently in medical imaging department. Continuous professional development is mandatory equally both for radiologists and radiographers. The results of the introduction of learning management systems and eLearning are promising by providing a viable learning environment for radiographers to enhance their professional expertise. Continuous education and development of key practical skills in respect to novel technology are essential for maintaining the expected quality standards and performance.

Session Objectives:
1. To appreciate the impact novel technology has on radiographers.
2. To understand the importance of continuous professional development.
3. To learn how to maintain optimal quality and performance with new technology.

also EPOS

A-173 16:05

The impact of radiographers on performance and quality issues arising with novel technology

F. Girard; *Pont de Roide/FR (franck.girard@opteamage.com)*

The emergence of new technologies in the medical field is putting pressure on the technologist's job. Among other questions, training, performance of these technologies and image quality are especially under scrutiny. This presentation will cover these aspects, always from a technologist's point of view and will give an outlook on the implications expected from the emergence of these new technologies in the radiographers' world. The influence of the technicians' role will be demonstrated through MR and CT images acquired following standard procedures. A longitudinal follow-up study will show not only that regular refresher courses are one part of the solution to be applied for a better image quality, but also that the technologists should be part of the front line of developments, through regular readings of specialised papers, participation to technical congresses and to professionals forums. This is very often not compatible with a daily work and it is one topic of concern to be addressed by the radiology management. The radiographer is instrumental in today's and tomorrow's medicine, but he/she needs to be constantly challenged, helped and brought to the highest possible level of education, always ultimately to the benefit of the patient.

Learning Objectives:

1. To consolidate knowledge of novel technologies faced by radiographers.
2. To identify quality issues radiographers have to overcome with new technologies.
3. To appreciate the radiographer's role in providing quality imaging services.

A-174 16:28

How to keep up with new technique application: a continuous education programme for radiographers in action

C.A. Tipker-Vos, S. Kolkman, A.A. Bak, L.F. Beenen, J.S. Laméris; *Amsterdam/NL (c.a.tipker@amc.uva.nl)*

Continuous education of radiographers is needed to keep up with state-of-the-art techniques. To maintain a high quality standard of radiological examinations we introduced a continuous education programme for radiographers. The Academic Medical Center Amsterdam started to make an inventory of the actual expertise and preferences for education of radiographers in 2008. The main outcome of the initial inventory was that radiographers appeared less competent on new technology, such as emergency CT. Also, the prior level of education appeared to be a mediating factor in the competence of the radiographers. Subsequently, continuous education was implemented on a per modality basis and at two levels for some modalities. The attendance to education was registered by means of Edumanager. Also, radiographers were able to maintain a digital education portfolio by themselves. The effectiveness of the education was evaluated after two years (2010). The radiographers valued the education highly. Higher expertise of the radiographers was found after two years regarding emergency CT. The effectiveness of the education varied with the prior education level of the radiographers. Additionally, radiologists were asked to evaluate the quality of the radiological examinations. The radiologists valued about 5% of the radiological examinations as insufficient and approximately 75% as good-excellent. We did not find a significant trend over time. Continuous education remains urgently needed to keep up to date with current radiological technique. Our continuous education will be adapted based on the outcomes of the questionnaires. The difference in prior education is a matter of concern and needs special attention.

Learning Objectives:

1. To become familiar with (digital) portfolio-based continuous education.
2. To learn about potential pitfalls in portfolio-based learning.
3. To understand the key factors of using learning management system.

A-175 16:51

The role of radiographers in respect to applications of novel technologies

B. Bailey; *Manchester/UK (bill.bailey@cmft.nhs.uk)*

Radiographers working within cross-sectional imaging need to understand their role in respect to the pathology they are imaging and the significance of the images they produce in respect to patient care-pathways. Adaptation and implementation of new and 'novel' techniques is fundamental in achieving the best possible information for the clinician and thus improved patient treatment. The modern cross-sectional radiographer needs to be knowledgeable, flexible and be able to operate in an MDT environment in order to deliver a 'first class' service. Only then can the profession advance to become an integral part in the patient care delivery.

Learning Objectives:

1. To consolidate knowledge of issues radiographers face in respect to novel technologies.
2. To appreciate the expertise expected of the next generation of radiographers.
3. To understand the multidisciplinary approach of novel technologies.

Panel discussion:
How can radiographers best face the challenge of novel technologies? 17:14

16:00 – 17:30 **Room N/O**

Interventional Radiology

RC 709

Evaluation and treatment of common venous disorders

Moderator:
D. Ettles; Hull/UK

A-176 16:00

A. Pelvic congestion

A. Basile; *Catania/IT (antodoc@yahoo.com)*

Pelvic congestion syndrome (PCS) causes acute or chronic pelvic pain most often in multigravids, and the diagnosis is considered when other significant gynaecological or pelvic pathologies are excluded. The demands made on venous return by hormonal changes in pregnancy together with a congenital absence of valves in the ovarian veins lead to reflux of blood towards the ovarian veins into the internal iliac veins. This is more commonly seen in the left side, because the ovarian vein drains directly into the left renal vein. The consequent congestion of the pelvic vein leads to swelling and engorgement. The symptoms are various, classically post-coital, and can be acute and severe or chronic and dull. The diagnosis is based on a detailed history and physical examination correlated by radiological imaging confirmation such as ultrasound examination, computed tomography (CT), magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA). However, all of these studies may be capable of demonstrating only severe venous engorgement in the pelvis. For this reason, gonadal venography through femoral or jugular access still remains the definitive imaging modality to diagnose patients with PCS. If no reflux is seen, then it is highly unlikely that the patient has PCS. If reflux is present, selective catheterisation and embolisation can be performed. Sclerosant agents plus coils or plug are the suggested embolic materials even if some studies report the use of each material alone.

Learning Objectives:

1. To learn about the concept of pelvic congestion and its clinical and imaging evaluation.
2. To be familiar with the techniques of interventional management.
3. To learn about the results and complications.

A-177 16:30

B. Varicose veins in the extremities

C. Binkert; *Winterthur/CH (christoph.binkert@ksw.ch)*

Varicose veins of the lower extremity are a common problem. Besides the unsightly look, venous reflux can lead to swelling, heaviness and itching, and eventually to ulcerations. In many cases, the underlying cause is an insufficient saphenous vein. Duplex ultrasound is essential for the diagnosis of reflux and treatment planning. Endovenous thermal ablation has largely replaced surgery (vein stripping) in the United States because of equal results, outpatient set-up and an overall much quicker and easier recovery. The endovenous treatment is well tolerated. Post-interventional pain and tenderness is low (VAS < 2). It seems that the discomfort is slightly lower for RFA (closure fast) than laser (bare fibre). Severe complications such as deep vein thrombosis or skin burn are extremely rare. Minor complications such as hyperpigmentation, erythema and paraesthesia occur in < 5%. Thermal ablation can be done with RFA or laser, including different wavelength and bare or covered fibre tip). The results seem similar between the different endovenous treatments. In the short term (1 month), an occlusion rate of close to 100% can be expected. Mid- and long-term results (up to 48 months) maintain an elimination of reflux > 90%.

Learning Objectives:

1. To learn about imaging and clinical evaluation of varicose veins.
2. To know more about the minimaly invasive treatment modalities.
3. To become familiar with the short-term and long-term results.

A-178 17:00

C. Varicocele

M. Mansour, P. Haage; *Wuppertal/DE (michaelmansour@hotmail.com)*

The testicular varicocele is a pathological dilatation and tortuosity of the veins of the pampiniform plexus of unknown aetiology. Clinical presentation can include scrotal swelling and pain; the varicocele is more often seen in the subfertile or infertile man. The primary diagnostic imaging tool is ultrasound. Right-sided varicoceles can be symptomatic; a profound abdominal diagnostics is necessary. Therapeutic options include minimally invasive surgical and open microsurgical treatment, as well as interventional radiological therapy. The IR treatment by percutaneous venography includes the selective catheterisation of the spermatic vein and subsequent embolisation or sclerotherapy. Technical and clinical success rates are encouraging and complications are rare. In this lecture, diagnostic modalities, clinical and imaging features plus the indications for therapy will be discussed. In addition, the different therapy options and its results will be elucidated; furthermore, the management of the endovascular occlusion in treatment of varicoceles will be demonstrated in a step by step fashion.

Learning Objectives:

1. To know more about clinical evaluation and imaging of varicocele.
2. To become familiar with the techniques of interventional management of varicocele.
3. To be informed about the results, complications, and comparison with surgical options.

16:00 – 17:30 Room P

Cardiac

RC 703

Imaging of ischaemic heart disease

Moderator:
K. Gruszczynska; Katowice/PL

A-179 16:00

A. CT: angiography, function and perfusion

G. Feuchtner; *Innsbruck/AT (Gudrun.Feuchtner@i-med.ac.at)*

Myocardial function and coronary anatomy from one scan? This „science"-fiction has become true now for computed tomography (CT). Over years, we have often worried whether a lesion found on CTA is „significant" (= causes myocardial ischaemia indicating the need for coronary revascularisation) or not. Now, CT-perfusion (CTP) provides that information. Different CTP- techniques will be discussed (e.g. the „one-shot" approach and „dynamic"). New CT technology providing low radiation dose will be highlighted in this course. CT is also established technique for imaging of global and regional cardiac function. Beyond, imaging of myocardial viablity using delayed enhancement will be discussed. The aim of this course is to understand basic principles of functional imaging by CT, to learn „how-to" perform these scans, to review current scientific evidence and to discuss potential clinical applications.

Learning Objectives:

1. To learn how to perform functional CT studies: CT perfusion (CTP), CT function, combined CTA/CTP and viablity exams.
2. To review the current scientific data supporting the use of CTP and to understand basic principles and pitfalls.
3. To discuss potential clinical applications and which patients benefit.

A-180 16:30

B. MR perfusion imaging: how much quantification do we need?

A. de Roos; *Leiden/NL (A.de_Roos@lumc.nl)*

Most commonly MRI myocardial perfusion images are analysed by visual inspection, noting regions of hypointensity (ischaemia) during the first pass of a contrast medium bolus of a gadolinium chelate. High temporal resolution is required to capture transient ischaemia in the myocardium under pharmacological stress and to distinguish artefacts (e.g. dark rim artefacts during a few frames at peak enhancement). Various modifications of T1-weigthed, ECG gated, multislice acquisitions have been proposed to assess first-pass myocardial signal intensity changes in cine mode. The time-versus-intensity curves allow quantitative analysis by deriving parameter values from the time series of intensity values (e.g. upslope, peak, absolute myocardial blood flow). Epi/endocardial contour tracing is required for segmental analysis, by pixels or to construct perfusion maps. Time intensity curves are deconvoluted for arterial input function using a Fermi function for estimating absolute myocardial blood flow. The extra processing time for quantitative analysis has to be weighed against the speed of visual analysis. The potential added value of quantitative over qualitative perfusion analysis is under investigation.

Learning Objectives:

1. To understand the different quantification techniques.
2. To become familiar with the strengths and limitations of the various quantification techniques.
3. To understand the current and future role of MR perfusion imaging in risk stratification of patients with CAD.

A-181 17:00

C. Imaging patients after bypass surgery

K.-F. Kreitner; *Mainz/DE (kreitner@radiologie.klinik.uni-mainz.de)*

Besides drug therapy, the mainstays in the treatment of coronary heart disease (CHD) are interventional therapy and coronary bypass surgery. The need to image coronary bypass grafts is based on their limited lifetime: the occlusion rate at 10 years ranges between 5 and 15 % for arterial, and between 40 and 50% for venous grafts, respectively. Graft sclerosis develops in 38% of nonoccluded venous bypass vessels after 5 years and in 75% after 10 years. This sclerosis causes more than 50% luminal narrowing in approximately half of the affected vessels. Non-invasive imaging of coronary bypass grafts by MD-CT requires information about the operative procedure. With the increasing implementation of 64slice CT scanners and beyond, it is possible to scan the heart and the full anatomic extent of grafts with sub-millimeter slice-thickness within a single breath-hold. When analysing the grafts, three graft segments should be assessed: the origin or proximal anastomosis, the body of the graft and the cardiac anastomosis, either single or sequential. Recent studies have shown that graft patency and the presence of significant graft stenosis can be assessed with an accuracy of 100% using most recent MD-CT technology (256/320 slice CT or dual source CT). The assessment of native coronaries with respect to the progression of CAD may still be problematic in cases with severe calcifications of the native coronary arteries. In these cases, MR perfusion imaging in combination with Cine and late gadolinium enhancement (LGE) imaging may be helpful in detecting newly developed, stress-induced myocardial ischaemia.

Learning Objectives:

1. To learn the indications of CTA for bypass graft assessment.
2. To understand the clinical impact of CTA in this subgroup of patients.
3. To be able to suggest possible indications for MR imaging in patients after bypass grafting.

16:00 – 17:30 Room Z

Vascular

RC 715

Vascular imaging: diabetes and vascular occlusive disease

Moderator:
M.W. de Haan; Maastricht/NL

A-182 16:00

A. Metabolic syndrome, diabetes and vascular disease: what do we need to know?

E. Minar; *Vienna/AT (erich.minar@meduniwien.ac.at)*

The metabolic syndrome refers to the clustering of cardiovascular risk factors that include diabetes, obesity, dyslipidaemia and hypertension. The association between metabolic syndrome and cardiovascular diseases raises important questions about the underlying pathological processes, especially for designing targeted therapeutic interventions. Insulin resistance and visceral obesity have been recognised as the most important pathogenic factors. Metabolic syndrome generally precedes and is often associated with type 2 diabetes. Cardiovascular risk reduction in individuals with metabolic syndrome should include 1) control of obesity, unhealthy diet and lack of physical activity; 2) control of the individual components of metabolic syndrome, especially atherogenic dyslipidaemia, hypertension, hyperglycaemia and prothrombotic state; and 3) control of insulin resistance, a defect closely linked to metabolic syndrome. Appropriate management of metabolic syndrome should be able to prevent the progression from impaired glucose tolerance to frank diabetes and thus to prevent the increasing prevalence of type 2 diabetes and vascular diseases. Each 1% increase in HbA1c is associated with a 28% increase in risk of incident PAD. Diabetes is also highly associated with progression of PAD and especially with development of critical limb ischaemia. Rigorous control of blood glucose prevents the microvascular complications of diabetes, although similar benefits on the macrocirculation have not been ascertained. Patients with diabetes and PAD should have an aggressive control of blood glucose levels with an HbA1c goal of < 7.0% or as close to 6% as possible.

Learning Objectives:
1. To learn the principles of metabolic syndrome and diabetes.
2. To understand how both diseases affect the vascular system.
3. To learn which vascular territories are primarily affected.

A-183 16:30

B. Imaging strategies in diabetic foot syndrome

R. Iezzi; *Rome/IT (roberto.iezzi@rm.unicatt.it)*

Peripheral arterial disease (PAD) is a common cardiovascular complication in patients with diabetes. In contrast to non-diabetic PAD, it is more prevalent and, because of the distal territory of vessel involvement and its association with peripheral neuropathy, it is more commonly asymptomatic. Diabetic PAD may present later with more severe disease and have a greater risk of amputation. The pervasive influence of diabetes on the atherothrombotic milieu of the peripheral vasculature is unique. The abnormal metabolic state accompanying diabetes results in changes in the arterial structure and function. The proatherogenic changes include increases in vascular inflammation and derangements in the vascular cellular components, alterations in blood cells and haemostatic factors. These changes are associated with an increased risk for accelerated atherogenesis as well as poor outcomes. In contrast to the focal and proximal atherosclerotic lesions of non-diabetic PAD, in diabetic patients the lesions are more likely to be more heavily calcified, diffuse and distal, sparing the proximal vessels and mainly affecting the more distal arteries in the calf and the foot. By identifying a patient with subclinical disease and instituting preventative measures, it may be possible to avoid acute, limb-threatening ischaemia. The primary imaging modality to be used should be duplex ultrasound, due to its non-invasive nature, lower risks and costs. CT-angiography and MR-angiography are now replacing DSA as standard imaging methods, providing a non-invasive assessment of the localisation and extension of a vascular lesion and allowing an accurate planning of endovascular and/or surgical treatment.

Learning Objectives:
1. To become familiar with the typical lesions encountered in diabetic foot syndrome.
2. To understand the underlying pathophysiology.
3. To learn about imaging strategies for the evaluation of diabetic foot syndrome.

A-184 17:00

C. Imaging prior to revascularisation: US, CTA, MRA or DSA?

S.O. Schönberg; *Mannheim/DE*

The choice of the appropriate modality for imaging of the peripheral vascular system strongly depends on the type of disease. In the acute setting of lower leg ischaemia caused by embolism or thrombosis on top of a pre-existing high-grade stenosis, CT angiography frequently is the imaging modality of choice due to its 24-hour availability and robustness with reasonable accuracy in the upper leg exceeding 90%. With the introduction of dual energy CT, visualisation of lower leg arteries and highly calcified areas has improved. For elective patients, contrast-enhanced MR-angiography (CE-MRA) is the technique of choice, in patients with renal insufficiency preferably at 3 Tesla with a single dose of macrocyclic contrast agents. Recent continuous table-movement techniques have substantially reduced the complexity and scan time and extended the spectrum to the emergency stetting. Time-resolved CE-MRA improves the detection of small arteries in the lower leg and reduces artefacts from venous overlay. Accuracy of state-of-the art CE-MRA exceeds 95% compared to digital subtraction angiography (DSA). New fast-spin echo and steady-state free precession MRA techniques without contrast media demonstrate a high negative predictive value in areas without motion. DSA should be restricted to the display of the target lesion, inflow and run-off during the interventional procedure, as well as to the in-detail visualisation of the anastomosis site prior to surgical revascularisation, particularly in the lower calf.

Learning Objectives:
1. To learn about the appropriate imaging protocols for each modality.
2. To understand quantitative analysis of occlusive disease in peripheral arteries in order to plan revascularisation.
3. To learn about the specific pros and cons of ultrasound, MRA, CTA and DSA in diabetic foot syndrome prior to revascularisation.

Friday

Saturday, March 3

08:30 – 10:00 **Room A**

New Horizons Session

NH 8
Ablation beyond radiofrequency

A-185 08:30
Chairman's introduction
J. Bilbao; *Pamplona/ES (jibilbao@unav.es)*

Image-guided percutaneous ablation is currently accepted as the best therapeutic choice for non-surgical patients with early-stage hepatocellular carcinoma. Ablation is usually performed by the injection of ethanol (PEI) or by heating the tumour with the administration of radiofrequency (RF). Several published series have demonstrated their efficacy by showing a clear improvement in patients´ survival. RF is also currently used within the multidisciplinary approach of patients with liver metastases, either as a complementary treatment during a hepatectomy or as a unique method to increase the local control of a liver nodule. Finally, in recent years several series have demonstrated excellent results with the application of RF in other non-liver tumours such as renal or lung carcinomas. In spite of being a relatively safe procedure the use of RF has some limitations and is not exempt from complications. In general they include the need of the introduction of a needle, the decrease in its efficacy when the tumour is located close to a blood vessel and the impossibility to obtain a complete necrosis, with a safety margin, in tumours bigger than 3.5 cm in its greatest diameter. To overcome some of these limitations, new locally ablative methods have been developed. Some may not need the insertion of a needle and can be applied in many different tumoural locations, among them „high intensity focused ultrasound" (HIFU) or „stereotactic body radiation therapy" (SBRT). Others like „microwave ablation" or „irreversible electroporation" may be applied to tumours bigger than 4 cm or situated close to blood vessels.

Session Objectives:
1. To become familiar with new techniques for ablation.
2. To know about the specific indications of each technique.
3. To know about the outcomes and complications that each technique may offer.

A-186 08:33
Microwave ablation
T. de Baère; *Villejuif/FR (debaere@igr.fr)*

Radiofrequency ablation (RFA) provides complete ablation of most of the tumours less than 3 cm and away from vessels larger than 3 mm. For tumours larger than 3 cm success rate of RFA decreases due to limited volume of ablation that can be obtained with one RF delivery and impossibility to deliver treatment through several RFA electrodes at the same time. Success rate of RFA also decreases when tumours are close to large vessels. Microwave (MWA) might be a valid answer to these difficulties in size and vascular cooling due to the possibility to use several microwave antennas at the same time and better thermal profile, namely by being able to reach rapidly temperature superior to the ones used for RFA. High MWA energy can be nowadays delivered through microwave antennas inserted percutaneously, especially due to needle shaft cooling. Synergy has been demonstrated when multiple antennas are used at the same time. Consequently, MWA has been applied in lung, liver and kidney ablation where large ablation volumes were obtained with promising success rate of complete ablation when treating large tumour. Great care should be taken to avoid complications that can occur when very large volumes of ablation are performed.

Learning Objectives:
1. To become familiar with the technique.
2. To know about the specific indications.
3. To know about the outcomes and complications.

A-187 08:51
Irreversible electroporation
T.K. Helmberger; *Munich/DE (Thomas.Helmberger@klinikum-muenchen.de)*

In irreversible electroporation (IRE) repeated high power electrical pulses (up to 3000V and 50 A)---applied via percutaneous probes---cause nano-scale defects in the cell lipid-bilayer followed by a leakage of intracellular ions, a collapse of the homeostatic conditions inside the cell and finally cell death. In contrast to other ablative techniques structures in close proximity to the destroyed tissue as large blood vessels, biliary ducts or bronchioli are preserved. The probes are placed into tumour tissue under imaging guidance comparable as in other ablation procedures. The high-voltage pulses cause substantial muscle contractions (comparable to electro shocks); therefore, complete muscle relaxation under general anaesthesia is necessary. Moreover, the high-voltage pulse may induce cardiac arrhythmia, what can be prevented by using an ECG-controlled trigger device allowing pulse delivery only in the non-vulnerable phase of the cardiac cycle. Preliminary experience exists in IRE of tumours of the liver, prostate and lung, where the feasibility of IRE could be documented. However, there are some unique characteristics making IRE rather different from other ablative techniques. General anaesthesia with a complete muscle blockade is mandatory to avoid generalised muscle contractions as well as ECG gated delivery of the high-voltage pulses to avoid serious cardiac arrhythmias. Nevertheless, the observation that IRE creates very well-demarcated ablation volumes preserving surrounding structures, maintaining blood flow in adjacent vessels, may smooth the way for local ablative therapy in very crucial anatomical areas as, e.g. in close proximity to the bowel, cardiac, neural and vascular structures.

Learning Objectives:
1. To become familiar with the technique.
2. To know about the specific indications.
3. To know about the outcomes and complications.

A-188 09:09
High intensity focused ultrasound (HIFU)
F. Orsi; *Milan/IT (franco.orsi@ieo.it)*

High intensity focused ultrasound (HIFU) is a highly precise medical procedure using ultrasound energy for destroy the tumour tissue at depth within the body, selectively and without harming overlying and adjacent structures within the path of the beam. Unlike RFA and Cryo, HIFU is completely non-invasive and can be used to treat tumour deeply located, if an acoustic window is available for ultrasound transmission. Many reports underline the reduced toxicity with HIFU compared with other ablation techniques because of the non-invasive nature of the procedure. Diagnostic ultrasound has an excellent safety profile, with no clinically significant biologic effects; however, at high energy, ultrasound can result in tissue heating and necrosis, cell apoptosis and lysis. Localised heat generation due to absorption of the acoustic energy is the main biological effect in tissues where it rapidly raises temperatures from 55 °C to 100 °C, causing coagulation necrosis within a few seconds, as the result of biological effects from a combination of heating, cavitation and vascular destruction. Combination between imaging and technologies for local therapy has made ablative procedures more reliable and practical, allowing for safe and feasible application of HIFU in clinical practice. US-guided HIFU has been recently used to treat patients with various kinds of malignancies, including liver, breast, kidney, pancreas bone and soft tissue, both in Asia and Europe. MR-guided HIFU is currently used in North America, Europe and Asia for treating uterine fibroids. Investigation and applications of HIFU are growing rapidly worldwide, expanding clinical indications for this new technology.

Learning Objectives:
1. To become familiar with the technique.
2. To know about the specific indications.
3. To know about the outcomes and complications.

A-189 09:27
Stereotactic body radiation therapy (SBRT)
J.J. Aristu; *Pamplona/ES (jjaristu@unav.es)*

High-intensity focused ultrasound (HIFU) is a highly precise medical procedure using ultrasound energy for destroying the tumour tissue at depth within the body, selectively and without harming overlying and adjacent structures within the path of the beam. Unlike RFA and Cryo, HIFU is completely non-invasive and can be used to treat tumour deeply located, if an acoustic window is available for ultrasound transmission. Many reports underline the reduced toxicity with HIFU compared with other ablation techniques because of the non-invasive nature of the procedure. Diagnostic ultrasound has an excellent safety profile, with no clinically significant biologic effects; however, at high energy, ultrasound can result in tissue heating and necrosis, cell apoptosis and lysis. Localised heat generation due to absorption of the acoustic energy is the main biological effect in tissues where it rapidly raises temperatures from 55 °C to 100 °C, causing coagulation necrosis within a few seconds, as the result of biological effects from a combination of heating, cavitation and vascular destruction. Combination between imaging and technologies for local therapy has made ablative procedures more reliable and practical, allowing for safe and feasible application of HIFU in clinical practice. US-guided HIFU has been recently used to treat patients with various kinds of malignancies, including liver, breast, kidney, pancreas bone and soft tissue, both in Asia and Europe. MR-guided HIFU is currently used in North America, Europe and Asia for treating uterine fibroids. Investigation and applications of HIFU are growing rapidly worldwide, expanding clinical indications for this new technology.

Learning Objectives:
1. To become familiar with the technique.
2. To know about the specific indications.
3. To know about the outcomes and complications.

Panel discussion:
Which method should then be used for tumoural ablation? 09:45

08:30 – 10:00 **Room B**

Special Focus Session

SF 8a
Peritoneal carcinomatosis

A-190 08:30
Chairman's introduction
P.K. Prassopoulos; *Alexandroupolis/GR (pprasopo@med.duth.gr)*

Cytoreductive surgery followed by hyperthermic intraperitoneal chemotherapy is the current trend in the treatment of peritoneal carcinomatosis. Thanks to this approach, prognosis and quality of life have significantly improved during the pst decade, in selected group of patients with peritoneal carcinomatosis. Imaging may have a pivotal role in the preoperative selection of patients that may benefit from cytoreductive surgery, by determining tumour burden and presence of disease in specific areas that may implicate the surgical procedure. CT is considered the modality of choice in diagnosing peritoneal carcinomatosis and in disclosing the specific patterns of malignant extension in the abdomen. MRI has a complementary role and it may perform better than CT in exact forms of the disease. Tailored CT and MR imaging protocols (including dynamic, diffusion/perfusion imaging) are required to allow a detailed and accurate site by site demonstration of disease extent and type of involvement. Selection of candidates for cytoreductive surgery and surgical planning can be based on optimal preoperative imaging examinations. PET/CT has an emerging role in the initial assessment and especially in the follow-up evaluation of patients with peritoneal carcinomatosis. Closer collaboration between dedicated surgeons and radiologists and in-depth exploitation of the potential of new imaging techniques would have a significant impact on patients' management.

Session Objectives:
1. To learn about the imaging strategies for the diagnosis, evaluation of disease extent and follow-up in patients with peritoneal carcinomatosis.
2. To become familiar with the evolution of new treatment options in peritoneal carcinomatosis.
3. To understand the necessity for accurate preoperative staging by means of imaging techniques.

A-191 08:35
What does the surgeon want to know?
E. de Bree; *Iraklion/GR (debree@edu.uoc.gr)*

Intraoperative hyperthermic intraperitoneal chemotherapy (HIPEC) has been increasingly used in the treatment of peritoneal carcinomatosis. The pharmacokinetic advantage of intraperitoneal chemotherapy consists of high locoregional and low systemic drug concentrations, resulting in increased efficacy and decreased systemic toxicity. During HIPEC, the direct cytotoxic effect of heat and its synergistic effect with drugs are utilised. Since the drug penetration depth is limited to a few millimetres at the most, extensive cytoreductive surgery (CRS) is warranted. Various intraoperative staging scoring systems to quantify the extent of peritoneal disease before CRS have been developed, which predicts the possibility of adequate CRS and are of prognostic value for survival. Most frequently, the Peritoneal Cancer Index (PCI) is used. Surgical scoring systems have been designed to describe the residual disease after CRS. Only when no, or very small tumour nodules (≤2.5 mm) are left behind, may HIPEC be of therapeutic benefit. Adequate patient selection is of importance, since CRS followed by HIPEC is associated with considerable morbidity and mortality, high costs and poor survival in many patients. Besides performance status and tumour histology, there are many other selection factors. Extra-abdominal disease, (multiple/irresectable) hepatic metastases, high peritoneal disease staging score and involved areas that may exclude adequate CRS such as extensive small bowel or mesentery involvement, hepatic hilar involvement, gross involvement of the hepatogastric ligament and invasive ureteral obstruction may be considered as contraindications. Preoperative imaging methods demonstrating these issues adequately may be helpful in preoperative patient selection and result in avoidance of unnecessary laparotomy.

Learning Objectives:
1. To become familiar with the principles of cytoreductive surgery followed by hyperthermic intraperitoneal chemotherapy (HIPEC).
2. To learn about intraoperative staging and surgical scoring systems.
3. To understand criteria for selecting candidates for cytoreductive surgery and HIPEC.
4. To appreciate areas of special attention during intraoperative staging.

A-192 08:55
MDCT vs MRI: advantages and drawbacks
F. Iafrate; *Rome/IT (francoiafrate@gmail.com)*

Peritoneal carcinomatosis is usually associated with a poor overall survival rate. Recently, introduction of more aggressive surgical treatment and intraperitoneal chemotherapy appears to significantly increase the overall survival rate for these patients. A detailed preoperative assessment of peritoneal carcinomatosis could be very challenging in the field of imaging, but a new aggressive surgical approach requires an accurate preoperative assessment of the disease. Cross-imaging using CT and MRI with diffusion-weighted (DW) sequences is important for appropriate management of patients with peritoneal carcinomatosis. Appreciation of the spectrum of diagnostic patterns and pitfalls as well as different sites of involvement of peritoneal carcinomatosis using CT and DWI is crucial for appropriate surgical treatment. The aims of the lecture are to underline the role of 64 MDCT and DWI 3 T MRI in the evaluation of Peritoneal Metastases (PMs) in patients undergoing peritonectomy and hypertermic intraperitoneal chemotherapy (HIPEC), to understand advantages and drawbacks of each diagnostic imaging technique and to address which particular abdominal areas are the most important and crucial to evaluate in order to exclude the presence of PMs for a right selection of patients that must be surgically treated by HIPEC.

Learning Objectives:
1. To learn about CT/MR imaging patterns of malignant peritoneal dissemination.
2. To become familiar with tailored CT/MR imaging protocols in the diagnosis and evaluation of disease extent.
3. To discuss strengths and weaknesses of CT and MR imaging diagnosis.
4. To understand difficulties and pitfalls in disease assessment and preoperative staging by MDCT or MRI.

A-193 09:25
What is the added value of PET/CT?
G. Antoch; *Düsseldorf/DE (antoch@med.uni-duesseldorf.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. So hybrid PET/CT imaging must be considered one of the most promising new developments in medical imaging. The most recently launched line of PET/CT scanners combines high-definition PET with high-end multislice CT. These imaging systems do not only provide a higher diagnostic accuracy based on detection of smaller lesions with CT and PET, but also offer integration of complex CT protocols into the PET/CT scan. Detection of peritoneal carcinomatosis has been challenging with all imaging procedures. A „peritoneal cake" can be detected easily; however, in many cases peritoneal disease will be rather diffuse compromising its detection with cross-sectional imaging techniques. This also applies to FDG-PET/CT where low FDG-uptake in low-grade tumours and the anatomical resolution of PET may hamper detection of small lesions. Additional contrast-enhanced CT as part of the PET/CT scan may aid lesion detection in this situation. The aim of this talk is to give an overview concerning PET/CT in detection of peritoneal carcinomatosis.

Learning Objectives:
1. To become familiar with PET imaging findings in the diagnosis and evaluation of disease extent in peritoneal carcinomatosis.
2. To understand limitations and pitfalls of PET/CT in malignant peritoneal dissemination at initial presentation and disease follow-up.
3. To understand the role of PET/CT in selecting candidates for cytoreductive surgery or in avoiding unnecessary surgery.

Panel discussion:
Optimised imaging algorithms in peritoneal carcinomatosis 09:45

Saturday

08:30 – 10:00 **Room C**

Interactive Teaching Session

E³ 820a

Infections of the central nervous system: what the radiologist must report

A-194 08:30

A. 'Dangerous' viral and prion infections

G. Wilms; *Leuven/BE (Guido.Wilms@uz.kuleuven.ac.be)*

The most common viral infection of the brain is herpes encephalitis (HSV1). It is a necrotising encephalitis with a mortality rate of more than 50%. On imaging studies lesions will be seen in the "limbic system", i.e. the temporal lobes, hippocampi, insular cortex and cingulate gyrus. They appear as hypodensity on CT, T2- and FLAIR hyperintensity on MRI, possibly with haemorrhagic transformation. Diffusion is restricted in the early phase. Enhancement occurs at a later stage. Human immunodeficiency virus (HIV) infection is a multifocal giant-cell encephalitis eventually leading to a progressive leuco-encephalopathy. On MR atypical focal or diffuse symmetrical signal abnormalities are seen neither with mass-effect nor with enhancement and typically sparing the U-fibres. Spectroscopy can show an increase of myo-inositol. Progressive multifocal leuco-encephalopathy (PML) is due to reactivation of the JC polyomavirus in immunocompromised patients, 10% of which are HIV positive. On MRI "scalloped" multifocal asymmetrical lesions are seen with minimal mass effect and without enhancement. New treatments of HIV, especially highly active antiretroviral therapy (HAART) can lead to a paradoxical worsening of patients due to the immune reconstitution inflammatory syndrome (IRIS). On MRI mass lesions are seen with diffuse patchy enhancement. Cerebral toxoplamosis appears as multiple enhancing lesions with marked perilesional oedema. Calcification is possible. Prion diseases are caused by a proteinaceous infectious particle leading to Creutzfeld-Jacob disease in humans. Diffusion weighted MR images show high signal intensities in the cortex and the basal ganglia. Abnormalities on T2-weighted images and FLAIR occur at a later stage where atrophy is mostly prominent.

Learning Objectives:
1. To be familiar with the imaging pattern of most common viral and prion CNS infections.
2. To learn how to recognise and differentiate between the different viral and prion CNS infections.
3. To learn how to report detected viral and prion CNS infections.
4. To improve knowledge about follow-up and treatment monitoring of viral and prion infections.

A-195 09:15

B. Bacterial and parasitic infections

E.T. Tali; *Ankara/TR (turgut.tali@gmail.com)*

Most of the cerebral infections can be treated successfully as long as they are detected early. Radiological evaluations play important role in the diagnosis, subsequent treatment and treatment monitoring. Cerebritis is poorly localised perivascular inflammatory infiltrations with scattered necrosis, oedema, and petechial haemorrhage. Bacteria, fungi and parasites may cause cerebritis. In one-third of the cases more than one agent is found. Brain infection in newborn and infants differs from the adults. They are relatively larger in size, typically originate in the periventricular WM and capsule formation is relatively poor. Radiological findings may differ according to the stage of the infection. MRI findings vary from oedema, mass effect, mild/patchy/heterogeneous enhancement of cerebritis to ring-like lesions (thicker border near cortex, thinner near ependyma), with the capsule hypointense on T2WI, hyperintense on T1WI, heterogeneous enhancement, central necrotic area, surrounding oedema of abscesses. DWI shows high signal intensity while ADC map shows low signal intensity of the central necrotic area of the abscesses. MRS shows elevated lactate and amino acid peaks. Cystic lesions isointense to CSF are also seen at the parasitic infestations. Treatment can also be monitored mainly by MRI; decrease in oedema, decrease in mass effect, decrease in the degree of enhancement, decreasing signal on DWI, increasing signal on ADC maps, gliosis, occasionally focal calcifications, turning of lactate and amino acid peaks to normal at MRS are the indicators of successful treatment.

Learning Objectives:
1. To learn how to report detected and recognised bacterial and parasitic CNS infections basically.
2. To learn how to assist clinicians with the diagnosis and differential diagnosis of bacterial and parasitic CNS infections.
3. To learn what to include in the report of CNS infections for treatment planning.
4. To learn how to report follow-up and treatment monitoring of CNS infections.

08:30 – 10:00 **Room D1**

Controversies in Abdominal Imaging

MC 824

Abdominal emergencies: US resists CT!

Moderator:
M. Laniado; Dresden/DE
Teaser:
P.R. Ros; Cleveland, OH/US

A-196 08:30

A. Why bother with CT when US answers so many questions?

J.B.C.M. Puylaert; *The Hague/NL (dr.jbcmpuylaert@wxs.nl)*

The specific advantages of US over CT are that US has an image definition in the close range which is much higher. US is more interactive: patient's history as well as painful area or palpable mass can be correlated with the US findings. US shows peristalsis, pulsations and blood flow. US shows the effects of respiration, Valsalva manoeuvre, gravity and compression with the probe, allowing to assess whether organs as bowel and gallbladder are soft or rigid. US allows easy puncture of intraperitoneal fluid and drainage of pus. US in acute abdomen is performed with graded compression. Compression is necessary to displace or compress bowel, eliminating the disturbing influence of bowel gas and to approach the pathological structure closely. This allows using a high-frequency transducer with a better image quality. The compression should be graded to avoid unnecessary pain and to avoid pushing organs out of the US plane. US examination should be symptom-directed and requires communication with the patient. In patients with an acute abdomen the entire abdomen should be examined, i.e. from the axilla to the groin. The final US report should be integrated with the clinical findings, laboratory data, CT-scan and possible other radiological examinations. The US images of appendicitis, diverticulitis, intussusceptions, acute biliary, urological and gynaecological conditions, infectious ileocecitis, perforated peptic ulcer, small bowel obstruction, ruptured aneurysm, pancreatitis, Crohn's disease, epiploic appendagitis, omental infarction and perforating malignancy will be demonstrated using illustrative case histories, with emphasis on the specific advantages of US over CT.

A-197 08:55

B. Why lose time with US when CT gives you all you need to know?

D. Akata; *Ankara/TR (dakata@hacettepe.edu.tr)*

Multidetector computed tomography (CT) has emerged as the modality of choice for evaluation of patients with most of the traumatic and nontraumatic conditions causing acute abdominal pain. Operator dependency and technical inadequacy secondary to the body habitués or intestinal gas of the patient are not so rare limitations of the ultrasound exam. Although radiation and use of contrast material are the main drawbacks, CT is the fastest imaging modality for scanning patients. Moreover, multidetector CT scanners allow performing multiplanar reformation without loss of image resolution, a technique that has been shown to improve physician confidence in either confirming or excluding the diagnosis of abdominal emergencies. Increased certainty improves treatment planning and can reduce inappropriate utilisation of hospital resources. Also in trauma patients with multiorgan injuries additional post processing techniques, such as maximum intensity projection and volume rendering, multiplanar reformation may also improve identification and characterisation of especially vessel and bone injuries in the same setting. MDCT is the primary imaging technique used in evaluating patients suspected with most common causes of abdominal pain; acute pancreatitis, acute appendicitis, abdominal abscess or renal stone. It has a high sensitivity and specificity and high confidence level to diagnose or rule out the pathology. CT also has an indispensable role to differentiate nonsurgical rare conditions of acute abdominal pain such as epiploic appendages, omental infarct, mesenteric panniculitis or diverticulitis.

A-198 09:20
Discussion
M. Laniado[1], P.R. Ros[2]; [1]*Dresden/DE*, [2]*Cleveland, OH/US*

The discussion will address the following issues:
1. Are there situations in which US and CT do not compete, like cholecystitis for US or perforation for CT?
2. What is the most time and cost-efficient strategy: US and optional CT or direct CT (and optional US¼)?
3. What is the role of US in the era of teleradiology?
4. Should we teach emergency doctors to perform US and can we define limits for their expertise?
5. Is there any role for MRI in emergency patients?

08:30 – 10:00 **Room D2**

Urogenital Imaging

CC 821
Renal and adrenal tumours

Moderator:
G.M. Villeirs; Gent/BE

A-199 08:30
A. Imaging and staging of renal parenchymal tumours
U.G. Mueller-Lisse; *Munich/DE*

The staging of kidney tumours includes a systematic approach to recognise and describe the local, regional, and distant extent of tumour burden. Staging results determine therapeutic approach, success of individual treatments, and prognosis of individual patients. Evolving diagnostic, therapeutic, and prognostic experience continues to re-define staging categories. In renal cell carcinoma (RCC), the Robson classification has been replaced by the TNM classification. Since 2002, the TNM classification includes RCC of 4 cm or less in stage T1a, since recent surgical experience suggests that partial nephrectomy (nephron-sparing surgery) can be curative, while it preserves excretory capacity. Since surgery is currently the only means of curative treatment, lymph node (N-) or distant metastatic (M-) extent of RCC is associated with unfavourable prognosis. However, new therapeutic concepts involving tumour anti-angioneogenesis factors or multi-kinase inhibitors demonstrate promising effects on tumour volume or tumour viability. Staging and follow-up of RCC may involve various imaging modalities. However, the increase in speed and range of both CT and MRI suggests that these modalities may soon limit or obviate the need for other imaging modalities in the staging of renal tumours. PET-CT appears to be promising for the follow-up on new therapies in patients with metastatic RCC. Transitional cell carcinoma (TCC) of the kidney is a differential diagnosis in patients with solid renal lesions who do not have other primary tumours.
Learning Objectives:
1. To know the different imaging methods for the detection and staging of renal cell carcinoma.
2. To be able to explain the role of imaging in the detection and staging of renal cell carcinoma.
3. To learn about the implications of the staging classifications for renal cell carcinoma.

A-200 09:00
B. Tumours of the renal pelvis and ureter: the revolution of CT urography
N.C. Cowan; *Oxford/UK*

CT urography 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. The principal reason for the existence of CT urography is for diagnosing UUT-UCC. In adults, CT urography is now the preferred initial examination for patients with haematuria at high risk for upper urinary tract urothelial cell cancer (UUT-UCC). CT urography is evaluated for diagnosing UUT-UCC by analysis of results from haematuria clinics as well as by comparison studies using ultrasound, excretory urography and retrograde ureteropyelography. Technical aspects of image acquisition and processing will be explored and technical tips relating to protocol design given to optimise CT urography for diagnosing UUT-UCC.The principal problems with using CT urography for diagnosing UUT-UCC are reader error and false-positive diagnoses. Solutions to the problems will be proposed. Use of a formative teaching programme with the aim of reducing reader error will be put forward. A radiologically guided method for upper tract lesion biopsy will be demonstrated. CT urography may not be perfect, but it is the best single imaging modality we have for diagnosing UUT-UCC.
Learning Objectives:
1. To be able to evaluate CT urography for diagnosis of upper urinary tract urothelial cancers (UTUC).
2. To understand how to optimise CT urography for diagnosis of UTUC.
3. To be able to provide solutions to problems with CT urography for diagnosis of UTUC.

A-201 09:30
C. Adrenal tumours
F.M. Danza; *Rome/IT (fmdanza@gmail.com)*

Adrenal tumours are a wide group of masses where imaging plays an important role in diagnosis. Most of them are incidental findings during radiological CT or MRI studies, performed for oncological or non-oncological indications. A list of all possibilities will be presented with special consideration on the embryological origin of the tumours. A rationale for technical protocols in CT and MRI is presented in particular to apply to clinical settings. The differential diagnosis between adenoma and mets is the more frequent dilemma in oncologic patients. In non-neoplastic cases the tool is to distinguish between functioning and non-functioning masses, with all the endocrinological implications. More rarely, larger lesions may represent the diagnostic challenge for radiology: to recognise benign and malignant findings is crucial to orient towards different histotypes. Relations with neighbouring structures are also necessary to correctly stage the disease. CT and MRI have some potential diagnostic possibilities to be utilised in the characterisation attempt: density, enhancement, de-enhancement, variations of signal intensity, in particular in FS and IN-OUT of false sequences. Particular considerations will be given to some particular tumours as angioma, myelolipoma, adrenal carcinoma and collision tumours.
Learning Objectives:
1. To understand the role of different radiological techniques used for demonstration and characterisation of adrenal tissue and masses.
2. To know the major problems encountered with radiological imaging in the differential diagnosis of adrenal nodules in oncologic and non-oncologic patients.
3. To know the appearance of primary benign and malignant tumours of adrenals, either originating from the medulla or from the adrenal cortex, using different radiological techniques.

08:30 – 10:00 **Room E1**

Musculoskeletal

RC 810
Bone marrow oedema and bone marrow oedema-like lesions

A-202 08:30
Chairman's introduction
B. Vande Berg; *Brussels/BE*

The term bone marrow oedema was introduced to describe ill-defined bone marrow hypointensity on T1Wi and hyperintensity on T2Wi and water sensitive sequences. Bone marrow edema can be found in many similar unrelated disorders, such as bone contusions, osteonecrosis, inflammatory or degenerative disease, being a non-specific MRI abnormality representing a diagnostic challenge for radiologist. Recently has been demonstrated that bone marrow oedema might be a prognosis marker for OA (osteoarthritis) and inflammatory disease, and could be used as a powerful predictive tool for treatment options. Therefore our role as radiologist is to try to increase specificity to help patient management and decrease progression. The aim of this refresher course is to describe MR imaging features of bone marrow edema in different important and frequent disorders: osteoarthritis, inflammatory diseases and trauma.

A-203 08:35
A. BME and osteoarthritis
F.W. Roemer; *Augsburg/DE (f.w.roemer@gmx.de)*

The objective is to discuss the terminology, differential diagnoses, and clinical and structural significance of MRI-detected subchondral bone marrow lesions (BML) of osteoarthritic joints. Subchondral BMLs are a hallmark of knee osteoarthritis (OA) on MRI, but are also regularly seen in hip OA and in non-weight bearing degenerative joints. BMLs in OA are understood as non-cystic subchondral areas of ill-defined hyperintensity on T2w images and of hypointensity on T1w MR images. BMLs are observed regularly in conjunction with adjacent cartilage alterations. As the disease progresses, an increase in BML volume is seen in the same region subchondrally in many patients, which is positively correlated with an increase in cartilage loss and radiographic joint space narrowing. Subchondral cysts are strongly associated with BMLs in the same subregion and develop within non-cystic BMLs. BMLs fluctuate in size and the majority of subchondral BMLs may regress or resolve completely. Fluctuation of joint pain is positively correlated with fluctuation of BMLs in the same direction. Several validated semiquantitative and quantitative methods exist to assess BMLs in a research setting. Histologic correlation studies showed that the lesions consisted of a mixture of different tissue patterns with only little oedema. Specific changes in bone mineralisation and remodelling in areas of BMLs have further been reported. Differential diagnoses of OA-related BMLs include traumatic bone contusions and fractures with or without disruption of the articular surface. Osteonecrosis, inflammation, idiopathic BMLs, red marrow and post-surgical alterations should also be considered.

Learning Objectives:
1. To learn about the basic physiopathology of OA and its relation to BME.
2. To be informed about the distribution and natural history of BME in OA.
3. To understand the differential diagnosis and relevance of BME in staging OA and as a marker of prognosis.

A-204 08:58

B. BME and early inflammatory disease

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

Marrow oedema is identified as a feature of many forms of inflammatory and mechanical arthritis, but has been most studied in inflammatory arthritides and particularly in rheumatoid arthritis. It was first reported as a feature of RA as far back as 1986. Studies have been undertaken both using human specimens and specimens from animal models, which suggest that marrow oedema seen on MRI in RA corresponds to areas of inflammation associated with invading pannus, lymphocytic aggregates and hypervascularity. There is also evidence that the marrow lesions seen on MRI in ankylosing spondylitis correspond to histopathological inflammatory change. Marrow oedema has been shown to be an important predictor of future joint damage in patients with rheumatoid arthritis. In addition to predicting bone destruction for erosion, marrow oedema is independently predictive of joint space loss and therefore cartilage destruction. It also correlates well with other measures of disease activity. We have applied dynamic contrast enhancement techniques to show that treatment with anti-TNF therapy brings about a reduction in contrast uptake in areas of marrow oedema in patients with RA. In the seronegative arthritides, marrow oedema in the spine in ankylosing spondylitis has been shown to be predictive of future changes and of response to treatment. Diffusion-weighted imaging of marrow lesions in ankylosing spondylitis can also be used to show a treatment response, seen as a change in the apparent diffusion coefficient.

Learning Objectives:
1. To become familiar with the imaging pattern of seronegative and rheumatoid arthritis distribution.
2. To understand the relationship between BME and early diagnosis of inflammatory disease.
3. To understand whether BME helps in patient management, diagnosis and follow-up.

A-205 09:21

C. BME and trauma

S. Dzelzite, P. Likums; *Riga/LV (dzelzitis@apollo.lv)*

Most of the acute traumatic skeletal injuries are evaluated and treated on the basis of plain radiographs. Increased use of magnetic resonance imaging in investigation of acute musculoskeletal injuries during the last few years highlighted the value of recognition of the different bone marrow oedema patterns for more precise diagnosis of possible obscured soft tissue injuries. BME-like lesions in cases of traumatic injuries presented as focal bone marrow changes with decreased signal on T1W images and increased signal on T2W and STIR images; this appearance is thought to represent areas of haemorrhage, oedema or infarction secondary to trabecular microfractures. The osseous injuries may be the result of a direct blow or of compressive forces of adjacent bones impacting on one another. These injuries produce extensive BME. The indirect injury is the result of traction forces, which displays as avulsion injuries with localised BME. Sanders and Hayes in two different articles in “Radiographics” in the year 2000 identified distribution patterns of BME with different soft tissue and ligamentous injuries in the knee. Subsequently, the term “footprint” was introduced. In the knee, 5 different contusion patterns such as pivot-shift, dashboard, hyperextension, clip injuries and patellar dislocation were recognised, which correlate with ligamentous lesions. Similar correlations can be found in ankles and shoulders. In cases of bone contusion, BME significantly decreases in 12 weeks and resolution pattern is centripetal. If clinical symptoms persist, unresolved BME can indicate more serious osseous injuries including subchondral fracture or osteochondral injury.

Learning Objectives:
1. To learn about BHE physiopathology in trauma scenarios: direct and indirect mechanism.
2. To recognise BME as a footprint that allows other soft tissue injuries to be ruled out.
3. To understand whether BME can be a valuable tool for follow-up.

Panel discussion:
Can we still use the term BME or should we be more specific? 09:44

08:30 – 10:00 Room E2

Foundation Course: More About Ultrasound

E³ 820b

Volumetric imaging: where are we, where are we going to?

Moderator:
P. Mildenberger; Mainz/DE

A-206 08:30

A. Volume imaging in obstetrics and gynaecology

C.B. Benson; *Boston, MA/US (cbenson@partners.org)*

The addition of 3D and 4D techniques to ultrasound in the area of obstetrical and gynaecologic ultrasound has expanded the diagnostic capabilities of the modality and has provided a means to improve scanning efficiency. For gynaecologic images, 4D acquisitions of the uterus permit real-time visualisation of the coronal plane of the uterus, a plane that cannot be imaged with conventional ultrasound. This coronal plane is ideal for assessing the uterine shape and contour to diagnose duplication anomalies, for presence and position of masses such as fibroids and polyps, and for IUD placement. In obstetrical imaging, anomalies of the face and extremities, including facial clefts, limb reduction defects, and abnormal posturing of the hands and feet, are best visualised using 3D imaging with surface rendering. Anomalies of the spine and extremities can be assessed with 3D imaging in skeletal mode to provide an image similar to an x-ray, for evaluation of such abnormalities as hemivertebrae and skeletal dysplasias. With respect to scan efficiency, 3D sonography permits acquisition of a volume or several volumes of data in just a few minutes. After the patient has left, these volumes can be rendered into sectional planes for interpretation on the workstation, or they can be manipulated into the usual scanning planes for measurements and diagnosis. Storing 3D volumes for subsequent interpretation can diminish scanning time significantly with no loss of diagnostic accuracy.

Learning Objectives:
1. To learn how to optimise your 3D scan to best evaluate the foetal malformations.
2. To learn the benefits of using 3D to evaluate the female pelvic organs.
3. To learn how to use volume scanning to dramatically reduce scan time and improve your scanning efficiency by rescanning stored volumes of complete foetal anatomy.

A-207 09:00

B. Volume US: a plus or a new approach to body imaging

S.T. Elliott; *Newcastle upon Tyne/UK*

Volume (or 3D/4D) ultrasound has seen some significant new developments in recent years. Once restricted mainly to surface rendering in obstetrics, new software and manipulation tools, coupled with advances in transducer technology, are opening up applications in general imaging, such as abdominal and small parts. Users are discovering that this is not just an additional way to image, but with innovative thinking, volume acquisition ultrasound can change the way we practice or deliver a service; often this is has the double benefit of greater efficiency and greater accuracy. This presentation will review the latest volume ultrasound technology, outline the basic concepts and techniques and provide evidence of how this can change our approach to general imaging with ultrasound.

Learning Objectives:
1. To understand the basic concept and principles of volume acquisition US.
2. To learn how developments in transducer technology might change scanning techniques.
3. To understand how volume US can improve accuracy and efficiency in a general imaging department.

A-208 09:30
C. Why volume imaging and fusion are important for diagnosis and treatment
E. Leen; *London/UK (edward.leen@imperial.ac.uk)*

Fusion imaging is not new. However when combined with volume imaging and navigation, it becomes a very strong tool broadening ultrasound as well as CT clinical applications for both diagnostic and interventional practices and in particular in guiding therapy without or reduced ionising radiation. Currently available systems have been shown to be useful in a) the US tracking of liver and renal lesions for detection, characterisation of difficult/occult lesions and follow-up following therapy, b) in the guidance of biopsy and ablation of occult liver or renal tumours as well as c) a much needed training tool for interventional clinicians. A practical work-flow through various fusion and navigation systems for the clinical applications as well as their current benefits, limitations and future developments will be reviewed.
Learning Objectives:
1. To understand the features of volume imaging, fusion and navigation.
2. To develop the protocol to set up the systems.
3. To learn indications and benefits of volume imaging and fusion for diagnosis and treatment.

08:30 – 10:00 **Room F1**

GI Tract

RC 801
Rectal cancer imaging: the next phase

A-209 08:30
Chairman's introduction
L.C.O. Blomqvist; *Stockholm/SE (lennart.k.blomqvist@ki.se)*

Preoperative staging of rectal cancer implies detailed recognition of tumour extent, providing the basis for multidisciplinary team (MDT) treatment planning. The role of diagnostic imaging continues to increase in this setting. There are technological advances in all imaging modalities, and treatment is based on a synthesis of information in each patient. Diagnostic imaging discussed in MDT conferences is recognised as a quality assurance parameter in rectal cancer, ensuring that the available prognostic information is adequately used all the way to treatment decision. The multidisciplinary approach also has continuous educational advantages. For radiologists, recognition and reporting of tumour relation to anatomical structures such as the mesorectal fascia, the peritoneal reflection, the levators and anal sphincters, as well as identification of extramural venous invasion, lymph node involvement and evaluation of tumour response to neoadjuvant treatment, are all important parts of this educational process. MDT-based imaging discussions continue to result in new surgical and oncological treatment strategies to be considered both in randomised clinical trials or in single patients. Being able to stratify patients into prognostic groups based on imaging may help to identify not only those in whom neoadjuvant treatment is beneficial, but also those where primary surgery can be performed without need for radio- or chemotherapy. In this session, the present role of different imaging techniques for local and distant staging of rectal cancer will be presented, including their advantages and limitations. New treatment strategies and challenges based on assessment of response to treatment will also be presented and discussed.

A-210 08:36
A. Local and distant staging
S. Schmidt, J.-Y. Meuwly, R. Meuli; *Lausanne/CH (sabine.schmidt@chuv.ch)*

Accurate local and distant staging of rectal cancer is crucial for ensuring successful surgery, and also for correctly selecting patients with T3 rectal tumours, increasingly treated by neoadjuvant chemoradiation. Nowadays, an integrated and multidisciplinary approach seems mandatory. Endoscopic rectal ultrasound (EUS) particularly helps in the assessment of early tumours (T1), suitable for local transanal excision, which are not detected by MRI or CT. CT remains the working horse for distant staging, especially for assessing lung and liver metastases. Despite inherent low tissue contrast, the excellent spatial resolution due to isotropic and multiplanar capacities has nowadays also improved the accuracy for local staging, provided that watery rectal enema is performed. Thanks to excellent tissue contrast, MRI has evolved as a powerful tool for regional staging, in particular to distinguish between T2 and T3 tumors and to assess the relationship of the tumour with the mesorectal fascia. The prerequisites are data acquisition in high-resolution mode and adequate slice positioning. However, perirectal desmoplastic reaction, inherent in rectal cancers, may mimic tumour infiltration, thus overestimating the T-stage. This drawback does not seem to change significantly with high-field MRI (3 T). For accurate lymph node staging, neither EUS, neither CT, nor MRI has proven excellent accuracy. Thus, alternative imaging modalities are steadily being evaluated, without any international consensus so far. Furthermore, state-of-the-art requirements and advantages of the most important recently developed imaging techniques, such as perfusion-CT, diffusion-MRI and USPIO-enhanced MRI for lymph node staging, as well as the indication for 18F-FDG PET/CT, will briefly be discussed.
Learning Objectives:
1. To learn about optimised MR and CT techniques for rectal cancer staging.
2. To become familiar with the role of endorectal ultrasound in rectal cancer staging.
3. To understand basic TMN staging and assessment of the CRM on imaging.
4. To become familiar with new methods for whole body staging, notably PET/CT and whole body MRI.

A-211 09:01
B. Assessing tumour response
S. Gourtsoyianni; *Athens/GR (sgty76@gmail.com)*

Patients identified at initial MRI staging as having locally advanced rectal cancer undergo neoadjuvant chemoradiation therapy (CRT) for their tumour to be downsized and downstaged, especially in low rectal cancers so that sphincter sparing surgery may be performed. In 15-30% of patients, complete pathological response is achieved. Reimaging with MRI at 6 weeks post-treatment is of great importance for assessing tumour response. However, referral depends greatly on the strategy that is to be followed by the surgeons in case of complete imaging response (no deviation from initial surgical plan, "wait and see" policy). Conventional MRI has a reported moderate accuracy for prediction of mesorectal fascia (MRF) involvement after CRT therapy, mainly due to its inability to differentiate between fibrosis with/without the presence of tumour cells. Morphological MR imaging criteria that correspond to free of disease/ involved MRF have been reported, as well as criteria indicating disease being confined to the rectal wall (ypT0-T2). High-resolution MR images combined with radiologists' rising level of familiarity regarding the assessment of reactive changes post-CRT have increased local staging accuracy of MRI, including both T and N stage reporting. Introduction of imaging techniques such as diffusion weighted imaging, especially when combined with morphological T2w sequences and to a lesser degree PET/CT, for early and late tumour assessment response have shown promising results, especially when quantitative analysis is performed by means of post-CRT or % change of ADC values and SUV Response Index measurements.
Learning Objectives:
1. To learn the rationale for follow-up of patients after neoadjuvant chemoradiation.
2. To understand conventional imaging criteria for assessing tumour response.
3. To learn about new techniques for assessing response, including diffusion MRI and PET.

A-212 09:23
C. Changes in clinical treatment paradigms: the role of radiology
R.G.H. Beets-Tan; *Maastricht/NL (r.beets.tan@mumc.nl)*

The increasing role of radiologists in the multidisciplinary management team of patients with rectal cancer is recognised and the role of MR imaging for stratifying these patients into a differentiated treatment is consolidated. Nowadays, with preoperative chemoradiotherapy (CRT), advanced rectal cancer shows phenomenal response with downstaging to small tumours (ypT0-2) confined to the wall. In 15-20%, no residual tumour is found in the resection specimen (complete response, ypT0N0). The paradigm shift in treatment has been further tailoring the treatment for the good responders after CRT, aiming at organ saving treatment options with less morbidity, such as local excision. Although still controversial, a wait-and-see policy (omission of surgery under close monitoring) is being advocated for the complete responders. This shift in treatment has consequences for radiologists. Our major challenge will be to provide tools that can help in precise selection of these patients. The challenge will not only be restricted to an accurate evaluation of the local tumour response, but also be extended to an accurate evaluation of the nodal response. The objective of this lecture is to understand the increasingly important role of radiologists for stratifying rectal cancer patients, not only before but also after preoperative treatment. It will discuss the evidence for organ saving new treatment options and how this evolution will influence our diagnostic decision-making process. It will elucidate the (limited) role of present imaging and point at potential future techniques (diffusion and perfusion MRI, lymph node-specific contrast-enhanced MRI, PET/CT) for the precise selection of patients.

Learning Objectives:
1. To become familiar with the prognostic signs in imaging that may refine treatment.
2. To understand the importance of local nodal staging in patient management and review techniques to improve staging accuracy (3 Tesla, diffusion-weighted MR, lymph node specific enhanced MRI).
3. To appreciate 'wait and watch' treatment paradigms after neoadjuvant chemoradiation and highlight the role of imaging.
4. To understand the current role of the radiologist in the context of multidisciplinary assessment and correct treatment triage.

Panel discussion:
What will clinicians really expect from us in 2012? How should we image our patients? 09:45

08:30 – 10:00 **Room F2**

Special Focus Session

SF 8b

Cardiac imaging: from diagnosis to prognosis

A-213 08:30

Chairman's introduction

M.R. Rees; *Gwynedd/UK (m.rees@bangor.ac.uk)*

There have been very significant advances in cardiac imaging over the past decade. These advances have changed clinical practice in many areas. Calcium scoring has become a first line diagnostic investigation for patients with chest pain. The National Institute of Clinical Excellence in the UK which has suggested that calcium scoring replace treadmill exercise testing in patients with low risk of coronary disease. For those patients with a positive calcium score the next line of investigation is CT coronary angiography. A negative calcium score carries no further need for chest pain investigation For patients with medium risk the first line of investigation is stress MRI or Nuclear stress testing. These diagnostic protocols are bringing cardiac radiology into the centre of cardiac patient management. Cardiac MRI is now the fastest growing test for use in determining ventricular muscle viability prior to revascularisation. A negative MRI stress test also carries a good prognosis. The STICH trial which investigated patients undergoing surgical revascularisation with poor left ventricular function was the first trial to demonstrate an improved mortality in patients who had demonstrable viability. Societies concerned with cardiac MRI have recommended that there needs to be a significant increase in the number of cardiac MRI investigations performed for a broad range of indications. Training of radiologists in cardiac imaging is a challenge. We will need to train much larger number of radiologists in cardiac imaging to meet the demands of this fast developing specialty.

Session Objectives:
1. To understand the importance of prognosis assessment in cardiovascular diseases.
2. To learn about the widely used and most recent prognostic factors.
3. To review the role of imaging for prognosis assessment.

A-214 08:35

Coronary calcium scoring: is it good for prognosis assessment?

R. Vliegenthart; *Groningen/NL (r.vliegenthart@umcg.nl)*

Identification of (a)symptomatic individuals at high risk of myocardial infarction is important to optimise treatment and prevent a coronary event. However, optimal patient selection remains a challenge, even after evaluation of cardiovascular risk factors. The coronary calcium score, derived from newer CT generations (at least 16-MDCT), accurately reflects the amount of coronary atherosclerosis and can improve cardiovascular risk assessment. In this presentation, results from recent prospective population-based studies will be discussed, including the Heinz Nixdorf Study, Multi-Ethnic Study of Atherosclerosis and Rotterdam study. These asymptomatic, general populations consistently show strong predictive value of calcium scoring for coronary events, independent of risk factors. The predictive value of coronary calcification outperforms other non-invasive measures of atherosclerosis. Meta-analysis results show a very low risk of coronary events in case of a zero calcium score, also in symptomatic patients depending on pre-test probability of coronary artery disease. With the growing distribution of SPECT-CT and PET-CT scanners, nuclear scanning is increasingly combined with calcium scoring in patients suspected of coronary artery disease. In studies in symptomatic patients, calcium scoring has been found to have additional diagnostic and prognostic value compared with nuclear scanning alone. In recent years, scientific radiological and cardiological societies have recommended calcium scoring in asymptomatic individuals at intermediate risk of coronary heart disease. Calcium scoring can also be considered in case of low-risk individuals with a strongly positive family history. A potential role of calcium scoring in symptomatic individuals is matter of debate.

Learning Objectives:
1. To understand the basics of coronary calcium scoring.
2. To learn about the results of the most important clinical trials on prognostic value of calcium scoring.
3. To know about the current indications of calcium scoring for prognosis assessment.

A-215 08:58

Coronary CT angiography to predict future events

F. Cademartiri, E. Maffei; *Monastier di Treviso/IT (filippocademartiri@gmail.com)*

Coronary computed tomography angiography (CCTA) using 64-detector rows or greater has been recently introduced as a novel non-invasive anatomic method for evaluation of CAD, demonstrating high diagnostic accuracy for detection and exclusion of obstructive CAD. Several recent reports have also examined the prognostic value of CCTA findings for prediction of future adverse CAD events, but have been generally limited to single centres and by small patient cohorts. Further, prior studies examining risk stratification by CCTA findings have been primarily restricted to measures of obstructive CAD by maximal luminal diameter stenosis severity on a per-patient or per-vessel basis, with other plaque characteristics visualised by CCTA, including location, distribution, extent, and composition and non-coronary cardiac findings including left ventricular systolic function, volume, and regional wall motion, largely neglected within development of prognostic models. Several preliminary studies showed that CCTA has an incremental value over traditional risk factors, coronary calcium score and other imaging tests for the prediction of cardiovascular events. The interesting value of CCTA is also related to the capability of stratification in the area of sub-clinical atherosclerosis and in the definition of plaque type. With the implementation of low-dose CCTA the prognostic potential of CCTA can be imagined as a reliable clinical information. At the moment there is one large international multicentre registry that started to explore the predictive potential of CCTA in large number of patients (> 20.000).

Learning Objectives:
1. To understand the usefulness of coronary CTA in plaque characterisation.
2. To learn about evidence-based approach to using coronary CTA for prognosis assessment.
3. To learn about current clinical recommendations to use coronary CTA for prognosis assessment.

A-216 09:21

MRI predictors in coronary artery disease

J. Bogaert; *Leuven/BE (Jan.Bogaert@uz.kuleuven.ac.be)*

Coronary artery disease (CAD) is the leading cause of morbidity and mortality in the industrialised countries. In order to determine which patients are at risk to develop sudden cardiac death or non-fatal future cardiac events (e.g. myocardial infarction/ischaemia-related cardiac arrhythmias), traditional risk factors have been established. These are helpful to triage patients in high/intermediate/low risk groups. However, many patients in the high-risk group will never experience a cardiac event, while patients in the other risk groups can be falsely reassured. This has urged clinicians and scientists to assess novel prognostic factors better predicting future cardiac events. MRI, amongst other techniques, seems promising to improve prediction of patient prognosis. MRI is the reference technique to assess cardiac volumes and function. It allows to reliably assess the impact of coronary artery stenoses on myocardial perfusion and function in resting and stressed conditions, and this technique enables to noninvasively depict myocardial necrosis/fibrosis and to fully characterise the jeopardised myocardium in the acute setting. These applications are not only useful in the diagnosis but also to predict clinical outcome and to assess patient prognosis as increasingly shown in literature. In this presentation, the added value of MRI in the different CAD subgroups (stable CAD, acute ischemic event, chronic ischemic cardiomyopathy) will be discussed in detail.

Learning Objectives:
1. To know about prognostic factors evaluated with cardiac MRI.
2. To become familiar with the prognostic value of myocardial function, perfusion and viability.
3. To learn about current clinical recommendations to use cardiac MRI for prognosis assessment.

Panel discussion:
Cardiac CT and MRI vs traditional prognostic predictors: what is the evidence? 09:44

08:30 – 10:00 **Room G/H**

EFOMP Workshop

New technology in diagnostic radiology: frontiers in interventional radiological imaging

EF 1

Advances in technology for interventional radiology: general overview

Moderators:
R. Padovani; Udine/IT
P. Sharp; Aberdeen/UK

A-217 08:30

Welcome address

L. Bonomo[1], P. Sharp[2]; [1]*Rome/IT*, [2]*Aberdeen/UK (lbonomo@rm.unicatt.it)*

A-218 08:40

Radiologist's point of view: physician required for the new technology

J.A. Reekers; *Amsterdam/NL (jimreekers@xs4all.nl)*

Does improved technology lead to better outcome in vascular interventions? In some cases it does, but most of the time we just have no idea and we all follow the delusion of the day. Maybe the European notified bodies should start to handle registration of new medical devices and implants in the same way as they do with new drugs. This would be a great stimulus for good research, better patient care and most likely a reduction in medical treatment related costs. More than 90% of the new devices will never reach a more than a 3-4 level of evidence. Single arm and single centre studies, often underpowered and with a dubious methodology, presented at medical meetings or published in second class journals, that is main stream in new technologies for vascular medical devices, and probably this is also true for other specialities in medicine. Who are the main stakeholders in this game? The patients, who will be treated with a device without any proof of efficacy or superiority compared to standard treatment. The doctors who like new technology (gadgets). The health care providers, who will have to pay for expensive non-proven technology. The manufacturers who want a good return of investment for their shareholders. The weakness of the current regulatory will be discussed.
Learning Objectives:
1. To comprehend how new device technology is introduced.
2. To understand the limitations of CE marking.
3. To become familiar with the limitations of the current European system to introduce new medical devices and inplants.

A-219 09:00

Rotational angiography and cone beam CT

M. Kachelrieß; *Heidelberg/DE (marc.kachelriess@dkfz.de)*

Traditionally, interventional procedures, such as coronary interventions or orthopedic procedures, were guided using simple x-ray fluoroscopy, which delivers two-dimensional radiographic images as a function of time. During the past decade these c-arm systems became capable of acquiring tomographic information. This so-called rotational angiography or interventional cone-beam CT has found rapid application in the catheterisation laboratories and in the operating rooms. Today, many interventional procedures rely on the tomographic information taken before, during or after the intervention. While standard tomographic c-arm devices are equipped with cost-efficient image intensifiers the high-end systems use the flat detector technology, which is more compact and not prone to distortions. Compared with clinical CT rotational angiography allows for a far better patient access, provides images of higher spatial resolution, but suffers from the lack of low-contrast resolution and from low temporal resolution. The main reason for these differences is the detector technology used: while clinical CT scanners use structured detectors with a high dynamic range the flat detector technology uses unstructured scintillators and the read-out electronics are limited in available space and only allow for a low dynamic range. Recently, a promising technique that allows for 4D interventional imaging was proposed. It provides complete tomographic volumes as a function of time and thus may have the potential to replace the traditional radiographic imaging. To acquire the complete 4D information at the same low-dose levels as they are accepted in interventional CT today, a new mathematical framework called compressed sensing is used for image reconstruction.
Learning Objectives:
1. To become familiar with interventional CT.
2. To understand the differences between clinical CT and c-arm CT.
3. To comprehend cone-beam image reconstruction.

A-220 09:20

MR interventional techniques

J. De Wilde; *Edinburgh/UK (janet_dewilde@btinternet.com)*

Interventional MRI techniques incorporate a wide range of procedures including image-guided biopsies, MR-guided thermal ablation and more complex surgical procedures such as cardiovascular repairs. The talk will highlight applications such as MRI guidance in breast biopsies which has increased following developments in MR mammography coils and biopsy needles. Another application is MRI Focused Ultrasound Surgery, where MRI is used to guide the deposition of US energy to the target site and MR thermometry allows for the measurement of energy deposition which results in accurate monitoring of the thermal ablation process. MR-guided endovascular interventions are of increasing interest as MRI can be used to guide stents and other device delivery. The use of MR imaging for interventional procedures is attractive option as it does not use ionising radiation. However, there are caveats as it uses the strong static magnetic field, transmitted radiofrequency and time-varying gradients fields. These can affect instrumentation including projectile attraction and/or twisting of tools to align with magnetic field and operational interference. Hence the MRI interventional suite requires care and the use of specialised non-magnetic instruments (e.g. Titanium tools). Interventional MRI also requires staff to stay in the scanning room during imaging which presents a range of safety issues that will be discussed. Access to the patient is also a consideration; options include using an open bore scanner or having a surgical suite where the patient can be moved on a sliding patient table between the MRI scanner and another one for access.
Learning Objectives:
1. To become familiar with the wide range MRI Interventional techniques.
2. To understand the clinical applications.
3. To understand the considerations, including patient and staff safety and patient access, for using MRI as an interventional tool.

A-221 09:40

US interventional techniques

L. Solbiati; *Busto Arsizio/IT*

In the last 30 years, imaging-guided percutaneous aspiration biopsies of non-palpable targets, drainages of fluid collections and, more recently, thermal ablations with radiofrequency, microwaves, cryotherapy, laser, etc .. of either benign or malignant tumors have extensively entered clinical practice. An essential prerequisite for the correct use and the success of these procedures is the availability of precise, reliable imaging techniques, for careful pre-procedure planning, accurate intraprocedure targeting and elaborate post-procedure monitoring and assessment of the results achieved. Ultrasound (US) is the most widely diffused imaging technique for this purpose, as it allows for real-time visualisation of the whole procedure, and does not require ionizing radiation. US guidance overcomes some of the limitations of other imaging modalities such as computed tomography (CT) or magnetic resonance (MRI), like limited or absent real-time capability, very frequent need for the administration of contrast agents to visualize targets, use of ionising radiation, high costs, etc.. . Yet, a significant number of body targets are not sufficiently or at all visible at US, and can be visualised only with contrast enhanced CT or MRI. In order to improve the visualisation of targets with US, to increase precision and safety of US-guided procedures and to allow more accurate monitoring and assessment of percutaneous, US-guided therapeutic interventions, several technological innovations have been introduced into clinical practice in the last years, like dedicated biopsy probes, ultrasound contrast agents (microbubbles) and systems of real-time fusion of US and cross-sectional, static imaging modalities (CT, MRI and CT-PET).

Learning Objectives:
1. To become familiar with the large variety of interventional (diagnostic and therapeutic) procedures that can be guided by sonography.
2. To learn the most updated ultrasound facilities for guiding interventional manoeuvres.
3. To understand advantages and limitations of ultrasound as image modality to guide interventional procedures.

08:30 – 10:00 **Room I/K**

Chest

RC 804
How I report

Moderator:
M. Escobar; Barcelona/ES

A-222 08:30
A. Bedside chest radiography
E.E.J.G. Coche; *Brussels/BE (emmanuel.coche@uclouvain.be)*

Interpretation of bedside chest radiograph is particularly difficult, because only one antero-posterior view is available in patients with severe illness and sub-optimal breath-holding. The storage phosphore-based computed radiography system is frequently used in this clinical setting and provides several advantages: for example, compensation for variations in exposure and decreased radiation to the patient with a better image quality. Technical requirements are important to know because the bedside chest radiography has to be reported using optimal conditions: patient upright or in a semi-erect position at deep inspiration with a target-to-film distance of approximately 130 cm. In ICU, technical parameters are often limited with the patient supine and a shorter focus-film distance. Consistency in technique and positioning is critical for optimal evaluation of the patient on serial examinations, and technical parameters have to be transmitted between technicians in order to reproduce the same conditions. Careful plain film analysis begins with systematic control of the technical quality, followed by a careful analysis of external devices, chest tubes and catheters. Potential kinking and aberrant positions must be reported. Systematic comparison between both lungs will help the radiologist to discover abnormal findings. Repartition of air and fluid is different on bedside chest radiography and knowledge of their appearance is essential. Differential diagnosis of radiological patterns is often difficult and will be confronted with the clinical information. In many situations, a side-by-side comparison between standard radiography and CT will be performed to better understand the imaging findings, discover the main pitfalls and help the radiologist for eventual reinterpretation.
Learning Objectives:
1. To learn about the technical requirements of portable chest units.
2. To understand key imaging findings in different clinical settings.
3. To learn from side-by-side comparison of radiological patterns at bedside chest radiography and CT.
4. To improve confidence by linking pattern recognition, interpretation and diagnosis.

A-223 09:00
B. CT angiography
J.E. Wildberger; *Maastricht/NL (j.wildberger@mumc.nl)*

Current multi-slice spiral computed tomography (MSCT) allows for a robust examination of the entire chest with submillimeter collimated protocols in a single breath-hold. This is the basis for dedicated analysis of the thoracic vasculature, especially in an interactive setting, for instance using curved multiplanar reformats (cMPR). CT angiography (CTA) is mainly used for clinical suspicion of acute pulmonary embolism (PE), and for the assessment of acute and chronic aortic disease. With ECG synchronisation of the data set, a complete assessment of the cardiothoracic vasculature can be achieved, including the coronary arteries. Iodine mapping (depicting the segmental defects in iodine distribution in locations corresponding to embolic vessel occlusions) has become technically feasible in PE, e.g. using dual energy acquisition protocols. This might further improve detection of emboli and give insights into the effects on perfusion deficits in the adjacent lung parenchyma. In addition, an overview on the current status on computer-aided diagnosis software for the semi-automated assessment of PE will be provided. The current role of the different techniques will be reflected based on the current guidelines on diagnosis and management. At this moment, there is no dedicated role for MRA in the assessment of acute PE. However, magnetic resonance angiography (MRA; or better: time-resolved MRA) is the current gold standard for non-invasive and quantitative assessment for chronic PE. For aortic pathologies, CTA is the clinical gold standard in the acute setting. MRA is becoming increasingly popular in the follow-up setting and for the evaluation of chronic disease.
Learning Objectives:
1. To learn more about recent improvements in CT angiography.
2. To be informed about the current clinical applications of CT angiography and how to report them.
3. To become familiar with the role of CT angiography in comparison to MR angiography.

A-224 09:30
C. PET/CT
E.J.R. van Beek; *Edinburgh/UK (edwin-vanbeek@ed.ac.uk)*

Multimodality imaging has taken flight, particularly with the introduction of PET-CT. This presentation will demonstrate how to: optimise the viewing of these complex studies, obtain quantifiable data, and incorporate the use of both modalities independently, and then use fused images to increase the diagnostic accuracy and value of PET-CT reports.
Learning Objectives:
1. To review the basic principles of PET/CT using FDG.
2. To become familiar with the current role of PET/CT using FDG in oncology and how to report.
3. To learn about the future role of PET/CT in oncology compared to whole body MRI.

08:30 – 10:00 **Room L/M**

Vascular

RC 815
Vascular imaging in ischaemic stroke

Moderator:
J. Barkhausen; Lübeck/DE

A-225 08:30
A. Extracranial and intracranial atherosclerotic disease of carotid arteries
C. Catalano; *Rome/IT (Carlo.Catalano@uniroma1.it)*

During the presentation, technical aspects and clinical indications for all imaging modalities will be reviewed. The development of imaging modalities now allows scanning large body volumes in a very short time, necessary to obtain pure vascular phases. In particular, scanning of the extracranial and intracranial carotid arteries should be performed in less than 10 seconds, to avoid filling of jugular veins and image degradation. Either with computed tomography or magnetic resonance, such a short scanning is feasible, maintaining an excellent spatial resolution that allows detection of even minimal parietal irregularities. By performing such exams, it is possible not only to assess the patency of the vessels and demonstrate the degree of stenosis or the presence of aneurysms, but also to evaluate the characteristics of atherosclerotic plaque, which is also important for treatment planning. In this setting, magnetic resonance may provide some advantages over computed tomography, either exploiting its high intrinsic contrast or by using intravascular or high relaxivity contrast agents, which allow acquisition not only during the first pass, but also in the steady state. In particular during the steady state, it is possible to acquire high-resolution images with the result of increasing the detectability of small parietal ulcerations and wall irregularities. Magnetic resonance is generally preferred also when dynamic imaging is required, especially when malformations and/or fistulas need to be evaluated.
Learning Objectives:
1. To learn imaging signs of atherosclerotic disease of carotid arteries.
2. To learn about lesion morphology at the carotid bifurcation and intracranial arteries.
3. To become familiar with appropriate imaging protocols for all imaging modalities and the pros and cons of each modality.

A-226 09:00

B. Vertebrobasilar atherosclerotic arterial disease

L. Valvassori; *Milan/IT*

Intracranial atherosclerosis is a systemic and multifactorial disease, associated with atherosclerosis of carotids, coronaries, aorta, renal and iliofemoral arteries. Over one third of ischemic strokes occur in the posterior circulation, a leading cause of which is atherosclerotic vertebrobasilar (VB) disease. Symptomatic VB disease carries a high annual risk of recurrent stroke, averaging 10-15% per year, despite medical therapy. VB stroke is particularly prone to devastating consequences due to the eloquence of the regional brain tissue and is associated with high rates of death and disability. More common in older age and in Western countries, without differences of gender. CTA and/or MRA are excellent screening tool, but DSA is the gold standard to show focal stenosis, luminal irregularities, thrombosis, occlusion, arteries ectasia and elongation, serpentine aneurysms. Transient ischemic attack, along with severe stenosis and progressive occlusion, are most common symptoms. An important stroke mechanism in VB atherostenosis is regional hypoperfusion. Furthermore, both embolic and flow processes can synergize to increase stroke risk, reducing the wash-out of emboli from the distal circulation in hypoperfused regions. Posterior circulation collateral channels may maintain adequate distal flow. The existence and extent of these compensatory blood flow pathways, evaluated by DSA, may influence the risk of stroke. Percutaneous angioplasty and stenting for symptomatic atherosclerotic VB stenosis is a feasible and effective therapeutic method, but good experience and full understanding of neurology and hemodynamics are required.

Learning Objectives:
1. To learn the imaging signs of atherosclerotic disease of vertebral and basilar arteries.
2. To learn about the epidemiology, symptomatology and the natural history of the vertebrobasilar atherosclerotic disease.
3. To learn about classification of lesions and indication for treatment.

A-227 09:30

C. Dissection and vasculitis of intracranial and extracranial arteries

H.R. Jäger; *London/UK*

Dissection of the carotid and vertebral arteries are an important cause of stroke in young and middle-aged adults. Carotid artery dissections occur most frequently extracranially but 20% are primarily intracranial. Vertebral artery dissections occur predominantly in the atlas loop (V3 segment). Intracranial carotid and vertebral artery dissections can cause subarachnoid haemorrhage. MRA and CTA have largely replaced catheter angiography for the diagnosis of dissections and associated complications such as pseudo-aneurysms. Cross sectional MRI demonstrates the vessel wall and intramural hematoma. MR and CT perfusion imaging are useful to assess the hemodynamic effects of dissections. Cerebral vasculitis can affect the large (proximal intracranial) vessels, medium-sized vessels (distal to the MCA bifurcation) and small vessels < 300 µm. Cerebral vasculitis can occur as primary angiitis of the CNS, as complication of a systemic vasculitis (Takayashu's, Poloyartitis nodosa), as secondary vasculitis in connective tissue disorders (SLE, rheumatoid arthritis and Behçet's), infections (tuberculosis, aspergillosis, varicella, HIV, borreliosis), and drug use (cocaine, heroin). CTA and MRA can demonstrate involvement of large and medium sized vessels. Invasive cerebral angiography has the best spatial resolution but carries a procedural risk and is still unable to detect involvement of small vessels (< 300 µm). The latter is diagnosed by the effects on the brain parenchyma on MRI (infarcts, microhaemorrhages) and local hypoperfusion on MR perfusion studies. Whilst MRI is highly sensitive to detect changes in cerebral vasculitis, its specificity is relatively low and brain biopsy is frequently required to make a definitive diagnosis of cerebral vasculitis.

Learning Objectives:
1. To learn the imaging signs of dissection and different types of vasculitis.
2. To learn about lesion morphology and hemodynamic consequences of dissection and vasculitis.
3. To learn about imaging protocols for detection of dissection and vasculitis.

08:30 – 10:00 **Room N/O**

Interventional Radiology

RC 809

Percutaneous drainage for general radiologists

Moderator:
J.L. del Cura; Bilbao/ES

A-228 08:30

A. Pleural drainage

A. Keeling; *Dublin/IE (aoifekeeling@hotmail.com)*

Empyema represents a common medical problem with a mortality of up to 20%. Difficulty in differentiating empyema from simple pleural effusion with imaging alone often occurs. Needle aspiration with or without formal chest drainage may be necessary in many circumstances. Traditionally, large-bore chest drains (28-30 Fr) with underwater seals achieved decompression of pleural fluid collections. Recent literature suggests that small-bore drains may be adequate, with image guidance playing an important role. Pleural space anatomy including fissural locations will be revised. Aetiology of transudates, exudates and empyemas, along with typical clinical presenting features are outlined. Various examples of plain film, ultrasound, multi-detector computed tomography and MRI appearances of pleural collections and their aetiologies are presented. Selection of patients, image guidance methods, catheter size, insertion technique, pitfalls and procedure complications are discussed. The importance of physician-radiologist liaison with respect to catheter management and catheter dwell times is emphasised. Pleural space fluid collections are common clinical entities that radiologists can accurately diagnose as well as successfully treat. An overview of the aetiology, radiological appearances and method of image-guided drainage of infected pleural fluid collections is provided.

Learning Objectives:
1. To be familiar with the indications for drainage.
2. To learn about the technical aspects of catheter drainage.
3. To appreciate the efficacy of drainage and the appropriate follow-up.

A-229 09:00

also EPOS

B. Abdominal abscess

T.G. Vrachliotis; *Athens/GR (vrachliotis2@yahoo.com)*

Image-guided percutaneous abscess drainage is one of the most common interventional procedures performed today. It can provide definitive treatment of most collections in the chest, abdomen, pelvis and, selectively, other body parts, thus obviating surgical exploration. The most critical step in performing percutaneous abscess drainage is selection of the imaging modality and selecting the appropriate access route. Uncorrectable coagulopathy and lack of a safe route for catheter placement, most commonly due to interposed bowel loops, are contraindications to the procedure. Local anaesthesia or light sedation is usually employed. Children and uncooperative patients may need general anaesthesia. The shortest pathway between the skin entry point and the abscess is usually chosen. Tandem-trocar technique, Seldinger technique and direct trocar catheter placement are the most common catheter insertion methods. The catheter sizes used range from 8 to 24 Fr and most have an inner retention mechanism. The drainage catheter is secured to the skin after placement and the abscess is completely evacuated while the patient is in the x-ray department. The catheter is then left to gravity drainage connected to a collection bag. Occasionally, if catheter placement is not feasible, needle aspiration may be safe and effective. The catheter is checked on a daily basis and irrigated with 5-10 mL of normal saline to maintain patency. The success rate of percutaneous abscess drainage can be as high as 90% when combined with the appropriate antibiotic therapy. Major complications include bleeding and hollow viscus perforation.

Learning Objectives:
1. To understand imaging strategies and indications for drainage.
2. To learn about image guidance, route planning and catheter placement.
3. To appreciate the efficacy of drainage and the appropriate follow-up.

A-230 09:30

C. Nephrostomy

R.H. Portugaller[1], K.A. Hausegger[2]; [1]*Graz/AT*, [2]*Klagenfurt/AT*
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Percutaneous nephrostomy (PCN) is mostly performed to relieve the urinary tract from benign or malignant obstructions, urinary leakage or fistulas, or to obtain access to the collecting system for manipulations such as stone disintegration and removal. Ultrasound, fluoroscopy or, in complex cases, computed tomography (CT) as well as magnetic resonance imaging (MRI) may serve to guide the procedure. With the single stick technique, a renal calyx is punctured and probed directly to introduce the drainage catheter over a stiff guidewire. Alternatively, the renal pelvis can be opacified via a non-traumatic fine needle before definitive access is achieved under fluoroscopy (double-stick method). For PCN, technical success rates of approximately 98% were reported for obstructed collecting systems, whereas the success declined to 85% in non-dilated tracts. Severe complications such as septic shock and transfusion-demanding haemorrhage occur in 1.3% to 1.8% and 2% to 4%, respectively. In case of pyonephrosis, the rate of septic shock can be as high as 7%. To prevent encrustation of the nephrostomy catheters, outpatient catheter exchanges are usually scheduled at 8-week intervals. If the urinary bladder function is preserved, antegrade double-j ureter-stent insertion via the nephrostomy access may be reasonable. Then, every 3 months transvesical stent exchange is recommended.

Learning Objectives:
1. To understand the current indications for nephrostomy.
2. To learn the various imaging modalities for guidance and basic techniques.
3. To appreciate the efficacy of the procedure and the appropriate follow-up.

08:30 – 10:00 **Room P**

Radiographers

RC 814

Challenges and solutions for radiographers in MRI: high field and imaging under patient motion

Moderators:
L. Abernethy; Liverpool/UK
C. Malamateniou; London/UK

A-231 08:30

A. Advantages of high field MRI: a radiographer's perspective

E. Lavdas; *Athens/GR (lavdas@med.uth.gr)*

High-field magnetic resonance (MR) imaging may provide better SNR compared to low field. Many are excited about the opportunity not only to use the increased SNR for clearer images, but also to exchange it for better resolution or faster scans. The benefits of 3 T MR imaging in the depiction of CNS were initially established. In addition, it has been recently noticed that also body and cardiac high-field imaging combined with parallel imaging techniques decreases scan time exam and resultant motion artefacts, resulting in higher image quality compared to low field. Specifically, high-field MRI has increased susceptibility effect and prolonged T1 relaxation time. The first improves the sensitivity to the presence of haemorrhages and produces better perfusion and functional images, while the second has been exploited to succeed superior time-of-flight MRA angiographies and T1 contrast-enhanced imaging. Chemical fat suppression can be optimised due to the processional frequency difference between fat protons and water protons, which is double at 3.0 T compared to 1.5 T. Combined with the ability to increase resolution, high-field MRI is superior in the depiction of breast, musculoskeletal, adrenal, in mrcp and in spectacular. Recently, 3-dimensional contrast-enhanced magnetic resonance venography in high-field MRI has been able to more clearly visualize intracranial venous, vena cava and peripheral veins. MRI at high field combined with phased array coil, modern sequences and techniques is promising for the future and in the edge of technology. Therefore, every radiographer should be familiar with it and apply it properly.

Learning Objectives:
1. To be able to identify human anatomical areas where the use of high field MRI is advantageous compared to low field MRI.
2. To be able to identify human body and brain pathologies whose depiction is facilitated by high field MRI compared to low field MRI.
3. To understand the important role of the radiographer in making the most of advanced MRI technology.

A-232 09:00

also EPOS

B. Artefacts at high field MRI: clinical applications and technical solutions

S. Brandao; *Porto/PT (sofia.brand@gmail.com)*

The use of high-field magnetic resonance imaging (MRI) is known to provide better signal-to-noise ratio, spatial resolution and fat suppression efficacy, enabling increased quality on morphological images, as well as on spectroscopy and functional neuroimaging studies. Despite these advantages, operating at such field intensity raises technical challenges. First, pulse sequence design and implementation must take into account specific characteristics of MR physics at high-field strength (increased T1 and decreased T2 relaxation times, increased chemical shift or B0- and B1-related inhomogeneities). For this reason, merely transposing imaging sequence protocols that are effective at lower fields is not sufficient, because there are particular theoretical issues. Second, there are several artefacts and drawbacks resulting from some of these physical events, such as magnetic susceptibility-induced artefacts (resulting in signal misregistration and intravoxel dephasing), compromised fat suppression (specially on air-tissue or air-bone interfaces) or image B1-induced dielectric effects on abdominal imaging. Other types of artefacts such as patient (in)voluntary motion, CSF pulsation, blood flow or Gibbs are also present at lower-field strength; there are nevertheless variations that are more misleading and appear frequently and in a more severe way at high-field strength. By understanding the cause of such particularities, the radiographer should be able to identify and deal with most of the high-field strength-related difficulties, despite some hardware-related situations which cannot be dismissed. This presentation will revise the physical explanation for most of the artefacts present in high-field strength MRI, on both body and neuroimaging studies, as well as ways to avoid or compensate for them without impairment of diagnostic quality.

Learning Objectives:
1. To be familiar with the artefacts of high field MRI in clinical applications (brain, body).
2. To be able to suggest technical solutions to compensate for these disadvantages.
3. To understand the important role of the radiographer in making the most of advanced MRI technology, even in challenging situations.

A-233 09:30

also EPOS

C. Reducing motion artefacts in foetal MRI: the contribution of the radiographer

C. Malamateniou; *London/UK (cm1@ic.ac.uk)*

MRI is a safe technique for imaging the foetus due to the lack of ionising radiation. It is considered an adjunct to ultrasound for studying the foetal brain in vivo and additionally offers improved soft tissue differentiation and increased field of view compared to ultrasound. The use of MRI in this field of diagnosis is increasing steadily following hardware and software advancements as well as clinical needs. Perhaps, the single most important problem in foetal MRI after low signal-to-noise ratio (SNR) is foetal motion, which can induce severe motion artefacts and turn images non-diagnostic. Foetal motion is unpredictable and it is currently one of the most challenging areas for motion correction for image post-processing. However, there are many different ways to compensate for foetal motion from a patient preparation/ protocol planning point of view (sequence optimisation, scanning time minimisation, motion-resistant MRI protocols) and the radiographer's knowledge and contribution are essential to this end. This paper will review different motion compensation techniques in foetal MRI from a radiographer's perspective.

Learning Objectives:
1. To understand the challenges and constraints of foetal MRI.
2. To recognise common motion artefacts associated with foetal MRI.
3. To be able to suggest remedial strategies to minimise motion artefacts in foetal MRI scans.

08:30 – 10:00 **Room Q**

Paediatric

RC 812

Imaging the paediatric spine

Moderator:
E. Vázquez; Barcelona/ES

A-234 08:30

A. Congenital malformations and neonatal spinal imaging

I. Gassner; *Innsbruck/AT (ingmar@gassner.or.at)*

The spine and spinal cord form a couple of structures. Abnormal development of one structure is usually associated with the maldevelopment of the other. Spinal dysraphism and caudal spinal anomalies are the most common congenital malformations. Examination of the intraspinal contents is therefore performed predominantly in the screening evaluation of neonates with suspected spinal dysraphism (cutaneous lesion of the back, deformities of the spinal column, neurological disturbances) and is important in the evaluation of syndromes with known risk for spinal cord compression and of birth-related spinal cord injury. Sonography allows detailed depiction of the spinal cord in newborns and young infants, because the incompletely ossified posterior arches create an acoustic window that permits transmission of the ultrasound beam. Ultrasonography with high-frequency transducers can demonstrate the whole spectrum of intraspinal pathologic conditions with the same diagnostic accuracy as MRI and should be the imaging modality of choice for investigation of the spinal cord in newborns. Only in selected cases, MRI reveals additional findings. The lecture demonstrates the examination technique, normal findings and variants of spinal cord, reviews the open and closed spinal dysraphisms (myelomeningocele, myelocele, lipomyelomeningocele, lipomyelocele, myelocystocele, diastematomyelia, dermal sinus, caudal regression syndrome, tight filum terminale, filar and intradural lipoma, persistent terminal ventricle) and also shows acquired diseases of the spinal canal and cord (birth trauma, CSF fluid leakage after lumbar puncture).

Learning Objectives:
1. To become familiar with the most common congenital malformations of the spine.
2. To learn about the role of sonography, CT and MRI in the investigation.
3. To understand when additional imaging of the brain is necessary.

A-235 09:00

B. Inflammation, infection and tumours: the role of imaging

M.I. Argyropoulou; *Ioannina/GR (margyrop@cc.uoi.gr)*

Intramedullary and intradural-extramedullary tumours are less common than intracranial tumours. Spinal cord enlargement and heterogeneous appearance with solid and cystic components represent the main characteristics of intramedullary tumours. Low grade astrocytomas (pilocytic) are the most common, followed by gangliogliomas. Extensive involvement of the spinal cord is common. Holocord involvement and calcifications are most frequently seen in gangliogliomas. Paediatric intramedullary ependymomas are almost never seen outside the context of NF2. Metastatic disease due to CSF seeding of intracranial tumours (medulloblastomas) represents the most common intradural-extramedullary tumours. Multiple intradural neurinomas and meningiomas are found in NF2. Inflammatory demyelinating disorders my affect the cord and the spinal nerve roots in childhood. Guillain-Barre syndrome is an autoimmune acute demyelinating poly-radiculoneuropathy characterised by either diffuse or ventral nerve root enhancement. Spinal cord lesions in multiple sclerosis (MS) are mainly located dorsolaterally, extend over less than two vertebral segments in length and affect less than half the cross-sectional area of the cord. Spinal cord lesions in acute disseminated encephalomyelitis (ADEM) extend over more than three vertebral segments in length and occupy more than two-thirds of the cross-sectional area of the cord. Differences in brain and spinal cord imaging findings are useful in the differential diagnosis between MS and ADEM. Spinal cord involvement similar to that found in ADEM may be found in idiopathic acute transverse myelitis (ATM) and in neuromyelitis optica (NMO). Lack of brain involvement in ATM and the presence of the NMO-specific IgG autoantibody are useful in the differential diagnosis with ADEM.

Learning Objectives:
1. To learn about the etiologies and the imaging findings of infectious, parainfectious and autoimmune disorders.
2. To appreciate the role of spinal MRI in the differential diagnosis of MS vs MS mimics.
3. To become familiar with the imaging findings of primary and metastatic tumours.
4. To learn about the indications of whole spine MRI in presence of brain tumours.

A-236 09:30

C. Imaging spinal trauma in childhood

M. Maas; *Amsterdam/NL (m.maas@amc.uva.nl)*

The presentation will focus on acute trauma in the cervical spine and more chronic, sports-related overuse kind of trauma in the lumbar spine of paediatric patients. Although it is thought that cervical spine injuries in paediatric patients following acute trauma are extremely rare, the clearance of the paediatric cervical spine on admission to the emergency room remains a challenge for both clinicians as well as attending radiologists. For adults, the use of The National Emergency X-Radiography Utilization Study (NEXUS) guidelines is validated and thus useful in daily practice. The number of imaging cervical spine in adults, especially using high-dose multi-detector computed tomography (MDCT) has increased rapidly. The literature on the use of Nexus criteria and MDCT in the paediatric population will be critically debated. In clearing C-spine, the mainstay is conventional radiography. Guidelines for interpretation of these views will be given and examples of its use are illustrated. Also, the imaging findings when using MDCT will be enhanced. The urge for competing at the highest level leads to intensive training programmes in young children and adolescents. The growing lumbar spine is an area of well-known overuse-related injuries. Within the range of stress-induced bone marrow oedema-like patterns of abnormality, the devastating end stage is a stress fracture of the pars intervertebralis. The potential role of imaging, both in detecting as well as prognosis, is discussed. Imaging strategy both in the acute as well as the overuse type of injury will finalise the presentation.

Learning Objectives:
1. To understand how best to investigate a child with suspected spinal trauma.
2. To appreciate the imaging findings.
3. To consolidate knowledge about the differences between the paediatric and adult spinal trauma.

09:00 – 10:00 Room Z

The Beauty of Basic Knowledge: Interpretation of the Chest Radiograph

MC 27C

Major vessels

A-237 09:00

Major vessels

J. Cáceres; *Barcelona/ES (josecac@gmail.com)*

Diseases of major thoracic vessels can be suspected in conventional chest radiography and confirmed by cross-sectional imaging with contrast enhancement. The most common pathologies of the thoracic aorta are aneurysms and dissection. Pulmonary arterial hypertension can be detected in the chest radiograph if one is aware of its signs. It is important as well to detect pathology and abnormalities of the thoracic venous system (Superior and inferior vena cava and the azygos-hemiazygos system)

Learning Objectives:
1. To learn to recognise aortic pathology in the plain film.
2. To be able to evaluate pulmonary artery pathology.
3. To review alterations of the thoracic veins.

10:30 – 12:00 Room B

ESR meets Egypt

EM 3

Oncologic imaging and paleoradiology in Egypt: the past, present and future

Presiding:
M. Abdel Wahab; Cairo/EG
L. Bonomo; Rome/IT

A-238 10:30

Introduction

M. Abdel Wahab; *Cairo/EG (mabdelwahab.mahmoud@yahoo.com)*

The Egyptian Society of Radiology and Nuclear Medicine is invited to meet the European Society of Radiology and to be given the opportunity to present some of the main topics which are of special interest to our community. Egypt is the largest country in the Middle East with a population exceeding 80 millions. Imhotep the great Egyptian pharaoh is recognised as the founder of medicine and the world's first doctor in 27th century BC (2655-2600 BC). The number of radiologists in Egypt is approximately 3425, working in more than 565 public and university radiology departments as well as 258 specialised private radiology centers. In this session we have chosen to give an overview of imaging of the more frequent cancers in Egypt namely urinary bladder, liver and breast. The place of imaging of bladder carcinoma and its relation to schistosomiasis will be highlighted. The Egyptian experience in interventional management of hepato-cellular carcinoma shall be presented. An update of the Egyptian National Screening program for early detection of breast cancer among Egyptian women will also be demonstrated. We have also thought of Paleoradiology in imaging Egyptian mummies as an interesting topic with the use of Multi Detector CT to unveil their secrets. Three short interludes, between presentations, will tackle urinary diversion and ancient Egyptian medicine and present Egypt's charm.

Session Objectives:
1. To give an overview of imaging of the more frequent cancers in Egypt, namely, breast, liver and urinary bladder.
2. To inform the audience about imaging of urinary diversion.
3. To describe the secrets of Royal Egyptian Mummies after MDCT.
4. To explain the Egyptian experience in management of HCC.
5. To present the outcome of national screening programme for breast cancer.

A-239 10:35

Imaging of urinary bladder cancer

T. El-Diasty; *Mansoura/EG (teldiasty@hotmail.com)*

The urinary bladder is the most common site of cancer in the urinary tract. Squamous cell carcinoma (SCC) accounts for only 1% of bladder cancer in England and around 5% in US. In an Egyptian series SCC represented 59% of 1026 cystectomy specimens. Most of SCCs in Egypt are associated with Schistosomiasis. The aim of imaging is to assess the extent of the local tumour and to detect tumour spread to lymph nodes and other organs. Anatomical and functional information to help in making therapeutic decisions can be obtained using different imaging methods. The first treatment decision is whether the patient has a superficial or muscle-invasive tumour. If it is superficial, patients should undergo MR imaging to confirm lack of invasion prior to undergoing trans-urethral resection (TUR). Further imaging modalities, such as CT, bone scan, PET and certain MRI techniques, are reserved for patients with muscle-invasive bladder cancer. The second treatment decision, based on staging, is to identify patients with organ-confined from patients with non-organ confined cancer and in particular those with locally advanced or metastatic disease. Computed tomography (CT) cannot differentiate accurately between organ-confined and extravesical extension. The correlation between CT findings and tumour extent in cystectomy specimens is 65-80%. MDCT urography is helpful for monitoring patients undergoing neo-adjuvant chemotherapy or bladder-sparing treatment modalities. Magnetic resonance imaging (MRI) cannot detect microscopic extension into the perivesical fat. However, the overall accuracy of MR staging remains better than CT by 10- 30%.

Learning Objectives:
1. To understand the relation between schistosomiasis and carcinoma of the urinary bladder in Egyptian patients.
2. To learn the place of imaging in the detection of bladder cancer.
3. To describe the role of different imaging modalities in staging of bladder cancer.

A-240 10:50

Interlude: Imaging of urinary diversion

S. Hanna; *Cairo/EG*

A-241 10:55

MDCT of Royal Egyptian Mummies: secrets unveiled

A.S.M. Selim; *Cairo/EG (ashraf.selim@cairoscan.com.eg)*

Paleoradiology (paleo means ancient) involves the use of x-rays and advanced medical imaging modalities to evaluate ancient human and animal skeletons as well as biological materials from archaeological sites. Paleoradiological studies have been performed on mummies, skeletal remains and fossils to determine their sex and age at death as well as to detect ancient diseases. The great advantage of the roentgenographic examination is that it allows examination of mummies without either destroying or unwrapping them. Mummification is the preservation of human bodies after death. It symbolises the fear ancient Egyptians had of death and answers their belief and eager desire for immortality. The main principle was to dry the bodies so that bacteria could not live on its tissues. The mummification process secrets and technique will be presented. The Egyptian Supreme Council of Antiquities has initiated a large ongoing project, started in 2005, for scanning all the royal mummies that belong to the 18th and 19th dynasties. Among the great Kings and Queens scanned are Tut Ankh Amun and his family, KV55 (presumed Akhenaton), Amenhotep 3rd, Ramses 2nd and 3rd, Tuthmosis family, KV 60 (presumed Queen Hatchepsut), KV 35 (presumed Nefertiti) and many others. The CT scanning of all these great pharaohs revealed intense amount of information that helped to unveil their secrets. The most important of these discoveries will be presented some of which for the first time.

Learning Objectives:
1. To learn about paleoradiology and its applications.
2. To learn about methods of mummy preservation.
3. To become familiar with normal CT of mummies.
4. To appreciate the important discoveries made about Royal Egyptian mummies after MDCT scanning.

A-242 11:10

Interlude: Ancient Egyptian medicine

S. Hanna; *Cairo/EG*

A-243 11:15

Interventional management of HCC: Egyptian experience

A. El-Dorry; *Cairo/EG (ahmed_eldorry@hotmail.com)*

Barcelona clinic of liver cancer (BCLC) is one of several staging systems used for Hepatocellular Carcinoma (HCC); it has been endorsed as the preferred system in Europe and most of the Middle East countries including Egypt. This system groups patients into six potential treatments: curative options for early disease (BCLC A: resection, transplantation, ablation), palliative options for intermediate (BCLC B: chemoembolisation) or advanced disease (BCLC C: Sorafenib) and supportive care for end-stage disease (BCLC D). In Egypt living donor liver transplantation is still replacing cadaveric transplantation. The socio-economic status and the shortage of donors are major obstacles, resulting that only 75% of indicated cases. On the other hand, Sorafenib is the only treatment for advanced stage HCC according to BCLC; however, this drug is not economically feasible to most of our patients, where only < 20% of cases in advanced stage could afford its expenses. Therefore, TACE is performed for many patients in this stage and combined with only short course of Sorafenib to antagonise the angiogenic effect of the vascular endothelial growth factor (VEGF) which increases in the immediate post TACE period. So in Egypt we try to follow the BCLC staging system; however due to our special socioeconomic status, we have to expand the role of interventional radiology to cover the shortage in liver transplantation and the financial unfeasibility of Sorafenib.

Learning Objectives:
1. To learn about the different interventional methods used for management of HCC in Egypt.
2. To recognise the difference between the Egyptian and international protocols.
3. To compare Egyptian results with international results.

A-244 11:30

Interlude: Discover Egypt's charm

S. Hanna; *Cairo/EG*

A-245 11:35

Egyptian women's health outreach programme: yesterday, today and tomorrow

D. Salem; *Cairo/EG (dorriasalem@yahoo.com)*

Egypt's MOHP has identified breast cancer as a priority health area and is determined to improve awareness, services and outcomes. However, as Egyptians, we need to ask as to why breast cancer should be a priority health area. The Egyptian Women's National Council announced that breast cancer represents 33% of all female cancers, with 10% of cases metastatic at presentation; average size at presentation is 5 cm, and the average age of presentation is 10 years less than that in the west. Consequently, launching of "WHOP" was announced in October 2007. It is governmentally funded offering free screening for breast cancer, diabetes, hypertension and obesity for all women above 45 years. Double reading Digital mammography interpretation is performed using a specially designed BIRADS interpretation report. Positive cases are offered treatment free of charge. Implementation of this project, with well-constructed policies and procedures is sketched over a 5-year plan to reach all 27 Egyptian governorates through mobile and fixed digital mammography units. To date we have served 17 governorates and screened over 75,000 eligible ladies, out of whom 1545 were suspicious by mammography, of which 383 cases were operated upon.

Learning Objectives:
1. To learn about the basic requirements for implementation of a screening programme for breast cancer in limited/medium resource countries using the maximum available resources.
2. To learn how to make use of the available resources to achieve international standards.
3. To identify the challenges and hear about solutions for them.

Panel discussion 11:50

10:30 – 12:00 **Room C**

Interactive Teaching Session

E³ 920a

Common radiological problems: incidental chest lesions

A-246 10:30

A. Solitary pulmonary nodule

E. Castañer; *Sabadell/ES*

Pulmonary nodules are spherical radiographic opacities (solid and subsolid) that measure up to 30 mm in diameter. Extremely common in clinical practice, pulmonary nodules, especially small ones under 1 cm in diameter, are a challenge to manage. It is important to identify malignant nodules because they are potentially curable. The first step in assessing a pulmonary nodule on a chest radiograph is to determine that it is indeed a lung nodule rather than a pleural or chest wall abnormality. It is essential to review images from previous examinations, because a solid nodule that remains stable for at least 2 years is probably benign. Topics discussed in this talk include the importance of nodule size, growth rate, margin morphology, density (solid, ground-glass, part solid), calcifications or fatty components within the nodules, the significance of cavitations or bubble-like densities, enhancement patterns at dynamic contrast-enhanced CT, and findings on positron emission tomography (PET). The talk also covers the current guidelines for the management of incidentally detected nodules (solid and subsolid).

Learning Objectives:

1. To learn how to detect and characterise a pulmonary nodule.
2. To learn how to apply adequate protocols according to the clinical situation.

A-247 11:15

B. Mediastinal mass

J. Vilar; *Valencia/ES (vilarjlu@gmail.com)*

The mediastinum is a region of the thorax that separates both lungs and communicates with the neck and the abdomen. These two anatomic features are very important to understand the behaviour of some diseases and their radiological manifestations. Most asymptomatic mediastinal masses are benign, while clinical symptoms may raise the possibility of a malignant lesion. Imaging plays a very important role, especially CT and MRI. In the presence of a mediastinal mass we must ask ourselves two questions: 1) where is the mass located? The classic divisions of the mediastinum in compartments remain very useful, because it narrows the differential diagnosis. 2) Is the lesion cystic or solid? Pure mediastinal cysts are benign and their characterisation depends on their location: Thymic cyst (anterior mediastinum), bronchogenic and duplication cysts (middle mediastinum) and menyngoceles (posterior mediastinum). Solid lesions may be benign or malignant while some lesions may have a cystic component. Solid lesions of the anterior mediastinum are usually thymomas, germ cell tumours or lymphomas. In the middle mediastinum most masses are of lymphatic origin but we should also include aortic or oesophageal pathology. Intrathoracic thyroid usually follows the trachea and thus is situated in the upper-middle mediastinum although posterior and anterior extensions may occur. In the posterior mediastinum most masses are of neural origin. There are some locations that will typically indicate specific diagnosis or a narrow differential. Such is the case of the cardiophrenic angle masses, juxtadiaphragmatic lesions and thoracic inlet pathology.

Learning Objectives:

1. To learn how to detect and characterise a mediastinal mass.
2. To learn how to apply adequate protocols according to the clinical situation.

10:30 – 12:00 **Room E2**

Foundation Course: More About Ultrasound

E³ 920b

Elastography and high frequency US

Moderator:
A.V. Zubarev; Moscow/RU

A-248 10:30

A. Breast: when elastography adds to conventional US

G. Rizzatto; *Gorizia/IT (grizzatto@libero.it)*

Real-time elastography (RTE) of the breast may easily and quickly integrate conventional breast imaging. A mechanical force is applied to the tissue and sophisticated algorithms are used to estimate the tissue stiffness. Qualitative scores are usually derived from the estimate of the strain and help to differentiate soft benign lesions from malignancies. These are usually stiffer due to the secretion of collagen and fibronectin, and the surrounding oedema. Fluid lesions almost always show a typical three-layered pattern. Strain scores may be integrated by semi-quantitative data (fat-to-lesion ratio); unfortunately, cutoff values vary for different companies. Dedicated RTE technologies as an alternative track the shear wave propagation through tissues to obtain a true quantitative evaluation of the acoustic modulus and promise to be the gold standard for the future applications. Clinical reports show a high diagnostic accuracy: increased specificity for atypical carcinomas and a very high specificity in benign lesions, including BI-RADS category 3 lesions. With the best cutoff point between elasticity scores 3 and 4, the true negative predictive value is over 90%. In invasive carcinomas RTE clearly shows the peripheral infiltration improving the volume measurement; 3D elastography and tomographic imaging may help in this respect. RTE works better with small lesions, less than 10 mm in diameter. RTE is almost insensitive to breast thickness and echogenicity. RTE scores are well reproducible. Indexes of intra-observer and inter-observer agreement are very good. Still RTE score is only a complementary descriptor that requires global experience in breast imaging and strict guidelines.

Learning Objectives:

1. To understand the basics: pathology, physics and technologies.
2. To get a comparison of the reported clinical results.
3. To become familiar with guidelines for daily clinical practice.

A-249 11:00

B. US of the thyroid gland and the neck

S.M. Dudea; *Cluj-Napoca/RO (dudea@clicknet.ro)*

Ultrasonography is the widest accessible and most cost-effective means to assess thyroid morphology and neck masses. Diffuse thyroid disease evaluation implies not only thyroid volume measurement but also parenchymal echogenicity and vascularisation assessment as this may offer clues to different types of hyperthyroidism and thyroiditis. In thyroid nodule management, whether single or nodular goiter, the main role of US is to point, for further fine needle aspiration biopsy assessment, to suspicious nodules that might represent papillary carcinoma. Sonographic criteria pointing to nodular malignancy are marked hypoechogenicity, interrupted halo, irregular /invasive contour, punctate microcalcification or central or interrupted annular macrocalcifications, taller than wide appearance, increased central vascularisation and hypo / avascular rim and accelerated volume increase on follow-up. Malignant lymphadenopathy and extrathyroid spread are late signs. Evocative signs of benignity are also discussed. The current role of elastography and contrast imaging is presented briefly. The peculiar appearance of rare thyroid malignancies is presented. Clues on how to identify abnormal parathyroid glands and differentiate them from thyroid nodules are pointed out. The most common differentials of neck masses are illustrated: lymph nodes, branchial and thyroglossal duct cysts, carotid body and salivary gland tumours and strap muscle haematomas. The lecture concludes with a brief overview on US-guided diagnostic and therapeutic procedures in the neck.

Learning Objectives:

1. To learn about US anatomy and appearance of disease of the thyroid and parathyroid glands.
2. To become familiar with the ultrasonographic differential diagnosis of neck masses.
3. To appreciate the role of neck ultrasonography in the guidance of diagnostic/ therapeutic procedures and to learn about new ultrasonographic diagnostic techniques.

A-250 11:30

C. US in musculoskeletal diseases

S. Bianchi; *Geneva/CH (stefanobianchi@bluewin.ch)*

Ultrasound (US) has gained widespread acceptance as an accurate, dynamic, non invasive and inexpensive modality to assess joints, tendons, muscles, nerves and vessels of the extremities. The couple US-standard radiographs, obtained after a good clinical examination, allow a correct diagnosis in most patients and orient towards more expensive imaging technique in the remaining patients. In this lecture we will recall the fundamental practical rules of musculoskeletal US examination. Then we will present the basic normal and pathologic US appearance and the role of US in the clinical workup of the main disorders of the musculoskeletal system.

Learning Objectives:

1. To learn the fundamental practical rules of high frequency US examination of the joints, muscles, tendons and nerves.
2. To become familiar with the basic normal and pathologic US appearance of the musculoskeletal structures.
3. To appreciate the role of high-resolution US in the clinical workup of the main disorders of the musculoskeletal system.

10:30 – 12:00 Room G/H

EFOMP Workshop

New technology in diagnostic radiology: frontiers in interventional radiological imaging

EF 2

Advances in technology for interventional radiology: technology assessment

Moderators:
A. Torresin; Milan/IT
W.J.M. van der Putten; Galway/IE

A-251 10:30

Angiographic equipment performance assessment

A. Trianni[1], P.E. Colombo[2]; [1]*Udine/IT*, [2]*Milan/IT*
(trianni.annalisa@aoud.sanita.fvg.it)

In the last years great changes occurred in the technology of X-Ray angiographic systems: in particular the development of the new Flat Panel Detectors (FD) as dynamic detectors in replacement of Image Intensifiers (II). In the literature many studies have been conducted to evaluate the FD technology and compare it with the old one, but the results are often contradictory and no clear conclusion has been established yet. Indeed, the complexity of today angiographic systems is posing new questions in the assessment of imaging performances. On one hand, it is difficult to monitor all the acquisition and image processing parameters, since the protocols depend on manufacturer's optimization and customer's requests. On the other hand, it's difficult to assess the performances of each individual component (X-ray generation, exposure control with automatically added filtration, image detector and image post-processing) due to their inter-dependency in the overall system design. Moreover, the quality metrics typically used in the characterization of digital detector, like MTF, NPS and DQE, do not reflect the final image quality perceived by the physicians during clinical procedures and might not be good indicators of the performances of systems. Different methods, based on contrast-to-noise ratio and various figures of merit, have been developed to evaluate the dosimetric characteristics and image quality performances. But rarely these measurements have been correlated with subjective evaluation of clinical images. When done, the comparisons between test object and clinical image quality on different systems demonstrated that the test objects currently used have some limitations in simulating the clinical imaging tasks. New test objects more close to the clinical situation should be investigated.

Learning Objectives:

1. To review methods in use for angiographic equipment performance assessment.
2. To understand the critical issues of image evaluation.
3. To underline the importance of a clinical oriented.

A-252 10:50

Patient and staff radiation issues in angiography

E. Vaño; *Madrid/ES (eliseov@med.ucm.es)*

Different medical specialties are using fluoroscopy-guided procedures due to many clinical benefits. X-ray systems are becoming more complex and many imaging protocols are available including rotational and cone beam CT. The potential of high-radiation doses for patients and staff are the reasons to implement specific radiation safety and quality assurance programs. Radiation quantities and units used to describe the radiation risks for patients need to be understood by clinicians and dose values considered as part of the optimisation strategies. Electronic dosimeters to inform in real-time on the level of scatter dose may be used as part of the occupational radiation protection program. Patient dose reports and the future integration in DICOM standards will be presented together with the need to promote automatic software tools to process all the dosimetric information and to help in the optimisation of the clinical procedures including a clinical follow-up programme for high-dose procedures. Strategies of radiation protection (RP) of patients and staff will be addressed. The new ICRP recommendations on the use of diagnostic reference levels for interventional procedures and the new suggested annual limit for the equivalent dose to the lens of the eye of 20 mSv for occupational exposure need to be implemented in the angiography and interventional radiology units. Practical recommendations for RP of patients and staff will be summarised together with the international recommendations and standards, dealing with interventional radiology, including the need of a dedicated training and certification in RP for professionals using these techniques.

Learning Objectives:

1. To comprehend the complexity of the modern interventional x-ray systems, the many imaging protocols and the involved radiation doses.
2. To understand the need to include the radiation protection aspects as part of the quality assurance program.
3. To become familiar with patient and staff doses management in angiography.

A-253 11:10

Panel discussion with angiographic equipment manufacturers

L. Desponds[1], B. Hoornaert[2], M. Lendl[3]; [1]*Buc/FR*, [2]*Eindhoven/NL*, [3]*Ottensoos/DE*

1. Exposure management and features: dose reduction and image quality. What are the future trends?
2. Acceptance testing: protocols, tools, requirements and regulations; what is the cooperation between manufactures and users? Role of the physicist and clinical.
3. Image integration and registration (angio, cone-beam CT, CT, MRI, SPECT, PET): the relationship between dose, image quality for the future.
4. Role of robotics and image guidance, robotics/integration multi-modality.
5. Alternatives to x-ray interventional techniques.
6. What will an interventional room look like in 2020?

Final discussion 11:55

10:30 – 12:00 Room N/O

Standards and Audit Session

The future of radiological reporting: by whom, where, and how will it be done?

Moderator:
E.J. Adam; London/UK

A-254 10:30

Structured reporting: the benefits of uniformity of reporting world-wide

C.E. Kahn; *Milwaukee, WI/US (kahn@mcw.edu)*

Structured reporting uses standardised language and predefined formats to create clinical radiology reports. In this presentation, we will define structured reporting, describe its advantages and disadvantages and identify the motivations for its adoption. This session will discuss how structured reporting can make it easier to retrieve reported information, evaluate the appropriateness of imaging procedures and aggregate data across healthcare enterprises. Structured reporting can support radiology quality improvement, research, and education, and has the potential to improve the quality of communication between radiologists and their referring colleagues. The use of standardised terminologies, such as RadLex® and SNOMED Clinical Terms®, allows interoperability across a variety of languages and information systems. We will explore how structured reporting might advance the quality and effectiveness of radiology worldwide.

Learning Objectives:
1. To define structured reporting and its role in radiology.
2. To become familiar with current efforts for structured reporting of imaging procedures.
3. To identify how report consistency will promote the quality of radiology services.

A-255 11:00

Teleradiology: more disadvantages than advantages

R. FitzGerald; *Wolverhampton/UK (richardfitzgerald@nhs.net)*

Teleradiology benefits many patients: those caring for them, and healthcare systems. Many radiologists choose to practice/use teleradiology and derive substantial economic and/or work-life benefits. Large-scale teleradiology is less than 10 years old and we have yet to see the full extent of its negative, often unintended, consequences. Commoditisation of radiology by teleradiology, and increasing pressure on healthcare budgets in this age of austerity may lead to hospital departments losing contracts for less complex reporting, the funding from which is needed to cross-subsidise complex imaging. Local departments may have to curtail services and cut staff. The cut-throat marketplace of radiology reporting facilitated by teleradiology may encourage faster reporting and may discourage comparison with relevant previous imaging and reports, interrogation of electronic patient records, direct discussion with clinicians and service development. This could have adverse consequences for patients. We have yet to see the long-term occupational health and accuracy implications of call centre productivity applied to teleradiology reporting by companies having to secure contracts with ever tighter margins. Radiologists' pay, pensionability, tenure and working conditions could be at risk. Medical regulation of teleradiologists is patchy and this poses risks to patients. Legislative regulatory solutions and their implementation are years away, despite lobbying since 2004.

Learning Objectives:
1. To understand the risks to hospital radiology services and their staff from teleradiology companies securing reporting contracts.
2. To explore the possible long term occupational health and reporting accuracy implications in the ever more competitive commoditised radiology reporting market.
3. To discuss the potential implications for patients from current inadequate medical regulation of teleradiologists.

A-256 11:30

Teleradiology: more advantages than disadvantages

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

Teleradiology services, initially limited to consultations between smaller hospitals and tertiary care centres for second opinions and patient transfer, have developed substantially to include international reporting services. Although teleradiology confers many advantages in many circumstances, it also has a number of inherent limitations regarding the proper provision of imaging services and may therefore increase risks for the patient. Teleradiology involves much more than just technology. It is also important to optimize the workflow and communication among radiologists and other medical specialists. It is time we were aware that teleradiology procedures constitute medical acts with implications that go beyond mere reporting. Teleradiology requires a technological infrastructure adapted to distributed environments enabling collaborative networks to improve the efficiency of radiology procedures and radiologists' work/life balance. This presentation will highlight the advantages of using teleradiology and key parts of the guidelines developed for the benefit of patient care.

Learning Objectives:
1. To become familiar with different scenarios where teleradiology can be used.
2. To anticipate the changes telemedicine will bring to radiology departments.
3. To appreciate how creating collaborative networks can improve the efficiency of radiology procedures and improve radiologists' work/life balance.

12:30 – 13:00 Room A

Plenary Session

HL 2

Antonio Chiesa Honorary Lecture

Presiding:
L. Bonomo; Rome/IT

A-257 12:15

Small is beautiful! The voyage of head and neck imaging into the future

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

In the head and neck, a great number of anatomical structures and functions are concentrated within a very confined area. Some of these structures allow us to explore the surrounding environment through "senses" like sight, hearing, smell and taste. Others, as the larynx and pharynx, perfectly organise and coordinate breathing and swallowing. Also, the combination of voice and hearing permits a sophisticated interaction with the other humans. Surprisingly, all these functions are provided by miniaturised structures. Hence, miniaturisation is the least common denominator of the head and neck field. To image these structures and to identify subtle abnormalities requires the combination of two main factors. The first is the availability of high spatial and high-contrast resolution imaging techniques. Today, "high" goes beyond MSCT, high field MR, CBCT and PET-CT, getting to high-resolution hybrid imaging like MR-PET. The second factor is an adequate knowledge of anatomy, functions and physiopathology. In fact, if not properly trained, the radiologist might not be able either to correctly perform the examination – though using advanced imaging equipment – or to detect key findings for diagnosis and treatment planning. So far, parallel to technical progress, a whole community of radiologists has been walking, sharing a true enthusiasm for the fascinating depths of the head and neck imaging field, like small – very small indeed – structures and complex lesions. And today, the real challenge is to transmit and share this interest, enticing those young radiologists willing to voyage into the future of this wonderful "inner space".

Learning Objectives:
1. To appreciate the appealing world of analyzing those small structures that are critical for great human functions.
2. To learn about the below-100 micron imaging techniques in temporal bone and facial lesions.
3. To learn about the micro-structural and neo-angiogenesis imaging of head and neck malignant neoplasms (DWI, IVIM, DCE-CT and DCE-MR).
4. To understand the impact on clinical decision-making made possible by current imaging ultimate technology advances like MR-PET.

12:30 – 13:30 Room Z

Molecular Imaging

MC 23C

Imaging tumour biology and microenvironment

Moderator:
A.E. Sundin; Stockholm/SE

A-258 12:30

A. Modulation of the tumour microenvironment to optimise the response to therapies

B. Gallez; *Brussels/BE (bernard.gallez@uclouvain.be)*

The tumour microenvironment plays a major role in determining tumour response to radiation therapy or chemotherapy. As a key factor, tumour hypoxia is considered to be a therapeutic problem, as it makes solid tumours resistant to ionising radiation and some forms of chemotherapy. Overall, it has been shown that modification of tumour hypoxia significantly improved the effect of radiotherapy for the outcome of loco-regional control and with an associated significant overall survival benefit. Therefore, the predictive value of imaging markers of response to treatment is of crucial importance in the management of cancer patients in order to improve the therapeutic index by allowing better individualisation of treatment. In parallel, innovative therapies able to modulate the microenvironment such as flow and oxygenation are currently being developed in order to improve treatment outcome. In this lecture, we will discuss how it is possible to get parametric oxygen images from tumours or surrogate imaging markers of tumour hypoxia (MRI and PET). We will also discuss

how the delineation of hypoxic target volumes within solid tumours could be used to optimise the treatment efficacy either by delivering optimal radiation doses into the resistant areas (dose painting) or by delivering an associated treatment for potentiating the efficacy of radiation treatments (by alleviation of tumour hypoxia).
Learning Objectives:
1. To become familiar with key factors of tumour haemodynamics determining treatment response.
2. To understand how molecular imaging is able to monitor changes in tumour microenvironment.
3. To learn how molecular imaging can help in individualising treatment and optimising treatment response.

A-259 12:50

also EPOS

B. Molecular imaging of angiogenic characteristics of tumours
A.R. Padhani; *Northwood/UK (anwar.padhani@stricklandscanner.org.uk)*

Imaging of angiogenic characteristics of tumours in the clinic can be with and without the administration of exogenous contrast agents. Modalities include perfusion CT, microbubble US, dynamic contrast-enhanced MRI (DCE-MRI), blood oxygenation level-dependent (BOLD), dynamic susceptibility contrast (DSC)-enhanced and diffusion-weighted MRI. It is important to understand the biological basis for observations, validation, limitations as well as the applicability of each of these techniques. DCE-MRI and perfusion CT will be discussed in more detail including the need to examine suitable lesions and to adopt robust data acquisition protocols that are able to deal effectively with physiological motions. Kinetic parameter measures must be clinically meaningful and if possible closely linked to underlying physiological processes. Measurement error and causes of variability should be known.
Learning Objectives:
1. To become familiar with the biological basis, methods of data acquisition and analysis techniques for perfusion MRI methods used clinically.
2. To learn about strategies to deal with respiratory motion, importance of arterial input function and heterogeneity.
3. To appreciate the clinical roles of perfusion imaging.

A-260 13:10

C. Targets for tumour characterisation and treatment response
F.A. Gallagher; *Cambridge/UK (ferdia.gallagher@doctors.org.uk)*

Imaging targets for tumour characterisation range from simple size measurements of the tumour to more specific imaging biomarkers on functional, cellular, metabolic and molecular levels. The biodistribution of these specific biomarkers should complement the morphological information acquired using traditional techniques. This lecture will discuss current and emerging imaging techniques for tumour characterisation: (1) Functional measures of tumour blood flow and vascular permeability can be made using MRI, CT and ultrasound. (2) Cellular imaging targets include measurements of water and fat content using MRI. Diffusion-weighted imaging can be used to estimate tumour cellularity, which may decrease following successful chemotherapy or radiotherapy. Emerging techniques allow tumour necrosis to be specifically probed. (3) Changes in the extracellular space can be used to characterise tumours; for example the majority of tumours are acidic when compared with the surrounding normal tissue and recent advances in PET and MRI have been used to detect tumour pH. (4) On the molecular level, cell surface expression of proteins and enzyme activity within the cell have been exploited as imaging biomarkers. PET- and MRI-labelled probes have been developed which can bind to these proteins or mimic endogenous tumour metabolites; for example, fluorodeoxyglucose is a PET-labelled analogue of glucose that is widely used in oncological imaging. In the future, functional and molecular imaging techniques will be used in conjunction with anatomical imaging methods to aid cancer diagnosis, as well as to detect early response to chemotherapy and radiotherapy.
Learning Objectives:
1. To become familiar with the major imaging targets that are used to characterise tumours.
2. To understand how these targets may be used to predict tumour outcome and determine appropriate therapy.
3. To be informed about the use of imaging biomarkers in early treatment response monitoring.

16:00 – 17:30 **Room A**

State of the Art Symposium

SA 11

Polytrauma in the golden hour: the key role of emergency radiologists in the ED when time makes the difference

A-261 16:00

Chairman's introduction
U. Linsenmaier; *Munich/DE (ulrich.linsenmaier@med.uni-muenchen.de)*

Emergency radiology is one of the fastest growing fields in modern radiology and the delivery of advanced radiological diagnosis and interventional procedures for patients after polytrauma in a 24-hour x 7-day setting remains a very challenging task. Presently, many emergency departments rely much on height quality radiological diagnosis; an exponential increase in the use of MDCT could be observed in recent years with an impressive annual growth rate of 15-20% and a doubling time of only 4.7 years in many emergency departments. Trauma remains the leading cause of death in people below the age of 45 years. Radiology became a key player in the trauma teams worldwide and is today an integrated part of emergency medicine services. Emergency radiology developed into a new subspecialty in modern radiology and only recently a European Society of Emergency Radiology (ESER) was founded. This state-of-the-art session summarises today's high-end use of diagnostic imaging and radiological interventional therapy, as well as all major aspects of patient handling after polytrauma. It is challenging to keep up with technological developments and advanced use of imaging techniques and to provide a well-trained staff for these critically injured patients.
Session Objectives:
1. To understand the key role of emergency radiologists in the management of patients with polytrauma.
2. To become familiar with current state-of-the-art emergency radiology services and future trends.
3. To learn about state-of-the-art logistics and the interdisciplinary approach of modern polytrauma patient care.

A-262 16:05

Ultrasound: why, when, how and by whom?
P.-A. Poletti; *Geneva/CH (pierre-alexandre.poletti@hcuge.ch)*

The term «FAST» (Focused Assessment with Sonography for Trauma) refers to real-time sonographic scanning of four regions for depiction of intra-peritoneal blood, which is generally performed at patient's admission. This method of examination, which does not include direct visualisation of parenchymal injuries, gives an immediate overview about a possible major intra-abdominal injury, especially in haemodynamically unstable patients who may require immediate treatment. The value of FAST in haemodynamically stable patients is more controversial since free intra (or retro-) peritoneal fluid is not always found in patients with blunt abdominal organ injuries, including potentially life-threatening injuries. Besides, the adequate training schedule of FAST operators (radiologist or non-radiologists) is subject to controversy; there is no consensus with regard to the number of examinations an operator performs under supervision before being entitled to perform a FAST examination alone. In spite of the fact that ultrasound achieves a poor sensitivity (40 to 55%) for the direct depiction of parenchymal injuries, a full abdominal sonographic examination, including solid organ analysis, may be useful for the triage of patients towards CT or clinical observation, when time constraint is not a major issue and CT not immediately available. Contrast-enhanced sonography can be useful to improve the detection of solid organ lesions and for the detection of vascular injuries, such as delayed splenic pseudoaneurysms.
Learning Objectives:
1. To learn about the current use of ultrasound (US) in providing optimal management in patients with polytrauma.
2. To learn about where, when and by whom US should be performed.
3. To become familiar with US and CEUS findings associated with blunt trauma.
4. To become familiar with the limitations and pitfalls of ultrasound in assessment of blunt traumatic injuries.

A-263 16:28

Whole body MDCT for trauma: protocols and findings

M. Körner; *Munich/DE (markus.koerner@med.uni-muenchen.de)*

Diagnosis of trauma-related injuries is a key task in modern radiology. Early, thorough and accurate detection of potentially life-threatening injuries is crucial for fast and targeted initiation of treatment. Conventional radiography (CR) and ultrasound (US) are well established and still represent the basic diagnostic tools for trauma imaging. However, a number of studies have shown a lower detection rate of injuries for radiography and ultrasound compared with computed tomography (CT). Multi-detector CT (MDCT) with its shorter scan time and increased accuracy has become the gold standard for most indications in trauma imaging. As MDCT has a higher radiation dose, its use should be restricted and carefully indicated especially when dealing with a younger patient population. Careful optimisation of imaging parameters has to be performed to minimise exposure and maximise diagnostic safety. Modern MDCT examinations produce a large number of images, which have to be limited to a reasonable number for interpretation. This review article focuses on optimisation of examination protocols and on how to handle the flood of images for viewing and archiving.

Learning Objectives:

1. To learn about protocols for whole body trauma MDCT.
2. To appreciate typical findings and pitfalls in major trauma CT.
3. To become familiar with image quality and lower patient dose.

A-264 16:51

Interventional radiology as life-saving procedure

G. Carrafiello, F. Piacentino, F. Fontana, M. Mangini, A. Ierardi, C. Fugazzola; *Varese/IT (carrafiello@uninsubria.it)*

Arterial haemorrhage in polytrauma remains the leading cause of death. The aim of this presentation is to evaluate interventional radiology as a life-saving procedure. Contrast-enhanced CT has been reported to be an accurate technique for identifying ongoing arterial haemorrhage in polytraumatised patients. TAE may be a rapid, safe and effective technique for treatment of haemorrhage. To increase the efficacy of the method and to reduce complications, the trend is to combine several materials for embolisation. Several embolisation devices are available: a fibrin sponge is used for temporary embolisation (PVA) and microspheres are commonly used for permanent embolisation, whereas detachable balloons, glue, coils and plugs are used for definitive embolisation. Stent grafting permits the exclusion of bleeding and obtaining the patency of the vessel. Different types and sizes of stent grafts are available. The success rate, expressed in terms of haemorrhage control and reduction in transfusion requirement, for pelvic haemorrhage, liver, kidney and spleen is high. Stent grafting has different rates of success related to the injury site. TAE should be performed as early as possible, because effective embolisation must be achieved before severe systemic coagulopathy and multiple organ failure develop. CT allows locating and characterising the haemorrhages, which will reduce the diagnosis time and, above all, improve the embolisation procedures. These features make it very useful in this setting, where the clinical course and prognosis are related to the achievement of haemodynamic stability.

Learning Objectives:

1. To learn about different embolisation techniques for different organs (proximal and distal embolisation).
2. To become familiar with different types of embolisation materials.
3. To become familiar with the use of endovascular procedures in the management of patients with polytrauma.
4. To understand which injuries are interventionally accessible and when diagnostic radiologists should consult interventional radiology.

Panel discussion:
Is the emergency radiologist the 'captain of the ship' in the management of major trauma? 17:14

16:00 – 17:30 **Room B**

Interactive Teaching Session

E³ 1120
Malignant pancreatic tumours

A-265 16:00

A. Solid tumours

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

The most common pancreatic malignancy is ductal adenocarcinoma, with neuroendocrine tumours (NET), lymphoma and metastases being important differential diagnoses. Non-neoplastic pitfalls include focal pancreatitis and focal fatty infiltration. Multi-phasic hydro-MDCT is very effective in detection of hypoattenuating adenocarcinoma, with a sensitivity of up to 90%. In 5-11% of patients, isoattenuating cancers will only show indirect tumour signs (duct dilatation, contour deformity, or mass effect). MRI is a problem-solving tool in equivocal CT to depict small cancers. Best pulse sequences for tumour detection are T1w 2D-GRE fatsat, dynamic gadolinium-enhanced 3D-GRE fatsat and DWI. Important issues in cancer staging are vascular involvement (celiac trunk, SMA, SMV, portal vein), lymph nodes and liver metastases. 3D MDCT reformations (MIP, VRT, CPR) are helpful to demonstrate vascular invasion, although minimal invasion may elapse CT or MR imaging. NET tend to be hypervascular, which is best seen in the arterial phase. RCC metastases to the pancreas are not uncommon. They are typically hypervascular, mimicking NET at imaging. The most important non-neoplastic solid mass is focal pancreatitis. The duct-penetrating sign at MRCP helps to differentiate focal inflammation from cancer, although multimodality imaging including biopsy is often required to make a definitive diagnosis. Focal steatosis or lipoma is easily diagnosed by chemical shift imaging (T1w GRE in- and opposed-phase). In conclusion, multi-phasic hydro-MDCT is excellent for pancreatic cancer detection. 3D reformations are helpful for demonstration of vascular involvement during staging. For differentiation between cancer and tumour-simulating disease (focal pancreatitis, steatosis), MRI is complementary to MDCT.

Learning Objectives:

1. To be able to differentiate tumours from other non-tumoural pathology.
2. To know how to choose the proper imaging technology.
3. To learn how to determine extension and resectability of the tumour.

A-266 16:45

B. Cystic tumours

G. Morana; *Treviso/IT (gmorana@ulss.tv.it)*

Cystic tumours of the pancreas are less frequent than solid lesions, and quite often they are occasionally recognised, as many of these lesions are small and asymptomatic, but they may be associated with pancreatitis or have malignant potential. An accurate differentiation between different cystic tumours is important because they require a different treatment according to their histological type and differentiation, but due to the frequent lack of specific clinical and laboratoristic signs, the overlap of imaging findings between different cystic tumours and between non neoplastic and neoplastic cistic lesions of the pancreas, the management of these patients is complex, and knowledge of symptoms of the patients, natural history and predictors of malignancy for pancreatic cysts are important. When dealing with pancreatic cysts, the aim of the imaging is to differentiate cystic tumour from tumour-like lesions and to characterise cystic tumour, distinguishing benign tumour, which usually does not require surgical excision, from border-line or malignant ones, which must be resected whenever possible. On the basis of imaging criteria alone, it can be very difficult to differentiate non tumoural cystic lesions from neoplastic ones; in order to achieve a correct diagnosis it is important to correlate the imaging findings with the clinical history of the patient, the presence or absence of symptoms and their type. US, CT and MRI are excellent tools which permit to accurately evaluate these lesions, making thus possible their correct management.

Learning Objectives:

1. To know how to choose the proper imaging modality.
2. To be able to describe the criteria of malignancy and benignity.
3. To know how to follow-up lesions.

16:00 – 17:30 Room C

CLICK (Clinical Lessons for Imaging Core Knowledge): Common Clinical Cases

CC 1118

Palpable abdominal mass

Moderator:
C. Matos; Brussels/BE

A-267 16:00

A. Clinical considerations

D. Akata; *Ankara/TR (dakata@hacettepe.edu.tr)*

Finding of a palpable mass in the abdomen always raises the possibility of an important clinical problem. A potentially life-threatening process, especially malignancy is the major concern. The list of differential diagnosis of "abdominal mass" is a very long one. In the process of differential diagnosis the most common approach is to evaluate the patient according to the gender, age, patient history and coexisting clinical and laboratory findings. The accompanying symptoms and signs and the location of the abdominal mass are the key indicators in the clinician's way of thinking in the process of differential diagnosis. For instance, a palpable mass with acute abdomen or intestinal obstruction will be assessed differently than a mass found incidentally. Imaging is commonly required to confirm or ascertain the diagnosis. Cross-sectional imaging is required to accurately evaluate a palpable abdominal mass in most situations. Ultrasound and computed tomography have each been used successfully in evaluating patients with palpable abdominal mass. Although each modality is appropriate in most situations, the advantages and disadvantages of each modality in certain situations will be addressed and the appropriateness criteria will be reviewed in this lecture. Knowledge of a detailed clinical history is as important to the radiologist as to the clinician. Its impact on the diagnostic accuracy in the interpretation of the images will also be addressed.

Learning Objectives:
1. To learn more about the clinical conditions that cause abdominal space-occupying lesions.
2. To be informed about the clinician's way of thinking in the process of differential diagnosis.
3. To become familiar with the potential role of imaging in the establishment of the final diagnosis and planning of therapy.

A-268 16:30

B. Imaging techniques and typical findings

M. Prokop; *Nijmegen/NL (M.Prokop@rad.umcn.nl)*

A palpable abdominal mass has a long list of benign and malignant differential diagnoses. These diagnoses may be as different as a hydatid cyst of the liver, a volvolus, an aneurysm, or a giant renal cell carcinoma. The diagnostic approach is based on two major steps: first, the affected organ must be identified. Second, the differential diagnosis must be established based on imaging characteristics. The choice of ultrasound, CT or MRI should be based on location and size of the mass. Despite the fact that ultrasound is frequently used as a first step, the overview and anatomic orientation in large masses may be hampered, making ultrasound a better technique for image-guided biopsy than for primary diagnosis. In the vast majority of cases, multidetector CT is the first technique of choice. A thin-section protocol should be used to allow for high-quality multiplanar imaging. A pre-contrast scan is usually not required but can be helpful in suspected haemorrhage. For most upper and middle abdominal masses, biphasic imaging in the arterial and portal phase is recommended in order to establish the relation of the mass to the vasculature and to assess vascularity. In the small pelvis, MR is the superior imaging technique. Otherwise, MRI is mainly used for problem-solving. This course will discuss how to use the various imaging tools efficiently to narrow the differential diagnosis, decide about the need for biopsy and establish a suitable therapy.

Learning Objectives:
1. To learn about the available imaging modalities to be used for the evaluation of patients with a palpable abdominal mass.
2. To become familiar with the technical imaging considerations and the proper diagnostic algorithm.
3. To know more about the typical imaging findings.

A-269 17:00

C. Interactive case discussion

A.H. Freeman; *Cambridge/UK (a.h.freeman@talk[21].com)*

The patient presenting with an abdominal mass represents a common clinical problem. Clearly, the differential diagnosis is large and obviously will depend on the age and sex of the patient as well as location of the mass. Of course history and clinical examination are mandatory, but formal diagnosis will usually rest on radiological interpretation. Contrast examinations have now been replaced by cross-sectional imaging and endoscopy and it behoves the clinical radiologist to be aware of the advantages and limitations of these methods in order to reach a diagnosis. Particular difficulty may be encountered when the mass is so large that it is difficult to determine the organ of origin. The purpose of this interactive case discussion is to explore the relative merits of ultrasound, CT, MR and Endoscopy in establishing a diagnosis in two different cases. The cases concerned are 1. a 21-year-old man who presents with a right iliac fossa mass, but is otherwise asymptomatic. 2. A 54-year-old woman who presents with anaemia and a large upper abdominal mass. Active audience participation will be encouraged by means of key pads in order to respond to issues raised during the debate.

Learning Objectives:
1. To review typical cases illustrating the role of imaging modalities in the differential diagnosis of palpable abdominal mass cases.
2. To get involved in the diagnostic process by the use of electronic voting pads.
3. To understand the conclusion that may be drawn on the basis of the discussed cases.

16:00 – 17:30 Room D1

Emergencies in Neuroradiology

CC 1119

Subarachnoid haemorrhage ('the worst headache ever')

Moderator:
P.H. Nakstad; Oslo/NO

A-270 16:00

A. Diagnosis of subarachnoid haemorrhage (SAH)

M. Söderman; *Stockholm/SE (michael.soderman@karolinska.se)*

Clinical presentation: patients with spontaneous (SAH) most often present with severe, so-called thunderclap headache. However, the clinical picture can vary from mild headache to abrupt death. Rupture of an intracranial arterial aneurysm (AA) is the most common source; other non-aneurysmatic causes may be perimesencepahic haemorrhage or SAH secondary to cerebral vasculitis. Arteriovenous malformations (AVM) and dural arteriovenous fistulae (DAVF) may also present with SAH. Diagnosis of SAH is typically by non contrast CT, less often by lumbar puncture or MRI. Intracranial AA that has ruptured carries a 50% chance of re-rupture the first year, with 20% mortality. The risk for re-bleeding from an AVM or DAVF is 5-10%. Imaging strategies to detect aneurysms: The aim of the neuroradiological investigation is to identify AA or other causes for the SAH. CT and CT angiography are effective in finding AA and excluding some pathologies, such as cerebral vasculitis. The sensitivity of MRI or MRA is less well documented. An arterial dissection, a microAVM or a DAVF may not be visible on CTA or MRI/MRA. Thus further investigation with conventional catheter angiography is warranted in all cases where there are doubts about the source of the bleeding and for further anatomical assessment. Different forms of aneurysms: Berry aneurysms comprise the majority of the AA, the rest being partially thrombosed AA or dissecting AA. Screening: Non-invasive screening is with MRI/MRA or CT/CTA and may be warranted in patients with two relatives having suffered from aneurysmal SAH or a family history of AA.

Learning Objectives:
1. To understand the clinical presentation and acute findings in SAH.
2. To be familiar with imaging strategies for detecting aneurysms: CT angiography? MR angiography? Catheter angiography?
3. To appreciate the different types of aneurysms.
4. To learn how to perform non-invasive screening for cerebral aneurysms.

A-271 16:30

B. Endovascular treatment of aneurysms

M.H.J. Voormolen, T. Van der Zijden, T. Menovsky, O. d'Archambeau,
H. Fransen, P.M. Parizel; *Edegem/BE (maurits.voormolen@uza.be)*

Intracranial aneurysms are in most cases the cause of a subarachnoid haemorrhage (SAH). Ideally, ruptured aneurysms should be excluded from the circulation as soon as possible to prevent rebleeding and allow aggressive treatment of SAH complications such as vasospasm. Endovascular treatment of intracranial aneurysms has evolved in the twentieth century from parent vessel occlusion to selective occlusion of the aneurysm sac with detachable microcoils ("coiling"). The first coiling was performed twenty years ago in 1992. The endovascular approach to the coiling of aneurysms has become an alternative to surgical clipping both due to the low procedural morbidity and mortality, and to the possibility to treat aneurysms with complex vascular anatomy and at locations not accessible to clipping. Compared with clipping the disadvantage of coiling is the incomplete occlusion of aneurysms (neck remnants). Therefore, coiled aneurysms need to be regularly followed by angiography or magnetic resonance imaging. Recently, supportive techniques to coiling have been optimised to help occlude the aneurysm and preserve the parent artery. Compliant balloons can be used to temporarily support the introduction of coils in the aneurysm sac. In wide-necked or dissecting aneurysms intracranial self-expanding stents can be placed. Anticoagulants need to be taken after stent placement complicating the post procedural care of recently ruptured aneurysms. The most recent development is the use of flow-diverting stents that alter the haemodynamics inside the aneurysm sac. Based on various patient and aneurysm characteristics the treatment options need to be discussed with a neurovascular surgeon, neurologist and interventional neuroradiologist.

Learning Objectives:

1. To learn how to select patients for endovascular treatment.
2. To become familiar with currently available techniques (coils, stents, etc).
3. To learn about the limitations and complications of these techniques.

A-272 17:00

C. Imaging after aneurysm treatment

J.-P. Pruvo; *Lille/FR (jean-pierre.pruvo@chru-lille.fr)*

At the subacute phase after surgical or endovascular aneurysm treatment, aneurysm rebleeding or intracranial vasospasm must be clinically suspected when the neurological status suddenly worsens including increased headaches, neurological deficit or loss of consciousness. Doppler sonography and brain CT scan must be performed in emergency to confirm the diagnosis and to discuss an additional treatment in selective cases. In the mid- and long-term follow-up, non-invasive imaging is needed to detect aneurysm recurrence, neck remnant regrowing or de novo aneurysm. After endovascular treatment, the rate of aneurysm recurrence may be estimated between 10 and 30% according to the aneurismal size with a risk of rebleeding from 1 to 2% per year. Most of recurrences are detected during the first 6 months after embolisation leading to an additional treatment in about half of cases. MR angiography is the technique of choice including time-of-flight technique and/or Gd-enhanced MR angiography at 6 months after the initial event and then every year during the following 5 years and finally every 3 years in the long-term follow-up. After surgical treatment, the rate of aneurysm recurrence and the risk of rebleeding are much lower when the aneurismal neck has been clipped in good technical conditions. CT angiography using 64-detector rows or more is definitely the best technique to detect post-surgical aneurysm recurrence. CT is usually performed at 3 years after the initial event and then every 5 years.

Learning Objectives:

1. To become familiar with the signs of vasospasm or re-bleeding in the subacute phase.
2. To learn what is the best technique for follow-up of these patients after treatment.
3. To understand the advantages and disadvantages of CT versus MR angiography after aneurysm treatment (endovascular coiling or surgical clipping).

16:00 – 17:30 Room D2

Urogenital Imaging

CC 1121

Paediatric genito-urinary imaging

Moderator:
F. Papadopoulou; Ioannina/GR

A-273 16:00

A. Normal findings and diseases of the male and female developing genital systems

M.L. Lobo; *Lisbon/PT (mluisalobo@gmail.com)*

Normal genital anatomy varies with the age and the hormonal status of the paediatric patient. Knowledge of embryology is essential to understand congenital anomalies of the male and female developing genital systems. Common congenital anomalies include cryptorchidism in males and Müllerian duct anomalies and/or obstructing vaginal anomalies in females. Abnormalities of sexual differentiation result from non-accord of chromosomal, gonadal and genital sex. Dysplastic gonads carry a high risk of gonadal malignancy. Acquired disorders include a variety of acute and non-acute conditions such as testicular or ovary torsion, inflammatory and infectious scrotal or pelvic disorders, ovarian cysts and genital neoplasms, ectopic pregnancy and genital (scrotal) trauma. Ultrasound, including Doppler tools, is the primary modality for imaging both male and female genitalia. A proper and dedicated ultrasound technique examination is essential to obtain maximum diagnostic information. Further genital system imaging, when needed, is preferably accomplished with magnetic resonance such as in cases of complex urogenital (female) malformations and oncologic conditions. Except for tumour spread assessment, computed tomography has a limited role in paediatric genital disorders and should be avoided due to the associated high radiation burden. Plain films are obtained to assess bone age in pubertal disorders, and genitography is usually restricted to the evaluation of rare complex genital malformation.

Learning Objectives:

1. To understand normal anatomy and congenital anomalies of the male and female developing genital systems.
2. To be able to recognise the most common, and uncommon disorders.
3. To appreciate the most appropriate imaging techniques and to understand the clinical relevance of imaging.

A-274 16:30

B. Imaging urogenital tumours in children: what is different from imaging in adults?

M.B. Damasio; *Genoa/IT (beatrice.damasio@libero.it)*

Genitourinary tumours in paediatrics usually present as a painless abdominal mass, the patient's age being an important clue in the differential diagnosis. Neonatal renal tumours are rare and mesoblastic nephroma is the most common tumour at this age. In children older than one year, the most common intra-abdominal masses in children are Wilms tumour and neuroblastoma. Wilms tumour represents approximately 95% of paediatric renal tumours (peak incidence of 2-3 years); mainly sporadic, it may occur in a small number of genetically predisposed children; it may be unilateral or bilateral. Abdominal color Doppler-US and chest radiograph are first-line tests; abdominal contrast-enhanced CT or MRI further delineates tumour extension and excludes bilateral disease; the role of CT versus chest radiograph to detect pulmonary lesion is still controversial. US surveillance is recommended in predisposed children. Non-Wilms tumours may represent a significant proportion of renal tumours in children (especially in children aged 12 years); preoperative imaging, however, is of limited value in the differential diagnosis. The differential diagnosis for a painless scrotal mass in a child includes primary testicular tumours, rabdomyosarcoma, and leukaemia. Scrotal ultrasound remains the imaging modality of choice. The presentation of adnexal masses in childhood differs from that in adult women: children may present with poorly localised symptoms, precocious puberty or with an acute abdomen due to torsion or haemorrhage within an adnexal mass. Both imaging studies and the assessment of the patient's hormonal and pubertal status should be considered in the differential diagnosis.

Learning Objectives:

1. To learn about the classification and epidemiology of malignant and benign tumours.
2. To learn about the available imaging modalities.
3. To become familiar with the technical imaging considerations, adequate diagnostic algorithm and typical imaging findings.

A-275 17:00
C. Hydronephrosis and urinary tract obstruction in neonates and infants
M. Riccabona; *Graz/AT (michael.riccabona@medunigraz.at)*

The imaging algorithm and imaging examples for most common conditions in neonatal obstructive uropathy (ureteropelvic junction obstruction, obstructive megaureter, posterior urethral valve and stone disease) will be presented and discussed. Imaging urinary tract obstruction is a common query in paediatric uroradiology. The submitted infants have increased by fetal screening ultrasound (US). With the advent of more conservative treatment approaches the task of imaging is not only to establish the diagnosis, but also to identify those kidneys as early as possible which will deteriorate and lose function and/or growth potential and thus benefit from surgery. For these, however, there is at present no reliable a-priori pro-futuro assessment in spite of all modern techniques such as diuretic MR-Urography (MRU). Thus, often repeated follow-up imaging is necessary to monitor the development. Imaging usually starts with US, additionally complemented by diuretic renal scintigraphy and/or MRU; voiding cystourethrography (VCUG) is used for detection of vesicoureteral reflux (VUR). The frequency and timing of investigations as well as the detailed protocol vary within institutions, partially also because of different criteria used for indicating surgery. Intravenous urography (IVU) has practically vanished for this query; apart from few exceptions, the "Whitaker test" is today also seldom performed only for complicated cases (e.g., peri-operatively). Obstructive uropathy is usually detected foetally and primarily assessed by US. Once VUR is ruled out, further follow-up will include MAG3-scintigraphy or MRU. CT and IVU are used only exceptionally, with the most common indication in the work-up of complicated childhood urolithiasis.
Learning Objectives:
1. To understand the work-up of neonates and infants with prenatal diagnosis of hydronephrosis.
2. To become familiar with the differential diagnosis.
3. To be aware of the tasks and restrictions of imaging in childhood obstructive uropathy.

16:00 – 17:30 **Room E1**

Musculoskeletal

RC 1110
Intra-articular imaging

A-276 16:00
Chairman's introduction
A.H. Karantanas; *Iraklion/GR (akarantanas@gmail.com)*

Intraarticular imaging is a difficult task because of the small size of the anatomic structures and the curved shape of the articular surfaces. Technological advances during the past two decades have improved our ability of imaging the joints. The most important of them include high field MRI scanners and MDCT technology. Common joint disorders afflicting wide age groups include degeneration, inflammation and trauma. Early depiction of disease allows accurate treatment planning in trauma, early suppression of inflammation in rheumatologic disorders, and monitoring of degeneration in osteoarthritis. Depiction of early signs of disease activity or recurrence improves the efficiency of newer treatments. The importance of updated imaging is highlighted by the fact that new surgical techniques are applied in the cartilage and meniscus. Modern imaging allows clear depiction of the involved joint structure: synovium, articular cartilage, labrum and subchondral bone. The high spatial and contrast resolution provided currently with MRI and CT highlights findings which are clinically irrelevant. Radiologists should be familiar with the technical prerequisites for achieving a high-quality examination, as well as the pitfalls and variants that might simulate disease. Thorough knowledge of the above will allow the application of the proper imaging technique in each individual clinical scenario.

A-277 16:05
also EPOS

A. Standard MR techniques
C. Faletti; *Turin/IT (carlo.faletti@cto.to.it)*

In the evaluation of the osteoarticular pathology, magnetic resonance has taken on a particularly important role thanks to the characteristics of the methodology. Indeed, it is essential that the magnetic resonance examination be modulated on the basis of clinical requirements. That is the most suitable plane and sequence to evidence the underlying mechanisms/alterations at the source of the symptomatology be chosen. Nowadays, there are various types of magnetic resonance equipment available which differ both as to conception and field intensity and the various sequences must respond to precise technical indications. Basically, the structures that are to be evidenced are represented by fibrous-connective tissue, cartilage, synovial tissue and bone, and the modifications that may be caused on these by the varying pathologies must be taken into consideration. Sensitivity, specificity and multiplanarity are all fundamental elements to be considered when evaluating a magnetic resonance of the articulation. The morphology of the structure is best defined with the use of spin-echo sequences, in particular that of T1 weighted images. The sequences that exploit the suppression of fat, or fat--water separation, do seem to be the most suitable for a panoramic and comprehensive evaluation of the joint under study, as the various components may be observed in such a way so as to make a primary diagnostic codification on the underlying problem. Depending on the individual requirements, specific sequences may be added, such as those that give more detailed information/evaluation of cartilage damage, or a better view of flogistic synovial processes.
Learning Objectives:
1. To learn the techniques used in standard MR.
2. To learn about the strengths/weaknesses of standard MR along with diagnostic problems related to anatomical variation.

A-278 16:28
B. CT arthrography
C.W.A. Pfirrmann; *Zurich/CH*

With modern multidetector CT scanners CT arthrography with multiplanar reconstruction in high resolution is possible. CT arthrography is performed with intra articular injection of non diluted iodinated contrast material. CT arthrography of virtually any joint from head to toe is possible. There are several indications and advantages for CT arthrography: 1. Imaging time: imaging time with CT arthrography is much faster than MR. This is especially advantageous for anxious patients. Also for patients with claustrophobia, CT is often a better option. 2. Cartilage: CT arthrography has the advantage of high contrast between cartilage and contrast material. Therefore, CT arthrography may be superior in defining cartilage defects. 3. Postoperative Imaging: in the postoperative patient, artefacts from metal may be present in or near the joint. With CT arthrography these artefacts are often less pronounced, compared with MR imaging. 4. Bone and calcifications: assessment of bony structures may be easier with CT arthrography compared with MR arthrography. Small osseous fragments, such as glenoid rim fractures may be difficult to see with MR arthrography. With CT these fragment or calcifications may be easily seen. 5. MR contraindications: CT arthrography is a valuable alternative in patients that have a contraindication for MR imaging. For example, the diagnosis of a meniscal tear is possible in the same way using CT arthrography as with MR imaging. In the shoulder, CT arthrography is well suited for the assessment of labral lesions, cartilage damage and rotator cuff tendons using the same diagnostic criteria as with MR arthrography.
Learning Objectives:
1. To learn the techniques used in CT arthrography.
2. To learn about the strengths/weaknesses of CT arthrography.

A-279 16:51
C. MR arthrography
J. Kramer; *Linz/AT (kramer@ctmri.at)*

MR arthrography is an outpatient procedure, requires no anaesthesia and is essentially devoid of complications. It is relatively easy to perform, and is a definite aid in patients when conventional MR exams cannot provide for exact information which may be needed for sufficient therapy. MR arthrography, by virtue of its ability to demonstrate accurately intra-articular structures and abnormalities of these structures (e.g. labral lesions – shoulder, hip; partial articular-sided cuff tears), adds an important component to the radiologist`s armamentarium. Although not appropriate for all patients, MR arthrography plays an important role in the evaluation of patients with suspected intra-articular pathology who have equivocal clinical and conventional MR imaging findings. However, even nowadays, clinical use of MR arthrography is limited due to three main reasons: the conversion of a non-invasive procedure into an invasive, albeit minimally invasive, procedure; increased cost and time required to perform MR arthrography compared with conventional MR imaging; and the need to obtain patient`s consent for performing a MR arthrography exam since the use of intra-articular gadolinium compounds has not yet been approved generally. MR arthrography is an outpatient procedure, requires no anaesthesia and is essentially devoid of complications. It is relatively easy to perform, and is a definite aid in patients when conventional MR exams cannot provide for exact information which may be needed for sufficient therapy. MR arthrography, by virtue of its ability to demonstrate accurately intra-articular structures and abnormalities of these structures (e.g. labral lesions – shoulder, hip; partial articular-sided cuff tears), adds an important component to the radiologist`s armamentarium. Although not appropriate for all patients, MR arthrography plays an important role in the evaluation of patients with suspected intra-articular pathology who have equivocal clinical and conventional MR imaging findings. However, even nowadays, clinical use of MR arthrography is limited due to three main reasons: the conversion of a non-invasive procedure into an invasive, albeit minimally invasive, procedure; increased cost and time required to perform MR arthrography compared with conventional MR imaging; and the need to obtain patient`s consent for performing a MR arthrography exam since the use of intra-articular gadolinium compounds has not yet been approved generally.

Learning Objectives:

1. To learn the techniques used in MR arthrography.
2. To learn about the strengths/weaknesses of MR arthrography.

Panel discussion:
Which imaging technique in which clinical scenario? 17:14

16:00 – 17:30 **Room E2**

Multidisciplinary Session: Managing Patients with Cancer

MS 11
Breast cancer

A-280 16:00
Chairman's introduction
T.H. Helbich; *Vienna/AT (Thomas.Helbich@meduniwien.ac.at)*

Breast cancer is the leading cause of cancer death among women worldwide. Imaging plays a key role in the early detection of breast cancer. Beside imaging accurate treatment is pivotal. It has been shown that cooperation between different disciplines is the base for accurate patient management and improved treatment. The audience will learn about the importance of multidisciplinary breast centres and their effect on improved detection and treatment of breast cancer. We look forward to welcome you all to get an updated information that could directly be utilised in your clinical services.

Session Objectives:

1. To highlight the importance of multidisciplinary breast centres.
2. To introduce the EU guidelines for breast centres.
3. To introduce the 'key disciplines' for a multidisciplinary breast centre.

A-281 16:03
From the radiologist's perspective
T.H. Helbich; *Vienna/AT (Thomas.Helbich@meduniwien.ac.at)*

Breast cancer is the leading cause of cancer death among women worldwide. Imaging plays a key role in the early detection of breast cancer. Mammography is an accepted screening modality. It has been shown that additional imaging modalities like ultrasound and MR imaging of the breast can significantly improve cancer detection and characterisation. An international classification system (BIRADS®) has been introduced and offers a global language for breast imager. In case of BIRADS® 4 and 5 lesions imaging guided biopsies are recommended before definitive surgery. The interpretation of imaging findings and pathologic results (b-classification) is essential and should be performed in multidisciplinary team conferences. It has been shown that such conferences have a strong impact on overall survival because mismanagement and failures can be reduced significantly. During this session the assembly will learn basics as well as about the importance of guidelines and risk management (failure conferences), illustrated by case studies.

Learning Objectives:

1. To learn about the role of different imaging modalities to detect and characterise breast lesions precisely.
2. To understand the importance of needle biopsy in the management of women with breast cancer.
3. To understand the pathologic 'b-classifications' and its impact on patient management.
4. To understand the role of a multidisciplinary approach based on case presentation.

A-282 16:28
From the surgeon's perspective
M. Gnant; *Vienna/AT (michael.gnant@meduniwien.ac.at)*

Breast surgery has significantly changed in recent years---from mastectomy to breast conservation as a standard, from single discipline to inter-disciplinarity and from mechanistic to biology-driven strategy. By virtue of all these changes, breast surgeons today offer breast-conserving approaches for almost every breast cancer patient, sentinel-node dissection for most and cure for the majority.

Learning Objectives:

1. To learn about different surgical options in the treatment of breast cancer patients.
2. To understand the rationale behind current perioperative and adjuvant treatment approaches.
3. To consolidate knowledge about individualising treatment concepts according to the biology of breast cancer.

A-283 16:53
From the oncologist's perspective
G. Steger; *Vienna/AT (guenther.steger@meduniwien.ac.at)*

Primary breast cancer is a heterogeneous disease, thus requiring different therapeutic approaches according to the biological subtype. Since in most cases micrometastatic disease is present at time of diagnosis, systemic treatment after (adjuvant) or before (neoadjuvant) surgical removal of the primary tumour is able to reduce the potential risk for overt clinical metastasis resulting in a significant and clinically relevant prolongation of relapse-free survival (RFS) and overall survival (OS). The choice of the systemic treatment depends on predictive factors which are detectable on the tumour tissue. The steroid receptors, the HER2-receptor and most recently proliferation markers (e.g. Ki67) are used to select for hormonal treatment depending on the menopausal stage, cytotoxic chemotherapy and anti-HER2 treatment options. The neoadjuvant, preoperative treatment approach aims for downsizing the primary tumour to allow for adequate, breast-conserving surgery, but can induce a pathological complete remission (pCR, complete disappearance of invasive tumour cells in the breast) which potentially leads to a further amelioration of RFS and OS. Thus, systemic treatment options are currently explored to raise the rate of treatment-induced pCR, and in some subgroups of patients with primary breast cancer pCR-rates of 40-60% are currently observed. These neoadjuvant and adjuvant systemic treatment concepts require a high level of interdisciplinary collaboration and communication involving at least radiologists, pathologists, surgeons, medical oncologists and radiotherapists, but other disciplines including dedicated breast care nurses are necessary to deliver high-quality care to the patients in order to alter the prognosis of the patients in an optimal way.

Learning Objectives:

1. To learn about the current adjuvant medical treatment options and modalities.
2. To understand the indications for the neo-adjuvant treatment approach and the appropriate modalities.
3. To understand the interactions of known predictive factors, current neoadjuvant/adjuvant treatment options, and prognosis within an interdisciplinary treatment concept.

A-284 17:18
Case presentation and discussion
T.H. Helbich; *Vienna/AT (Thomas.Helbich@meduniwien.ac.at)*

16:00 – 17:30 **Room F1**

Special Focus Session

SF 11
How can I be sure that I'm dealing with HCC?

A-285 16:00
Chairman's introduction
F. Caseiro-Alves; *Coimbra/PT (caseiroalves@gmail.com)*

Hepatocellular carcinoma is a challenging tumour due to its variegated imaging appearance. Knowledge and recognition of the stepwise carcinogenetic process in the context of liver cirrhosis is of paramount importance for tumour detection and characterisation. Leading imaging signs like hypervascularity and the wash-out phenomena can only be correctly interpreted if the radiologist is able to set up the proper imaging technique in a multimodality perspective. Cirrhosis is a fertile soil for the development of different focal liver lesions, and vascular abnormalities can be now currently recognised by morphological and functional imaging including the use of cell-specific MR contrast agents. Presently, imaging acts as the common denominator in clinical decision-making, being instrumental in confirming the presence and staging of HCC and heavily influencing patient management. Apart from its diagnostic capabilities, radiology has special responsibilities in providing minimally invasive treatment options and in assessing tumour response. The current session aims to provide an overall integrated approach of the modern role of radiology in this clinical scenario, especially for all of those involved in providing consultation in a multidisciplinary environment.

Session Objectives:

1. To understand the role of imaging for HCC detection and screening.
2. To became familiar with the clinical guidelines for patient management.
3. To appreciate how biomarkers can assess tumour aggressiveness.
4. To learn how to evaluate tumour response and residual tumour.

A-286 16:03

Wash-in/wash-out: what do they represent?

L. Grazioli; *Brescia/IT (lgrazioli@yahoo.com)*

Although some authors still consider that fine-needle biopsy is safe, accurate, enables final diagnosis of focal liver lesions and is essential for deciding the therapeutic strategy, recent cohort studies have raised suspicions of its utility. The diagnosis with fine-needle biopsy has several limitations: location and size of tumour, clotting disorders or ascites interfere with needle insertion. False-negative results caused by sampling error may occur at a higher rate. Moreover, needle biopsy of HCC may carry a 2% to 5% risk of seeding tumour cells. Typical HCC is supplied mainly via the hepatic artery and the portal flow is lacking or reduced within the tumour. The characteristic HCC profile, including intense enhancement in AP (wash-in) and followed by contrast washout in PVP or EP (washout) on CEUS, MDCT and dynamic MR images using ordinary extracellular agents, has been established. A prospective study indicated a high PPV (> 95%) using these noninvasive imaging criteria (wash-in and washout) for diagnosis of HCC (> 1 cm), which was comparable with that of a liver biopsy. Identification of washout finding in PVP or EP is also crucial for reliable diagnosis of HCC, in particular differentiation between non-neoplastic early arterial enhancement (A-P shunt) and HCC. Based on these recent results, AASLD and EASL recommended that the diagnosis of HCC in cirrhotic patients can be made if these noninvasive imaging criteria are identified on contrast-enhanced US, MDCT or MR imaging without the use of liver biopsy.

Learning Objectives:

1. To learn about the angiogenetic process of HCC transformation.
2. To understand how wash-in/wash-out signs correlate with pathologic findings.
3. To learn how to set up imaging protocols to assess neoangiogenesis.

A-287 16:21

Equivocal nodules: how to interpret and clinical implications

V. Vilgrain; *Clichy/FR (valerie.vilgrain@bjn.aphp.fr)*

Cirrhosis is a chronic liver disease defined by the presence of fibrosis and regenerative nodules. These regenerative nodules may either remain stable or enlarge, or evolve to dysplastic nodules and hepatocellular carcinoma (HCC). This multistep carcinogenesis explains why the diagnosis of small HCC remains challenging. Other lesions such as perfusion disorders and confluent fibrosis are also often observed in cirrhosis. Last, the prevalence of peripheral cholangiocarcinoma has been shown higher than in normal livers. Therefore the goal of imaging is to provide clues which enable lesion characterisation. The classical imaging findings are mostly based on lesion size and lesion enhancement on arterial-dominant, portal venous and delayed phases. Yet, both HCCs and other lesions may show atypical enhancement. This lecture will detail the input of functional tools. For instance, combination of classical sequences and diffusion-weighted MR imaging increases distinction between HCC and other lesions developed on cirrhosis. The role and limitations of hepatospecific MR contrast agents will also be stressed.

Learning Objectives:

1. To be aware of the differential diagnosis of focal liver lesions in the cirrhotic liver in a multimodality perspective.
2. To understand the role of new strategies such as DWI, perfusion CT/MR, etc.
3. To learn about the role of hepato-specific MR contrast agents.

A-288 16:39

HCC staging and patient stratification: what's new?

C. Ayuso; *Barcelona/ES (cayuso@clinic.ub.es)*

Clinical management of patients with HCC is a decision-making process that should be approached following evidence-based data. Staging is a relevant topic in these patients because it determines the therapeutic approach. Tumoural extension based on MRI or CT findings and prognosis assessment are critical steps in the management of patients with HCC to indicate treatment, to predict response to treatment and to predict survival. For optimal results any proposal has to take into account liver function, tumour stage and physical status. Up to now, the only proposal linking staging to prognostic prediction and treatment indication is the BCLC approach. Updated BCLC staging in 2012, first presented in 1999 in Seminars in Liver disease will be discussed and also the recent imaging features supporting the tumoural extension. Genomic studies attempted to provide the basis to identify the abnormalities that reflect a higher risk of cancer and the biological profile will be discussed.

Learning Objectives:

1. To learn about current guidelines for patient management.
2. To become familiar with imaging findings related to staging.
3. To understand the role of new biomarkers for tumour grading.

A-289 16:57

Residual tumour and tumour recurrence: how to evaluate?

D.J. Breen; *Southampton/UK (david.breen@suht.swest.nhs.uk)*

In cirrhotic liver disease those unfit for surgery but with paucinodular (usually less than 3 nodules of < 3 cm) or intermediate disease (more advanced) are increasingly amenable to locoregional therapies. Treatment in situ is, however, difficult to assess for the purposes of treatment response and continued surveillance. Modified RECIST criteria have been proposed more recently and these aim to quantify and validate in situ tumour necrosis in the late arterial phase as a valid surrogate endpoint, increasingly justified by clear survival benefit after ablation, TACE and anti-angiogenic drugs. Optimised late arterial phase imaging is critical in the diligent assessment of treatment effect and to ensure that residual disease is not left untreated. There are, however, still typical patterns of residual and recurrent disease that the radiologist must recognise whilst becoming familiar with benign post-treatment features seen after ablation and radioembolisation, for example. These can include marginal hyperaemia, portal tract oedema, arterioportal shunting, etc. Post-treatment assessment can be complex but recent work suggests that diffusion-weighted MR and increased, mapped ADC values may be useful in confirming treatment response. Careful subtraction MR (late arterial phase – baseline) has also been shown to be a robust guide to residual disease. PET/CT assessment has proved problematic due to the highly variable degree of FDG-avidity in HCC. Changes in perfusion CT parameters have been observed in different treatment response groups. With regard to ablation semi-automatic volume segmentation processing is now permitting much more accurate assessment of treatment adequacy.

Learning Objectives:

1. To understand the concepts of residual and recurrent HCC.
2. To become familiar with interventional radiology options, indications and limits.
3. To learn about imaging criteria used for tumour response evaluation.
4. To be able to propose strategies for patient follow-up.

Panel discussion:
How far can we go with non-invasive imaging for diagnosis and staging of HCC? 17:15

16:00 – 17:30 **Room F2**

Professional Challenges Session

PC 11

An epidemic spreading from West to East: medico-legal challenges for radiologists

A-290 16:00

Chairman's introduction

É. Breatnach; *Dublin/IE (ebreatnach@mater.ie)*

Medicolegal consequence is now recognised to be a major aspect of modern radiological practice. Sins of omission and commission are the building bricks of an ever expanding industry of regulation, legislation and litigation. It is important for radiologists to recognise the implications of this development not only as an ongoing consideration in daily practice, but also in an attempt to protect themselves from unforeseen legal consequences. The personal impact of medicolegal litigation on practicing radiologists cannot be under estimated, and though this is at its infancy in certain countries, in many others it has gained significant momentum. The presenters in this Session will address and advise an approach to medicolegal avoidance in three clinical scenarios: when the radiologist has made a mistake, specific challenges within paediatric practice and emergency radiology.

Session Objectives:

1. To learn appropriate responses following a clinical radiological mistake (miss, inadvertant outcome).
2. To learn potential medico-legal dangers and responsibilities specific to paediatric radiology practice.
3. To learn appropriate responses to medico-legal issues specific to emergency radiology practice.

A-291 16:05

The correct conduct when you have just made a mistake

L. Berlin; *Skokie, IL/US (lberlin@live.com)*

Ethical standards, moral values and mandates of virtually all professional societies call for full disclosure of medical errors to patients affected by them. However, many radiologists are reluctant to divulge errors because of potential repercussions ranging from simple embarrassment, loss of face or professional standing, to malpractice litigation or restriction of clinical privileges. Nevertheless, divulging the mistake and offering an explanation and apology for it may diminish the patient's pain, assuage the radiologist's guilt and recrimination and strengthen the physician-patient relationship. All radiologists and non-radiological physicians must always keep in mind that it is their fundamental obligation to act in the best interest of the patient, not in their own personal interest.

Learning Objectives:

1. To understand why facing the patient and complications is always better than hiding.
2. To learn the appropriate words, recognising facts, but not responsibility.
3. To understand the difference between 'normal' complications and malpractice.

A-292 16:25

Medico-legal issues within paediatric practice: the history, the challenges, and the future

C. Owens; *London/UK (owensc@gosh.nhs.uk)*

Aim and objective of this lecure is to introduce the attendee to the historical, clinical and legal challenges which faced (and continued to face) health professionals dealing with child protection, with special reference and focus upon the unique issues which occur in the paediatric environment. The attendee will have the opportunity to hear a summary gleaned from opinions from those learned health professionals involved with the difficult challenges in non accidental injury and all of the issues arising and pursuing the medicolegal expert dealing in child protection. Specific individual examples from high profile UK legal cases will be highlighted to allow the listener to understand the harsh climate facing those involved in child protection from the legal perspective.

Learning Objectives:

1. To understand historical perspectives of the law in childrens' health.
2. To visit current high profile areas of litigation within paediatric imaging.
3. To contemplate the future directions.

A-293 16:45

Case-based review of medico-legal aspects in emergency radiology

A. Pinto; *Naples/IT (antopin[1968]@libero.it)*

Legal considerations relevant to emergency department radiology are significant. Most patients seeking emergency care are acutely ill. Imaging examination must be done promptly and interpreted without delay. Misdiagnosis is the most common allegation lodged against emergency radiologists as a basis for liability. Missing an abnormality on a radiograph performed in the emergency setting is never easy to explain: it can occur for a variety of reasons. Trauma care creates a "perfect storm" for medical and radiological errors: unstable patients, incomplete histories, time-critical decisions, concurrent tasks and often junior personnel working after-hours in busy emergency departments. Although good medical practice helps ensure against claims, the value of effective communication is also important. The emergency department regularly receives inebriated and uncooperative patients with whom the physician has had no prior contact. If the emergency department physician is handicapped by these factors, the emergency radiologist responding to such a patient is at an even greater disadvantage. In case of unconscious or irresponsible patient, having a kind manner, offering adequate information to patients' relatives, checking on the patient's comfort and trying to reassure the patients' relatives are as important for the radiologist as for the physician more directly involved in patient care. It is very important that family members or friends of the patients are politely treated. Moreover, before providing information to the family of a patient with cerebral death, clear communication between the emergency department physician and the radiologist is crucial.

Learning Objectives:

1. To evaluate the difficult balance between emergency, safety of diagnostic procedures and patient information.
2. To learn how to inform the patients' relatives in case of unconscious or irresponsible patient.
3. To learn the criteria for cerebral death and the necessity of appropriate communication with the clinician before information is provided to the family.

Panel discussion:
Specific case scenarios illustrating medico-legal pitfalls in communication skills, paediatric and emergency radiology 17:05

16:00 – 17:30 **Room G/H**

Neuro

RC 1111

Neuro paediatrics: imaging of the paediatric brain

Moderator:
N. Girard; Marseille/FR

A-294 16:00

A. Systemised approach to inherited white matter disease in children

A. Rossi; *Genoa/IT (andrearossi@ospedale-gaslini.ge.it)*

Paediatric white matter disorders can be distinguished into well-defined leucoencephalopathies, and undefined leucoencephalopathies. The first category may be subdivided into (a) hypomyelinating disorders; (b) dysmyelinating disorders; (c) leucodystrophies; (d) disorders related to cystic degeneration of myelin; and (e) disorders secondary to axonal damage. The second category, representing up to 50% of leucoencephalopathies in childhood, requires a multidisciplinary approach in order to define novel homogeneous subgroups of patients, possibly representing 'new genetic disorders''. An integrated description of the clinical, neuroimaging, and pathophysiological features is crucial for categorising myelin disorders and better understanding their genetic basis. A review of the MR imaging findings in the main genetic disorders affecting white matter in the paediatric age, including some novel entities, will be provided with a highlight on the concept of pattern recognition.

Learning Objectives:

1. To become familiar with the most common inherited white matter disease in children, and to understand the most relevant clinical and laboratorial features that help differential diagnosis.
2. To learn the characteristic neuroimaging findings that may be useful in establishing differential diagnosis.
3. To be aware of the importance of advanced MR imaging techniques for differential diagnosis.
4. To recognise the importance of a systemised imaging approach to the differential diagnosis of inherited white matter disease in children.

A-295 16:30

B. Malformation of the posterior fossa

C. Hoffmann; *Tel Hashomer/IL (chen.hoffmann@sheba.health.gov.il)*

In this presentation the new classification of posterior fossa malformations will be presented. This classification is based on embryology, making it easier to understand and remember. Embryology and radiological features will play together to teach the audience how to differentiate and diagnose this malformations. Knowing the features of these malformations is important, making it possible to look for them in MR scans, done on the paediatric population, suffering from developmental delay, and will lighten the way to the correct diagnosis. Developmental and genetic classification of mid-hindbrain malformations: 1. Malformations secondary to early anteroposterior and dorsoventral patterning defects, or to misspecification of mid-hindbrain germinal zone. 2. Malformations associated with later generalised developmental disorders that significantly affect the brainstem and cerebellum. 3. Localised brain malformations that significantly affect the brainstem and cerebellum. 4. Combined hypoplasia and atrophy in putative prenatal onset degenerative disorders.

Learning Objectives:
1. To become familiar with the most important aspects of embryological and foetal development that are essential for the understanding of the large spectrum of posterior fossa malformations.
2. To become familiar with the classification of posterior fossa malformations.
3. To learn the imaging features of the most common posterior fossa malformations in both pre and post-natal imaging.

A-296 17:00
C. Phakomatosis
P.D. Griffiths; *Sheffield/UK (p.griffiths@sheffield.ac.uk)*

This lecture will introduce the neuroradiological findings of the three commonest phakomatoses referred for neuroimaging in paediatric practice, namely Sturge-Weber syndrome, Tuberous sclerosis complex and Neurofibromatosis type 1. I will present the findings on the background of the suspected pathogenesis of the conditions with the aim of making the imaging findings understandable. Appropriate imaging protocols will be discussed for each of the conditions.
Learning Objectives:
1. To be aware of the epidemiology, genetics and clinical manifestations of phakomatosis.
2. To learn the imaging features of the most common phakomatosis and its differential diagnosis.
3. To be aware of some specific imaging features of rare phakomatosis.

16:00 – 17:30 **Room I/K**

Chest

RC 1104
Patterns in chest radiology: are there subtype patterns of ground glass opacity (GGO)?

A-297 16:00
Chairman's introduction
A. Oikonomou; *Alexandroupolis/GR (aoikonom@med.duth.gr)*

Ground-glass opacity (GGO) is characterised on HRCT by the presence of a hazy increase in lung opacity that does not cause obscuration of underlying bronchial and vascular margins. Although a very common finding, it also constitutes a very nonspecific term since it can be seen in a variety of different intraalveolar and interstitial processes with different histology including inflammatory, infectious and neoplastic diseases that have a common physiologic mechanism: partial displacement of air. Ground-glass opacity may even be seen in normal processes such as poor ventilation in dependant lung areas and in expiration. Moreover, GGO can represent either an ongoing, active and potentially treatable disease or an irreversible process. In order to interprete correctly this highly nonspecific but very significant finding it is crucial to attempt to further classify the different large main entities in which this radiological finding appears. Are there specific radiological and HRCT findings that can help us differentiate GGO in autoimmune-inflammatory conditions from infectious and neoplastic processes? Are there associated findings other than GGO – such as nodules, reticulation or focal disease and distribution of findings that can narrow the differential diagnosis? Systematic evaluation of GGO and associated findings as well as integration with clinical information (acute, subacute or chronic symptoms) is essential in defining GGO subtypes in order to improve radiological diagnosis.

A-298 16:05
A. Ground glass opacification: why do we see it and what can it mean?
S.R. Desai; *London/UK (sujal.desai@nhs.net)*

Radiologists who regularly review high-resolution CT (HRCT) should be aware of the range of patterns and, more importantly, their potential pathological meaning. A pattern of ground-glass opacification is one of the more common HRCT findings but, to the unwary, its interpretation can be problematic. An important underlying principle is that a ground-glass pattern may be caused by any process – physiological or pathological – which partially displaces air. Physiological (i.e. non-disease-related) ground-glass opacification is perhaps most commonly seen in subjects who, for whatever reason (e.g. breathlessness, obesity), are unable maintain or achieve a satisfactory inspiratory effort during scanning. A generally increased lung density (in contrast to adults) is also a feature in infants and young children simply because there are fewer alveoli in the developing lung. Finally, it is worth noting that intravenous contrast administration (presumably because of a relative but temporary increase in capillary blood volume causing partial displacement of air) can unpredictably increase lung density. Disease processes which lead to partial filling of the air spaces, thickening of the interstitium, partial collapse of alveoli and/or an increased capillary blood volume will also manifest as a pattern of ground-glass opacification. In clinical practice, the recognised causes of ground-glass opacities on HRCT include pulmonary oedema (cardiogenic or otherwise), infections (e.g. pneumocystis jiroveci pneumonia) and some of the idiopathic interstitial pneumonias (e.g. non-specific interstitial pneumonia and respiratory bronchiolitis-associated interstitial lung disease). The presentation will review and revise the causes of physiological and disease-related ground-glass opacification on HRCT.
Learning Objectives:
1. To review different physiological conditions which might cause a GGO pattern.
2. To be informed about the associations and reversibility of physiology-related GGO.

A-299 16:28
B. Inflammatory and infectious GGO
K. Marten-Engelke; *Göttingen/DE (kmarten@med.uni-goettingen.de)*

Ground-glass opacity (GGO) is defined as increased attenuation of the lung parenchyma without obscuration of the pulmonary vascular markings on CT images. GGO may be the result of a variety of interstitial and alveolar infectious and noninfectious inflammatory diseases. As an imaging finding alone GGO does usually not allow a specific diagnosis. GGO in inflammatory disorders often will be present in the company of other interstitial or alveolar findings. However, the number of diseases that cause diffuse isolated GGO or GGO as the predominant finding is relatively small and can be prioritised with clinical information. The most common cause of diffuse isolated GGO in immunocompromised hosts are a variety of diffuse, opportunistic pneumonias, e.g. Pneumocystis jiroveci pneumonia (PCP), cytomegalovirus pneumonia (CMV) or herpes simplex pneumonia (HSV), that constitute the first differential. Chronic onset disorders in immunocompetent patients include cellular nonspecific interstitial pneumonia (NSIP), subacute hypersensitivity pneumonitis (HP), organising pneumonia, air-space sarcoid and drug-induced lung disease. In these disorders, ancillary findings such as an associated reticular pattern with traction bronchiectasis/bronchiolectasis (NSIP), mediastinal lymphadenopathy (sarcoidosis), superimposed nodularity or cysts may help to refine the diagnosis. In patients with collagen vascular disorders, e.g. scleroderma, GGO secondary to pulmonary involvement needs to be differentiated from drug-induced lung disease. This refresher course will put GGO in the context of outpatients versus inpatients, the acuity of clinical symptoms, e.g. fever, cough and dyspnoea, signs of massive systemic inflammation, and the clinical situation such as inhalational history, pneumotoxic drug administration, immunocompromisation, or bone marrow-suppression.
Learning Objectives:
1. To learn more about the inflammatory conditions that cause GGO.
2. To review the histopathological correlates of inflammatory and infectious GGO.
3. To attempt to differentiate GGO in autoimmune and infectious lung disease.

A-300 16:51
C. GGO in dysplasia and neoplasia
J. Goo; *Seoul/KR (jmgoo@plaza.snu.ac.kr)*

Ground-glass nodules (GGNs) or subsolid nodules detected on CT have been reported to comprise a wide range of diagnoses from premalignant lesions such as atypical adenomatous hyperplasia, or malignant lesions such as adenocarcinoma in situ (formerly bronchioloalveolar carcinoma) or adenocarcinoma. In comparison to transient GGNs which are mostly inflammatory and infectious in origin, persistent GGNs are frequently dysplastic or neoplastic. It has been reported that these GGNs have higher malignancy rate than solid nodules. According to the presence of solid portion within the GGNs, GGNs can be classified as part-solid or nonsolid nodules. CT features of GGNs correlate well with the histological classification of adenocarcinoma and the histological features of lepidic pattern, which exhibits proliferation of cells along the alveolar walls and correspond well to the CT features of GGNs. In addition to the presence and proportion of solid component within the GGNs, larger size and a lobulated border of GGNs are predictive CT findings of malignancy. The evolving features of GGNs on serial CT that suggest malignancy include an overall increase in the size of a GGN, development of a solid component within a GGN or an increase in the solid component of a GGN. Stable size with increasing attenuation of GGN could also be a sign of malignancy. Like the proportion of lepidic pattern in lung adenocarcinoma, the proportion of GGO in lung nodule is a positive prognostic factor. Despite the high probability of malignancy of GGNs, the possibility of overdiagnosis should be considered in the management of GGNs.

Learning Objectives:
1. To learn more about the dysplastic and neoplastic conditions causing GGO, e.g. semi-solid nodules.
2. To review the histopathological correlates of dysplastic and neoplastic GGO.
3. To attempt to estimate malignancy on the basis of GGO pattern.

Panel discussion:
How do we report and manage ground glass opacity? 17:14

16:00 – 17:30 **Room L/M**

Physics in Radiology

RC 1113
High field MRI: beyond 3 T

Moderators:
F. Schick; Tübingen/DE
S. Trattnig; Vienna/AT

A-301 16:00
A. Challenges of high field MR
M. Bock; *Freiburg/DE (michael.bock@uniklinik-freiburg.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 with 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 understand how increased field strength affects exposure and image quality characteristics.
2. To learn about MR imaging protocols developed for ultra-high field MRI.
3. To become familiar with technology for specific absorption rate reduction.

A-302 16:30
B. A complicated solution to a complicated problem: transmit array
M.E. Ladd; *Essen/DE (mark.ladd@uni-duisburg-essen.de)*

MRI has become a vital tool for clinical diagnosis and research. A major current trend is the introduction of more powerful static magnetic fields, in particular human research magnets > 3 T. Advantages of higher magnetic fields include higher SNR and unique tissue contrasts due to enhanced sensitivity to tissue susceptibility differences. As field strength increases, the frequency of the RF fields used for tissue excitation increases linearly according to the Larmor relation, leading to correspondingly shorter wavelengths inside the tissue. Interference and penetration effects make it quite difficult to achieve RF excitation uniformity, particularly in body applications when a large cross-section is imaged, and lead to subject-dependent signal dropouts according to body habitus. The inherent advantages of higher magnetic fields can thus often not be leveraged to realise expected imaging benefits. Preliminary research indicates that these effects can be addressed by use of parallel transmission strategies such as RF shimming and Transmit SENSE: in RF shimming a multi-element transmit coil array is driven with amplitude and phase weightings optimised for a particular body region; Transmit SENSE is a further generalisation in which different RF pulse waveforms are applied to each element. These novel excitation strategies result in alterations of the RF energy distribution in the tissue, making new demands on the prediction and monitoring of SAR and concomitant tissue heating. Once these challenges are mastered, it can be conjectured that MRI beyond 3 T could have groundbreaking impact on the diagnosis and characterisation of selected disease processes.
Learning Objectives:
1. To learn about the need to control radio-frequency fields, particularly at high B0.
2. To understand the principles of controlling radio-frequency fields by multiple-channel transmission.
3. To become acquainted with methods of obtaining uniform and tailored excitation within SAR limits.

A-303 17:00
C. Is 7T ready for clinical use?
S. Francis; *Nottingham/UK (susan.francis@nottingham.ac.uk)*

The number of 7T magnetic resonance (MR) scanners is growing rapidly, and 7T has proved beneficial for MR imaging and spectroscopy. 7T provides the principal advantages of higher image signal-to-noise ratio, changes in T1, T2 and T2* contrast and increased blood oxygenation level-dependent (BOLD) contrast for use in functional MRI. These gains can be exploited to improve the spatial resolution and/or temporal resolution of anatomical and functional images. Changes in contrast can be exploited to enhance depiction of pathology such as lesions in multiple sclerosis, and neurodegenerative conditions such as Alzheimer's and Parkinson's disease. Whilst for MR spectroscopy, 7T provides the advantage of increased spectral resolution. 7T has opened up novel contrast mechanisms including susceptibility-weighted imaging (SWI) which provides information on the local variation in magnetic susceptibility highlighting differences in iron concentration and myelin. Ultra-high field provides increased longitudinal relaxation times, providing increased signal changes for Arterial Spin Labelling (ASL). This presentation will discuss the advantages of 7T and the applications which benefit from 7T over lower field MR. The limitations of 7T in the clinical setting will be discussed, including the issue of specific absorption rate (SAR), and B1 and B0 inhomogeneity. Technical developments to overcome these limitations and enable the wider clinical use of 7T MR will be discussed.
Learning Objectives:
1. To become familiar with the advantages that 7T provides for magnetic resonance imaging and spectroscopy.
2. To be able to recognise the areas of clinical application where 7T already offers significant benefits over lower fields.
3. To understand the barriers to clinical use of 7T.
4. To be able to recognise the technical developments that will help to overcome these barriers and allow wider clinical use of 7T.

16:00 – 17:30 **Room N/O**

Interventional Radiology

RC 1109
Biliary interventions

A-304 16:00
Chairman's introduction
A.A. Hatzidakis; *Iraklion/GR (adamhatz@med.uoc.gr)*

There are some basic IR techniques everybody needs to know before starting to treat biliary diseases. These are Percutaneous Transhepatic Cholangiography (PTC) and Percutaneous Transhepatic Biliary Drainage (PTBD). PTC is the basic procedure for opacification of the biliary tree. We puncture the liver with a 21G Chiba needle entering the liver in the right middle axillary line targeting the xiphoid. For the left biliary duct system we puncture the anterior abdominal wall just under the xiphoid, aiming posterior and right lateral. After opacification, decision must be made about the site of puncture for introduction of the drainage catheter. There are two major techniques: A. the fine 22 G needle technique and B. the 18 G needle technique. Advantage of the fine needle technique is that even multiple needle passages may not cause complications. The drainage of the bile ducts is performed with a plastic multiple hole pigtail 8-10 Fr catheter. Dilatation of stenosed parts of the biliary system is performed after negotiation of the stricture or occlusion with help of high-pressure angioplasty balloons of variant sizes. Balloons of 8- to 14-mm-width can be used alone or two parallel to each other. Percutaneous lithotripsy with or without cholangioscopic assistance is a widely used technique for clearance of biliary stones or fragments. Extraction balloons or baskets and special lithotripsy devices are commonly used for impacted or large calculi.

A-305 16:05

A. Fistula and benign stenosis

M. Krokidis; *London/UK (mkrokidis@hotmail.com)*

Benign biliary stenoses may be due to postoperative injury (laparoscopic cholecystectomy, gastric/hepatic resection and bilio-enteric anastomosis), post-liver transplantation, post traumatic (blunt or penetrating trauma), inflammation associated with lithiasis, congenital (usually in paediatric population), parasitic and post radiation. Internal biliary fistulas occur due to acute inflammation with obstruction that leads to adhesions, erosion of the bile duct or gallbladder wall and eventual erosion with formation of a fistula. The most common causes of benign fistulas are cholelithiasis, peptic ulcerartion and Crohn's disease of the duodenum. Diagnosis of benign biliary strictures is usually performed with Ultrasound, Computed Tomography, Magnetic Resonance Cholangiopancreatography or Endocopic Retrograde Cholangiopancreatography (ERCP), whereas biliary fistulas are difficult to diagnose with non invasive methods and the diagnosis is usually made either with Percutaneous Transhepatic Cholagiography, ERCP or even intraoperatively. Percutaneous approach is an established method of treatment of benign stenosis, particularly when they are a result of bilio-digestive anastomosis, either with the use of multiple and prolonged balloon dilatations, or with the use of plastic or metallic (bare or covered) stents. Biliary fistulas can be percutaneously treated by correcting the reason keeping the fistula active (patent). A biliary stricture or stone may be such a reason and can be dilated or removed, respectively, either through the existing fistula or through a new transhepatic access. Embolisation of the fistula tract or use of a metallic stent can be also discussed. In case of portal-biliary fistula, embolisation of the portal branches or positioning of a covered stent might be the solution.

Learning Objectives:

1. To know about the etiology of fistulas and benign stenoses.
2. To be familiar with the various imaging modalities and findings in benign fistulas and stenoses.
3. To understand the techniques, results, and complications of interventional treatment.

A-306 16:28

B. Interventions after liver transplantation

P. Goffette; *Brussels/BE (goffette@rdgn.ucl.ac.be)*

Bile tract complications occur in 10-35% of liver transplants, with major incidence in partial LT. The incidence is highest in the first few month after LT and 80% are diagnosed within 6 months. Type of surgical anastomosis, cold and warm ischaemic liver injury and pre-existing biliary diseases are all factors influencing the frequency, type and severity of complications which include biliary strictures, bile leakage, stone formation and bilomas. Screening sonography (38% sensitivity) may be misleading due to false-negative results. Therefore, systematic PTC at 6 month after LT is recommended in order to disclose biliary complications at early stage. Main indications for percutaneous approach include 1. Early anastomotic strictures unaccessible to endoscopy (segmental graft or hepaticojejunostomy anastomosis). 2. Late non-anastomotic strictures due to arterial occlusion, recurrent sclerosing cholangitis, CMV infection (often a temporising measure before retransplantation). 3. Access for subsequent procedures such as lithotripsy, intrahepatic stones, sludge or biliary cast removal. 4. Post-LT bile leaks. The conventional approach to biliary strictures included 1. Repeated and prolonged (30 minutes) high-pressure balloon bilioplasty (3X) at 2-3 weeks' interval. 2. Long-term drainage with large bore drains. 3. Chronic catheters left in place in patients with recurrent or diffuse strictures. Long-term patency of bilioplasty is reported from 50 to 60% at 5 years after a 80% 6 months' patency. Cutting balloons with micro-surgical blades and metallic stents may be useful to treat refractory strictures in non surgical candidates. Temporary retrievable covered stent grafts for resistant stenosis is associated with an 50% restenosis rate at 6-12 Mo. The management of biliary leaks (5-15%) includes combined drainages of the injured biliary duct and biloma. Temporary insertion of covered stent may be necessary to manage hilar or anastomotic leaks. Selective embolisation of intrahepatic leaks or segmental portal vein embolisation is an alternative to a surgical approach to manage refractory non-anastomotic leaks.

Learning Objectives:

1. To know about the appropriate imaging algorithm for the detection of biliary complications after liver transplantation.
2. To be familiar with the techniques of interventional treatment of biliary complications after liver transplantation.
3. To understand the results and complications in comparison with surgical management.

A-307 16:51

C. In tandem with endoscopy

D.F. Martin; *Manchester/UK (derrick.martin@uhsm.nhs.uk)*

Most biliary intervention is performed endoscopically but endoscopy may fail and the antegrade placement of a catheter into the bowel assists endoscopic access. Previously, the primary management of malignant bile duct obstruction was with the endoscopic placement of 10 F plastic stents. When ERCP failed, PTC using a 7 F catheter allowed the placement of an endoscopic 10 F stent but kept complications low because of the avoidance of a 10 F trans-hepatic track. Now, with the advent of 6 Fr trans-hepatic delivery systems for 10 mm diameter metal stents this combined procedure has fallen into disuse. Endoscopic access for the management of stones can fail, most commonly because of a peri-ampullary diverticulum. In this situation, a trans-hepatic approach can allow wire-guided sphincterotomy leading to successful endoscopic management and the avoidance of open bile duct surgery. This presentation will describe the technical aspects of this approach together with illustrative case examples. The technique has a very high success rate with complications of haemorrhage, bile leak and cholangitis in approximately 10% of patients. Polya-gastrectomy is declining in its incidence and experienced endoscopists who can deal with these patients are becoming uncommon. A trans-hepatic approach may allow a guide wire to be passed along the afferent loop for endoscopic access. There is a small but growing experience of EUS-guided biliary drainage for the management of biliary obstruction. Gastroenterologists favour this approach because it appears to generate fewer complications than a trans-hepatic approach and is certainly less uncomfortable for the patient. These newer techniques will be illustrated and discussed.

Learning Objectives:

1. To be aware of the indications for tandem use of percutaneous and endoscopic approach.
2. To learn the tips and tricks of the tandem technique.
3. To learn about the results and complications of tandem treatment.

Panel discussion:
What are the new possibilities in this classic topic? 17:14

16:00 – 17:30 **Room P**

Radiographers

RC 1114

Radiographers' impact on dose optimisation and radiation protection: the essential link in the chain

Moderators:
A.B. Aslaksen; Bergen/NO
A. Henner; Oulu/FI

A-308 16:00

A. Dose optimisation – what more is there to be done? The role of the radiographer

S. Mc Fadden; *Newtownabbey/UK*

The concept of reference dose levels was introduced in the UK to act as an aid to radiation protection. Initially, DRL were calculated for common diagnostic x-ray examinations and in more recent years the concept has been extended into interventional studies. The aim of DRL was to indicate abnormally high doses for common x-ray examinations. Recent literature states that DRLs are still very variable across Europe and Asia for common examinations using similar x-ray equipment. Hence, patients are consistently receiving higher radiation doses in different countries. It has also been reported that poor image quality results in unnecessary radiation exposure to these patients. Simple measures can be put in place by the radiographer to ensure that image quality is maintained and the ALARA principle is adhered to at an international level. The use of anti-scatter grids, standardised techniques, DRLs and the impact of digital imaging will be explored and recommendations for best practice made. These simple modifications to technique can be easily implemented into daily practice in the imaging department and have achieved dose reductions of up to 49% with minimal loss of image quality during simulated experimental conditions. The session will conclude with a discussion on the concept of producing a diagnostic image which is adequate for the purpose with a lower radiation dose, rather than optimum image quality with a high radiation dose.

Learning Objectives:
1. To understand the importance of dose optimisation as a part of the everyday work of the radiographer.
2. To consolidate knowledge in the area of dose and image quality optimisation.
3. To be informed about current and future opportunities in dose optimisation and image quality.

A-309 16:30

B. From screen-film to digital systems: how to implement an optimisation process

J. Santos; *Coimbra/PT (joanasantos@estescoimbra.pt)*

The screen-film system has been the primary tool in radiology for over a century and the radiation dose was a minor consideration during the early days. The technology evolution for digital radiography provided a lot of advantages, like a better workflow, a high image quality and when properly used can decrease the dose per exam. It is mandatory for radiographer follow the whole process of transition from screen-film to digital system and has thorough knowledge of new installed technology. The technical system specifications are crucial to optimization. Digital systems have high Detective Quantum Efficiency (DQE) and enable the reduction of exposure complying ALARA (As Low As Reasonable Achievable) principle. Exposure parameters have to be adequate to the digital reality and new presets, for standard patients, should be established. Phantoms tests and quality control tests must be performed, and the results should be compared with guidelines and literature. The exposure parameters should be tested in different weight and height phantoms. After this procedure dose values, image quality and dose index should be controlled as daily routine to promote optimization.Contrary to what it provides, technology advances has contributed to increase the dose per exam. To counteract this phenomenon, education for dose reduction, establishment of Diagnostic Reference Levels (DRLs) and periodic review of doses grant the best way of achieving optimisation. Radiographers are the key player in the optimization process and they should be permanently focused on it.

Learning Objectives:
1. To understand the implementation process when changing from conventional to digital systems.
2. To be aware of the critical points in the optimisation process.
3. To understand the different considerations in dose optimisation between conventional and digital imaging.

A-310 17:00

C. The importance of education and training in the development of the role of the radiographer in quality assurance and radiation protection

M.-L. Butler; *Dublin/IE (marielouise.butler@ucd.ie)*

Internationally, medical radiation accounts for the majority of radiation exposure to the public. With the increasing international focus on radiation protection in clinical practice, there has never been a more appropriate time to promote education in this area amongst the radiography community. With the advent of new technologies and changes in working role, the radiographer‘s role is ever developing. Because radiographers are directly involved with the technology and patients on a daily basis, their role in quality assurance (QA) and radiation protection is pivotal. This presentation will focus on the current role of the radiographer in QA and radiation protection from a European perspective and will explore the increasing role of QA in the clinical department. The importance of appropriate education and training and the types of education currently available for radiographers will be discussed alongside current literature and guidelines available in this field. The experience of an online radiation safety course and its impact on the role of the radiographer will be reviewed. The future of the radiographer‘s role in this field and deficiencies in current practice will be examined and conclusions will be drawn.

Learning Objectives:
1. To understand the role of education in QA and radiation protection.
2. To be aware of the new perspectives in education for QA and radiation protection.

16:00 – 17:30 Room Z

EuroAIM Session

Evidence-based radiology: ongoing projects and perspectives

Moderators:
G.P. Krestin; Rotterdam/NL
F. Sardanelli; Milan/IT

A-311 16:00

Evidence-based radiology 2001-2010: the authorship

F. Sardanelli; *Milan/IT*

A systematic literature search for secondary studies concerning diagnostic imaging or interventional radiology published from 2001 to 2010 was performed on PubMed/EMBASE. Of 3,502 papers initially screened, 1,931 studies were selected for evaluation. Up to November 24 2011, 1,664 papers were evaluated (86%) and 1,058 entered authorship analysis (64% of evaluated): systematic reviews with meta-analysis 61%, systematic reviews without meta-analysis 35%, guidelines/position papers 3%, cost-effectiveness and other 1%. Subspecialties: neuro 20%; cardiac 15%; abdominal-gastrointestinal 14%; vascular/interventional 12%; musculoskeletal 9%; breast 6%; thoracic 4%; urogenital 4%; maternal/fetal 4%; pediatrics 3%; head-neck 3%; oncology (general) 3%; and other 4%. For these 1,058 studies, a radiologist or a nuclear medicine (NM) physician resulted as first author in 167 (16%), second author in 162 (15%), last author in 140 (13%). Notably, the number of studies with a radiologist or a NM physician as first, second, or last author was only 231 (22%): about four of five evidence-based secondary papers had no radiologists or NM physicians in a relevant authorship position. Looking at subspecialties for the rate of authorship representation compared to the overall rate, oncology (general), urogenital, head-neck, abdominal-gastrointestinal, and breast resulted relatively over-represented while pediatrics, maternal/fetal, neuro, thoracic resulted relatively under-represented. Considering the large amount of secondary imaging literature examined, imaging specialists, especially radiologists, seem to play a minor role in determining evidence-based studies concerning their own medical field. In other words, indications for diagnostic imaging and interventional procedures are defined by teams mainly composed by other medical figures.

A-312 16:25

State-of-the-art in medical imaging: a dynamic overview of current evidence via modern media

M.G.M. Hunink; *Rotterdam/NL*

Context: Knowledge concerning sensitivity and specificity of medical imaging tests is indispensible for choosing the appropriate imaging technique and interpreting imaging results. The extensive number of publications hampers radiologists and clinicians in their effort to keep their knowledge up-to-date. Objectives: (1) Provide a systematic review of meta-analyses concerning the sensitivities and specificities of MRI, CT, ultrasound, conventional radiography, PET, SPECT, and scintigraphy for a range of clinical indications. (2) Launch a Wikipedia page with an overview of the results. (3) Initiate a collective effort among clinicians and radiologists to keep the review up-to-date. Data Sources: A Pubmed search was performed to identify all meta-analyses published up until March 2011, analyzing the sensitivity and specificity of the 7 imaging modalities. Study Selection: Studies were excluded if (a) the imaging modality played only a marginal role in the analysis, (b) no specific imaging indication was investigated, (c) the journal in which the article was published was not assigned an impact factor in the JCR Science Edition 2010, (d) sensitivity and specificity were not reported, (e) the meta-analysis was superseded by a qualitatively better meta-analysis. Data Extraction: Two independent reviewers extracted year of publication, journal, imaging modality, clinical indication, imaging protocol, study quality assessment, number of original studies, number of patients, substudies, sensitivity, and specificity. Results: The search retrieved 343 publications. After excluding non-eligible studies we reviewed 39 MRI, 43 CT, 53 ultrasound, 9 conventional radiography, 21 PET, 10 SPECT and 16 scintigraphy studies. An exponential increase in number of meta-analyses was found over time. The overview will be available on Wikipedia. Conclusion: We are initiating a collective effort to provide up-to-date information on diagnostic performance of imaging tests in an accessible web-based system.

A-313 16:50

Preoperative breast MRI: Multicenter International Prospective Analysis of individual woman data

R.M. Trimboli; *Milan/IT*

Meta-analyses of studies (mostly nonconsecutive patient series) showed that breast MRI detects otherwise occult ipsilateral and contralateral disease in 11% and 4% of women who had the test, respectively. The ongoing controversy regarding preoperative breast MRI and the balance between potential advantages (reduction in re-operation rate for positive margins and ipsi-/contralateral recurrence) and drawbacks (overdiagnosis/overtreatment) persists given limited evidence. Association of increasing use of preoperative MRI and increased rate of mastectomies has been suggested. Two recent randomized controlled trials did not show advantages from preoperative MRI but have been criticized due to various limitations. Thus, EuroAIM in cooperation with EUSOBI, designed an observational multicenter study which will analyses individual women data: "Preoperative breast MRI multicenter international prospective analysis (MIPA) study". Two concurrent consecutive cohorts of newly diagnosed breast cancer patients defined by receiving/not receiving preoperative breast MRI will be compared matched for age/breast density. Analytical adjustment will be performed for relevant covariates. All involved centers will be high-volume breast imaging/care facilities. We plan to enroll about 2,600 women from 18 to 80 years of age with newly diagnosed breast cancer: 1,300 for the MRI group and 1,300 for the no-MRI group. Rate and type of changed surgical planning in the MRI group will be assessed. Primary outcomes will be rate of primary upfront mastectomy and re-excision rate for positive margins. Secondary outcome will be ipsilateral recurrence rate, contralateral cancer rate, and distant metastasis occurrence during 5-year follow-up.

Discussion 17:15

Sunday, March 4

08:30 – 10:00 **Room A**

GI Tract

RC 1201

CT colonography: three steps to success

A-314 08:30

Chairman's introduction

S.A. Taylor; *London/UK (csytaylor@yahoo.co.uk)*

CT colonography is widely considered as the radiological examination of choice for the large bowel. It has a variety of indications including investigation of symptomatic patients and potentially in screening of asymptomatic individuals. Radiologists undertaking CTC must be well versed in the technical protocol requirements as well as how best to interpret the examination. Furthermore, they must have a thorough understanding of the epidemiology of colorectal neoplasia, so reporting practices are evidence based. This session will guide participants in a stepwise fashion through the pre-requisites to high-quality CTC in 2012. Lectures will discuss how to achieve a high-quality examination, how to interpret the examination and finally consider the requirements for setting up and running a successful CTC service.

A-315 08:35

A. Step 1: bowel prep and distension

A. Laghi; *Latina/IT (andrea.laghi@uniroma[1].it)*

Bowel preparation and colon distention represent two critical steps of CT colonography (CTC) examination. The ideal colonic preparation is still under debate. It is general consensus that patients should undergo a low-residue diet before the examination, and to ingest a cathartic agent the day before. Different cathartic agents are available. In order to improve sensitivity and specificity, "tagging" of residual fluids, in combination with the administration of a cathartic agent, is now routinely used. It consists in the administration, prior to CTC, of water-soluble iodinated contrast medium or alternatively diluted barium sulfate suspension. Since bowel cleansing is consistently the most unpleasant part of colonic examination, minimally-invasive preparation schemes (using mild or no laxatives at all), more comfortable and less demanding for patients, are now available. For reduced bowel preparations the combination with faecal/fluid tagging is mandatory. Gaseous colonic distention is another critical step since collapsed bowel is a frequent cause of missed lesions at CTC. The use of a rectal balloon catheter has been replaced by a thin rubber tube in order to improve patient compliance and to minimise risks of perforation. To further improve Patient comfort, automatic CO2 insufflation represents a possible alternative to room air. The administration of a spasmolytic agent is particularly useful in the case of colonic spasm, typically in sigmoid colon, and in patients with severe diverticular disease. The use of a MDCT scanner is mandatory and dedicated scanning protocols need to take into account radiation exposure, especially in individuals undergoing screening CTC.

Learning Objectives:

1. To become familiar with the options available for bowel preparation, including the use of tagging agents, and to learn three examples of a bowel preparation regimen that 'works'.
2. To learn a step-by-step evidence-based approach to distending the colon (including spasmolytic agents, patient positioning, insufflation technique).
3. To appreciate optimum CTC acquisition parameters.
4. To become familiar with described complications (notably perforation) and how the risk may be minimised.

A-316 08:58

B. Step 2: analysis and how to avoid pitfalls

T. Mang; *Vienna/AT (thomas.mang@meduniwien.ac.at)*

The evaluation of CT colonograpy (CTC) studies is based on detection, interpretation and reporting of colonic findings. It is performed on a workstation equipped with dedicated CTC software by a primary 2D or a primary 3D approach. In either case, the alternative viewing technique must be available for rapid correlation and characterisation of suspicious findings. Primary 2D evaluation is based on "lumen tracking" by interactively scrolling through the axial slices and multiplanar reformatted images, focusing only on the air-distended colonic lumen from one end to the other. Primary 2D evaluation provides information about the attenuation of findings during the search process and is time-efficient. Primary 3D evaluation is based on 3D virtual endoscopy in an antegrade and retrograde direction and increases both, the conspicuity, especially of small- and medium-sized polyps, and the duration of visualisation. The use of advanced 3D displays like virtual dissection or unfolding techniques may reduce the interpretation time for primary 3D evaluation. Colonic findings are characterised by their morphology, by their attenuation characteristics, and by their mobility. Knowledge of CTC imaging features of common colonic lesions and artefacts is necessary for characterisation of findings and to differentiate between definite colonic lesions and pseudo-lesions. Computer-aided detection (CAD) algorithms used as a 2nd reader have shown to reduce the number of perceptual errors by pointing out possible abnormalities that might otherwise be missed. Standardisation of CTC reporting facilitates classification and communication of findings and the comparison with previous studies, thereby better assisting physicians in making appropriate management decisions.

Learning Objectives:

1. To learn about a structured approach how to analyse CT colonography datasets, based on 2D and 3D imaging techniques.
2. To become familiar with common interpretative pitfalls and strategies to avoid them.
3. To emphasise on the role of CAD in CT colonography.
4. To learn how to create a structured CT colonography report.

A-317 09:21

C. Step 3: setting up your service

B. Schaeffer[1], M. Kreis[1], T. Mang[2], A. Graser[1]; [1]*Munich/DE*, [2]*Vienna/AT (Anno.Graser@med.uni-muenchen.de)*

Recent results show that CTC is an accurate test to detect colonic polyps and masses. Although the CMS has declined reimbursement for screening CTC in the United States in 2009, CTC is being used increasingly in the radiologic community. Indications for CTC include examination of elderly and symptomatic patients as well as examination of asymptomatic adults who select CTC as their screening option for colorectal cancer. In the light of a lack of reimbursement certain steps have to be taken to set up a successful CTC service. In many countries, ionizing radiation cannot be used for screening examinations other than mammography. Therefore, radiologists have to be well familiar with radiation exposure considerations in CTC. Also, specialists have to know about indications, contraindications, and pitfalls that have to be followed for succesful CTC. Furthermore, training strategies for CTC interpretation will be discussed; in the beginning, expert double reading is recommended. In this presentation it will be outlined which steps have to be undertaken to set up a succesful CTC program.

Learning Objectives:

1. To appreciate the need for training prior to CTC and understand the role of training courses and double reporting.
2. To become familiar with ways of maximising service efficiency.
3. To appreciate the differences in approach between setting up a service for older symptomatic patients and setting up colorectal cancer screening.
4. To learn how to formulate local polyp reporting guidelines and how best to integrate the service with the needs of local clinicians.
5. To learn a basic audit framework.

Panel discussion:
What exactly do I need to do? 09:44

08:30 – 10:00 **Room B**

Interactive Teaching Session

E³ 1220

Common radiological problems: incidental abdominal masses

A-318 08:30

A. The incidental adrenal mass

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

With the increasing use of abdominal cross-sectional imaging, incidental adrenal masses are being detected more often. The important clinical question is whether these lesions are benign adenomas or malignant primary or secondary masses. Benign adrenal masses such as lipid-rich adenomas, phaeochromocytomas, myelolipomas, adrenal cysts and adrenal haemorrhage have pathognomonic cross-sectional imaging appearances. However, there remains a significant overlap between imaging features of some lipid-poor adenomas and malignant lesions. The nature of incidentally detected adrenal masses can be determined with a high degree of accuracy using computed tomography and magnetic resonance imaging alone. Positron emission tomography is also increasingly used in clinical practice in characterising incidentally detected lesions in patients with cancer. The performance of the established and new techniques in CT, MRI and to a lesser extent PET, that can be used to distinguish benign adenomas and malignant lesions of the adrenal gland will be reviewed.

Learning Objectives:
1. To appreciate the range of adrenal pathology that can present incidentally and recognise their imaging features.
2. To appreciate the need to characterise these lesions in the clinical context of the patient's management.
3. To become familiar with CT and MRI for characterising an incidental adrenal mass.

A-319 09:15

B. Renal mass

M. Prokop; *Nijmegen/NL (M.Prokop@rad.umcn.nl)*

With the increasing use of imaging, incidentally detected renal masses are very common. While masses detected by CT or MR usually can be properly classified, renal masses detected by ultrasound frequently require further workup. The following considerations determine the diagnostic workup: simple cysts are very common but may present atypically. Renal cell carcinomas may be cystic but usually display at least a small solid component. Renal cell carcinomas have a bad prognosis when metastasized but metastases hardly every develop before the tumour has reached 3 cm in diameter. Differentiation between solid tumours by imaging alone is exceedingly difficult, save for the identification of angiomyolipomas in adults. This course will discuss suitable diagnostic algorithms based on the initial presentation of the mass. Typical imaging findings of various benign and malignant renal masses will be presented. The role of the Bosniak classification will be illustrated. Newer developments such as a wait-and-see approach or primary biopsy for small solid renal masses will be discussed.

Learning Objectives:
1. To learn how to detect and characterise a renal mass.
2. To understand how to apply appropriate protocols according to the clinical situation.

08:30 – 10:00 Room C

CLICK (Clinical Lessons for Imaging Core Knowledge): Common Clinical Cases

CC 1218

Focal neurological disorders

Moderator:
M. Golebiowski; Warsaw/PL

A-320 08:30

A. Clinical considerations

D. Balériaux; *Brussels/BE (dbaleri@ulb.ac.be)*

When dealing with "focal neurological disorders", what kind of neuroimaging should we apply and what should be the optimal diagnostic work-up? What pathological condition must be searched for in function of the focal neurological signs? When is imaging playing a vital role? The radiologist must and should remain first of all a Medical Doctor: he/she should keep close contact with the clinical world and always keep an active dialogue with the referring clinician. As medical imaging has become more and more sophisticated and also more expensive, it should not just be a "screening procedure" for brain pathology but should be performed in order to confirm a clinical, suspected diagnosis. The radiologist must answer precise questions about the patient's suspected pathological condition and if necessary, discuss the imaging findings with the clinician in order to narrow the differential diagnosis. Each MRI or CT must be performed with a clear knowledge of the clinical question and the suspected pathology. Symptoms and clinical history may already strongly orient towards lesion location and even the nature of the pathology. Still, similar symptoms may be present in multiple and very diverse pathological conditions such as infectious, neoplastic, haemorrhagic, vascular diseases. Therefore, the radiologist should make the proper choices of imaging techniques, especially with MRI, where imaging sequences have become numerous: by knowing the clinical history, and what the focal neurological disorders are, a good, "clinically conscious" radiologist will undoubtedly be of greater "added value".

Learning Objectives:
1. To learn more about the clinical conditions causing focal neurological symptoms.
2. To be informed about the clinician's way of thinking in the process of differential diagnosis.
3. To become familiar with the potential role of imaging in the establishment of the final diagnosis.

A-321 09:00

B. Imaging techniques and typical findings

G. Rudas; *Budapest/HU (grudas@mrkk.sote.hu)*

Given the vast selection of possible imaging modalities and techniques, it is practically impossible to detail all the imaging techniques and typical findings of Neuroradiology in 25 minutes. It has become clear lately, that except for politrauma patients – where CT is still the first method of choice – MRI is the gold standard for Neuroradiology examinations and thus my talk will focus on MRI. In the first part of the talk I will give a short introduction to the MRI techniques used in the evaluation of focal neurological disorders and discuss their utility and possible pitfalls. In the second part I will highlight some hot topics of diagnostic Neuroradiology, starting with recent changes in diagnostic guidelines, e.g. in acute stroke, where MRI become the first modality of choice. Then I will continue with lesser-known but nevertheless important diseases: the acute disseminated encephalomyelitis (ADEM), the posterior reversible encephalopathy syndrome (PRES) and the neonatal asphyxia. I will detail the up-to-date MRI protocols, the differential diagnostic questions and the possible pitfalls.

Learning Objectives:
1. To learn about the available imaging modalities for the evaluation of patients with focal neurological disorders.
2. To become familiar with the technical imaging considerations and the proper diagnostic algorithm.
3. To know more about the typical imaging findings.

A-322 09:30

also EPOS

C. Interactive case discussion

G. Krumina; *Riga/LV (gaida.krumina@apollo.lv)*

Original clinical cases illustrating the importance of appropriate imaging modalities in the right interpretation of neurological symptoms and evaluation of correct diagnosis are presented. The role of clinical history and disease course are accented. The spectrum of pathologies includes vascular, inflammation, metabolic, degenerative diseases and tumours of the central nervous system. Each case story is described shortly in a standard form followed by demonstration of typical CT and/or MRI images. In some cases conventional MRI is supplemented by MR spectroscopy, DTI and MR tractography images. Follow-up images are presented where appropriate. Several diagnostic options are offered for attendants. The audience will be asked to participate in the diagnostic process by the use of voting pads. After highlighting of final diagnosis the basic differential diagnostic considerations will be summarised and emphasised from the clinical and imaging point of view for each presented case.

Learning Objectives:
1. To review typical cases illustrating the role of imaging modalities in the differential diagnosis of focal neurological symptoms.
2. To get involved in the diagnostic process by the use of electronic voting pads.
3. To understand the conclusion that may be drawn on the basis of the discussed cases.

08:30 – 10:00 **Room D1**

Emergencies in Neuroradiology

CC 1219

Radiological management of traumatic emergencies

Moderator:
D. Goldsher; Haifa/IL

A-323 08:30

A. Maxillofacial trauma

B.F. Schuknecht; *Zurich/CH (image-solution@ggaweb.ch)*

Maxillofacial injuries may occur in isolation or in conjunction with cranio-cerebral trauma. The goal of imaging is to depict the presence, location, and displacement of fractures, to delineate compromise of airways, ocular motility, and dental occlusion and to recognise concomitant skull base and intracranial injury. A concise imaging strategy employs MDCT with thin multiplanar reformations to delineate and classify fractures, to assess stability and to provide a basis for surgical midface restoration. 3D techniques add information in complex fractures and in perception of fracture displacement. In isolated mandibular trauma, panoramex and pa radiographs maintained a certain role, which is challenged by superiority of CT or Digital volume tomography (DVT) for condylar fractures as well. MR in maxillofacial trauma serves as an adjunct to CT in case of injury to cranial nerves, dura, vessels, orbital contents and brain parenchyma. Late complications of maxillofacial trauma related to sinus drainage, ocular motility and dural integrity require a combination of MR and CT as well. Maxillofacial fractures are classified into mandibular, zygomatico-maxillary fractures including LeFort I and II fractures, centrolateral Lefort III fractures and nasoethmoid fractures. Mandibular fractures comprise dento-alveolar, subcondylar, condylar neck and condylar head fractures. Orbital fractures are divided into inferior and medial blowout fractures, orbital trap door and roof fractures. Orbital penetrating injuries are an indication for both CT and MR to recognise the type_organic versus nonorganic_and the location of a foreign body and to depict potential retro-orbital, optic nerve and intracranial brain and vascular involvement.

Learning Objectives:
1. To learn what is the preferred imaging technique.
2. To learn how to report maxillofacial injury and fracture patterns (Le Fort fracture lines).
3. To become familiar with the different types of orbital fractures.
4. To learn how to manage foreign bodies or penetrating objects on imaging.

A-324 09:00

B. Craniocerebral trauma

P.M. Parizel; *Antwerp/BE*

Neuroimaging techniques constitute an essential part of the diagnostic work-up of patients with traumatic brain injury (TBI). In the acute setting, imaging findings determine patient management and influence clinical course. CT remains the first choice technique to determine the presence and extent of injury, and to guide surgical planning. Multi-detector CT allows simultaneous assessment of head and cervical spine, obviating the need for plain radiographs. From a clinical point of view, it is important to understand the difference between primary and secondary TBI. Primary injuries occur as a direct result of the impact with damage to brain tissue. Examples include fractures, different types of traumatic haemorrhage (epidural, subdural, intracerebral, subarachnoid), cerebral contusion, diffuse axonal injury (DAI). CT-angiography is useful to document traumatic blood vessel injury. Whenever there is a discrepancy between the patient's clinical status and imaging findings, MRI is indicated. Secondary brain injuries are caused by systemic factors such as increased intracranial pressure, edema, brain herniation, decreased cerebral blood flow, excitotoxic damage. These lesions can be documented with multiparametric MRI including diffusion, perfusion, and susceptibility-weighted imaging. Diffusion tensor imaging with fractional anisotropy mapping may show microstructural abnormalities in patients with mild TBI, even when traditional MRI sequences appear normal. Neuroimaging also plays a role in the chronic stage of TBI, identifying sequelae, determining prognosis, and guiding rehabilitation. In conclusion, advances in neuroimaging improve our understanding of the pathophysiology of craniocerebral trauma and allow us to detect abnormalities, even in patients with mild TBI, when routine imaging studies appear normal.

Learning Objectives:
1. To become familiar with the different types of traumatic haemorrhage (epidural, subdural, intracerebral, subarachnoid).
2. To understand the difference between primary and secondary traumatic brain lesions.
3. To understand how the brain can be severely damaged in closed head injuries (deceleration trauma, diffuse axonal injuries).

A-325 09:30

C. Spine trauma

A. Cianfoni; *Charleston, SC/US (acianfoni@hotmail.com)*

The role of imaging in acute c-spine trauma is to assess the spinal injury, determine the stability and instability of the injury, evaluate integrity of neural elements, to direct appropriate management, and to predict neurological outcome. A set of clinical and/or amnestic criteria can be very useful in identifying patients who need acute spinal imaging. Underdiagnosis should absolutely be avoided, due to potentially devastating sequelae. Awareness of the strengths and limitations of plain radiography, MDCT and MRI in the diagnosis of spinal injuries is fundamental. Traumatic spinal lesions are represented by fractures, dislocations, ligamentous disruption, disc injury, acute disc herniations, and epidural haematomas, often combined, with variable involvement of neural structures. Fractures and dislocations usually occur based upon a single predominant mechanism of injury. The six major mechanisms of injuries are hyperflexion, simultaneous hyperflexion and rotation, hyperextension, simultaneous hyperextension and rotation, vertical compression or lateral flexion. The cranio-vertebral junction and the mid-lower cervical spine have different anatomy and different pattern of injuries. This lecture will review the role of different imaging modalities clinically used to assess the cervical spine in acute trauma patients and the various injury patterns. Elements of imaging diagnosis in paediatric patients will be presented. Imaging pitfalls will be also discussed.

Learning Objectives:
1. To learn how to image the patient with spine trauma.
2. To understand the role of plain radiographs in spine trauma patients.
3. To learn what is the role of MDCT in spine trauma.
4. To learn what is the role of MRI in spine trauma.

08:30 – 10:00 **Room D2**

Urogenital Imaging

CC 1221

The female pelvis

Moderator:
V. Gazhonova; Moscow/RU

A-326 08:30

A. Diagnosis of endometriosis with imaging

K. Kinkel; *Chêne-Bougeries/CH (karen.kinkel-trugli@wanadoo.fr)*

Endometriosis is defined by ectopic endometrial glands and stroma and sensitive to changes in estrogen leading to peri-menstruel bleeding causing pain and adhesions. Ultrasound is the first imaging method to diagnose endometriosis of the ovary and the bladder. Posterior localisations of endometriosis pelvis include utero-sacral ligaments, the retrocervical region, the posterior vaginal fornix and the recto-sigmoid wall. Those lesions can be diagnosed by trans vaginal ultrasound but include difficulties due to a limited field of view, pain during mobilisation of the probe and absent bowel or vaginal distension. MRI of the pelvis has an excellent sensitivity for all pelvic localisation of endometriosis. Endometrioma is typically hyper-intense at T1 fat-suppressed sequences and of variable signal intensity at T2-weighted imaging. Other localisations are displayed by focal thickening of ligaments/walls or a T2 hypo-intense nodule. Vaginal or bowel wall distention due to ultrasound gel filling, thin slice sections and slice orientation perpendicular to the main direction of the organ helps identification and diagnosis of extent of deep localisations of endometriosis. Intra-venous contrast injection details depths of wall invasion and adnexal mass characterisation. Rare lesion sites such as the abdominal wall, the round ligament, the sciatic nerve or the parametrium can also be detected with MRI. A delayed contrast-enhanced URO-MRI might be useful to display ureteral lesions and the urinary tree. According to lesion localisation, extent and clinical symptoms additional imaging methods might include CT of the abdomen for small bowel endometriosis and hysterosalpingography to check tubal patency in infertility patients.

Learning Objectives:
1. To appreciate the proposed mechanisms of pathogenesis of endometriosis and the relationship with the distribution of disease.
2. To be able to identify the most common imaging findings of endometriosis and to discuss the differential diagnosis.
3. To be familiar with the unusual manifestations and complications of the disease.

A-327 09:00

B. The acute female pelvis

E. Sala; *Cambridge/UK (es220@radiol.cam.ac.uk)*

Imaging plays a crucial role in diagnosis and management of female patients presenting with acute pelvic pain. The combination of transabdominal and transvaginal US is the study of choice for initial evaluation of acute female pelvis. Colour, power and spectral Doppler provide additional information regarding associated vascularity which is of particular importance when evaluating for presence of ovarian torsion. US is very accurate in determining the specific cause of acute pelvic pain; common causes include ovarian cyst rupture, persistent corpus luteum cysts, ectopic pregnancy and endometriosis. US can reliably demonstrate the presence of a pyosalpinx or tubo-ovarian abscess complicating pelvic inflammatory disease. US is the initial modality for evaluating patients with a pelvic mass with or without suspected torsion. It can confirm the presence of the mass, establish its organ of origin and demonstrate its internal consistency (endometrioma versus dermoid versus complex/solid mass) as well as complications such as torsion, rupture, etc. US is also the first imaging modality for assessment of lost intra-uterine coil devices which can present with acute pelvic pain. CT may be performed after US to visualise the full extent of disease in severe cases of tubo-ovarian abscess. It is also indicated if clinical symptoms mimic appendicitis and is very useful in detection of post-operative complications. MRI is a problem-solving modality. It helps differentiate benign processes that necessitate specific immediate therapy from those that can be managed expectantly. This triage is particularly important in pregnant patients presenting with acute pelvic pain or indeterminate pelvic mass.
Learning Objectives:
1. To learn about the role of US as the primary imaging modality in the evaluation of the acute female pelvis.
2. To be able to recognise the added value of CT and MRI in the assessment of acute female pelvis.
3. To understand the role of MRI in evaluation of acute pelvic conditions in pregnant patients.

A-328 09:30

C. Imaging and image-guided therapy of uterine leiomyomas

T.J. 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 symptomatology and burden of disease. Especially the location, size, and number of leiomyomas are important to determine the treatment options of the patient. As a rule, both single and multiple fibroids can be treated by UAE. However, the clinical outcome of UAE does not primarily depend on the number and location of the individual tumours (subserosal, intramural, transmural, submucosal) but the infraction rate of fibroids. 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 is 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 summarises 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 the role of US and MRI prior to image-guided therapy of leiomyoma.
2. To learn typical and atypical MR imaging features of uterine leiomyomas.
3. To understand the basic principles of high-intensity focused US (HIFU) and uterine artery embolisation (UAE), indications and contraindications, advantages and disadvantages.
4. To learn about expected clinical and imaging outcomes after HIFU and UAE.

08:30 – 10:00 **Room E1**

Musculoskeletal

RC 1210

Sports injuries: US or MRI?

A-329 08:30

Chairman's introduction

G.M. Allen; *Oxford/UK (georgina.allen@gtc.ox.ac.uk)*

US and MR are excellent imaging techniques for studying tendons and muscles. During this integrated session we will review the advantages and disadvantages of US and MR for the diagnosis and follow-up of sports injuries. Tricks of both techniques will be addressed, together with some useful guidelines for specific sports injuries. Ultrasound is being used at the pitch side and in sports medicine practice as an adjunct to clinical practice. With this in mind there are a number of questions that will be answered in these talks: 1. when are US and MRI the primary imaging and when are they complimentary? 2. What advances have there been in US and MRI imaging to help advance our use of these techniques in tendon and muscle injury? 3. Should we be aspirating haematomas and using autologous blood injections or PRP to treat tendon or muscle disease? 4. Can we predict the athletes return to sport?

A-330 08:35

A. Muscle and US

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

Muscle imaging is inherently complex and presents unique morphological challenges and continuing integration of dynamic, physiological and functional capabilities as imaging technology progresses. In sports medicine, high-resolution ultrasound (US), which is now available not only in high-end equipments but also in portable machines, has proved to be an excellent tool to evaluate muscle strain and contusion injuries in athletes, providing good correlation with clinical findings. In the acute phase, US has nearly equal sensitivity to MR imaging to diagnose muscle strains, except in the first few hours after the injury, when fresh haemorrhage and oedema have similar echogenicity to normal muscle and strains may go unnoticed. Later in the process, US has been shown to be a useful tool in assessing the sequential stages of muscle repair. Local complications, such as vein thrombosis, irritation of adjacent neurovascular bundles, chronic haematoma and myositic ossificans can be demonstrated with this technique as well. However, US tends to underestimate the extent of injury and the abnormalities seen disappear more quickly when compared with MR imaging. At least in elite athletes, MR imaging seems, therefore, to play a more significant role in management of muscle injury, particularly when decisions regarding the time at which the patient can return to play are needed. By contrast, US is quicker, more accessible and cheaper than MR imaging. In most clinical settings, US should be regarded as the first-line imaging choice for assessing skeletal muscle injury.
Learning Objectives:
1. To understand the mechanism of injury of muscles in athletes.
2. To understand the role of US in the diagnosis of muscle injuries.
3. To recognise the imaging pattern of abnormalities in athletes.
4. To understand how US might be used for diagnosis and follow-up in the management of sports injuries.

A-331 08:58

B. Tendon and US

A. Klauser; *Innsbruck/AT (andrea.klauser@i-med.ac.at)*

Sports activity can affect tendons due to chronic overuse or acute injury. Both can result in complete tendon rupture. US is helpful not only in precise assessment of rupture severity and extent, but also in assessment of tendon degeneration, where rupture of individual collagen fibres stimulates a chronic cycle of reparative response caused due to repetitive microtrauma. In chronic tendinopathy histopathological changes, such as hypoxic, mucoid, calcifying, or lipoid degenerations are present. US enables differentiation of partial tears, tendinosis, tenosynovitis or paratendinosis because of active and passive dynamic examination possibilities and high-resolution capability when using high-frequency probes. US developments as power Doppler US, sonoelastography and contrast-enhanced US allow further new insights into tendinopathy. With the use of US, tendon changes can be diagnosed before they become symptomatic and a reduction of tendon load and initiation of treatment before the condition becomes chronic seem to gain important place in therapeutic regimes. Furthermore, US-guided therapies are advisable over blinded-guided injections to minimise side effects and to allow an accurate targeted therapeutic approach.

Learning Objectives:
1. To understand the mechanism of injury of tendons in athletes.
2. To understand the role of US in the diagnosis of tendon injuries.
3. To recognise imaging patterns of abnormalities in athletes.
4. To understand how US might be useful for diagnosis and follow-up in the management of tendon injuries.

A-332 09:21

C. Muscle and tendon by MRI

U. Aydingoz; *Ankara/TR (uaydingo@hacettepe.edu.tr)*

MRI is an excellent tool in depicting sports-related muscle and tendon injuries. Most sports-related muscle injuries are located in the lower extremities and some are quite deep-seated, thereby somewhat harder for US to show. Another advantage of MRI over US in this setting is that concomitant bone injury is readily displayed. US is admittedly a high-resolution, well-tolerated and readily available tool for musculoskeletal soft tissue injuries. On the other hand, considerable expertise is needed for musculoskeletal US, which is also quite time consuming. During the time needed for a single musculoskeletal US to be performed and reported by an expert musculoskeletal radiologist, several MRI studies may well be reported. Overall, considering reimbursement constraints, „fee-for-service" healthcare systems favour MRI over US for evaluating sports-related musculoskeletal injuries. Myositis ossificans, which is usually readily displayed by plain radiographs, is a caveat in MRI of the muscles, may be overlooked or mistaken for more sinister conditions, and is a case in point highlighting the need for evaluating musculoskeletal MRI exams along with plain radiographs. Muscle herniations are better depicted by US, given dynamic imaging capabilities of this modality.

Learning Objectives:
1. To understand the specific role of MRI in the evaluation of muscle and tendon injuries in athletes.
2. To recognise imaging patterns of tendon abnormalities in athletes: acute and over-use injuries.
3. To learn about the different mechanisms of muscle injuries: direct and indirect.
4. To understand how MRI might be used in the management of athletes.

Panel discussion:
What is the best imaging modality for diagnosing sports injuries? 09:44

08:30 – 10:00 **Room E2**

Oncologic Imaging

RC 1216
Lymph node imaging: where are we now?

A-333 08:30

Chairman's introduction

R.G.H. Beets-Tan; *Maastricht/NL (r.beets.tan@mumc.nl)*

Positive lymph node status is an important predictor for a poor prognosis. Accurate nodal staging often influences the choice of treatment and outcome of these patients. However, detection of nodal infiltration by non-invasive imaging has been challenging and to date FNA or biopsy has remained important to dictate treatment. Nowadays, the combination of morphological and functional or metabolic information with modern imaging technology offers us new perspectives. In this session we will learn about the present status of lymph node imaging using new generation CT, MRI or PET and become familiar with the strength and weaknesses of each.

A-334 08:35

A. The current criteria for nodal involvement on CT/MRI

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

Lymph node involvement in metastatic spreading and benign lymph node enlargement are common in a variety of diseases. Thus, lymph node characterisation is an important issue. It is based on size (short axis diameter) and morphologic criteria such as shape, homogeneity and contrast enhancement. For abdominal nodes, location-specific size criteria apply (upper limit of normal: lower paraaortic 11 mm, upper paraaortic 9 mm, gastrohepatic ligament 8 mm, portocaval space 10 mm, retrocrural space 6 mm; pelvic nodes 10 mm). In chest CT, an upper limit of normal of 10 mm is universally applied. However, size criteria alone are unreliable: CT for lung cancer staging has a pooled sensitivity of 51% (i.e., false-negative diagnoses of metastatic deposits in nodes < 10 mm), and a specificity of 86% (i.e., false-positive diagnoses due to enlarged benign nodes). With MRI the same size criteria apply. However, additionally, imaging features such as central necrosis on T2w fatsat or gadolinium-enhanced images are suggestive of metastasis (or suppurative infection). Lymph node-specific USPIO MR agents can depict tumour deposits in subcentimeter pelvic nodes. Unfortunately, they did not receive market approval. DWI is helpful in identifying in lymph nodes as they exhibit high SI with higher b-values. However, diffusion pattern of benign and malignant nodes overlap, so that measurement of ADC values do not aid in characterisation. Despite the use of modern MDCT and MRI techniques, lymph node characterisation needs further improvement.

Learning Objectives:
1. To be familiar with the current criteria.
2. To learn the imaging features that are highly specific to nodal disease.
3. To understand the diagnostic performance of cross-sectional imaging.

A-335 08:58

B. MRI techniques: what do they contribute?

H.C. Thoeny; *Berne/CH (harriet.thoeny@insel.ch)*

Up to date lymph node staging is based on size and shape criteria only; however, micrometastases can also be present in normal sized lymph nodes and nodes can be enlarged due to inflammatory changes. New contrast agents in MRI such as ultrasmall particles of iron oxide have substantially improved the diagnostic accuracy of lymph node staging compared with conventional MRI. Unfortunately, USPIO is not commercially available and therefore new approaches to differentiate benign from malignant lymph nodes are required. Diffusion-weighted MRI (DWI) is a noninvasive method that provides microstructural information on the underlying tissue. Up to date several studies mainly in the pelvis have shown promising results to detect lymph nodes and also to allow differentiation between benign and malignant nodes with reported sensitivities of 79-87% and specificities of 74-93% based on the underlying mean apparent diffusion coefficient (ADC) value. In these studies any size of lymph nodes has been included with the smallest short axis diameter of 5 mm. There is an overlap between ADC values of benign and malignant nodes; therefore, further studies with histopathological correlation are needed to reduce the high rate of false-positive nodes. Combination of USPIO and DWI might facilitate and improve lymph node staging in the future provided that USPIO will be available.

Learning Objectives:
1. To understand the principles of DWI of nodes.
2. To be able to recognise the imaging appearance of nodes on diffusion weighted MRI.
3. To be introduced to the studies evaluating the diagnostic performance of diffusion weighted MRI.

A-336 09:21

C. Nuclear medicine: PET and other techniques

W. Weber; *Freiburg/DE (wolfgang.weber@uniklinik-freiburg.de)*

Currently, nuclear medicine uses sentinel node scintigraphy and PET with the glucose analogue fluorodeoxyglucose (FDG-PET) to detect lymph node metastases. Sentinel node scintigraphy images the lymphatic drainage of a tumour. A radiolabelled colloid is injected at the site of the tumour and the drainage of the colloid to the regional lymph node is imaged with a gamma camera. Intraoperatively, lymph nodes are identified with a handheld gamma probe. Lymph nodes that have accumulated the radiolabelled colloid are resected and analysed histopathologically. Randomised studies have shown that in patient with breast cancer sentinel node biopsy significantly reduces the rate of complications as compared with systematic axillary dissection. Conversely, the risk for axillary recurrence is not increased. FDG-PET imaging can detect metastases in lymph nodes that are not pathologically enlarged. Furthermore, many unspecifically enlarged lymph nodes do not demonstrate increased FDG uptake. However, it is important to note that false-negative cases can occur in very small lymph node metastases, in mostly necrotic lymph node metastases or in tumour types with low metabolic activity. False-positive findings occur in active inflammation. Despite these limitations, studies have clearly documented that FDG PET significantly improves the accuracy of lymph node staging in several malignant tumours. In non-small cell lung cancer randomised trials have shown that FDG-PET significantly improves patient management by avoiding unnecessary surgery. Ongoing preclinical and initial clinical studies evaluate radiolabelled amino acid analogues that are potentially

more tumour specific than FDG. Furthermore, tracers that image tumour-induced lymph angiogenesis are being developed.
Learning Objectives:
1. To become familiar with which tumours are typically FDG-avid.
2. To understand the factors that contribute to the diagnostic performance of FDG-PET.
3. To be introduced to other nuclear medicine imaging techniques for lymph node imaging.

Panel discussion:
When and how will imaging make diagnostic biopsy unnecessary? 09:44

08:30 – 10:00 **Room F1**

Special Focus Session

SF 12
Radiology on the road: working when you are away from home

A-337 08:30
Chairman's introduction
L. Donoso; *Barcelona/ES (ldonoso@clinic.ub.es)*

Telemedicine is an increasingly important element in health care management. In fact, in the past 10 years, teleradiology has been consolidated for the provision of radiology services and has proven effective in different scenarios. In this session, we review the current role of teleradiology in the diagnostic process and try to predict likely changes in the coming years in Europe. We anticipate significant changes from the organisational point of view, with the emergence of distributed imaging departments and/or collaborative networks of radiologists, as well as technological developments that will enable visualisation in new mobile devices. All these changes will have legal implications.
Session Objectives:
1. To appreciate the implications of teleradiology in healthcare management.
2. To become familiar with different scenarios where teleradiology is used.
3. To understand the importance of proper workflow management.
4. To learn about the e-health regulatory initiatives at the European level.

A-338 08:35
Teleradiology in 2012: growing or shrinking in importance
E.R. Ranschaert; *,s-Hertogenbosch/NL (ranschaert@telenet.be)*

In Europe a clear evolution has taken place regarding the implementation of various teleradiology scenarios. Not only the difficulties and risks but also the advantages of using teleradiology will be addressed, based upon the experience of a decade with this technique. An attempt will be made to predict a future role of teleradiology in Europe.
Learning Objectives:
1. To understand the current role of teleradiology in the diagnostic process.
2. To review different teleradiology scenarios.
3. To be aware of problems encountered with intensive use of teleradiology.
4. To anticipate the changes due to telemedicine in radiology departments.

A-339 08:58
Use of PDAs and other hand held devices in radiology: beyond the head?
O. Ratib; *Geneva/CH (osman.ratib@hcuge.ch)*

Mobile devices such as smart phones and touch screen tablets have taken the market by storm and are becoming major players in medical informatics providing convenient solution for physicians on the move. The resolution and processing power of these devices allow nowadays displaying medical images with sufficient resolution for image review and analysis in clinical practice. While they may not be adequate for routine diagnostic tasks they provide a convenient mobile solution for on-call and remote consultations. There are, however, different types of software solutions that can be implemented for such tasks. Two major different design are (1) online web-based applications where the device serves as a "thin-client" to display images rendered and manipulated on a remote computer and (2) local applications that reside on the mobile device and can run independently after images have been downloaded on the device. The first solution requires the user to be constantly connected to the network to be able to display and manipulate images, while the second solution can continue to function after disconnecting from the network. The advantages of these two solutions will be reviewed and existing functioning examples will be presented and discussed. Additional considerations regarding patient confidentiality and data security are also important aspects of mobile device applications that need to be secured. It is, however, undeniable that portable devices will become a major component of our life and will significantly change workflow and clinical practice. Examples of clinical applications and use of portable devices will be presented and discussed.
Learning Objectives:
1. To become familiar with recent developments in mobile computing.
2. To understand the technical aspects of secure data communication techniques.
3. To be aware of the technical and workflow aspects.
4. To review practical examples of new technical solutions.

A-340 09:21
Legal issues of teleradiology and portable reporting
R. FitzGerald; *Wolverhampton/UK (richardfitzgerald@nhs.net)*

A legislative proposal to modernise the EU Professional Qualifications Directive is planned for December 2011. Its likely adoption is expected in 2013 with implementation by Member States after that. The revised Directive should include provisions for comprehensive medical regulation of all those who provide telemedicine services for patients in EU Member States, identical to those applied for those in use for non-electronic healthcare provision. The issue of ghost teleradiology reporting needs to be addressed. The European Society of Radiology has requested that the revised directive increase the minimum duration of training in Radiology from 4 to 5 years. The ESR has made clear to the European Commission the need for formal EU recognition of European diplomas, e.g. the European Diploma of Radiology, as a supplemental proof of fitness to practice. Many consider the wording of the current directive on language skills is too weak and compromises patient safety. The modernised directive may include provisions on demonstration of competence, and continuing professional development. The current lack of legal duty on EU Medical regulators to proactively share registration and fitness to practice information needs to be addressed. The revised directive may establish European Professional Cards for each speciality. Teleradiologists need to be aware of medico-legal vulnerability if they work excessive hours, report too fast, and/or do not review previous relevant imaging. Interrogation of electronic patient data of some patients may become the accepted standard of care in radiology in the next few years.
Learning Objectives:
1. To be updated on current European medical regulation of teleradiologists.
2. To be prepared about changes in the next five years.
3. To review legal precedents.
4. To understand how to avoid litigation in teleradiology.

Panel discussion:
How will we be viewing images in 20 years' time? 09:44

08:30 – 10:00 **Room F2**

Breast

RC 1202
Breast interventions: from diagnosis to treatment
Moderator:
S.H. Heywang-Köbrunner; Munich/DE

A-341 08:30
A. Practical tips for a successful needle biopsy procedure
L.J. Pina Insausti; *Pamplona/ES (ljpina@unav.es)*

Breast interventional procedures are performed using Ultrasound (US), Stereotaxis (Stx) or Magnetic Resonance (MR) guidance. US is the most widely used guidance and the preferred one for lesions that can be detected on US. In fact, US should be performed for all suspicious lesions detected on mammography, MR (second look) or even palpation. In this lecture several tricks to perform a biopsy will be shown: how the local anaesthesia can be injected under US guidance to move a lesion to a more convenient location, tricks to perform a biopsy of a skin lesion or a very deep seated lesion close to the chest wall, tricks to perform a biopsy under stereotactic guidance in posterior lesions or in very thin breasts and tricks to optimise the biopsies under MR guidance.
Learning Objectives:
1. To consolidate knowledge of needle selection for successful biopsies.
2. To understand the guidance technique for successful biopsies.
3. To learn about possible solutions to increase accuracy in needle biopsies.

A-342 09:00

B. Underestimation of disease in needle biopsies

S.C.E. Diepstraten, H.M. Verkooijen, M.A.A.J. van den Bosch; *Utrecht/NL*

Breast biopsy has developed from an open surgical to an image-guided, minimally invasive approach. Two large prospective studies, COBRA and COBRA 2000, have shown that large core needle biopsy (LCNB) is less costly and better tolerated by the patient than open surgical biopsy, while still achieving high diagnostic accuracy, i.e. 98%. A disadvantage of minimally invasive breast biopsy is malignancy underestimation, defined as less severe pathology in the biopsy specimen than in the subsequent surgical excision specimen. Consequently, these patients might receive insufficient treatment or need to undergo additional surgery. Improvement of breast biopsy methods to reduce malignancy underestimation is ongoing. Vacuum-assisted large core needle biopsy (VACNB) enables removal of larger tissue volumes from the target region with a single needle insertion. A recently introduced biopsy method, the Breast Lesion Excision System (BLES), allows image-guided, percutaneous removal of an intact lump of the target lesion. Malignancy underestimation in breast biopsy specimens is addressed in two recent meta-analyses. Brennan et al. report pooled DCIS underestimation rates of 30.3% for LCNB and 18.9% for VACNB. Specifically for stereotactic breast biopsy, Bruening et al. report pooled DCIS underestimation rates of 24.4% (LCNB) and 13.0% (VACNB), and pooled high-risk underestimation rates of 43.5% (LCNB) and 21.7% (VACNB). Reported DCIS underestimation rates for BLES vary from 3.2% to 21.3%, and high-risk underestimation rates from 0% to 9.4%. In conclusion, malignancy underestimation is an important issue in minimally invasive breast biopsy. With BLES, further reduction of underestimation rates may be realised.

Learning Objectives:
1. To realise the risk of a false negative result in needle biopsies.
2. To understand the performance standards needed to minimise the risk of underestimation.
3. To be aware of the importance of radiologic-pathologic correlation prior to definite diagnosis.

A-343 09:30

C. New developments: therapeutic interventional procedures

G. Manenti; *Rome/IT (guggi@tiscali.it)*

Breast cancer management has been evolving toward minimally invasive approaches. With the improvements in imaging techniques that have allowed the earlier detection of smaller breast cancers and the desire for improvements in cosmetic outcome, a number of minimally invasive techniques for the treatment of early stage breast cancers are being investigated. Breast conservation therapy has become the treatment standard for early-stage breast cancer. The next challenge is to treat primary tumors without surgery. For this purpose, several new minimally invasive procedures, including radiofrequency ablation, cryotherapy, interstitial laser ablation, microwave ablation, focused ultrasound ablation and percutaneous tumor excision, are currently under development and may offer effective tumor management and provide treatment options that are psychologically and cosmetically more acceptable to the patients than are traditional surgical therapies. In this course, we give an overview of minimally invasive approaches for the therapeutic management of benign breast lumps and early-stage breast cancer. It is cautiously optimistic that these therapies can be used as a routine adjunct in the treatment of selected breast cancers. The challenge will lie in the ability to identify multifocal disease and in situ carcinoma as well as to ensure complete and effective eradication of the breast cancer. Actually, breast conserving surgery remains the standard of care for breast malignancies and additional research is needed to determine the efficacy of these techniques when they are used as the sole therapy and to determine the long-term local recurrence rates and survival associated with these treatment strategies.

Learning Objectives:
1. To learn about current therapeutic interventional procedures for malignant lesions.
2. To learn about current therapeutic interventional procedures for benign lesions.
3. To learn about the possible role of therapeutic interventions in the future.

08:30 – 10:00 Room G/H

Genitourinary

RC 1207

How I report

Moderator:
D. Negru; Iasi/RO

A-344 08:30

A. Female pelvis MRI

C. Del Frate; *San Daniele del Friuli/IT (iaiacdf@hotmail.com)*

For MR imaging optimisation for ultimate reporting, the radiologist needs to not only understand pelvic MR imaging but also be aware of what the surgeons / oncologists / radiotherapists need to know to plan the correct therapy. The MR imaging report should start with clinical information and requirements, followed by the technique used. Patients with uterine and cervical cancer undergo MR imaging after diagnosis for staging purposes. MR imaging may detect accurate findings regarding the T and the N stage. The report should be focused on this findings and the radiologist should give an estimation of stage. Patients with adnexal masses undergo MR imaging for characterisation purposes. MR imaging findings need to be correlated with clinical information and blood tests to be as accurate as possible. The report should be focused on the features of the adnexal mass and offer a possible diagnosis to the clinician.

Learning Objectives:
1. To learn the tips for MR imaging optimisation for ultimate reporting.
2. To learn what should be reported in uterine and cervical cancer staging.
3. To learn what should be reported in adnexal masses.

A-345 09:00

B. Prostate MRI

J.J. Fütterer; *Nijmegen/NL (j.futterer@rad.umcn.nl)*

In this presentation a standardised reporting system for multiparametric prostate MRI examinations will be presented. Furthermore, the imaging assessment of prostate cancer, with emphasis on information useful for surgical and focal treatment planning, will be discussed. Emphasis will be placed on functional MR imaging techniques in conjunction with clinical staging nomograms and tumour localisation. The major teaching points of this exhibit are knowledge of the role of multi-parametric MR imaging in the detection, localisation, and characterisation of prostate cancer. Knowledge of standardised reports will enable us to overcome current limitations in communication with the referring physicians.

Learning Objectives:
1. To learn tips for MR imaging optimisation for ultimate reporting.
2. To learn the most essential points and details to be reported in prostate cancer patients.
3. To understand the major weaknesses of a prostate MR report.

A-346 09:30

C. CT urography

N.C. Cowan; *Oxford/UK*

Technological advances in computed tomography (CT) have improved the diagnostic imaging of the urinary tract, surpassing ultrasound and the intravenous urogram. CT urography 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. In adults, CT urography is now the preferred initial examination for patients with haematuria at high risk for upper urinary tract urothelial cell cancer (UUT-UCC). A practical method for risk stratification will be discussed. Technical aspects of image acquisition and processing will be explored and technical tips relating to protocol design given to optimise CT urography for ultimate reporting. The principal reason for the existence of CT urography is for diagnosing UUT-UCC. Examples of the typical and atypical upper urinary tract urothelial tumours and bladder cancers will be demonstrated. A method for reporting CT urography will be demonstrated. For patients with haematuria, early and accurate diagnosis helps optimise prognosis but conventional investigative pathways are complicated and lengthy, utilising multiple imaging tests and many diagnostic algorithms exist without rigorous evaluation. CT urography offers a single imaging test of high diagnostic accuracy with the potential to replace multiple alternative imaging tests in the diagnostic pathway, improve patient experience, improve diagnostic performance and accelerate diagnosis. A system for imaging haematuria involving use of

CT urography, unenhanced CT of the kidneys, ureters and bladder, urinary tract ultrasound and cystoscopy will be proposed.

Learning Objectives:
1. To learn how to optimise CT urography for ultimate reporting.
2. To learn how to perform and report CT urography in the clinical setting of possible urothelial cancer.
3. To learn how to perform and report CT urography in the clinical setting of haematuria.

08:30 – 10:00 **Room I/K**

Chest

RC 1204
When CT sees both the heart and the lungs

A-347 08:30
Chairman's introduction
M. Rémy-Jardin; *Lille/FR (martine.remy@chru-lille.fr)*

Before the advent of fast-scanning multidetector-row CT (MDCT) technology, thoracic CT studies were exclusively used for the morphological assessment of thoracic organs but concurrent examination of the heart has traditionally been hampered by image degradation from cardiac motion artefact. The introduction of fast rotation speed and dedicated cardiac reconstruction algorithms exploiting the multislice acquisition scheme of the data has opened new possibilities for chest imaging, starting with the possibility to integrate cardiac functional information into a diagnostic CT scan of the chest. Initiated with 16-slice MDCT, this concept of integrating morphology and function has been further simplified with 64-slice and dual-source CT scanners, thus allowing the radiologists to provide vital information in the management of patients with a wide variety of acute or chronic respiratory disorders. Because this CT technology offers the possibility of generating high-resolution and motion-free images of the coronary arteries, evaluation of the coronary arteries during CT examinations of the chest should further widen the clinical applications of CT for respiratory patients, keeping in mind that cigarette smoking is a shared risk factor for both impaired lung function and cardiovascular events. The purpose of this session is to review practical aspects of this new concept in thoracic imaging.

A-348 08:35
A. Anatomic cardiac details that every radiologist should know
J. Bremerich; *Basle/CH (jbremerich@uhbs.ch)*

Increasing temporal, contrast and spatial resolution of modern imaging techniques is paralleled by improved conspicuity of cardiac structures, even when examinations are not focused to the heart. This requires thorough knowledge of cardiac anatomy which is crucial for all Radiologists in order to identify relevant pathology and to avoid overcalling normal anatomy or normal variants resembling pathology. Systematic review of cardiac structures is required on all plain or cross-sectional images of the thorax. Detailed assessment may require reconstruction in specific planes similar to echocardiography or along coronary arteries for further analysis. Knowledge of cardiac anatomy enables identification of pathology such as thrombi, infarcts, aberrant coronary arteries, masses and ventricular enlargement or hypertrophy. On the other hand such knowledge is required to avoid overcalling of normal structures such as the crista terminalis as mass or pericardial recessus as lymphadenopathy. Moreover, it is important to identify variants of coronary anatomy and to distinguish benign from malignant variants. Thorough knowledge of cardiac anatomy and systematic review of all cardiac structures on plain and cross-sectional images of the thorax is relevant to identify pathology and to distinguish pathology from normal anatomy and normal variants.

Learning Objectives:
1. To learn more about cardiac anatomy and anomalies.
2. To review the clinical relevance of cardiac details: what has to be reported?
3. To become familiar with the interaction between anatomic details of heart and lung.

A-349 08:58
B. Incidental findings and their clinical relevance
J.D. Dodd; *Dublin/IE*

The main outline of this talk will cover cardiac incidental findings, pulmonary findings in heart failure and the cardiopulmonary findings associated with smoking. Several cardiomyopathies will be reviewed such as ischaemic cardiomyopathy and hypertropic cardiomyopathy, including their appearance on regular chest CT. Several valve disease entities such as mitral valve stenosis and prolapse, heavily calcified aortic valve disease/stenosis, bicuspid aortic valves and infective endocarditis will also be reviewed on regular chest CT. Several different types of cardiac shunts such as ASD, VSD, PAPVR-with sinus venosus ASD and interatrial septal aneurysm will also be discussed and their appearance evaluated on routine chest CT. A spectrum of coronary anomalies/fistulas that may be detected on standard chest CT will be discussed. The talk will also review the typical pulmonary changes seen in heart failure, both in the lung parenchyma and the heart and its vessels. Finally, the cardiopulmonary manifestations of smoking will be discussed including the appearances and implications of coronary artery disease.

Learning Objectives:
1. To learn about incidental cardiac findings to be reported on a regular chest CT.
2. To review typical pulmonary findings in heart failure.
3. To review typical cardiopulmonary findings associated with smoking.

A-350 09:21
C. Pulmonary hypertension and right ventricle function
K.-F. Kreitner; *Mainz/DE (kreitner@radiologie.klinik.uni-mainz.de)*

The causes of pulmonary hypertension (PH) are diverse and include a wide variety of diseases. There is increasing recognition that PH is---besides acute and chronic thromboembolism---associated with diseases such as connective tissue disease, COPD and interstitial lung disease. Emphysema is visualised by a decrease in mean lung density; the characteristic findings of fibrotic changes include honeycombing, reticular opacities, ground-glass attenuation, and traction bronchiectasis and architectural distortion. Both changes go along with chronic, progressive hypoxia leading to hypoxic vasoconstriction of the peripheral pulmonary arteries as well as parenchymal destruction. The introduction of fast rotation speed and dedicated cardiac reconstruction algorithms has opened new possibilities for thoracic imaging: besides the better delineation of peripheral pulmonary arteries; there is the possibility of integrating cardiac functional information into a diagnostic CT scan of the chest. Assessment of right ventricular function and analysis of the distensibility of the right pulmonary artery provide insights not only of right heart imapairment but also enable recognition of patients with elevated pulmonary arterial pressures. Furthermore, it is possible to assess the severity of coronary artery disease to determine left vetricular function parameters as well as to depict the sequelae of ischaemic heart disease such as postinfarct aneurysms or wall-thinning due to myocardial infarction. Last but not least, imaging of lung perfusion either by using colour-coded maps of lung density without or without subtraction technique or using dual energy imaging will further widen the clinical applications of thoracic CT.

Learning Objectives:
1. To learn about the different etiologies of pulmonary hypertension and their specific imaging findings.
2. To learn about a comprehensive concept for imaging and reporting pulmonary hypertension.
3. To become familiar with the dedicated evaluation of right heart function.

Panel discussion:
Ready for routine reporting of cardiovascular findings on CT scans of the chest? 09:44

08:30 – 10:00 **Room L/M**

Physics in Radiology

RC 1213
Diagnostic radiology and pregnancy

Moderators:
H. Ringertz; Linköping/SE
W.J.M. van der Putten; Galway/IE

A-351 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.

Sunday

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 13 to about 31 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 CT 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/foetus from diagnostic x-ray examinations.

A-352 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/foetus 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 taking history 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/foetus. 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 understand the role of imaging modalities in the evaluation of pregnant patients.

A-353 09:30

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 foetus when magnetic resonance imaging (MRI) is used. MRI uses three main components to produce images from inside the body: a static magnetic field; a pulsed radio-frequency (RF) field and time-varying gradient electromagnetic field. 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 is also a wide range of options for gradient strengths and slew rates to be considered as well. The overall exposure for the foetus depends ultimately on the imaging sequence used and the area being scanned. 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 foetal exposure in MRI will also be discussed including the following situations: the patient may not be aware that she is pregnant, likely to be in the first trimester; the mother is referred for direct foetal imaging after ultrasound (normally second or third 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 foetus during MR imaging will be discussed.

Learning Objectives:
1. To understand the risks to the foetus in MRI from static and time-varying magnetic fields, with particular reference to the radiofrequency field.
2. To be informed about the exposure of the foetus to noise during MRI.
3. To understand how to minimise the exposure of the foetus during MR imaging.

08:30 – 10:00 Room N/O

Interventional Radiology

RC 1209

Expanding the role of interventional radiology in hepatocellular carcinoma

A-354 08:30

Chairman's introduction

G. Maleux; *Leuven/BE (Geert.Maleux@uzleuven.be)*

Although surgery, including hepatic segmentectomy, hemihepatectomy and orthotopic liver transplantation, remains the only curative treatment option for patients suffering from hepatocellular carcinoma (HCC), locoregional interventional procedures increasingly play an important role in the preoperative and palliative management (and potentially even in the curative management) of HCC. First, the technique and clinical value of portal vein embolisation prior to hemihepatectomy will be discussed. Next, the role of radiofrequency (RF) ablation and other, new ablative interventional technologies will be highlighted for the palliative and potentially also for the curative treatment of HCC. Finally, an overview of different transcatheter procedures will be given, including bland and chemo-embolisation with or without drug-eluting beads as well as Y90-radioembolisation, to target HCC lesions. Results of technical and clinical outcome will be discussed as well as the potential of combination therapies.

A-355 08:35

A. RF ablation

V. Válek; *Brno/CZ (vlvalek@med.muni.cz)*

RFA is recommended as a technique for the treatment of early stage (Child A or B, solitary HCC or up to 3 nodules < 3 cm in size) HCC. The best outcomes have been reported in Child-Pugh A patients with small single tumour, commonly less than 2 cm in diameter. When the patient is considered inoperable, RFA can be indicated also in huge tumours, even in combination with other procedures. RF is coagulation induction from electromagnetic energy sources with frequencies less than 30 MHz For tumour ablation purposes the frequency is usually in the 375-500 kHz range. Even if there exist optimistic data concerning survival of the patients with HCC treated by RFA, RFA is "only" palliation with therapeutic potential. After correctly indicating and performing RFA we can expect 5-yr survival in 40-70% and curative treatments in 30% patients. Major complications after percutaneous ablation such as severe pain, neoplastic seeding, intrahepatic abscesses, intestinal perforation, pleural effusion and peritoneal bleeding after RFA have been reported in up to 6% of patients and mortality related to RFA up to 0.3%. The most common complications are abdominal haemorrhage, abscess, biliary tract damage, liver failure, pulmonary complications and ground pad burns. Follow-up imaging studies should be aimed at detecting local tumour progression, the development of new hepatic lesions, or the emergence of extra hepatic disease. A recommended follow-up protocol includes CT or MR examinations at 3-, 6-, 9-, and 12 months after the treatment and at 6-month intervals thereafter for the subsequent 3 years.

Learning Objectives:
1. To understand indications for RF ablation.
2. To learn about the technique and devices for RF ablation.
3. To learn about results, complications and follow-up strategies.

A-356 08:58

B. Intra-arterial procedures

F. Orsi; *Milan/IT (franco.orsi@ieo.it)*

While resection and ablation are still the gold-standard for curative local treatment of the early stage HCC, several effective intra arterial procedures have been developed for advanced HCC stage. There is still no consensus on the best intra arterial local therapy; however, it offers great promise based upon the premise that HCC are fed mainly, if not exclusively, by arteries. Bland embolisation, chemoembolisation and radio-embolisation are some of the most common local treatments for patients with HCC and several embolic agents have been specifically developed for that purpose. Both TACE and TAE may shut-down the arterial blood flow to the tumour, leading for tumour ischaemia and, eventually, tumour 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 (DEB-TACE= Drug Eluting Beads TACE). For Radioembolisation, 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 tumours are supplied by several arterial feeders, complete tumour death may be obtained only if the entire vascular network supplying the tumour is treated. If even small feeding arteries are be missed, tumour 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 be familiar with the indications for intra-arterial treatment of HCC.
2. To learn the techniques of intra-arterial treatment (TACE, DC beads TACE, radioembolisation).
3. To learn about results, complications and follow-up strategies.

A-357 09:21

C. Portal vein embolisation before surgery

T.J. Cleveland; *Sheffield/UK (trevor.cleveland@sth.nhs.uk)*

Surgical resection remains one of the few treatments considered to be “curative” for malignancy contained within the liver (both primary and secondary). For resection to be effective all of the segments containing tumour must be removed. For a patient to survive such a procedure the remaining hepatic function must be sufficient to sustain life. In some circumstances so much of the liver is removed that the remaining segments are too small (or they were small in the first place). Pre-operative portal vein embolisation (POPE) is designed to stimulate enlargement in the segments that are intended to remain, so that when the cancer is removed, survival is improved. POPE is a technique where the portal venous supply to the diseased segments is blocked, so that growth factors are diverted to the healthy segments. Over a period of 4-6 weeks prior to surgery, these segments enlarge so that the diseased segments can be removed more safely. POPE is performed percutaneously, and a variety of embolic materials are used to occlude, usually the right portal vein. After POPE the liver is scanned to assess for hypertrophy of the healthy segments, and surgery scheduled to coincide with enlargement but before time has elapsed which would allow for tumour progression (local or distant). Surgery can usually be planned for 4-6 weeks after POPE (this time may vary depending upon factors such as the presence of cirrhosis and diabetes).

Learning Objectives:

1. To learn about imaging strategies and indications for embolisation.
2. To learn about embolisation methods.
3. To learn about results, complications and follow-up strategies.

Panel discussion:
How to select the ideal treatment in a patient with HCC 09:44

08:30 – 10:00 Room P

Radiographers

RC 1214

Changing era of radiography education in Europe: new perspectives for students and staff

Moderators:
G. Paulo; Coimbra/PT
H.M. Zonderland; Amsterdam/NL

A-358 08:30

A. The change from diploma to bachelor’s degree: new perspectives for students and staff

M. Rosenblattl; *Wiener Neustadt/AT (michaela.rosenblattl@fhwn.ac.at)*

In Austria the education for radiological technologists was first established by law in 1961. At this time the ‘Matura’ entrance-level standard for university education was implemented. In 1992 a special law was introduced. Professional academies were considered eligible for European programmes such as Erasmus-Socrates. This law still offers the basis for professional qualification. In 1994, Universities of Applied Sciences were founded in Austria in addition to universities. The students of both university types were equal and they received an academic degree. The structure was similar to our professional academies. As a consequence of this, the professional association (RTaustria) also joined in the task of converting academies into the university sector. The first bachelor study programme “Radiological Technology” started in 2005. The students finish with a BSc degree in health studies in Radiological Technology. The demands on teaching staff and students are already very large. A Bachelor’ Degree is recognised as a university sector. Master’s Degree programmes can be pursued immediately, e.g. MedTech (Master or Engineering for Functional Imaging, and Conventional Ion Radiotherapy), or Master of Science in Radiological Technology. This technology offers radiographers a starting point for medical computer science. Doctoral programmes for molecular and functional imaging, medical physics and computer science are well established and alumni are admitted. The strategic influence on the profession is a social benefit. If Radiological Technologists attain even more profound knowledge that more deeply penetrates their specialisation, the better their future patients will be treated.

Learning Objectives:

1. To understand the change from the diploma to bachelors degree in Austria and the implications of this change.
2. To understand the implications of this change from the perspectives of the students and the staff.
3. To understand the strategic influence of this change on the students, staff and profession.
4. To be informed about how the change was implemented in Austria.
5. To be able to compare this change in Austria to the same change in other countries.

A-359 09:00

B. Strengthening radiography education through European networks

V. Challen; *Lancaster/UK (Val@valchallen.wanadoo.co.uk)*

Across Europe radiography education is now firmly embedded into the Higher Education (HE) sector with only a very few exceptions at present. Variations in the nature, coverage and length of radiography bachelor programmes in Europe see graduates emerging with either separate or combined imaging and radiotherapeutic competencies. In some European countries curriculum responses to service needs has also meant that a number of radiographers now graduate with those skills, knowledge and competencies once thought as being solely within the remit of the medically qualified. Radiography networks enable practitioners, educators, students and researchers to co-operate, share, support and assist each other in the opportunities and challenges that confront radiography thus strengthening its professional ethos. This presentation examines the political, educational and professional factors that may be addressed through the presence of European radiography networks.

Learning Objectives:

1. To become familiar with the current status of European educational networks.
2. To understand the ongoing challenges faced by radiography education throughout Europe.
3. To understand the main advantages and potential for radiography networks to continue to improve radiography education in the future.

A-360 09:30

C. Exploring the benefits of European radiography networks: a personal and professional perspective of the Erasmus radiography group

J. Portelli; *Msida/MT (jonathan.portelli@um.edu.mt)*

Since its advent in 1987, ERASMUS has become the EU's leading education and training programme – enabling more than 2.2 million students to benefit from study and work experiences in different European countries. Furthermore, ERASMUS has also encouraged co-operation and staff mobility between higher education institutions across Europe and over the past 15 years about 250,000 higher education teachers and other staff have embarked on teaching exchanges and training opportunities abroad. The ERASMUS Radiography Group (ERG) was born from an initiative taken up by three European universities in 1990, who wanted to create a network that would facilitate the exchange of undergraduate radiography students. Ever since the success of the first student exchanges in 1994, the ERG has evolved considerably and today it is formed by 16 higher education institutions from 14 European countries. To date, more than 1,200 radiography students have successfully participated in ERASMUS exchange programmes organised by the different ERG institutions and more are expected to do so in the future. In this context, one may note just how such networks and groups can help bridge and strengthen the radiography profession across Europe. Apart from providing some historic details about the ERG and is underlying aims, this presentation will also seek to outline the benefits and opportunities that the ERASMUS programme may bring about on an individual and professional basis, as highlighted by the personal experience of a past ERASMUS student who today is one of the ERG coordinators.

Learning Objectives:

1. To understand the history, structure, aims and objectives of the Erasmus radiography group.
2. To gain an insight into the Erasmus radiography group from a student-cum-coordinator's perspective.
3. To explore the potential for such groups or networks to strengthen the radiography professionals of the future.
4. To be aware of threats and opportunities in student and staff mobility in Europe.

08:30 – 10:00 **Room Q**

Paediatric

RC 1212

Oncologic imaging: how to image, follow-up and report

A-361 08:30

Chairman's introduction

R.R. van Rijn; *Amsterdam/NL (r.r.vanrijn@amc.uva.nl)*

In the field of oncology, childhood cancer makes up only a minor amount of cases with less than 2% of all cases occurring in children. However, these 2% of cases do constitute, after trauma, the second most common cause of death in children. In the past five decades the survival rate of children with cancer has increased significantly. In the beginning of the 1960s approximately 30% of children survived whereas this figure is approaching 80% nowadays. This will also have an impact on adult radiology as survivors of childhood cancer have shown to have an estimated 10% increased incidence of subsequent neoplasms. Paediatric radiology plays an important role in the diagnosis, staging, treatment (interventional radiology) and follow-up of childhood cancer. In order to fullfil its role the radiologist should have clinical knowledge about the epidemiology, presentation and treatment of childhood cancer. From a radiological point of view he/she should have knowledge of state-of-art imaging techniques and the implication of these techniques on cancer staging. The paediatric radiologist should play a pivotal role in imaging protocols, not only on a local level but also on an international level through, e.g. the International Society of Paediatric Oncology. With respect to reporting childhood cancer there is an ongoing debate on which measurements should be used. Historically paediactric cancer response assessments are based on 3-D measurements. However, with the introduction of new European guidelines it is expected that pharmaceutical companies will insist on the use of RECIST criteria in trials.

A-362 08:35

A. Renal and adrenal tumours in children

A.M.J.B. Smets; *Amsterdam/NL (a.m.smets@amc.uva.nl)*

Primitive malignant renal tumours comprise 6% of all childhood cancers. Wilm's tumour (WT) is the most frequent type accounting for more than 90%. Imaging alone cannot differentiate between these tumours with certainty but it plays an important role in screening, diagnostic workup, assessment of therapy response, preoperative evaluation and follow-up. The outcome of WT after therapy is excellent with an overall survival around 90%. This allows for a risk-based stratification maintaining excellent outcome in children with low-risk tumours while improving quality of life and decreasing toxicity and costs. The imaging issues for WT from the European perspective will be discussed as well as the characteristics of other paediatric malignant renal tumours. Primary adrenal malignant tumours can be categorised according to their origin. Adrenocortical neoplasms are rare in children. A size greater than 5-10 cm suggests malignancy as well as signs of local invasion or distant metastasis. The most frequent malignant medullary tumour is neuroblastoma. It accounts for 7-10% of all childhood cancers and has a survival rate between 5 and 80% depending on age at diagnosis, tumour spread, genetic markers, etc. It is related to borderline malignant ganglioneuroblastoma and benign ganglioneuroma. Imaging cannot distinguish between these tumours but it is essential in the diagnostic workup and during follow-up. Currently, two systems are used to stage neuroblastoma: The International Staging System (INSS) is based on surgery; the International Neuroblastoma Risk Group (INRG) has developed image-defined risk factors (IDRF) used for staging. Both staging systems will be discussed.

Learning Objectives:

1. To appreciate the role of US, CT, MRI and scintigraphy.
2. To become familiar with the imaging findings and the main differential diagnoses.
3. To learn about the imaging strategies for diagnosis and staging.

A-363 08:58

B. Paediatric liver malignancies

D. Roebuck; *London/UK (roebud@gosh.nhs.uk)*

The role of imaging: The main aims of imaging are confirmation of the hepatic origin of the tumour, diagnosis and staging. Differential diagnosis is facilitated by combining imaging findings with clinical parameters, such as serum alpha-fetoprotein (AFP). Children with malignant liver tumours often require three modalities (US, chest CT and MRI) for optimal imaging. Differential diagnosis: It is important to identify vascular tumours of infancy and mesenchymal hamartoma on imaging grounds if possible. These lesions rarely require biopsy. The major malignant primary tumours are hepatoblastoma, hepatocellular carcinoma, rhabdoid tumour, undifferentiated (embryonal) carcinoma and hepatocellular carcinoma variants (transitional liver cell tumour and fibrolamellar carcinoma). Malignant vascular tumours (epithelioid haemangioendothelioma and angiosarcoma) are rare. The distinction between multifocal primary liver tumours and metastases from an extrahepatic primary tumour (or multifocal infantile haemangioma) can almost always be made on a combination of imaging and clinical features. Staging: There are two major staging systems in current use. The Children's Oncology Group (COG) uses a surgical staging system, in which the main role of radiology is the detection of extrahepatic spread and preoperative surgical planning. The other major trials group, SIOPEL, uses the PRETEXT system, in which the role of imaging is much more important because surgery is delayed and chemotherapy is stratified according to clinical and radiological risk factors. Because COG now also collects data using the PRETEXT system, there is a global consensus that the ideal radiology report should include a description of each of its parameters.

Learning Objectives:

1. To understand the role of US, CT and MRI.
2. To become familiar with the imaging findings and the main differential diagnoses.
3. To learn the imaging strategies for diagnosis and in staging.

A-364 09:21

C. Oncologic imaging in the paediatric brain

G. Hahn; *Dresden/DE (gabriele.hahn@uniklinikum-dresden.de)*

Brain tumours of children account for 15% to 20% of all primary brain tumours. Posterior fossa tumours and supratentorial tumours occur in nearly equal frequency. However, supratentorial tumours are more common in the first two to three years of life, whereas infratentorial tumours predominate from ages 4 to 10. The symptoms of children with brain tumours depend upon the age at the time of presentation and the location. MR is today the study of choice for diagnosis of intracranial neoplasms because the multiplanar imaging capability is extremely useful in determining the exact extent of the tumour and its relationship to surrounding normal structures. For MR evaluation the standard sequences are T2-, T1-, FLAIR-sequences in axial, sagittal and coronal planes. Neuronavigation sequences are important for planning tumour surgery. The most common posterior fossa tumours of childhood are medulloblastomas, astrozytomas and ependymomas. Brainstem tumours should be separated into four separate major categories with different diagnostic pathway, prognosis and therapy. Supratentorial tumours involve the parenchyma of the brain or grow intra- or suprasellar, intraventricular and in the pineal region. Tumours arising from the calvarium are rare in childhood.

Learning Objectives:
1. To understand the role of CT, MRI and MRS.
2. To become familiar with the imaging findings and the main differential diagnoses.
3. To learn about the imaging findings of post chemo/radiation therapy conditions and complications.

Panel discussion:
How far the radiologist can go in suggesting tumour recurrence or post treatment complications? 09:44

10:30 – 12:00 **Room B**

ESR meets Romania

EM 4

Oncology imaging: breast and liver

Presiding:
L. Bonomo; Rome/IT
G. Iana; Bucharest/RO

A-365 10:30

Introduction: Romanian radiology today

G. Iana; *Bucharest/RO (george_iana@yahoo.com)*

History and use of x-ray began in 1895 with the discovery by W.C. Roentgen and his publication in 1896, without forgetting P. Lenard who built ray tube in 1892 and allowed the study of cathode rays outside the tube in which they were produced. One year later, the Romanian scientist Prof. S.D. Hurmuzescu, who was working in a physics research laboratory in Paris (Sorbonne) with Professor Benoit began to study the properties and effects of x-rays. On June 10, 1896 Prof. Hurmuzescu gave a lecture on Röntgen x-rays and in the same year the Hospital Coltea began to make the first radiography in our country. In 1976, under the leadership of Prof. Dr. D. Radulescu radiological investigation has widened horizons by participating in various symposia, conferences and congresses. There have also been remarkable radiogenetics research, angioseriografic diagnosis, urinary exploration etc. Nowadays, exceeding the period 1990-2010, we can say a lot about radio-imaging application development in Romania. Because access to the latest equipment and diagnostic possibilities has been extended, new areas of radiology and medical imaging to meet the needs have been developed. Many subspecialties have been established in the last years for example the Sectional Imaging Society, the Magnetic Resonance Society and the Senology Society. The latest established society (2009) is the Neuroradiology and Interventional Radiology Society which successfully combines interventional radiology with medical imaging. Romanian radiology benefited from the contribution of outstanding personalities and also from the support of the scientific societies from other countries, especially from France. All these factors contributed to the return of the Romanian radiology where it belongs.

Session Objectives:
1. To underline the algorithm of diagnostic and interventional treatment in liver tumours.
2. To explain the types of interventional treatments (vascular and non-vascular) applied in liver malignant nodules.
3. To highlight the complexity of breast cancer diagnosis and imaging.

A-366 10:35

also EPOS

Hepatic nodules in cirrhosis

I.G. Lupescu; *Bucharest/RO (ilupescu@gmail.com)*

Liver cirrhosis is a major public health problem. The purpose of this work is to present our last 10 years of experience regarding CT and MR imaging of benign and malignant nodules developed in liver cirrhosis. It is based on 1407 patients explored in our radiology department and focused on the CT and MRI techniques, semiology of cirrhotic nodules (regenerative, dysplastic, hepatocarcinoma), their structural changes in time and the multidisciplinary team management of cirrhotic nodules. Multislice CT evaluation of cirrhotic nodules involved a nonenhanced and enhanced multiphase CT during the arterial, portal and parenchymal phases to highlight early hypervascular lesions and for the analysis of time washout curve. MRI evaluation of the cirrhotic liver included conventional sequences without contrast (T1 and T2w, chemical shift artifact sequences, diffusion) in combination with multiphase dynamic 2D and 3D acquisition after iv. administration of liver-specific contrast agents including the hepatobiliary phase. From the total number of patients, 280 had "uncomplicated" liver cirrhosis, 578 patients had liver nodular regenerative cirrhosis and portal hypertension, 112 patients had regenerative and dysplastic nodules and 437 patients had hepatocellular carcinoma (multiple tumours in 278 cases and single tumour in 159 cases). Cross-sectional imaging with CT and MRI plays an important role in the evaluation and follow-up of patients with cirrhotic liver disease and its complications. Multidisciplinary dialogue between the clinician (gastroenterologist, surgeon, and oncologist), radiologist, medical laboratory scientist and anatomo-pathologist allows finding the optimal solutions concerning the monitoring and correct therapeutic approach of hepatic nodules developed in the cirrhotic liver.

Learning Objectives:
1. To understand the particularities of CT and MR imaging techniques in liver cirrhosis.
2. To consolidate knowledge of CT and MR imaging appearance of regenerative nodules, dysplastic nodules, and hepatocarcinoma in cirrhosis.
3. To become familiar with the differential diagnosis in liver cirrhotic focal lesions considering the various enhancement patterns.
4. To discuss the importance of clinical, biochemical information and follow-up of small nodules by the same imaging modality that may be helpful in differential diagnosis of these lesions.

A-367 10:55

Interlude: The beginning of Romanian radiology

M. Buruian; *Targu-Mures/RO*

A-368 11:00

Interventional treatment in liver malignancies

B. Popa, M. Popiel, L. Gulie; *Bucharest/RO (valeriu.popa@yahoo.com)*

Interventional treatment in liver malignancies is a very important alternative to surgery. In this lecture we present our experience in liver endovascular treatment applied on patients with both primary and secondary malignant tumours in a period of 3 years, trying to underline the efficacy's interventional treatment and post-intervention follow-up. Our retrospective study was designed to evaluate the clinical outcome in patients treated with chemoembolisation, local chemoinfusion or loaded microspheres.The evaluation before and after interventional treatment included CT measurements of hepatic tumours. The lesions size was assessed by Response Evaluation Criteria in Solid Tumours (RECIST). Total number of interventions assessed was 551, in the period 2009-2011.The patients had one single lesion up to seven lesions (in both lobes), and we appreciated the patient response at 6 and 12 months (complete response, partial response, stable disease or progressive disease) using RECIST criteria. The majority of our patients did not show progression. The patients with liver metastases from colorectal cancer were treated with 5-FU 1000 mg/m, Adriablastine (Doxorubicine) 60-90 mg and Lipiodol. An objective tumour response to interventional treatment was observed in 76 % of patients with HCC and in 68% of patients with metastatic disease. The most common adverse events were mild nausea and vomiting (35%) and occurrence of gastroduodenal ulcers (15%). Haematological toxicity was minimal. The median survival time was 23.7 months in patients with HCC and 13.5 months in patients with metastatic disease.

Learning Objectives:
1. To learn about indications and limits of interventional treatment in hepatic nodules.
2. To evaluate the efficacy of different interventional methods in the liver.
3. To become familiar with the procedures used as endovascular treatment of liver tumours.
4. To know the main complications of interventional procedures in liver malignancies.

A-369 11:20
Interlude: Ten reasons to see Romania
D. Negru; *Iasi/RO*

A-370 11:25
Imaging and guided biopsy in breast malignancies
M. Lesaru; *Bucharest/RO (mlesaru@hotmail.com)*

The past decade in Romanian breast imaging was a time of progress. Training in breast imaging began to be organised systematically in 2001. Standards in quality assurance were set according to European standards in 2004 and 14 mammography centres were trained and equipped with materials in order to have consistent quality in mammography. For sustaining our perspective, we used the experience of two major centres in breast imaging, Cluj-Napoca and Bucharest, which initiated together the breast imaging „journey" in Romania. These centres at this moment account for over 13.000 breast examinations every year (mammography, ultrasound and MRI). The final result is a growing number of infraclinical breast carcinomas. The main challenge we encountered along this period were the BIRADS 3 lesions and the number of these cases is analysed. In detected BIRADS 4 or BIRADS 5 lesions, the imaging methods were used for the inventory of the lesions and biopsy guidance. The biopsy performed by radiologists for these lesions is always done under imaging guidance obtaining histology specimens. The number of needle core biopsies done by radiologists was zero before 2001 and reached 757 in 2010. The clinical impact was high as we discovered cases other than breast carcinoma, i.e. haematological malignancies. In conclusion, we believe that Romania is able to prove at this moment its ability to have an appropriate radiological practice in breast imaging and breast biopsy, in line with the European standards.
Learning Objectives:
1. To appreciate the improvements in breast cancer diagnosis in Romania.
2. To discuss the experiences of major breast imaging centres in Romania concerning protocols, difficulties and practical approaches to achieving the European standards.

Panel discussion 11:45

10:30 – 12:00 **Room C**

CLICK (Clinical Lessons for Imaging Core Knowledge): Common Clinical Cases

CC 1318
Female pelvic pain
Moderator:
V. Logager; Copenhagen/DK

A-371 10:30
A. Clinical considerations
G. Restaino; *Campobasso/IT (gennares@hotmail.com)*

Pelvic pain is an important part of clinical practice for any clinician who provides health care for women. Pelvic pain may be acute, recurrent or chronic. Acute pelvic pain (APP) rarely lasts more than one month without crisis, resolution, or cure. Pain of more than 1 or 3 or 6 months of duration is considered as chronic pelvic pain (CPP) and in many settings may be considered and treated as an illness itself. Women who present with APP frequently exhibit nonspecific signs and symptoms. Diagnostic considerations encompass multiple organ systems, including obstetric, gynaecologic, urologic, gastrointestinal, and vascular aetiologies. As the first priority, urgent life-threatening conditions (e.g. ectopic pregnancy, appendicitis and ruptured ovarian cyst) and fertility-threatening conditions (e.g. pelvic inflammatory disease and ovarian torsion) must be considered. Adolescents and pregnant and postpartum women require unique considerations. CCP is a common and significant disorder of women, with a prevalence of 3.8-12%. Many disorders of the reproductive tract, gastrointestinal system, urological organs, musculoskeletal system, and psychoneurological system may be associated with CCP, the most common being endometriosis, adhesions, irritable bowel syndrome, and interstitial cystitis. Ultrasonography should be the initial imaging test because of its sensitivities across most aetiologies and its lack of radiation exposure. Computed tomography (CT) serves an important role in patients with nonlocalising symptoms, an indeterminate US evaluation, or in patients who require a wider search beyond the field of view available with US. Magnetic resonance imaging is an extremely useful second-line modality for problem solving after US or CT.
Learning Objectives:
1. To learn more about the clinical conditions that cause pain in the female pelvis without an apparent origin.
2. To be informed about the clinician's way of thinking in the process of differential diagnosis.
3. To become familiar with the potential role of imaging in the establishment of the final diagnosis and planning of therapy.

A-372 11:00
B. Imaging techniques and typical findings
B. Brkljacic; *Zagreb/HR (boris@brkljacic.com)*

Many gynaecologic and nongynaecologic conditions causing pelvic pain are grouped according to the anatomic origin; after determining whether the patient is pregnant imaging work-up is tailored to establish potential causes within and outside of pelvis. Transabdominal and transvaginal ultrasound (TVUS) with color duplex-Doppler are first imaging modalities. Examination technique will be discussed. Most patients with pelvic pain and normal US findings have improvement or resolution of symptoms; normal TVUS has negative predictive value of 92%. US findings are often inconclusive, some diseases are hard to diagnose, and appearance of benign and malignant conditions may overlap. CT is performed when US and/or clinical findings are equivocal or indicate pelvic abscess, haematoma, postpartum complications, complications of pelvic inflammatory disease, and when GI or urinary diseases need to be excluded. Advantage is availability in emergency, but CT lacks precise definition of pelvic structures and includes exposure to ionising radiation, problematic in young or pregnant women. Examination technique and protocols will be presented. MRI has the highest accuracy. Fast MRI considerably shortened imaging time. Fat-suppression sequences help to establish fat-containing lesions and increase the conspicuity of inflammatory lesions. Different sequences will be discussed. MR is rated below US and CT for evaluation of acute pelvic conditions, but is excellent alternative when administration of iodinated contrast media or radiation exposure is undesirable, especially in young or pregnant patients. Long imaging times, limited access and cost are major drawbacks of MRI. Imaging findings of various gynaecologic and nongynaecologic conditions causing female pelvic pain will be presented.
Learning Objectives:
1. To learn about the available imaging modalities for the evaluation of female patients with pelvic pain.
2. To become familiar with the technical imaging considerations and the proper diagnostic algorithm.
3. To know more about the typical imaging findings.

A-373 11:30
C. Interactive case discussion
A.G. Rockall; *London/UK (andrea.rockall@bartsandthelondon.nhs.uk)*

This case-based lecture will present typical clinical cases of pelvic pain as well as some unusual but important causes. Cases of acute and of chronic pelvic pain and benign, as well as malignant disease will be included. The audience will have the opportunity to participate in case discussion by the use of interactive voting pads. The selection of imaging modality for each clinical presentation and the importance of knowing the clinical findings at the time of the radiological interpretation will be discussed. For each case, the key radiological features will be illustrated. The essential elements of the radiology report and the key information required by the clinician will be discussed. In each case, the differential diagnosis and the need for follow-up imaging will be considered. The key teaching points for each diagnosis will be reviewed.
Learning Objectives:
1. To review typical cases illustrating the role of imaging modalities in the differential diagnosis of pelvic pain in female patients.
2. To get involved in the diagnostic process by the use of electronic voting pads.
3. To understand the conclusion that may be drawn on the basis of the discussed cases.

10:30 – 12:00 **Room Studio 2012**

ESR Undergraduate Working Group Session

Undergraduate teaching: the future of radiology

Moderator:
D.E. Malone; Dublin/IE

A-375 10:30

Why teach undergraduates radiology?

S.J. Golding; *Oxford/UK (stephen.golding@nds.ox.ac.uk)*

Today the pressures – clinical, managerial and academic – on radiologists may be extreme, with the pressure to meet acceptable productivity criteria usually the most prevalent. Despite this, radiologists need to maintain a broad vision of the life of their subject and resist pressures that threaten the future at the cost of the present. The current session results from the recommendations of a Working Group set up by ESR to advise on this subject. The series of presentations promotes the view that teaching is an essential task for any radiologist who comes into contact with undergraduates and that departmental and personal timetables should allow radiologists adequate opportunity to teach. The objectives perceived to justify this view are 1. To ensure that junior doctors are equipped to practice safely and effectively. 2. To ensure newly qualified doctors are aware of their legal responsibilities. 3. To provide an understanding of the importance of resource management. 4. To provide awareness of how developments in Radiology will influence future practice. 5. To support students' learning across their curriculum. 6. To raise the profile of Radiology as a career choice. The radiologist who undertakes this work makes a valuable contribution to the future of medical practice and the schedule of Departments of Radiology should be so ordered to facilitate this work.

Learning Objectives:
1. To understand the importance to radiological practice of undertaking teaching to undergraduates.
2. To understand the learning needs of newly qualified doctors as they relate to radiology.
3. To understand what aspects of a student's learning are assisted by teaching from radiologists.
4. To understand the role of undergraduate teaching in supporting recruitment into radiology.

A-376 11:00

The European scene: lessons from the 2010 survey

K. Verstraete; *Gent/BE (koenraad.verstraete@ugent.be)*

Purpose: To analyze undergraduate teaching in Europe. To provide tips and tricks for undergraduate education in radiology. Methods and Materials: 1. A questionnaire was sent to > 200 teaching centers in Europe to investigate how undergraduate teaching is performed in Europe. 2. Teachers should have clear learning objectives on "interpretation skills" and "radiological knowledge": what do students have to know and what should they be able to recognize on imaging studies? How can we achieve these learning objectives? Results: 1) Results of European survey: 1. How is undergraduate teaching done? 2. In what medical school year (s) do students encounter radiology and what proportion of the curriculum focuses on radiology or radiology topics? 3. What type of staff and how many teachers are responsible for radiology education? 4. What radiology topics are examined and how are they being examined? 2) Based on the results of this survey, tips and tricks for undergraduate teaching include: 1. Be present in the whole curriculum (in basic years with radiological anatomy and radiological techniques; in advanced years with radiology of diseases, guidelines). 2. Provide handbook, notes and exercises in all forms (video streaming, e-learning, web based teaching and exercises with immediate feedback). 3. Restrict number of teachers to few, dedicated teachers. 4. Have separate exams (not together with other disciplines). 5. Organize visits and clerkships to the department of radiology. 6. Have a policy to attract potentially interested students.
Conclusion: 1. Undergraduate teaching in radiology is not uniform throughout Europe. 2. Optimal undergraduate teaching in Radiology improves knowledge and interpretation skills of our future colleagues, who will make a better use of radiology. Moreover, investment in education will attract more and better students for a radiological career.

Learning Objectives:
1. To comprehend how undergraduate teaching is done in Europe.
2. To understand the heterogeneity of undergraduate teaching in Europe.
3. To understand how undergraduate teaching can be improved and students can be attracted for a radiological career.

A-377 11:30

What and how should we teach undergraduates?

S. Pedraza; *Girona/ES*

Detection of intestinal inflammatory lesions is crucial for management of patients with Crohn's disease (CD). Awareness of the shortcomings of mere clinical evaluation for assessment of disease activity has grown. Ileocolonoscopy has been the gold standard for evaluation of lesions in the colon and terminal ileum. However, ileocolonoscopy cannot always be complete, there exist lacks in the evaluation of the complete small bowel and there are several drawbacks related to the invasiveness. Over the past few years, cross-sectional imaging techniques, including ultrasonography (US), computed tomography (CT) and magnetic resonance imaging (MRI) have been increasingly used for evaluation of patients with CD, allowing objective assessment of location, extension and severity of CD-related lesions. Imaging techniques are also the accepted reference for detection of complications including strictures and penetrating lesions such as fistulas and abscesses. Objective assessment of inflammatory lesions is required for guiding therapeutic interventions and for assessing the efficacy of these interventions. The choice between imaging techniques is often determined by local availability, expertise and technical details of these examinations which are also subject to considerable variation, which may affect accuracy.

Learning Objectives:
1. To comprehend the essential radiological knowledge and interpretational skills that undergraduates should achieve.
2. To understand the models of radiology curriculum during pregraduate medical education.
3. To become familiar with modern education methods.
4. To understand the clues of problem-based learning (PBL) applied to radiology.

11:00 – 12:00 **Room Z**

The Beauty of Basic Knowledge: Interpretation of the Chest Radiograph

MC 27D
Pleura and chest wall

A-374 11:00

Pleura and chest wall

J. Cáceres; *Barcelona/ES (josecac@gmail.com)*

Free pleural effusion tends to accumulate in the dependent parts of the pleural space. The erect PA and lateral radiographs are especially suitable for detecting pleural fluid and to help obtaining a sample for diagnostic purposes. Extrapleural lesions are easily detected in the chest radiograph and characterized with cross-sectional imaging. Detection of calcium in a pleural lesion does not necessarily imply that the lesion is benign or inactive.

Learning Objectives:
1. To be able to recognise the typical and atypical appearance of pleural effusion.
2. To learn to recognise extrapleural disease.
3. To be able to identify pleural calcification and its probable causes.

12:12 – 12:45 **Room A**

Plenary Session

HL 3
Wilhelm Conrad Röntgen Honorary Lecture

Presiding:
L. Bonomo; Rome/IT

A-378 12:15

In search of venous thromboembolism: the first 2,912 years

L.R. Goodman; *Milwaukee, WI/US (lgoodman@mcw.edu)*

Past: The search for venous thromboembolism (VTE) spans three millennium and several continents. Although deep venous thrombosis (DVT) was first described in India in 600 BCE, there was little discussion of VTE in western medicine until the eighteenth century. Virchow (1846) was the first to link pulmonary embolism (PE) to DVT and propose his famous triad mechanism for venous thrombosis. Present: The diagnosis was clinical and pathological until VTE imaging developed

in the mid twentieth century. Much of our current understanding, and misunderstanding, of VTE, however, stems from the era before definitive imaging diagnosis was possible. The first definitive in vivo imaging diagnosis for VTE was lower extremity venography in the 1930s and pulmonary angiography in the 1960s. Since then, scintigraphy, CT, ultrasound and MRI have been developed. Each occupies a specific niche in the workup. CT currently has the largest role because of its sensitivity, specificity, availability and ability to provide alternative diagnosis. The first CT report of pulmonary infarction was in 1978 (Sinner) and the first use of helical scanning direct visualisation of central PE was in 1992 (Remy-Jardin). Future: Many diagnostic and clinical challenges remain. How do we better screen patients prior to imaging? How do we minimise or eliminate radiation? How do we decrease costs? Are we overdiagnosing VTE? Do all VTEs require similar therapy?
Learning Objectives:
1. To become familiar with the evolution of our understanding of VTE – the truths, the half-truths, and the fallacies.
2. To understand our current imaging techniques and to optimise their use.
3. To comprehend the impact of imaging on the clinical understanding of VTE.
4. To highlight controversial issues and future directions.

12:30 – 13:30 Room Z

Molecular Imaging

MC 23D
From inflammatory to fibrotic processes

Moderator:
T.F. Massoud; Cambridge/UK

A-379 12:30
A. Imaging inflammation in organs and vessels
X. Montet; *Geneva/CH (xavier.montet@hcuge.ch)*

'Classical' imaging is used every day in clinics to guide diagnosis and therapy, but only gives access to anatomical and/or structural information. Molecular imaging will give access to the activity of a protein, the fate of a biomolecule and even to molecular pathways. The role of molecular imaging in the diagnosis of inflammation will be discussed in this lecture. Molecular imaging agents are classically designed as activatable or targeted agents. Activatable agents consist of chemically engineered substrates that undergo a physicochemical change after interaction with their intended target. This results in the activation of the contrast media. We will use the recruitment of monocytes/macrophages to the location of myocardial infarct to illustrate the concept of activatable probes. As monocytes/macrophages are known to produce a substantial amount of myeloperoxidase, an activatable agent capable of imaging myeloperoxidase will be discussed. Imaging the recruitment of monocytes/macrophages with iron oxide-based MR contrast agent will also be illustrated in the case of inflammatory lesions. Lastly, MR-targeted probes consisting of nanoparticles with added targeting moieties will be discussed. Adding targeting moieties on the surface of probes allows to specifically target a receptor over-expressed by cells. To illustrate this specific targeting, neo-vessels over-expressing integrin and selectin will be used.
Learning Objectives:
1. To understand the benefit of a multimodal approach to imaging inflammation.
2. To learn about anti-inflammatory treatment efficacy by imaging.
3. To learn about the potential role of imaging inflammation in clinics.

A-380 12:50
B. Molecular imaging of extracellular matrix changes
M. Taupitz; *Berlin/DE (matthias.taupitz@charite.de)*

Most pathologic processes are accompanied by changes in the extracellular matrix. Cases in point are sites of tumor development and tumor invasion as well as inflammtory conditions such as progressive atherosclerotic lesions, inflammatory bowel disease, or multiple sclerosis. This lecture provides an overview of the nature of extracellular matrix changes in various diseases. A variety of targets in the altered extracellular matrix can theoretically be exploited for imaging. These include both structural and functional components of the extracellular matrix, on the one hand, and enzymes involved in pathologic matrix changes, on the other hand. Examples of probes for noninvasive imaging are fluorescent agents for optical imaging and magnetic probes for MRI (Gd-containing probes, magnetic nanoparticles). At the end of this lecture, participants will have gained insights into the role of extracellular matrix changes in the progression of diseases but also in their cure and have an overview of the targets that are currently used in different imaging modalities or that may be addressed in the future. Another aspect this lecture deals with is to what extent imaging of extracellular matrix changes can be used to monitor treatment responses. Here a distinction will be made between approaches that are expected to remain at the stage of experimental studies in basic research and approaches that show promise of being translated to clinical use in the medium term.
Learning Objectives:
1. To learn about the components of the extracellular matrix, i.e. structural elements and enzymes.
2. To understand the role of extracellular matrix changes in diseased tissue.
3. To become familiar with some concepts of imaging extracellular matrix changes.

A-381 13:10
C. Structural and molecular imaging of fibrotic process
B. Van Beers; *Clichy/FR (bernard.van-beers@bjn.aphp.fr)*

Chronic liver diseases represent a major public health problem. Their prognosis and management greatly depend on the amount and progression of liver fibrosis. Liver biopsy, traditionally considered as the reference examination, is currently less performed because of the development of non-invasive biological and imaging biomarkers. Serum biomarkers of liver fibrosis are neither very sensitive nor specific. Imaging biomarkers have the potential to more specifically quantify hepatic fibrosis. Anatomical imaging of liver fibrosis is hampered by its limited spatial resolution. Functional imaging is very promising because fibrosis is accompanied by changes of perfusion, diffusion, mechanical properties and metabolism that can be quantified with ultrasound or more comprehensively with MRI. Indeed, functional MRI can be used not only to stage liver fibrosis, but also to grade steatosis, necrosis and inflammation occurring in chronic liver diseases. Molecular imaging can be performed by targeting collagen or metalloproteases in fibrogenesis. However, molecular imaging remains currently an experimental tool. In conclusion, imaging biomarkers obtained at ultrasound and MRI are increasingly used to assess liver fibrosis. Functional MRI offers the opportunity of a global assessment of fibrosis, steatosis, necrosis and inflammation in chronic liver diseases.
Learning Objectives:
1. To understand the need for imaging biomarkers of liver fibrosis.
2. To be able to appreciate the comparative value and limitations of anatomical and functional methods to assess liver fibrosis.
3. To learn about the potential value of molecular imaging of fibrogenesis.

14:00 – 15:30 Room A

New Horizons Session

NH 14
New insight into vascular wall

A-382 14:00
Chairman's introduction
M.F. Reiser; *Munich/DE (Maximilian.Reiser@med.uni-muenchen.de)*

Atherosclerosis is a slow, progressive disease involving multiple if not all vascular territories and potentially results in disastrous events, such as myocardial infarction, stroke and renal failure, respectively. Frequently, more than one vascular territory is affected. Due to the demographic changes within developed countries and the dramatic increase in obesity and metabolic syndrome, atherosclerosis and its sequelae play an ever increasing socioeconomic role. Until recently imaging techniques have focused on depicting the degree of luminal stenosis. However, luminal stenosis occurs late in the atherosclerotic disease process, and several recent studies have shown that knowledge of luminal stenosis alone is insufficient to predict vulnerability of plaques. Thus, recent developments in imaging technology have focused to assess the vessel wall. With these techniques, qualitative and quantitative information of plaque composition and morphology can be obtained non invasively. Moreover, functional and molecular imaging techniques have emerged that allow assessing the biological activity of atherosclerotic plaques. While some of these methods are still in the realm of basic research, others are entering the field of clinical application. For radiologists and nuclear medicine specialists, as well as for imaging scientists knowledge and expertise in this important field has become mandatory. In the future, these techniques will most likely contribute to a personalised medicine by helping to tailor drug selection to an individual's atherosclerotic risk and to enable to assess an individual's response to therapy. Non invasive imaging of the vascular wall could transform clinical management for diagnosis, risk stratification, selection and efficacy assessment of anti-atherosclerotic therapeutics. If methods are optimised, we may be able to decide which patients harbour high-risk atherosclerotic plaques that will ultimately cause myocardial infarction or stroke.

Session Objectives:
1. To discuss new concepts of evolvement of atherosclerotic plaques and mechanisms resulting in complications.
2. To give information concerning risk factors of atherosclerotic plaques in different vascular territories.
3. To understand the impact of imaging in primary and secondary prevention.

A-383 14:05

Molecular imaging of atherosclerosis: ready for prime time?

M. Schäfers; *Münster/DE (schafmi@uni-muenster.de)*

The majority of cardiovascular diseases arises from atherosclerosis resulting in coronary heart disease and its principal manifestations, angina pectoris, myocardial infarction, sudden cardiac death and heart failure or stroke. A hallmark of atherosclerosis is vascular inflammation initiated by an endotheial injury and driven by various noxes such as hypercholesteremia. The most dangerous lesions are unstable and prone to rupture. These plaques are often of lesser stenosis severity and thus would sometimes not impair blood flow at rest or during exercise. Unstable plaques are characterised by activated macrophages, mast cells and other cells being localised in the plaque shoulder which secrete a variety of matrix-degrading enzymes such as metalloproteinases (MMPs). Non-invasive molecular imaging of MMP activity in patients could help identify patients at high risk of major acute cardiovascular events. SPECT and PET provide the most sensitive and selective means for imaging molecular interactions non-invasively in the living body and could therefore prove a potent approach to the identification of the metabolically active plaque that is vulnerable to rupture. New radiopharmaceuticals addressing relevant targets in plaques, improvement in image acquisition and processing (e.g. motion correction), preclinical imaging in models and the first translational approaches will be discussed.

Learning Objectives:
1. To learn about potential targets for molecular imaging of atherosclerosis.
2. To become acquainted with molecular imaging studies which have assessed atherosclerosis.
3. To understand the role of molecular imaging in current clinical practice and its potential role in the future.

A-384 14:28

Non-invasive imaging of the vulnerable atherosclerotic plaque

J.H. Gillard; *Cambridge/UK (jhg21@cam.ac.uk)*

Until recently the risk of carotid disease in symptomatic patients was determined by simple luminal measurement-based conventional angiography, all on more subjective changes in Doppler ultrasound measurements which would establish whether a patient should undergo carotid endarterectomy or optimal medical therapy. Developments in MR and CT over the past decade have given us alternative tools to measure luminal stenosis which have reduced risks when compared with conventional X ray angiography. The current goal is to be better able to characterise plaque risk, whether it is in the carotid, coronary or peripheral vasculature. MR imaging of the carotid is feasible due to its size and superficial position, equivalent reproducible imaging of the coronary arteries being considerably more challenging. Although the carotid artery may be viewed as a surrogate for disease in the coronaries, this is probably an oversimplification. Nevertheless it remains an important and practical target. 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. We can use MR to assess the contribution of local flow dynamics and the individual components of plaque to produce maps of stress in a specific patient. MR contrast media can contribute additional information with regard to plaque function. We are also able to image not only individual plaque structure, but also function allowing an improved understanding of why two patients with identical degrees of luminal stenosis may have completely different degrees of vulnerability.

Learning Objectives:
1. To understand the morphological components of plaque associated with risk of rupture.
2. To understand the concept of functional/cellular imaging in atherosclerosis.
3. To learn the role of macrophage-specific MR imaging in diagnosis and monitoring of atherosclerotic disease.
4. To get an outlook on future developments in assessing plaque risk using MR techniques.

A-385 14:51

Atherosclerosis: a reversible disease?

T. Saam; *Munich/DE (Tobias.Saam@med.uni-muenchen.de)*

Atherosclerosis is a chronic disease of the vessel wall which accounts for > 25% of ischaemic strokes and for the majority of myocardial infarctions and sudden cardiac deaths. Until recently little was known about the natural history of atherosclerosis due to difficulties to image the arterial wall. However, several new imaging methods, such as intravascular ultrasound (IVUS), high-resolution black blood magnetic resonance imaging (hr-bb-MRI) and Positron Emission Tomography / Computed Tomography (PET/CT) have emerged on the horizon. These techniques are able to depict the full vessel wall and are able to provide detailed information of plaque composition, morphology and activity non-invasively. In this lecture natural progression studies of atherosclerosis will be discussed and it will be demonstrated that certain plaque features, that develop over the years, such as thin-cap fibrous atheromas, intraplaque haemorrhage and inflammation, are associated with an increased risk of cerebro- or cardiovascular events. Data will be shown which demonstrate the effects of common atherosclerotic risk factors on the progression of the disease. In addition studies will be shown which suggest that certain plaque factors, such as intraplaque haemorrhage or plaque inflammation, accelerate the atherosclerotic disease process. Furthermore, the effects of anti-atherosclerotic drugs on plaque progression and plaque morphology will be discussed. Last but not least the pharmacological possibilities will be discussed to reverse or to decelerate the anti-atherosclerotic disease process.

Learning Objectives:
1. To become familiar with the imaging modalities that enable study of atherosclerosis progression and regression.
2. To consolidate knowledge of the natural history of the atherosclerotic disease process.
3. To understand factors that accelerate or decelerate plaque progression.
4. To learn how to answer the question ‘is atherosclerosis a reversible disease?’

Panel discussion:
Predictive values of imaging markers of atherosclerosis: where do we stand? 15:14

14:00 – 15:30 Room B

Interactive Teaching Session

E3 1420
Lung cancer

A-386 14:00

A. Detection

S. Diederich; *Düsseldorf/DE (s.diederich@marien-hospital.de)*

Lung cancer most often presents as a pulmonary nodule or mass, less commonly as a hilar mass or endobronchial lesion. Most small tumours radiologically present as pulmonary nodules. Chest radiography (CXR) is limited in demonstration of small nodules and even lesions as large as 3 cm may be missed. Digital tomosynthesis has been shown to markedly improve sensitivity for pulmonary nodules as compared with CXR but is not yet widely available. Magnetic resonance imaging (MRI) also is more sensitive for nodule detection than CXR, but is not routinely performed in most cases due to limitations in cost and availability. The gold standard for detection of pulmonary nodules as small as 1-2 mm is multidedector-computed tomography (MDCT). Technically, MDCT is able to demonstrate pulmonary nodules with sensitivity close to 100%; however, sensitivity of individual radiologists is much lower due to the task of analysing several hundred images, confusion between nodules and vessels imaged in cross section and other errors. Computer-assisted detection (CAD) software can improve sensitivity but may be limited by false-positive findings. Positron emission tomography (PET)-CT using 18 F Deoxyglucose (18 FDG) has a high sensitivity for lung cancer; however, false-negative findings may be due to well-differentiated adenocarcinoma, carcinoid and nodules < 10 mm, whereas false-positive findings may be due to inflammatory lesions. This interactive session will include examples of manifestations of lung cancer as well as data on the accuracy of different imaging methods for lung cancer detection.

Learning Objectives:
1. To know what imaging techniques are appropriate for detecting lung cancer.
2. To learn the most relevant imaging findings in lung cancer.
3. To understand the behaviour of lung cancer related to imaging.

A-387 14:45

B. Follow-up

F. Gleeson; *Oxford/UK (fergus.gleeson@orh.nhs.uk)*

Whilst the pathways for the detection and staging of lung cancer are well known, the use of imaging for the detection of disease relapse are less well established. Detection of relapse is now more complex, due to the use of multimodality therapy, including surgery, radiotherapy, chemotherapy and new ablative techniques. Each of these therapies may affect the site and appearance of recurrent disease. Additionally new techniques such as PET-CT and diffusion-weighted imaging have not yet been fully evaluated in this context. This presentation will focus on the timing of repeat imaging post treatment, the features of recurrent disease and suggest follow-up protocols, paying particular attention to imaging in the context of retreatment of disease relapse.

Learning Objectives:
1. To know the common features of recurrence of lung cancer.
2. To learn how to establish follow-up protocols after treatment of lung cancer.

14:00 – 15:30 **Room C**

CLICK (Clinical Lessons for Imaging Core Knowledge): Common Clinical Cases

CC 1418

The vomiting infant and child

Moderator:
M. Riccabona; Graz/AT

A-388 14:00

A. Clinical considerations

L.-S. Ording-Müller; *Tromsø/NO (lil-sofie.ording@unn.no)*

Vomiting is a common symptom in childhood and can be caused by numerous conditions. In children we not only face difficulties in defining the conditions that may cause vomiting but also in differentiating true vomiting from physiological regurgitation, especially in younger children. In this session the clinico-radiological approach to a vomiting child will be discussed and illustrated by different clinical scenarios. This session will focus on the most common age-specific entities that may cause vomiting and how the approach to imaging in a vomiting child differs from in adults. It emphasises the importance of a good collaboration between the paediatrician and the radiologist to improve the diagnostic pathway. In detail, a multi-disciplinary approach is needed to avoid unnecessary diagnostic tests. The role of imaging not only in establishing the final diagnosis, but also in excluding underlying conditions that may need intervention will be discussed.

Learning Objectives:
1. To learn more about the difficulties in clinically defining a condition that causes vomiting in an infant or young child and to learn about different clinical scenarios.
2. To become familiar with important and common entities in childhood vomiting of unclear origin, and to be informed about potential underlying conditions that might be a reason for imaging.
3. To become familiar with the potential role of imaging in the establishment of the final diagnosis and planning of therapy in infants and children, particularly the different approaches to adult imaging.

A-389 14:30

B. Imaging techniques and typical findings

H.-J. Mentzel; *Jena/DE (hans-joachim.mentzel@med.uni-jena.de)*

This paper reviews the use of imaging techniques for the assessment of the vomiting infant and child. The differential diagnostic workup for the common clinical presentations of vomiting in the different age groups will be described and illustrated for age-specific diseases. Nausea and vomiting are common sequelae of multitude of disorders that can range from mild, self-limited illness to severe, life-threatening conditions. Bilious vomiting in the newborn is considered a radiological emergency and requires quick and exact diagnosis, whereas vomiting in children often is associated with gastroenteritis which not requires any imaging. In neonates with bilious vomiting, the first step in the imaging evaluation is the abdominal plain film which may reveal evidence of upper gastrointestinal tract obstruction. Direct imaging of the stomach and small bowel using the upper contrast gastrointestinal series or fluid-aided ultrasound answers the question if there is a mechanical obstruction. X-ray contrast enema may play a role in the evaluation of suspected malrotation and midgut volvulus or with a water-soluble contrast enema in newborns with suspected meconium plug or microcolon. Ultrasound plays a complementary role in the neonates, but in all other ages US becomes the method of choice in the vomiting child because of its high sensitivity and specificity (e.g. in hypertrophic pyloric stenosis) and offers the advantage to avoiding exposure to the potential harmful radiation of x-rays. Computed tomography and/or magnetic resonance imaging in diagnosing the vomiting child will be reserved for less common causes such as intracerebral abnormalities or intracranial pressure.

Learning Objectives:
1. To learn about useful and applicable imaging techniques, including their specific adaptations and the needs when applied in infants and children.
2. To become familiar with the respective imaging algorithms in applicable typical childhood scenarios.
3. To become familiar with the common imaging findings and their differential diagnoses and common pitfalls.

A-390 15:00

C. Interactive case discussion

R.R. van Rijn; *Amsterdam/NL (r.r.vanrijn@amc.uva.nl)*

The vomiting child can present the paediatrician and paediatric radiologist with a difficult diagnostic problem. As discussed in the previous lectures the differential diagnosis is based on age specific diseases. Both gastrointestinal as non-gastrointestinal diseases of childhood can cause vomiting in a child. During this interactive session a broad range of cases, the usual and unusual, will be presented. Each case will be introduced by a short summary of the clinical information. The question will not only be which diseases should be included in the differential diagnosis but also which imaging modality and protocol should be used in this case. The importance of choosing the correct imaging technique and protocol is of importance not only from a perspective of patient satisfaction but even more from an ALARA point of view. In paediatric radiology avoiding unnecessary (repeat) exams and choosing the right technique and protocol has the biggest impact on radiation reduction.

Learning Objectives:
1. To review typical cases illustrating the role of imaging in infants and children with unclear vomiting.
2. To get involved in the diagnostic process by the use of electronic voting pads.
3. To understand the conclusion that may be drawn on the basis of the discussed cases.

14:00 – 15:30 **Room D1**

Emergencies in Neuroradiology

CC 1419

Oncologic emergencies in neuroradiology

Moderator:
J. Walecki; Warsaw/PL

A-391 14:00

A. Acute paraparesis

M. Essig; *Erlangen/DE (mediag@me.com)*

Paraparesis is clinically defined as a weakness of the lower extremities. It is usually caused by an injury of the spinal cord in the thoracic, lumbar or sacral part of the spine or by toxic effects. An acute onset is a neurologic emergency, which requires an immediate clarification – mainly by an imaging study. There are several conditions in oncology that may cause an acute paraparesis. These include acute myelogenous leukaemia, metastasis, Hodkin´s disease, lymphomatosis meningitis, cervical or lumbar spinal cord tumour or metastasis, multiple myeloma, primary myelofibrosis/myeloid metaplasia or metabolic and treatment-associated changes in the spinal cord. As the paraparesis starts in this context without a traumatic background, MR imaging is the method of choice in the workup of these patients. In this overview we will classify and describe the different oncologic conditions which may cause an acute paraparesis and highlight typical imaging findings in both intramedullary and extramedullary causes.

Learning Objectives:
1. To learn about the preferred examination technique in a patient with sudden onset on acute paraparesis.
2. To understand how and when to perform the examination.
3. To learn what are the signs of spinal cord compression on CT and MRI.

A-392 14:30

B. Iatrogenic emergencies in oncology patients: PRES and radiation necrosis

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

Posterior reversible encephalopathy syndrome (PRES) is characterised by headache, altered mental status, visual disturbances and seizures. Different conditions have been associated with PRES, such as for example eclampsia bone marrow transplantation and immunosuppressive treatment, hypertension, autoimmune disease and cancer chemotherapy. The pathophysiology of PRES is still unclear and different hypothesis will be discussed in this lecture. Typical radiological imaging findings which are best presented on MRI include signal abnormalities due to vasogenic oedema in predominately but not only white matter of the posterior regions of the cerebral hemispheres, like the occipital and posterior parietal lobes but also the frontal lobes often involved, whereas the cerebellum, the brainstem, the deep white matter and basal ganglia are more atypical locations. The incidence of radiation necrosis ranges from 5 to 24%. The delayed neurological symptoms include functional and cognitive impairments, including deficits in learning, working memory, executive function, vision, and motor function, and eventually dementia. A complete understanding of the pathophysiology of radiation therapy-induced changes to the central nervous system (CNS) is still lacking. MRI cannot reliably discriminate tumour recurrence/progression from the inflammatory or necrotic changes resulting from radiation, although the latter can be associated with more specific patterns of enhancement, such as “soap bubble”- or “Swiss cheese”-like with or without feathery margins and central necrosis. This lecture will focus on the pathophysiology, aetiology and imaging features, of PRES and radiation necrosis and their differential diagnosis in oncology patients.

Learning Objectives:

1. To understand the pathophysiology and imaging findings of reversible posterior leukoencephalopathy syndrome (PRES).
2. To understand the pathophysiology and imaging findings of radiation necrosis.
3. To consolidate knowledge on how to differentiate tumour recurrence from radiation necrosis on CT, MRI and PET imaging studies.
4. To become familiar with the potential role of perfusion imaging.

A-393 15:00

C. Interventional techniques in oncologic patients

A. Gangi, X. Buy, G. Tsoumakidou, J. Garnon; *Strasbourg/FR (gangi@rad[6].u-strasbg.fr)*

Percutaneous image-guided procedures can be applied for tumour management in cases of spinal tumours. They consist of the tumour ablation and/or vertebral consolidation. These procedures are usually not considered as acute emergency. However, in cases of impending vertebral collapse, spinal consolidation should be performed on an emergent basis. For the palliative treatment of painful spinal tumours (metastases), the therapeutic goal should not be the complete ablation of the tumour, but one or more of the following: tumour reduction, pain management, prevention of risk of pathological fractures and in some cases, decompression of spinal tumours extending towards the spinal canal. Precise clinical evaluation of the patient is mandatory: origin and location of pain, previous treatment, which anaesthesia the patient can tolerate, and life expectancy. For tumours causing any neurological signs, surgical decompression should be the first treatment option. Multidisciplinary decision is required to choose the more efficient and less disabling technique.

Learning Objectives:

1. To learn what is the role of vertebroplasty in treatment of patients with metastatic spine fractures.
2. To learn if there is a role for tumour embolisation.

14:00 – 15:30 Room D2

Urogenital Imaging

CC 1421

Tumours of the female pelvis

Moderator:
M.M. Otero-García; Vigo/ES

A-394 14:00

A. Imaging of the ovarian mass: is US enough?

J.A. Spencer; *Leeds/UK (johnaspencer[60]@hotmail.com)*

The simple answer to this question is “yes” for most situations: and notably when surgery is not planned. The complicated answer is that US relying on morphology-based systems supplemented by Doppler evaluation cannot reliably provide the information used to direct women with a complex ovarian mass to appropriate surgery unless there are clear secondary signs of disseminated malignancy. The difficulty is in deciding when to use CT or MR imaging after US. That is the topic to be discussed in the context of new ESUR guidelines.

Learning Objectives:

1. To understand the strengths and limitations of US in assessment of an adnexal mass.
2. To be able to recognise the complementary roles of US, CT and MR in the imaging pathway.
3. To become familiar with the clinical goals of imaging of an ovarian mass.

A-395 14:30

B. Imaging and staging of endometrial tumours: putting guidelines into clinical practice

H. Hricak; *New York, NY/US*

Most women diagnosed with endometrial cancer are postmenopausal (~25% are premenopausal). Endovaginal ultrasound is widely used for initial assessment in menopausal patients, especially if bleeding is present. Measurement of the thickness of the endometrial stripe can help determine the need for D&C. After diagnosis, MRI is the best imaging modality for locoregional staging and detecting recurrence (preliminary data suggest FDG-PET may also be useful for follow-up). Surgery remains the primary treatment modality, but radiotherapy and chemotherapy are being used for advanced disease and patients at high risk of recurrence. In 2009, FIGO staging guidelines were revised. MRI is especially helpful for distinguishing stage IA from stage IB (≥ 50% myometrial invasion), which is associated with a 40% incidence of lymph node metastasis and a need for lymph node dissection and for identifying stage II (invasion of the cervical stroma, calling for radical hysterectomy). While pretreatment knowledge of these findings is helpful, cost-effectiveness studies are lacking, and routine use of MRI is controversial. MRI should include at least two T2-weighted sequences showing the short and long axes of the uterus (sagittal, axial oblique or coronal oblique). High-resolution imaging 2 min ± 30 s post-contrast injection is optimal for diagnosing myometrial invasion. If cervical invasion is suspected, an additional slice perpendicular to the endocervical channel is recommended. Pre-contrast sequences up the renal hilum enable retroperitoneal lymph node screening. Indications for MRI include high-grade, serous or clear-cell adenocarcinoma; suspicion of stage ≥IB; detection of enlarged nodes for sampling; inability to perform D&C or surgical staging.

Learning Objectives:

1. To learn how to adapt a standard MRI staging protocol to high imaging quality.
2. To understand the impact of imaging results for treatment options.
3. To learn what should never be missing in the imaging report.

A-396 15:00

C. Imaging and staging of tumours of the uterine cervix: putting guidelines into clinical practice

B. Hamm; *Berlin/DE (bernd.hamm@charite.de)*

MR imaging is the method of choice for primary staging of cervical cancer. The backbone of staging cervical cancer is T2-weighted imaging with high spatial resolution performed in two imaging planes. 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 reducing costs. This categorical course focuses on pretherapeutic staging of cervical cancer taking current guidelines of the FIGO and of the European Society of Urogenital Radiology into account. The course presents an outline of the morphologic imaging criteria of the different T-stages of cervical cancer based on scientific evidence.

Learning Objectives:
1. To become familiar with the imaging strategies in cervical cancer.
2. To learn how to stage cervical cancer by MRI.
3. To learn how to avoid pitfalls in MR imaging of cervical cancer.

14:00 – 15:30 **Room E1**

Musculoskeletal

RC 1410
Postoperative joint imaging

Moderator:
G. Mantzikopoulos; Athens/GR

A-397 14:00
A. Shoulder
K. Wörtler; *Munich/DE (woertler@roe.med.tum.de)*

Imaging evaluation of the shoulder after surgery is challenging, as it necessitates familiarity with several surgical techniques and their typical complications, knowledge of normal and abnormal postoperative findings, awareness of the advantages and weaknesses with the different radiological techniques, as well as clinical information on current symptoms and joint function. This course reviews the most commonly used surgical procedures for treatment of glenohumeral instability and rotator cuff lesions and highlights the significance of imaging findings with a view to detection of recurrent lesions and postoperative complications. The indications for plain radiography, MR imaging, MR arthrography and CT arthrography in the postoperative setting will be discussed together with technical aspects and their diagnostic performance. Special attention will be drawn to the depiction of shoulder-specific and general surgical complications, such as deltoid dehiscence, implant dislocation, foreign-body reactions, nerve injury and infection.

Learning Objectives:
1. To understand the principles of basic surgical techniques.
2. To become familiar with technical aspects of different modalities for imaging post-surgical patients.
3. To recognise normal imaging findings after surgery and how to differentiate them from pathological ones.
4. To become familiar with the main complications after shoulder surgery.

A-398 14:30
B. Knee
K. Verstraete; *Gent/BE (koenraad.verstraete@ugent.be)*

There are many surgical techniques to repair meniscal tear: focal cartilage defect, cruciate ligament tear, malalignment, fracture, osteoarthrosis,… Conventional radiography, CT-scan, CT-arthrography and MRI play an important role in evaluation of the knee after surgery or arthroscopy. Indications for postoperative imaging are infection, persistent pain and dysfunction. Every radiologist should be familiar with “normal” imaging findings after arthroscopy, osteosynthesis, ligament reconstruction, osteotomy, knee prosthesis and meniscal or (osteo)chondral repair, but also recognise the main complications after knee surgery or arthroscopy. Orthopaedic hardware is usually evaluated on plain radiography or CT, and only a relative contraindication for MRI. Microscopic metal artefacts and fibrotic scarring are frequently seen along the course of the instrumentation tract. After partial meniscectomy, an obtuse angle at the apex of the meniscus and increased signal intensity of the remnant part of the meniscus are normal findings, whereas fibrillation and recurrent tear may explain complaints of the patient. Various intra- and extra-articular reconstructive procedures exist for anterior and posterior cruciate ligament reconstruction. Besides the neoligament, an osseous tunnel, screws and metal artefacts are also visible. Postoperative findings of the extensor apparatus include a thickened patellartendon, focal myxoid degeneration, fibrosis and focal defects, e.g. after harvesting tendon tissue for ACL reconstruction or after release of the lateral patellar retinaculum for ‘unstable’ patella. Accelerated osteoarthritis may be a late postoperative finding. MRI very well depicts incorporation and alignment of osteochondral auto- or allografts, and the position, morphology and integrity of the meniscus after repair or transplantation.

Learning Objectives:
1. To understand the principles of basic surgical techniques.
2. To become familiar with technical aspects of different modalities for imaging post-surgical patients.
3. To recognise normal imaging findings after surgery and how to differentiate them from pathological ones.
4. To become familiar with the main complications after knee surgery.

A-399 15:00
C. Ankle
C. Masciocchi; *L’Aquila/IT (carlo.masciocchi@cc.univaq.it)*

To evaluate postsurgical patients it is important to know the primary clinical diagnosis, the surgical treatment, the interval since surgery and patients’ current clinical symptoms. Radiography is the most common imaging modality to evaluate the postoperative ankle, particularly in traumatic cases; after reduction and fixation of a fracture or dislocation it is generally carried out as routine. Ultrasonography is highly sensitive and specific in postoperative tendon assessment, thanks to the superb resolution, and the opportunity for dynamic evaluation of tendon integrity. MRI has rapidly become important in post-operative assessment of the ankle, because it provides high soft-tissue contrast, multiplanar capability and osseous structures visualisation. It shows signal changes of ligaments and tendons, hypointense subchondral sclerosis, subchondral bone marrow oedema, joint effusion, capsular thickening, fibrosis and synovitis. MRI has also an important role in the evaluation of post-surgery ankle pain due to impingement syndrome and in the hindfoot chronic instability related to postoperated sinus tarsi syndrome; it demonstrates the anatomy of sinus tarsi, chronic synovitis and nonspecific inflammatory changes, synovial cysts, fibrosis and subtalar joint effusion. It is important also in the follow-up of tumours and tumour-like conditions of bone and soft tissues after surgery. Computed tomography is the most valuable method to define the osseous anatomy of the postoperative ankle, so it is important in the follow-up of the operated osteochondral lesions of the talus. CT allows the evaluation of irregularities or degenerative changes and progressive degenerative arthritis; however, CT usually fails to evaluate soft tissue ankle lesion.

Learning Objectives:
1. To understand the principles of basic surgical techniques.
2. To become familiar with technical aspects of different modalities for imaging post-surgical patients.
3. To recognise normal imaging findings after surgery and how to differentiate them from pathological ones.
4. To become familiar with the main complications after ankle surgery.

14:00 – 15:30 **Room E2**

Oncologic Imaging

RC 1416
Monitoring response: the essential guide for all radiologists

A-400 14:00
Chairman’s introduction
H.-P. Schlemmer; *Heidelberg/DE (h.schlemmer@dkfz.de)*

Patient care in oncology requires repeated decision making continuously escorting the individual course of the disease. As the interdisciplinary concept of therapy planning and administration can be very complex, it has essentially to be based on timely re-assessment of the individual treatment response at various time points. Reproducible and quantitative assessment of response is also crucial for anticancer drug development in clinical phase II and II trials. Taking repeated measurements of the tumour size on Radiologic cross-sectional images yield the primary quantitative parameter for objectively determining response in solid tumours. Different methods have been employed for standardisation, e.g. WHO- and RECIST-criteria. It is important to have in mind that a precise understanding and careful application of the specified criteria is notably required to quantify response in a consistent way. Common understanding of the underlying principles is of particular importance as repeated image evaluation for patients during the course of their disease and/or for multicentre trials cohorts may be conducted by different Radiologists working even at different institutions. With the introduction of novel molecular targeted anti-cancer agents (e.g. with anti-angiogenetic activity), however, early response assessment by tracking tumour size changes alone may be insufficient. For this, new imaging biomarkers are needed capable of detecting function and metabolic tissue alterations, particularly early after treatment. This course will give an insight into the current standards as well as provide new approaches for objective assessment of tumour response.

A-401 14:05

A. RECIST made easy

A.G. Rockall; *London/UK (andrea.rockall@bartsandthelondon.nhs.uk)*

A significant part of cancer imaging involves the assessment of change in tumour burden within the context of a clinical trial or research study. The reporting requirements for these imaging studies are documented in the research protocol and need to be adhered to by the reporting radiologist. A standardised response assessment is important in order to allow data to be collated between different centres, as well as to evaluate published data from different studies. Response evaluation criteria in solid tumours (RECIST) were developed and published in 2000. RECIST criteria have been widely adopted for the evaluation of treatment response in the clinical trial setting. A revised version, RECIST 1.1, was subsequently published in 2009, in order to address several problems that had been encountered with RECIST 1.0. An extensive analysis of data was undertaken in order to underpin the changes with a strong evidence base, prior to the publication of RECIST 1.1. New clinical trials frequently use RECIST 1.1 but in some cases, new studies will still use RECIST 1.0 in order to allow direct comparison with a previous similar study. In this lecture, the key features of RECIST will be presented together with the important changes between RECIST 1.0 and 1.1. Frequently asked questions will be addressed and the criteria will be illustrated with clinical examples.

Learning Objectives:
1. To learn the rules for recording measurable disease.
2. To learn the rules for recording non-measurable disease.
3. To be able to answer frequently asked questions.

A-402 14:28

B. Response measurement in 'difficult' tumours

L. Ollivier[1], S. Apter[2], V. Servois[1], S. Neuenschwander[1]; [1]*Paris/FR*, [2]*Tel-Aviv/IL (liliane.ollivier@curie.net)*

Even if the RECIST criteria based on anatomic size measurements of the tumours have been recently updated, difficulties are still often encountered in measuring lesions, both in primary tumours and metastases. The aim of this course is to analyse the major causes of these difficulties. Some are due to the tumours themselves, known to be a constant problem in assessing their response to treatment. Bone lesions for example are even considered non target lesion leading to a non-eligibility of the patients for a new therapy and the absence of correctly measurable disease in malignant pleural mesothelioma or ovarian cancer can affect patient management. Evolution under treatment of some tumours (even if they are easily evaluable before treatment) and /or the adjacent parenchyma may also be the cause of difficulties in assessing response. Modality used in the study, use of automated measurements, type of study and type of treatment (GISTS) may affect the measurements. The different criteria of response may also lead to discrepancies between observers. Panel reviews often offer the opportunity to realise how much intra-observer variability is important in these particular tumours. The second part of this course consists in searching either in our experience or in the literature, the new avenues to improve the quality of assessment of response in these kinds of tumours known as „difficult" and even to look forward to using new criteria, new techniques and also new endpoints

Learning Objectives:
1. To understand why response measurement is difficult in some tumours.
2. To learn how response is measured in ovarian cancer/mesothelioma/GIST tumours/myeloma.

A-403 14:51

C. Assessment of response using functional imaging: the essentials

A.E. Sundin; *Stockholm/SE (Anders.Sundin@ki.se)*

The mainstay for image evaluation of response to oncological therapy is CT or MRI applying morphological criteria, generally RECIST, or in recent clinical trials RECIST 1.1. For some tumour types these criteria are not applicable and for others RECIST-like criteria have been developed depending on the specific characteristics of the tumour type. One example is the so-called Choi criteria for GIST that relies not only on changes in tumour size but also on alterations in lesion attenuation. In functional imaging using FDG-PET the tumour uptake reflects the metabolic activity of the tumour and a decrease of FDG accumulation at follow-up during and/or after therapy as compared with the base-line examination indicates treatment response. For some tumours, such as lymphoma, a visual interpretation in this regard is often sufficient but for most cancers the FDG uptake in the tumours needs to be quantified in the PET images. Usually, the standardised uptake value (SUV) is used. SUV is a measure of the tumour radioactivity concentration that is normalised to the amount of FDG injected (the injected radioactivity, Bq) and the distribution volume, for which the body-weight (g) is usually used. The tumour lesions are delineated in the PET images by regions and/or volumes of interest (ROIs, VOIs). The EORTC have published criteria to be applied on the results of these measurements and recently also the PERCIST (PET Response Criteria In Solid Tumours) have been proposed that combines measurements of tumour FDG uptake and size to determine the results of the treatment.

Learning Objectives:
1. To learn how response is measured with FDG-PET.
2. To understand quantitative measurement with FDG-PET.
3. To be familiar with pitfalls in measuring response.
4. To understand the role of FDG-PET in monitoring response in lymphoma.

Panel discussion:
When and how will functional imaging overcome morphological assessment? 15:14

14:00 – 15:30 **Room F1**

Special Focus Session

SF 14
HIV/AIDS update 2012

A-404 14:00

Chairman's introduction: Living with AIDS – numbers and facts

M.M. Thurnher; *Vienna/AT (majda.thurnher@meduniwien.ac.at)*

Since its first introduction 30 years ago, the researches continue to fight with the human immunodeficiency virus (HIV). Not that long ago, the term "HIV" immediately induced a vision of an untreatable infection that progressed to acquired immunodeficiency syndrome (AIDS) and death. Highly Active Anti-Retroviral Therapy (HAART) has significantly changed this scenario. HIV infection, whilst certainly not conquered, has become a treatable chronic disease. Global HIV epidemic is a series of very different epidemics in different countries. HIV prevalence rates vary widely, as do transmission routes. Although the overall HIV-associated morbidity and mortality has decreased worldwide, the access to HAART is not equal in all parts of the world. In contrast to universal access to antiretroviral therapies in some European countries and USA, in the Eastern Europe and Central Asia just 23% of people who are in need have access to antiretroviral treatment. Globally, in 2008, more than 10 million people living with HIV were still in need of treatment. HIV/AIDS remains one of the world's most significant public health challenges, particularly in low- and middle-income countries. This Special Focus Session attempts to elucidate, discuss and update on: a) HIV-associated diseases and imaging findings b) current antiretroviral strategies and c) future developments.

Session Objectives:
1. To review the current numbers and facts about HIV infection worldwide.
2. To highlight the evolution of HIV infection, novel findings in HIV pathogenesis, and the interactions of the virus with the immune system.
3. To emphasise new diagnostic imaging tools for diagnosing and monitoring the most common HIV-related diseases.

A-405 14:03

Clinical challenges in HIV and CART era

A. Rieger; *Vienna/AT*

The broad implementation of antiretroviral combination therapy (cART) in high-budget countries has significantly changed the clinical course of HIV infection. Although eradication of the virus is still not feasible, long-term suppression of viral replication is associated with immune reconstitution, a marked reduction of opportunistic diseases, an improved quality of life and a life expectancy that in absence of HCV coinfection is approaching that of HIV negative individuals. Nevertheless some caveats have to be issued. In spite of years of educational efforts up to one third of new HIV diagnoses are made only when significant immunodeficiency had occurred already. Even with potent HIV therapies available late diagnosis is a negative predictor for treatment success. In patients on successful cART immune activation is reduced but not to the levels of an HIV negative person. This chronic low level inflammation as compared to age matched HIV negative persons confers a higher risk for cardiovascular diseases, lymphoma and/or osteoporosis and is possibly associated with a general premature ageing process. Similar to other manifestations of progressed HIV disease the prevalence of HIV associated dementia has decreased, however milder forms of neurocognitive deficits are reported increasingly in spite of cART and viral suppression in the peripheral blood. The importance of the brain as a sanctuary site for the immune system and antiretroviral drugs has been established for many years. For both a successful long-term management as well as a potential eradication of HIV, future strategies have to be capable to battle the virus where it hides.

Learning Objectives:

1. To learn about the developments within the global HIV epidemic.
2. To understand the complexities and controversies related to the natural history, diagnosis and management of HIV infection; antiretroviral therapy and immunotherapy.
3. To explain the synergy between basic and clinical sciences.

A-406 14:21

HIV and brain

M.M. Thurnher; *Vienna/AT (majda.thurnher@meduniwien.ac.at)*

The human immunodeficiency virus (HIV) enters the brain very early after exposure. The most probable way is through infected monocytes and lymphocytes that cross the blood-brain barrier (BBB). The introduction of antiretroviral therapies (cART) has resulted in significant declines in morbidity, mortality and prevalence of opportunistic infections. Despite treatment HIV-related CNS complications have remained common. HIV-associated dementia (HAD) is considered as the most severe form of HIV-related injury. Mild neurocognitive disorder (MND) represents a milder form of impairment. An asymptomatic neurocognitive impairment (ANI) was introduced to recognise individuals with impairment on neuropsychological testing who report functional limitations. Neuroimaging plays an important role in detection of HIV-related changes in the brain. New imaging modalities (DTI, MRS) are increasingly used to measure injury within white matter tracts and regional changes in brain metabolites. This lecture will focus on the spectrum of “Neuro-AIDS disorders” and their imaging characteristics.

Learning Objectives:

1. To review the most common CNS diseases in the HIV-positive population.
2. To learn how to use advanced imaging findings in distinguishing HIV-related brain disorders.
3. To consolidate knowledge on imaging-based therapy monitoring.

A-407 14:39

Understanding the role of immune activation and restoration in HIV infection

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

Immune reconstitution inflammatory syndrome (IRIS) occurs when restored immunity causes an abnormally robust response to infectious or noninfectious antigens. IRIS develops in 15-35% of AIDS patients beginning combination antiretroviral therapy (cART). IRIS develops in two distinct scenarios: “Unmasking” IRIS (u-IRIS) and “paradoxical” IRIS (p-IRIS). u-IRIS in AIDS occurs when beginning cART reveals a subclinical opportunistic infection against a living pathogen. p-IRIS occurs when a treated patient deteriorates after initiated of HAART. The recovering immune response targets persisting pathogen-derived antigens or self-antigens to cause tissue damage. This presentation discusses both types of IRIS and their imaging manifestations in the CNS. Neuro-IRIS affects only 1% of all IRIS cases but must be identified. u-IRIS should be distinguished from p-IRIS as disease management and prognosis differ significantly. PML-IRIS, TB-IRIS, fungal- and parasite-IRIS are illustrated. Non-HIV IRIS associated with natalizumab (Tysabri)-related PML will also be illustrated and insights into the roles of immune restoration in disease development in the setting of HIV-AIDS discussed.

Learning Objectives:

1. To understand the pathophysiology of HIV infection of the brain.
2. To learn about the restoration of the immune function with antiretroviral therapies.
3. To become familiar with IRIS.

A-408 14:57

Changing spectrum of HIV-related diseases in the chest: 30 years later

T. Franquet; *Barcelona/ES (tfranquet@santpau.cat)*

Since acquired immunodeficiency syndrome (AIDS) was first reported in the early 1980s, the lung was the organ most frequently affected by opportunistic lung infections (PCP) and noninfectious processes (Kaposi sarcoma and lymphoma). Since the beginning of the epidemic, more than 60 million people have contracted HIV and more than 25 million have died of AIDS-related causes. Actually, more than 33 million people live with HIV/AIDS and in 2009, 1.8 million people died from AIDS. The introduction of highly active antiretroviral therapy (HAART) has resulted in a considerable increase in the length of survival of HIV-infected patients. Although significant progress has been made in the past decade in the treatment of these patients, partial restoration of specific immunity may worsen a preexisting disease. Immune reconstitution inflammatory syndrome (IRIS), which occurs in some patients in the weeks to months after the institution of HAART, may alter the typical imaging appearance of infectious diseases. Patients with IRIS demonstrate paradoxical deterioration in their clinical status; IRIS-reported illnesses include M. tuberculosis, MAC, AIDS-associated malignancies (Kaposi sarcoma), lymphoma, and sarcoidosis. In the evaluation of HIV-related diseases, it is important for radiologists to recognise the effect that treatment has on imaging appearances.

Learning Objectives:

1. To review pulmonary HIV-associated diseases.
2. To learn changing patterns in the presentation and epidemiology of thoracic manifestations of AIDS.
3. To learn about the role of thoracic imaging at the beginning of AIDS and 30 years later.

Panel discussion:
How the shift in the natural history and clinical manifestation of HIV is changing my imaging diagnosis 15:15

14:00 – 15:30 **Room F2**

Breast

RC 1402

How I report

Moderator:
I. Leconte; Brussels/BE

A-409 14:00

A. Mammography

F.J. Gilbert; *Cambridge/UK (fjg28@cam.ac.uk)*

A structured mammogram report avoids ambiguous communication of information and aids audit and data collection. It should contain the following information: an assessment of the breast density (fatty, mixed or dense or use the BIRADS system of 1 – glandular tissue < 25%, 2 – scattered fibroglandular tissue 25-50%, 3 – heterogeneously dense 51-75%, 4 – > 75% fibroglandular and fibrous tissue. A description of any mass seen in the breast with the size (maximum diameter together with perpendicular measurement), the shape (round, oval, irregular), margin (sharply or well defined, indistinct or illdefined, spiculated), density of the lesion, any associated features; presence of asymmetric density or architectural distortion. If calcifcation is present then the extent in two dimensions should be given, type of particles (amorphous or indistinct calcification with tea cupping) or fine linear, branching or casting. A description of the position of the abnormality naming the quadrant of the breast or the distance from the nipple. Coarse benign calification is not ususally reported. The presence or absence of any satellite lesions is important. Several different scoring systems are used. The UK uses a 5-point system – 1 – normal, 2 – benign, 3 – indeterminate, 4 – suspicious, 5 – malignant. The American BIRADS system: 0 – more imaging required, 1 – normal, 2 – benign lesion, 3 – high probability of being benign, short interval follow-up recomended, 4 – suspicious, 5 – high probability of cancer and 6 – known malignancy.

Learning Objectives:

1. To be familiar with the basic parts of a structured report.
2. To understand which information a clinician needs in a breast cancer patient’s report.
3. To learn to compose a report for a patient with a BI-RADS 3 lesion.

A-410 14:30

B. Breast US

G. Rizzatto; *Gorizia/IT (grizzatto@libero.it)*

Breast ultrasound (US) examinations are sometimes reported separately from mammography and sometimes reported as part of a combined examination. In either case, the structure of the report should follow some general guidelines to make the report clear and concise. The report should start with a brief description of the technology used: transducer type and frequency, type of elastography when relevant. A brief description of clinical history will follow as long as the rationale for the use of US. Findings must be reported having in mind the diagnostic accuracy of US for different clinical and/or comparative studies (i.e., US of a cancer lesion will include findings relative to staging) and with comparison to prior studies when relevant. Reporting of findings must be followed by the assessment (BI-RADS categories should be preferred) with clear management recommendations. The report should be succinct, using terminology and descriptors internationally accepted.

To reduce legal problems, other aspects of the report and documentation data should comply with the available guidelines published by the reference National or Continental Societies. As US examinations are made by frames with limited field of view minimal documentation must be at least correlated to the reported findings. To reduce legal problems avoid mistakes with patient name, date and time of examination and lesion location.

Learning Objectives:

1. To be familiar with the ultrasound BI-RADS categories.
2. To learn how to integrate clinical information and radiological findings.
3. To know how to write a ultrasound report for a breast cancer patient.

A-411 15:00

C. Breast MRI

M.H. Fuchsjäger; *Vienna/AT (michael.fuchsjaeger@meduniwien.ac.at)*

Breast Magnetic Resonance Imaging (MRI) examinations should be reported in a structured way following guidelines of respective national, continental or international societies. Adequate non-clinical information (i.e. patient name, date and type of examination, etc). is indispensable. Any breast imaging report has to follow a stringent structure including – indication, clinical history, clinical findings, brief description of technology used, assessment of parenchymal density, detailed description of significant findings, comparison with previous imaging studies, final assessment according to BI-RADS. Indications and contraindications of breast MRI will be discussed. Significant findings at breast MRI include foci (small contrast-enhancing spot, NOS, < 5 mm), mass lesions, "non-mass-like enhancement" (no mass lesion, partly diffuse regional contrast enhancement of various size) and associated findings. As breast MRI is a functional study, different appearance patterns of kinetic contrast enhancement will be presented. The current status and the appropriate use of the BI-RADS MRI lexicon will be discussed. Any breast MRI report should not only follow these guidelines, but also express confidence, follow a red thread, be consistent and therefore be comprehensible for clinicians. The overall final BI-RADS assessment is based on the most worrisome finding, taking into account both breasts and all imaging methods (Mammography, Ultrasound, MRI) evaluated. Furthermore, adequate communication of the result as well as do's and don'ts of report wording will be discussed.

Learning Objectives:

1. To learn how to integrate conventional (mammography and ultrasound) findings into a breast MRI report.
2. To know how to write a complete report with all morphological and kinetic information obtained and why this information should be thorough.
3. To acquire the necessary skills to compose a report for a breast cancer patient at any stage (staging, follow-up, relapse, etc).

14:00 – 15:30 **Room G/H**

Neuro

RC 1411

Angioplasty and stenting of extra and intracranial arteries

A-412 14:00

Chairman's introduction

P. Vilela; *Almada/PT (ferrovilela@sapo.pt)*

The development of balloon angioplasty for atherosclerotic lesions in the 1960s & 70s by Dotter and Gruentzi was a tremendous breakthrough for endovascular treatments. Nowadays, both balloon angioplasty and stenting are widely accepted for the treatment of stenoocclusive atherosclerotic lesions. In the neurovascular field the application of these techniques has been broadened to other disorders such as vasospasm, dissection aneurysms and stroke. In the 1980s, major breakthroughs for the extracranial disorders endovascular treatments were accomplished by Mathias and successful angioplasties of the subclavian and carotid arteries by the introduction of cerebral protection techniques by Theron. More recently, during the 1980s & 90s, emerged the intracranial endovascular advances with the tranluminal angioplasty by Sundt and stenting by Horowitz for intracranial stenosis and with the use of stent-assisted coiling in aneurysms by Higashida. In the past years, there have been significant advances in the endovascular treatment of extracranial and intracranial disorders using stents, resulting from new devices and from safer techniques. This session will be devoted to an update on angioplasty and stenting of extra and intracranial arteries, experience the data coming from the major trials and run through the indications, techniques and devices used for extracranial and intracranial stenting in different disorders ranging from stenoocclusive atherosclerotic lesions to aneurysms.

A-413 14:05

A. Critical appraisal of the literature

J. Fiehler; *Hamburg/DE (fiehler@uke.de)*

Four randomised controlled trials (RCTs) comparing outcomes after carotid artery stenting (CAS) with carotid endarterectomy (CEA) have been published recently. Based on recent systematic reviews it has been recommended that CAS can no longer be justified for patients suitable for CEA. Indeed pooled data of the RCTs show higher peri-operative risk of performing CAS vs. CEA with comparable long-term efficacy in many centres. The inferiority of CAS to CEA as a method cannot be concluded from SPACE, EVA3S and ICSS because of limitations in study design and conduct. The goal of this presentation is not to discredit these trials but to develop a more differentiated and critical interpretation of the data and to create more discussion. I will discuss the necessity of randomised control trials (RCTs) for Interventional Neuroradiology in general and particular problems in study design (non-inferiority design and interpretation of results, clinical equipoise, study endpoints), practical study conduct difficulties (operator and centre experience, antiaggregation, timing of treatment) and the interpretation of the results (relation of internal and external validity, procedural complexity, the 68-years-surprise, longer-term outcome). A premature rejection of CAS based on the data from these studies could harm future patients who would have benefited from this procedure. For the time being there is no reason why centres with good and independently controlled track records should stop performing CAS.

Learning Objectives:

1. To recognise the general critical statistical and clinical issues in the interpretation of a trial.
2. To understand and interpret the results from the trials assessing the treatment of extracranial carotid diseases.
3. To understand and interpret the results from the trials assessing the treatment of intracranial stenosis treatment.
4. To be informed about the conclusions that can be drawn from the current published trials.

A-414 14:28

B. PTA and stenting of extracranial arteries

T. Andersson, M. Söderman; *Stockholm/SE*

The most common indication for PTA and stenting of extracranial arteries is atherosclerotic disease. Arterial dissection, spontaneous or traumatic, may also warrant such treatment. Other, less common, indications are Fibromuscular Dysplasia (FMD) and Takayasu´s arteritis (TA). Proximal stenosis of the internal carotid artery (ICA) is a common manifestation of atheroclerosis in the western world. It can be treated surgically with endarterectomy, but PTA/stenting has proven a good or better alternative for many patients as shown in recent multicentre randomised studies. It is today also possible in selected patients to reopen a completely occluded internal carotid artery. This may be a treatment option for patients with proven symptomatic hypoperfusion. Symptomatic atherosclerotic stenosis of the extracranial vertebral arteries (VA) is not as common, but PTA/stenting may be a treatment option also in this vascular territory. Arterial dissections usually heal but in a situation with haemodynamically significant impairment of flow, PTA/stenting may be needed in the acute situation. If the dissection causes a subarachnoidal haemorrhage, vessel sacrifice is often the safest treatment option. If that, however, for haemodynamic or other reasons is not possible, treatment with one or more stents may lead to a good outcome. When performing thrombectomy for acute stroke, a significant stenosis of the ipsilateral ICA or VA can be a complicating factor demanding procedural alterations including PTA/stenting. FMD may cause stenosis of the ICA, whereas TA predominately concerns the common carotid artery, both possible to treat with PTA/stenting if the patient suffers from thromboembolic or haemodynamic symptoms.

Learning Objectives:

1. To become familiar with the endovascular treatment of extracranial arterial disorders.
2. To understand the endovascular treatment strategies for extracranial vertebral artery atherosclerotic and nonatherosclerotic disease.
3. To understand the endovascular treatment strategies for extracranial carotid artery atherosclerotic and nonatherosclerotic disease.
4. To recognise the present and future challenges for PTA and stenting of extracranial arteries.

A-415 14:51

C. PTA and stenting of intracranial arteries

V. Pereira, K. Lovblad; *Geneva/CH (vitormpbr@hotmail.com)*

There are three major indications for intracranial stents: atherosclerotic stenotic disease, aneurysm treatment and acute stroke recanalisation. Intracranial atherosclerotic disease has a different distribution around the world being more frequent in Asian population (around 20%) and less frequent in European and American cohorts. Best medical treatment demonstrated safety and better long-term results compared with interventional treatment (SAMPPRIS). The current indication for intracranial stenting for atherosclerotic stenotic disease would then be the cases where the best medical treatment failed to control the disease with recurrent emboli or stenosis progression. Intracranial aneurysms have been treatment with endovascular techniques in most of the cases. Stenting pushed forward the treatment of large neck and complex lesions. Aneurysm bridging permitted to approach cases where the balloon remodelling was not enough or bifurcation aneurysms. More recently, stents with a dense porosity started to be used without associated coiling in order to change intra aneurismal flow to induce aneurysm thrombosis and progressive vascular remodelling. Patient's selection is the key point for a successful procedure. Some technical details like good support on proximal access and good anti-aggregation therapy are important to increase the safety of the procedure. The most recent domain to introduce the intracranial stent was the acute stroke treatment. The development of retrievable stents (like the stent solitaire). They have the capability to remove clot or dissolve with lytics. The rates of recanalisation are close to 90%. The future prepare: coated stents to be used without anti-aggregation, absorbable stents and very lower profiles.

Learning Objectives:

1. To become familiar with the intracranial applications of angioplasty and/or stenting in intracranial disorders.
2. To understand the endovascular treatment strategies for intracranial atherosclerotic artery disease.
3. To understand the endovascular treatment strategies for intracranial nonatherosclerotic artery disease.
4. To learn about the present and future challenges for PTA and stenting of intracranial arteries.

Panel discussion:
What will be the fate of extracranial and intracranial angioplasty and stenting procedures? 15:14

14:00 – 15:30 **Room I/K**

Genitourinary

RC 1407

MRI in prostate cancer

A-416 14:00

Chairman's introduction

J. Venancio; *Lisbon/PT (josevenancio@netcabo.pt)*

MRI is used in the detection of prostate cancer (PCa) in several circunstances highlighting A. patients with previous series of negative ultrasound-guided biopsies and clinical or biochemical suspicion of PCa. B. Patients already treated for PCa, with rising PSA. Functional multiparametric MRI including dynamic contrast-enhanced MRI (DCE-MRI), diffusion-weighted MRI (DW-MRI) and spectroscopic MRI (S-MRI) is useful to detect suspect areas, mainly in peripheral zone and direct TRUS or MRI-guided biopsies. Nowadays 3 T MRI can improve PCa detection due to higher multiparametric capabilities and more precise staging. It is very important precise localisation of tumour in some kind of patients indicated for focal treatment: HIFU, brachytherapy, cryotherapy… In the follow-up after treatment, with a biological or clinical suspicion of relapsing, it is very important to detect peri-anastomotic or pelvic recurrences, and MRI (combining the use of endorectal and pelvic phased array coils) is better than US or CT. Particular conditions concerning present and future clinical needs on imaging PCa will be discussed. New developments in MRI of PCa will be presented, emphasising local staging, recurrences perianastomotic and the evaluation of lymph nodes (Fe-nanoparticles?).

Session Objectives:

1. To analyse and compare the most important MRI developments.
2. To evaluate prostate after treatment for cancer, and evaluate the signal intensity changes to detect local recurrencies.
3. To present future trends of MRI in prostate cancer, answering the future clinical needs, namely in the evaluation of lymph nodes.

A-417 14:05

A. MRI in detection of prostate cancer

F. Cornud; *Paris/FR (francois.cornud@imagerie-tourville.com)*

MRI is more and more often used for PCa detection in patients with a negative series of biopsies and a persistent biological suspicion of PCa. Multiparametric MRI (mp-MRI) increases the accuracy of T2W-Imaging to localise PCa. The most widespread protocol includes dynamic contrast-enhanced MRI (DCE-MRI) and diffusion-weighted MRI (DW-MRI) which improve accuracy of T2W-MRI to detect P-Zone cancers with a tumour volume > 0.2-0.5 cc. DCE-MRI has a high sensitivity but a limited specificity related to a common enhancement of benign P-Zone sextants and of T-Zone BPH nodules. On DW-MRI, PCa shows a significantly lower Apparent Diffusion Coefficient (ADC) value than that of benign prostate tissue which increases the specificity of T2W-MRI. Chronic prostatitis and BPH stromal nodules can have a low ADC value close to that of PCa, but the use of ultra-high b values (b2000) allows for a better differentiation between the three conditions. Significant differences in tumour ADC values are observed between patients with low risk, and those with higher risk localised P-Zone PCa. Image fusion between MR and TRUS data set is a promising tool to increase the accuracy of targeted TRUS guided biopsies. There is more and evidence that a normal MRI is correlated with absence of cancer or presence of an insignificant tumour. PSA level and mp-MRI may thus select patients requiring immediate biopsy to detect significant tumours and those in whom biopsy could be deferred and indicated if follow-up shows signs of PSA level progression and/or occurrence of suspicious MRI findings.

Learning Objectives:

1. To understand the role of MRI in the diagnosis of prostate cancer.
2. To understand the key MRI findings in prostate cancer.
3. To learn about the role of MR spectroscopy in the diagnosis of prostate cancer.

A-418 14:28

B. MRI in post-treatment follow-up

A.T. Turgut; *Ankara/TR (ahmettuncayturgut@yahoo.com)*

The role of imaging in patients with increased PSA level after radical prostatectomy or radiation therapy, which are the two main curative treatment options for prostate cancer, is to aid in differentiating locally recurrent disease which can be managed with local therapy from distant metastatic disease requiring systemic therapy. Although the majority of local recurrences in post-surgical patients can be detected by MRI in the perianastomotic region which can also be evaluated with TRUS and TRUS-guided biopsy, some recurrences can occur at pelvic sites that are beyond the range of TRUS; MRI has a role of labelling these sites for TRUS-guided biopsy. The combination of an external phased-array coil and endorectal coil is recommended for detecting local recurrent cancer. Current protocols involve T2-weighted MRI combined with functional techniques like dynamic contrast-enhanced MRI (DCE-MRI), magnetic resonance spectroscopy and diffusion-weighted MRI. In the post-prostatectomy bed, recurrences present as lobulated masses having low to intermediate signal intensity on T2-weighted images and showing early, nodular enhancement with early washout of gadolinium on DCE-MRI. After radiotherapy early contrast enhancement and early wash-out is seen recurrent tumors whereas the enhancement of post-radiation fibrosis is slow and low, offering a good contrast with the usually hypervascular recurrent cancer. The overall diagnostic efficacy of conventional MRI in combination with functional techniques is better than T2-weighted MRI alone which may play an important role in better assessment of locally recurrent disease.

Learning Objectives:

1. To understand the role of MRI in the follow-up of patients with prostate cancer after radical prostatectomy or radiotherapy.
2. To learn about the MRI findings for local or distant metastasis in the post-treatment follow-up of prostate cancer.
3. To learn about changes in signal intensity and the detectability of recurrent prostate cancer after radiotherapy.

A-419 14:51

C. New frontiers in imaging of the prostate

J.O. Barentsz; *Nijmegen/NL (J.Barentsz@rad.umcn.nl)*

In this presentation new techniques with potential clinical value will be described with a focus on prostate cancer multi-modality MR imaging. Techniques such as T2W, DWI, DCE and MRSI will be addressed, and their role in screening, determination of tumour aggression and localisation, MR-guided biopsy, MR-guided minimal invasive focal therapy (laser, cryo, HiFu), and MR-guided radiotherapy will be discussed. Examples will be shown.

Learning Objectives:
1. To become familiar with new developments in MRI of prostate cancer.
2. To understand the future clinical needs, and how MRI can solve them.

Panel discussion:
What is the most appropriate radiological approach in patients with rising PSA levels and when should it be taken? 15:14

14:00 – 15:30 **Room L/M**

Physics in Radiology

RC 1413

Hybrid imaging systems

Moderators:
A.A. Lammertsma; Amsterdam/NL
J. Votrubová; Prague/CZ

A-420 14:00

A. Clinical SPECT/CT and PET/CT
T. Beyer; *Zurich/CH (thomas.beyer@cmi-experts.com)*

In 1996, Hasegawa et al. presented a prototype SPECT/CT-design comprising a clinical SPECT-camera in tandem with a clinical single-slice CT. The combined device was used to perform a small number of clinical studies, such as for quantitative estimation of radiation-dosimetry in brain cancer, whereby the CT data were used also to generate the SPECT attenuation-correction-factors (ACF). Since then, SPECT/CT has benefited a great deal from the advances in CT-technology and several commercial system designs are available today. The clinical adoption of SPECT/CT has been rapid, particularly for oncology and cardiology. SPECT/CT currently has a smaller installed base than PET/CT. The proposal to combine PET with CT was made in the early 1990s by Townsend, Nutt et al. In addition to intrinsic image alignment, the anticipated benefit of PET/CT was to use the CT-images to derive the PET-ACF's. The first prototype-PET/CT became operational in 1998 and was clinically evaluated at the University of Pittsburgh. Since then PET/CT-technology has grown rapidly by incorporating new concepts of PET, available as PET/CT only, and multi-slice CT. Today's installed base is about 5,000 systems worldwide. The improvement in accuracy of PET/CT compared with PET or CT for re-/staging is statistically significant and averages 10-15% over all cancers. Image artefacts inherent to SPECT/CT and PET/CT can be detected, interpreted and corrected/avoided by well-trained users. By adopting more innovative acquisition schemes and data processing SPECT/CT and PET/CT will become faster and more dose-efficient imaging methods and manifest themselves as integral parts of state-of-the-art patient management.

Learning Objectives:
1. To understand the origins and evolution of SPECT/CT and PET/CT.
2. To understand the basic principles and general clinical applications.

A-421 14:30

B. Clinical PET/MRI
G. Antoch; *Düsseldorf/DE (antoch@med.uni-duesseldorf.de)*

PET/CT has been implemented in clinical routine in 2001. Since then the focus of PET/CT indications has been oncology with neurological and cardiovascular indications dragging behind. PET/MRI has just been introduced as the next generation hybrid imaging system. Two different PET/MRI scanners are currently available on the market. In the first scanner PET and MRI are installed at a distance hooked by one patient table. PET and MRI are acquired sequentially with this system. The second scanner available represents both imaging modalities combined in one machine, offering simultaneous image acquisition of PET and MRI. At this early stage of PET/MRI scanning, many questions have to be answered: as to what is the most feasible method for MR-based PET attenuation correction and as to how does the MR-magnetic field or MR-hardware (e.g. coils) affect the PET emission quanta, etc. Apart from these technical questions the most important question is on potential indications for this new imaging method. Will it be mainly oncology, or will neurological and cardiovascular indications gain ground as compared with PET/CT? This refresher course will discuss current concepts of PET/MRI and will give answers to the questions named above.

Learning Objectives:
1. To become acquainted with the origins and evolution of PET/MRI.
2. To be informed about the current applications.

A-422 15:00

C. Pre-clinical hybrid imaging
N. Belcari; *Pisa/IT (belcari@df.unipi.it)*

During the past decade we have observed a growing interest in in-vivo imaging techniques for small animals. On the shadow of the successful application of dual-modality imaging in the clinical environment, such as combined PET-Computed Tomography (CT) or SPETC/CT, the hybrid imaging modalities have been recently transferred to small animal scanners. Nowadays, the possibility of easy integration of nuclear imaging techniques with other modality such as PET/SPECT/CT, PET/MR or PET/Optical has become a mandatory requirement in the design of small animal imaging systems. The combination of different imaging modalities in the same scanner offers the possibility to perform experiments more effectively than with a single modality only. This is especially true when two modality scans are performed sequentially or simultaneously and without moving the animal. Present technologies for the construction of hybrid systems for small animals will be presented together with examples of commercially available hybrid scanners. Looking at the next future, small animal PET/MR seems to be one of the most appealing perfect choice for hybrid imaging, combining the exquisite sensitivity of PET with the morphological/functional/spectroscopic high-resolution imaging of MR. The present major limitation on the development of simultaneous PET/MR scanners is the non-insensitivity of PMTs to magnetic fields. A reliable solution could be the development of magnetic field insensitive position-sensitive photodetectors. A brief overview of the present status of development of the detector technology for PET/MRI will be also presented.

Learning Objectives:
1. To learn about hybrid imaging tools in animal imaging/pre-clinical research.
2. To understand possible clinical applications.

14:00 – 15:30 **Room N/O**

Head and Neck

RC 1408

Performing and reporting head and neck examinations: how do I do it?

Moderator:
P.-Y. Marcy; Nice/FR

A-423 14:00

A. Sinonasal CT scans
M. Becker; *Geneva/CH (minerva.becker@hcuge.ch)*

The purpose of this lecture is to discuss the most common indications to perform sinonasal CT scans, to provide an understanding of the most common disease states and their impact on the choice of the respective imaging protocol and to provide a checklist of what the radiologist needs to report. First, the basic concepts of sinonasal CT and cone beam CT imaging including current protocols, radiation doses, 2D and 3D reconstructions and administration of contrast material will be discussed, followed by a brief discussion of the pertinent anatomy including the most relevant radiological anatomical landmarks. A systematic review will include key radiological features of acute and chronic sinusitis and related complications, polyposis, mycetomas, allergic fungal sinusitis and sinonasal tumours. Major emphasis will be put on the systematic approach, on the bottleneck areas where occlusion of normal passages may occur, on CT findings necessitating an additional MR and on how to report in a comprehensive way.

Learning Objectives:
1. To learn how to perform a state-of-the art CT examination of the sinuses.
2. To learn to decide when you inject a contrast agent on CT or suggest an additional MRI exam.
3. To learn what to report on CT examinations of the sinuses.

A-424 14:30

B. Temporal bone CT and MRI scans
M.M. Lemmerling; *Gent/BE*

CT examination of the temporal bone: Temporal bone CT scans should be performed in a reproducible way. Axial reconstructions are made in the plane of the lateral semicircular canal and coronal reconstructions exactly perpendicular to this plane. Thin sliced images are postprocessed using high-resolution algorithms. MR examination of the temporal bone: the challenge is to perform a complete examination. The standard version of such an exam starts with axial T2-weighted images of the brain and posterior fossa, and axial T1- and heavily T2-weighted images covering the temporal bone. After intravenous injection of gadolinium axial and coronal T1-weighted images are performed. Temporal bone report on CT and MRI: structured reporting is the result of structured viewing. In the evaluation of the middle ear on CT examinations it is best to follow the sound wave on the axial images (from tympanic membrane over malleus, incus and stapes to oval window), than inspect the fissula antefenestram region and the oval window. The inner ear is evaluated from cranially to caudally (semicircular canals, vestibule and vestibular aqueduct, cochlea and cochlear aqueduct). The facial canal, carotid canal and jugular fossa are finally evaluated. On the coronal images one should at least inspect the intactness of tegmen tympani and the bony cover of the lateral semicircular canal. On MRI, after viewing the brain images, one best first tries to detect abnormal enhancing inner ear structures on the gadolinium-enhanced T1-weighted images, and then explains them using the heavily T2-weighted images.

Learning Objectives:
1. To learn how to perform a state-of-the art CT examination of the temporal bone.
2. To learn how to perform a state-of-the art MR examination of the temporal bone.
3. To learn how to make a complete temporal bone report on CT and MRI.

A-425 15:00

C. CT scans of the head and neck

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

The purpose of this lecture is to present how a good diagnostic head and neck scan can be achieved. Indications, technical problems and pitfalls, timing and contrast administration issues will be addressed. Tips and tricks regarding the best quality of the images will be discussed with appropriate examples. Afterwards, an example of a structured report will be presented, describing comprehensively all steps of radiological evaluation of the disease, followed by clear conclusion and staging. Emphasis will be placed on what the surgeon needs to know in order to plan the treatment. Next, attetion will be paid to lymph node evaluation: features of malignant infiltration will be discussed. As an endpoint, all steps including proper CT examination, radiological findings and structured reporting will be reviewed.

Learning Objectives:
1. To learn how to scan a neck on CT: technique, contrast administration and timing.
2. To learn how to do structured reporting: “did I see it all”?
3. To learn to report abnormal lymph nodes in a structured manner.

14:00 – 15:30 **Room P**

Radiographers

RC 1414

Promoting best practice in forensic imaging

Moderators:
C. Vandulek; Kaposvár/HU
P. Vock; Berne/CH

A-426 14:00

A. Forensic imaging: another important growing field

P. Vock; *Berne/CH (peter.vock@insel.ch)*

Forensic imaging has grown slowly from its early radiographic applications starting before the year 1900, soon after the detection of x-rays, over the whole 20th century, before turning into an exponential growth after the introduction of multidetector CT and fast MRI techniques in the past ten years. Starting with a short summary of the history, this conference will address the advantages of virtual autopsy as compared with conventional autopsy: its non-destructive character, frozen objective documentation, ease of archiving and distribution, the lack of motion artefacts, and the lack of effects of ionising radiation. There are, however, significant disadvantages of postmortem imaging; these and approaches to overcome the limitations will be discussed as well as applications of forensic in vivo imaging. The differences between clinical and forensic imaging will finally be pointed out, and we will discuss some questions specific to forensic imaging, such as identification, detecting the cause and manner of death, vital reaction at imaging and reconstruction.

Learning Objectives:
1. To be informed about the history of the field of forensic imaging.
2. To understand developments in the field of forensic imaging.
3. To be informed about the impact of these developments on the work of radiologists.

A-427 14:30

B. The role of radiographers in forensic imaging

J. McNulty; *Dublin/IE (jonathan.mcnulty@ucd.ie)*

Radiographers have a key role to play in the provision of high-quality forensic imaging services and indeed forensic radiography should be viewed as an area of specialisation within the broader profession in keeping with other specialist areas. The concept of optimisation has been established in clinical radiography practice across Europe and indeed in the forensic examination of living individuals, but remains an issue in many centres performing a variety of forensic examinations on the full or partial remains of deceased individuals along with specimen radiography. As with many other areas of service development barriers often exist to the development of forensic imaging services and there are key steps that must be considered in order to implement a high-quality service. Such barriers can include access to appropriate equipment and other resources, availability of education and training, a variety of medico-legal challenges and the voluntary nature of forensic work within a clinical setting. A guideline-driven, well-planned approach involving all key stakeholders is essential to the development and implementation of an excellent forensic imaging service. While many international centres of excellence in forensic imaging have now been established, and as more come on stream over the coming years, there remain many examples where the radiography-based forensic imaging service is not optimal and could be improved. A series of practical approaches and potential opportunities for radiographers to help develop their own local forensic imaging services will be explored.

Learning Objectives:
1. To understand the potential role of radiographers in forensic imaging.
2. To be aware of potential barriers and key steps in the implementation of a local forensic imaging service.
3. To become familiar with good and bad examples of a radiography-based forensic imaging service.
4. To be aware of local opportunities to develop forensic imaging services and professional development.

A-428 15:00

C. The importance of standards in education and training in forensic imaging

E. Faircloth; *Devon/UK (emily.faircloth@nhs.net)*

Radiography is now internationally regarded as a valuable tool in forensic and humanitarian investigations with continuous developments in this field. Despite this, there are currently no internationally recognised standards for education and training in forensic radiography. Training has traditionally been based on apprenticeship and as such, the use of clinical imaging techniques in the forensic context remains variable with little uniformity in service provision, training or education between countries. A 2006 study on international forensic radiography provision indicated a direct “correlation between the level of training given and its level of utilisation and perceived benefit to the investigation”. Lack of standards in training and education can undermine good practice leading to poor record keeping, poor techniques in evidence provision and increased levels of anxiety in imaging personnel. This presentation further explores the role of international training and education in forensic radiography with recommendations for best practice including: 1. Development of international standards. 2. An increase in formally accredited, accessible education programmes. 3. Robust, sustainable national response teams of suitably trained personnel. 4. A database of trained personnel for international deployment. 5. The provision of practical simulation exercises (e.g. multidisciplinary mock disasters) encouraging experiential learning. 6. The provision of online professional development opportunities (e.g. modular e-learning programmes). There is nothing that can entirely prepare for the provision of forensic radiography services, particularly in response to a mass fatality incident. However, the international forensic radiography community has a responsibility to provide training opportunities for imaging practitioners to meet agreed international standards.

Learning Objectives:
1. To understand the potential impact of a lack of standards in forensic imaging on forensic investigations.
2. To be informed about the role of education and training in key areas of forensic imaging practice.
3. To become familiar with examples of international best practice in forensic imaging education and training.

14:00 – 15:30 **Room Q**

Paediatric

RC 1412

Children's bones and joints

Moderator:
O.E. Olsen; London/UK

A-429 14:00

A. Imaging of sports injuries
M. Alison, G. Sebag; *Paris/FR (marianne.alison@rdb.aphp.fr)*

Musculoskeletal sport injuries of children and adolescents differ from that of adults because they occur on a growing skeleton with particular characteristics. The bone and the cartilage are weaker than the muscles and the ligaments, resulting in specific lesions. The vulnerability of the growing bone and cartilage are increased during the rapid growth periods. There are two main types of sport injuries. The acute traumatic lesions are the most frequent and correspond to the specific fractures of the paediatric age. The chronic overused injuries are related to repetitive micro traumas and are more frequently encountered in young athletes. The specific acute sport injuries, more frequently seen in adolescents, are the metaphyso-epiphyseal fractures, the apophyseal avulsions and the patellar dislocation. Sport injuries in children can lead to specific complications when the physis is involved, resulting in growth disturbance, with the need of an extended follow-up. X-rays are the first imaging tool but indication should be selected according to the clinical findings. Ultrasonography is ideally suited for the evaluation of soft tissue, muscles, tendons and ligaments. CT is useful to better analyse complex articular fractures. MRI is the imaging of choice to look for ligaments, menisci, osteochondral injuries and overused injuries. MRI is also used to assess complications like epiphysiodesis or osteonecrosis.
Learning Objectives:
1. To learn about the most common sports injuries in children.
2. To learn about the imaging protocols and algorithms.
3. To become familiar with the imaging findings in common and relevant conditions.

A-430 14:30

B. Hip dysplasia: US techniques and recommendations
K. Rosendahl; *Bergen/NO (karen.rosendahl@helse-bergen.no)*

Developmental dysplasia of the hip (DDH) is the most common musculoskeletal disorder in childhood, with a reported prevalence of 1-4% according to method of ascertainment and definitions used. Ultrasound has enabled a detailed view of both neonatal hip stability (NHI) and morphology, and two different schools have developed: one arguing that NHI alone is the major pathology warranting splinting, the other including acetabular dysplasia as an important feature. Both static (Graf, Morin) and dynamic (Harcke) ultrasound techniques, as well as a combination of the two (modified Graf (Rosendahl)), have been described and are currently used. In Europe, Graf's ultrasound technique or a modification of this is commonly used within the German-speaking countries and areas, in parts of Scandinavia, the UK, Italy, France, Hungary and the Netherlands. Others use a modified Morin's method while Harcke's method is used only occasionally. Initially, universal ultrasound screening using Graf's method led to higher treatment and follow-up rates than that based on NHI alone, i.e. 3-5% versus 0.4-1.5% and 10-20% vs. 6-7%, respectively. However, improved examination techniques and a better understanding of the findings have led to a more tailored approach, and an extensive meta-analysis performed in 2000, including 534 papers, could not find any differences in treatment rates due to different ultrasound techniques. In this lecture I will present a crude status for US techniques used and also give recommendations for a worthwhile screening strategy based on present knowledge.
Learning Objectives:
1. To learn about the different approaches of hip sonography in neonates.
2. To understand the need for a systematic study.
3. To learn about proposed standardisation for examination and reporting.

A-431 15:00

C. Imaging of juvenile idiopathic arthritis
M. Valle, C. Martinoli; *Genoa/IT (maura.valle@libero.it)*

Ultrasound (US) and MR imaging have been used for early assessment of joint disease in juvenile idiopathic arthritis (JIA). US is an accurate means to reveal markers of intraarticular disease, such as joint effusion, synovial hypertrophy and microvasculature and is able to detect subclinical synovitis. The ability of US to check multiple joints in one study and reveal subclinical synovitis seems to be particularly relevant in JIA, as definition of oligoarthritis and polyarthritis is based on the number of affected joints. US is an ideal means, therefore, for drawing a more correct patient classification, as well as for alerting the referring physicians towards the need of more aggressive treatment and closer monitoring. US is also an excellent means to distinguish between joint synovitis and tenosynovitis and to guide the aspiration and injection of steroids into joints that are difficult to reach blindly. Despite these advantages, US is inferior to MR imaging in depicting early inflammatory change and evaluating the articular cartilage. MR imaging is able to assess bone marrow abnormalities and can better evaluate the late manifestations of the disease, including erosions, joint space loss and ligamentous involvement. Both Doppler US and contrast-enhanced MR imaging are able to provide a measure of disease activity.
Learning Objectives:
1. To learn about imaging protocols.
2. To learn about imaging findings, mimics and pitfalls.
3. To understand the importance of early imaging of clinically 'silent areas' e.g. hip and TMJ.

14:00 – 15:30 **Room Z**

ENCITE Session

Imaging highlights: monitoring disease and therapy

Moderator:
S. Aime; Turin/IT

A-432 14:00

Get trained on imaging cell therapies with probes and procedures developed by ENCITE
S. Aime; *Turin/IT*

The project aims at developing imaging tools able to improve the monitoring of cell therapy as well as the understanding of the fate of transplanted cells and the mechanism of action of cell-based therapies. Using the knowledge obtained, tools and treatment strategies can be further optimised to reap the full benefit of cell-based therapies. The project relies on the extensive collaboration of European experts for the development and implementation of novel imaging procedures with several working groups from different disciplines (physics, chemistry, biology, informatics, endocrinology, immunology, neurology, nuclear medicine, radiology). The work is organized in five subprojects:1) Novel Imaging Technologies (New imaging methods, post-processing techniques, visualisation tools); 2) Probe Chemistry (New MRI reporter probes that draw a more comprehensive picture of molecular imaging applications); 3) Novel Tools for Cell Imaging (Technologies enabling tracking of cell migration, proliferation, differentiation and death); 4)Pre-Clinical Validation (Tools to assess stem cell engraftment, cell differentiation in major disease areas); 5)Translation towards Clinical Applications (to increase the efficacy of cancer immunotherapy). Responding to an increasing level of interest and a great need for educational activities in the field of cellular and molecular imaging, ENCITE has elaborated a specific training initiative based on the creation of a Multi-Centre Cluster devoted to the implementation of a repository of training procedures and imaging reporters. The output of this activity is made available to all the project partners and, more in general, to all the Cellular Molecular Imaging community.

A-433 14:15

Cell tracking with 19 F magnetic resonance imaging
P. Böhm-Sturm; *Cologne/DE*

Fluorine magnetic resonance imaging (19 F MRI) has recently received much attention in the field of cell tracking. In models of cell-mediated regeneration, cells can be labeled with 19 F before implantation thus enabling in vivo detection with 19 F MRI. Due to lack of 19 F in endogenous tissue there is no confounding background signal. Furthermore, the 19 F image intensity is proportional to the amount of 19 F. A conventional 1H MR image acquired in the same session provides the anatomical context. Therefore, for the first time it is possible to unambiguously track cells in a quantitative manner. However, a lack of sensitivity has prevented a broad application so far. Here, insight to the 19 F MRI activities within ENCITE is given. Various cell types of interest for therapy have been labeled with 19 F agents without impairment of cell function. Detection sensitivity is shown to have reached a stage allowing practical use of 19 F MRI to track human neural stem cells in the healthy and stroke-damaged rodent brain, to non-invasively control actual number of implanted cells, and to optimize dendritic cell migration in vitro for clinical cancer vaccination studies. Finally, a multimodal imaging approach combining 19 F MRI with Bioluminescence Imaging (BLI) is presented which allows non-invasive imaging of the anatomical location (19 F MRI) and function (BLI) of neural stem cell grafts. In conclusion 19 F MRI will help to optimize pre-clinical protocols of cell therapy and possibly become clinically relevant with further advances in 19 F compound synthesis, development of MRI hardware, and MRI pulse sequence optimization.

A-434 14:30

Imaging of novel therapies in Gliblastomas using multiple biomarkers

W. Reichardt; *Freiburg/DE*

Glioblastomas still have an extremely poor prognosis up to now and new therapeutic concepts are urgently needed. One of them is Anti-angiogenesis, which has been approved recently and is now under clinical evaluation. Next to edema formation and tumor morphometry, MR imaging can provide a number of vascular characteristics for therapy assessment in the tumors, which could especially provide an early assessment of the therapy. Anti-angiogenic therapy in tumors can be monitored by dynamic contrast enhanced MRI (DCE-MRI) or dynamic susceptibility contrast imaging (DSC-MRI) and vessel size imaging (VSI) to detect changes in tumor microvasculature. DCE-MRI (yielding permeability) is based on the measurement of a concentration time curve after injection of a Gd-based contrast agent (CA), whereas vessel size imaging and DSC-MRI (yielding blood volume) is usually performed with iron-oxide particles. We could show that it is possible to acquire multiple biomarkers to assess therapy response simultaneously in vivo using a single shot gradient echo spin echo (GESE) EPI sequence with only one Gd-CA injection. To account for the typical tumor heterogeneity in gliomas, tumor segmentation was performed prior to the determination of the bloodflow characteristics. The determination of VSI and blood volume measurements using Gd-DTPA has already been demonstrated successfully.

A-435 14:45

Integrated image analysis of multi-modal pre-clinical imaging studies

B. Lelieveldt; *Leiden/NL*

The rapid developments in in-vivo molecular imaging modalities such as fluorescence and bioluminescence imaging enables the live imaging of gene expression, cell fate and protein interactions. Combined with detailed structural imaging modalities such as magnetic resonance (MR), the biochemical onset of disease and therapy can be monitored in combination with structural and functional consequences over time. This presentation discusses a number of image analysis challenges emerging from longitudinal pre-clinical molecular imaging studies that have been addressed within the ENCITE project. Three steps towards a quantitative 3D analysis of follow-up small animal imaging are presented: whole-body registration, change visualization in follow-up data and fusion of optical and 3D structural imaging data. Several application examples are presented in the context of cell tracking and translational cancer research.

A-436 15:00

In vivo imaging of immune responses in cancer patients

C. Figdor; *Nijmegen/NL*

We have been among the first to exploit dendritic cell (DC) therapy to treat cancer patients. Over the past years, immunological responses are increasingly reported and clinical responses have consistently been observed. Moreover, DC therapy often has much milder side effects than standard chemotherapy. A major hurdle in the development of the DC therapy is accurate delivery of the cells to lymph nodes (LNs), or their successful migration from the site of injection to LNs. In particular, tools for measuring cell migration in vivo are necessary. Ideally, we would be able to quantify the number of DCs at the relevant site, with high resolution anatomical context to allow differentiation of LNs and the possibility of longitudinal data acquisition. Furthermore, functional data on the ensuing immune response is also required. Towards these ends, we have been working on developing imaging techniques to study DCs in vivo, for example with scintigraphy on 111In-labeled DCs, and magnetic resonance imaging (MRI) on iron-labeled DCs. Scintigraphy is quantitative, but it is restricted to the relatively short half-life of the radioisotope and is unable to resolve individual LNs. MRI allows high resolution anatomic localisation, but the use of contrast agents such as iron oxide is not quantitative. Our recent work has focused on imaging the functionality of these DCs using positron emission tomography (PET) to study LN activation. Finally, we have also developed in vitro assays that closely mimic in vivo DC migration in 3D scaffolds imaged using quantitative 19F MRI, as a substitute for in vivo optimization. We plan on applying 19F MRI to the tracking of DCs in vivo, as the technique allows both quantification and high-resolution anatomic detail.

Discussion 15:15

16:00 – 17:30 **Room A**

Abdominal Viscera

RC 1501

Abdominal MRI: standard and advanced protocols in clinical settings

Moderator:
I. Vivas; Pamplona/ES

A-437 16:00

A. Liver: how to study a cirrhotic patient

A. Filippone; *Chieti/IT (a.filippone@rad.unich.it)*

Magnetic Resonance (MR) imaging has emerged as an important imaging modality for the assessment of cirrhosis and its complications, such as HCC. Concurrent technical improvement as well as implementation of advanced imaging sequence designs permits high-quality examination of the liver with high intrinsic soft-tissue contrast. The use of automated contrast detection methods combined with faster sequences allows to optimise the arterial phase, which is essential for the detection and characterisation of HCC. Finally, combining sequences, including T2 and T1 weighted images, diffusion-weighted sequences, dynamic gadolinium-enhanced 3D multiphasic imaging and liver-specific delayed phase sequences, allow a simultaneous evaluation of the background liver parenchyma and of the liver lesions. Morphologic features as well as the degree of fibrosis of the background liver parenchyma represent the most important criteria in the clinical setting for determining the presence of cirrhosis. Although liver biopsy is the standard of reference for diagnosis and staging of liver fibrosis, MR elastography, diffusion-weighted imaging and MR perfusion imaging have been developed for non-invasive assessment of the liver fibrosis.

Learning Objectives:

1. To know how to perform a standardised study protocol that correctly assesses the cirrhotic changes in liver parenchyma.
2. To learn which contrast media are applicable for nodule characterisation and liver function evaluation.
3. To go through DW imaging, perfusion and MR elastography: help or hype?

A-438 16:30

B. Small bowel and colon: how to study a patient with suspected inflammatory bowel disease

N. Papanikolaou; *Iraklion/GR (nickolas.papanikolaou@gmail.com)*

MR Enteroclysis and MR Colonography examinations have been mainly utilised to study patients with Crohn's disease. Early, subtle lesions such as superficial ulceration, mucosal nodularity and thickening or distortion of the intestinal folds may be detected by MRE, although to a lesser extent comparing with conventional enteroclysis, due to its lower spatial resolution. To improve detection rate of these subtle lesions utilisation of dedicated ultrafast, high-resolution pulse sequences, coupled with strong gradients have to be considered. Fibrofatty proliferation can be easily depicted, while its composition regulates its signal intensity characteristics being of low signal intensity in case of fibrosis and of high signal intensity in case of excessive fat accumulation. Gadolinium uptake on FLASH images allows identification of hyperemic bowel segments due to inflammation and accompanying small inflammatory nodes. Certain MR imaging findings, including the presence of deep ulcers, wall thickness more than 7 mm and marked mesenteric lymph nodes gadolinium enhancement were well correlated with the clinical activity index (CDAI), and it is suggested that such findings may serve as indicators of Crohn's disease activity. Another important clinical challenge that MR Enteroclysis and MR Colonography must address is accurate disease subtype classification. By recruiting multiple contrast mechanisms like signal intensity on T2-weighted images, contrast-enhancement patterns on T1-weighted post gadolinium gradient echo images and motility-related information as identified on cine-TrueFISP images the latter clinical questions can be answered in a certain extent.

Learning Objectives:

1. To review the basic technical aspects of MR enteroclysis.
2. To become familiar with diagnostic imaging findings related to disease activity.
3. To understand the use of optional sequences depending on the clinical question in patients with Crohn's disease.

A-439 17:00

C. Pancreas and bile ducts: how to study a patient with suspected chronic pancreatitis

M.A. Bali; *Brussels/BE (mbali@ulb.ac.be)*

Chronic pancreatitis (CP) is a continuing inflammatory process, characterised by irreversible morphological changes, pain and permanent loss of exocrine/endocrine function. Patients with suspected CP will undergo imaging and/or pancreatic function tests to rule out early CP. Standard MR protocols consist of: axial/coronal TSE T2-w, fat-suppression axial GRE T1-w and axial/coronal MRCP sequences. Early ductal changes, as ectatic secondary ducts (pathognomonic sign of early CP) may not be detected on standard MRCP. Secretin-enhanced MRCP (S-MRCP) studies, performed during exogenous secretin stimulation, increase the diagnostic accuracy in patients with suspicion of CP. The physiologic effect of secretin, i.e. transient increase of pancreatic exocrine juice in the ductal system, improves pancreatic duct visualisation on MRCP images. S-MRCP can quantitatively estimate pancreatic exocrine reserve. Significant differences were reported between normal and severe CP, while values obtained in mild CP were in the same range of normal. Normal pancreatic parenchyma appears bright on unenhanced fat-suppressed GRE T1-w images due to high protein content in the acini. On contrast-enhanced GRE T1-w studies normal pancreas enhances significantly on the arterial phase due to its rich arterial network. Parenchymal changes in CP patients are characterised by loss of normal functional parenchyma and vascularity, replaced by fibrosis. These changes induce the loss of pancreatic parenchyma hyper-intensity on unenhanced GRE T1-w images and delayed arterial enhancement on contrast-enhanced images. Recent published studies reported significant differences of apparent diffusion coefficients (ADCs) calculated at baseline and after secretin stimulation between normal and CP, with no differences among the different degree of severity.

Learning Objectives:
1. To understand the basic sequences (with technical details) for MRI/MRCP of the pancreas and bile ducts.
2. To learn about advanced imaging protocols for MRI/MRCP of the pancreas and bile ducts concerning functional/structural imaging.
3. To appreciate the most appropriate technical approach for characterising focal pancreatic lesions.

16:00 – 17:30 Room B

Interactive Teaching Session

E³ 1520

Female pelvic infections: what the radiologist must report

A-440 16:00

Female pelvic infections: what the radiologist must report

J.A. Spencer[1], R. Forstner[2]; [1]*Leeds/UK*, [2]*Salzburg/AT*
(johnaspencer[60]@hotmail.com)

Most episodes of infection within the female pelvic organs are simply diagnosed on clinical grounds and resolve over time with or without antibiotic therapy. Infection which drains spontaneously usually resolves with these simple measures. Infection trapped within the female pelvic organs results in pyometra and/or tuboovarian abscess. These complications may require imaging. More severe infections may discharge internally with the development of a pelvic abscess or dissemination to the peritoneal cavity. Chronic infection may result in fibrosis with stricture formation in the female pelvic organs or the adjacent bowel, bladder and urethra. This involvement may result in lower GI or urinary tract symptoms. Other secondary effects include lymphadenopathy which can be cystic/necrotic and venous thrombosis with iliac and/or ascending ovarian vein thrombosis. Factors predisposing to complicated infection include recurrent infections, previous surgery/radiotherapy, intrauterine devices, instrumentation and immunocompromise. US is the first line imaging test, ideally from the transvaginal route. This may be poorly tolerated by women with severe infection/pelvic peritonitis. MR imaging is useful for sonographically indeterminate pelvic masses. Women with pelvic or generalised peritonitis may be suspected to have appendicitis or diverticulitis. Diagnosis may therefore arise from emergency CT. Both US and CT are used for aspiration or drainage of pelvic infections. A variety of endocavitary and percutaneous approaches are available.

Learning Objectives:
1. To become familiar with the clinical spectrum of infection and inflammation of the female genital tract.
2. To understand their pathways of spread.
3. To recognise typical imaging findings of pelvic inflammatory disease and pelvic abscesses and the role of image-guided intervention.
4. To consider the appearances of unusual infections and the differential diagnosis of female pelvic infections.

16:00 – 17:30 Room C

CLICK (Clinical Lessons for Imaging Core Knowledge): Common Clinical Cases

CC 1518

Fever of unknown origin

Moderator:
C.J. Herold; Vienna/AT

A-441 16:00

A. Clinical considerations

C. Heussel; *Heidelberg/DE (heussel@uni-heidelberg.de)*

Patient transport into the radiology department, contact to other potentially infectious persons, and things like breath-holding are reasonable burdens and dangers to immunocompromised patients. When searching the focus of fever, imaging should help to identify an affected organ system in order to eventually guide invasive procedures to identify underlying micro-organism or non-infectious disease. Equally relevant is the exclusion of its involvement with a reasonable specificity. Depending on local epidemiology, organ system, and the clinical signs and symptoms, suspected differential diagnosis can be derived from image patterns. Some of these diagnoses might be exclusion diagnosis; others might require invasive procedures including time-consuming and costly analysis to be verified. Invasive procedures, however, require adequate heostasis, which is usually not available for a substantial duration due to pancytopenia in patients which underwent chemotherapy. If imaging fails to derive the underlying disease confidently and conclusively in a fast way, clinicians might need to treat on an empirical basis. Empirical treatment plays a major role in immunocompromised or severely ill patients at risk, since mortality rises within hours of untreated disease. On the other hand, empiric treatment causes relevant toxicity and substantial costs, while imaging might become cost effective. The appropriate investigational technique, frequently targeted differential diagnosis, and the special needs of immunocompromised patients need to be understood by the referring physician as well as by the radiologist. Thus, an intensive interdisciplinary co-operation on a patient basis, as well as on a department basis is essential.

Learning Objectives:
1. To learn more about the clinical conditions that cause fever without an apparent origin.
2. To be informed about the clinician's way of thinking in the process of differential diagnosis.
3. To become familiar with the potential role of imaging in the establishment of the final diagnosis and planning of therapy.

A-442 16:30

B. Imaging techniques and typical findings

G.R. Ferretti; *Grenoble/FR (GFerretti@chu-grenoble.fr)*

Diagnosis of fever of unknown origin (FUO) is a major challenge for internists. The spectrum of disease includes infections (28%), inflammatory diseases (21%), malignancies (17%), and "no diagnosis" (19%). Deep vein thrombosis (3%) and temporal arteritis in the elderly (16%-17%) are important considerations. Investigation of patients with FUO usually includes clinical and standard biological tests which give numerous clues. Imaging procedures depend on objectives and various imaging investigations should be organised in strategies. Early identification of the best tissue to be the site of biopsy is one of the most decisive procedures. First-line imaging studies usually include chest radiography, abdomen ultrasonography, and contrast-enhanced CT of the thorax abdomen pelvis in order to disclose common aetiologies such as infections (tuberculosis, Pneumocystis carinii pneumonia, abdomen abscesses, pelvic abscesses), malignancies (Lymphoma, Metastatic cancers, Renal cell carcinoma, Pancreatic carcinoma), autoimmune conditions (Behçet's disease), and Miscellaneous (sarcoidosis). Vein sonography is useful for detecting deep venous thrombosis. Nevertheless, there is a need for more complex techniques if this strategy fails. Second-line techniques include MRI and 18-FDG PET scan as (18)F-FDG accumulates in malignant tissues, at the sites of infection and inflammation and in autoimmune and granulomatous diseases. In some studies, the PET scan contributed to the final diagnosis in 25%-69% of the patients.

Learning Objectives:

1. To learn about the available imaging modalities to be used for the evaluation of patients with fever of unknown origin.
2. To become familiar with the technical imaging considerations and the proper diagnostic algorithm.
3. To know more about the typical imaging findings.

A-443 17:00

C. Interactive case discussion

G.H. Mostbeck; *Vienna/AT (gerhard.mostbeck@wienkav.at)*

Based on the previous lectures in this session covering important clinical and imaging findings of patients with FUO, this interactive lecture will present 5 to 8 cases where multimodality morphologic and functional imaging finally made the diagnosis. According to the broad spectrum of FUO etiologies, inflammatory, infectious and neoplastic causes of FUO will be covered. The audience will be asked for imaging findings, differential diagnoses and recommendations for further imaging, if indicated.

Learning Objectives:

1. To review typical cases illustrating the role of imaging modalities in the differential diagnosis of patients with fever of unknown origin.
2. To get involved in the diagnostic process by the use of electronic voting pads.
3. To understand the conclusion that may be drawn on the basis of the discussed cases.

16:00 – 17:30 Room D1

Emergencies in Neuroradiology

CC 1519

Acute central nervous system infections

Moderator:
V. Dousset; Bordeaux/FR

A-444 16:00

A. Acute infections of the brain

S. Karampekios; *Iraklion/GR (karampek@med.uoc.gr)*

In spite of the development of many antimicrobial therapies and the general improvement of hygiene and health care systems all over the world, the incidence of CNS infections has increased significantly. This can be attributed to the increased number of patients with defective immune status, the widespread immigration, the increased number of drug abusers and to the acquired immunodeficiency syndrome (AIDS) and its devastating effect on the immune system. The brain is relatively protected from infection by the calvarium, the meninges and the blood-brain barrier. However, a large number of pathogens, including bacteria, viruses, fungi and parasites, can reach the brain haematogenously, or less likely by direct extension from an adjacent infected focus. When an intracranial infection does occur, the precise localisation in a specific anatomic compartment (parenchyma, meninges, epi- or sub-dural space) is of great importance, because it narrows the differential diagnosis, sometimes even determining the type of the pathogen, allowing immediate institution of the appropriate treatment and eventually leading to a more favourable outcome. The acuteness of the clinical presentation depends on patient`s immune status, the type of the pathogen and the clinical symptoms and signs, since patients with meningitis or encephalitis tend to present more acutely than those with mass lesions (abscesses). MRI is the most sensitive imaging modality in detecting focal or diffuse infectious lesions. Recently, using advanced MR techniques, such as Diffusion-Weighted Imaging (DW) and MR Spectroscopy (MRS), further improvement in the detection and characterisation of infectious brain lesions is possible.

Learning Objectives:

1. To become familiar with acute cerebral infections (viral, bacterial and fungal).
2. To learn about how to differentiate acute CNS infections from tumour.
3. To become familiar with new concepts in infectious diseases of the brain, e.g. immunity reconstituted inflammatory syndrome (IRIS).

A-445 16:30

B. Acute infections of the spine and spinal cord

M.M. Thurnher; *Vienna/AT (majda.thurnher@meduniwien.ac.at)*

Infections are among the most common causes of morbidity and mortality worldwide. An increased incidence of human immunodeficiency virus (HIV) infection worldwide resulted in a correspondingly increased frequency of brain and spine infections. The compromised host is different than the normal host in distribution of pathogens, which is determined by the nature of the host and defence defect. Infections may be caused by bacteria, viruses, fungi and parasites. Intravenous drug abuse is a growing cause of bacterial spinal infections. Typically, the organism most likely to infect the spine is Staphylococcus aureus. In the spinal canal bacterial infections can be located in the extradural (spondylitis, discitis, epidural phlegmone/abscess), intradural-extramedullary (arachnoiditis, polyradiculitis) and intramedullary (spinal cord abscess, myelitis) compartments. Toxoplasmosis and cysticercosis are the most common parasitic infections. Fungal infections will be frequently seen in patients after bone marrow transplantation with Candida and Aspergillus being the most common agents. Pathogenic agents gain access to the spine via several principal routes, which include haematogenous (both arterial and venous), direct extension from adjacent soft tissue and iatrogenic inoculation during surgery or interventional procedures. Iatrogenic spinal infections constitute 2.5% of all spinal infections. The symptoms of spinal infections vary with the particular disease, but constant back pain without a history of trauma is worrisome. Often there is a delay in diagnosis because of the subtle presentation and the absence of systemic signs such as temperature elevation.

Learning Objectives:

1. To learn about acute infections involving the spinal cord (myelitis).
2. To understand how to differentiate spinal cord infections from demyelinating disease or tumours.
3. To learn about infections of the spine (spondylodiscitis).

A-446 17:00

C. Acute disseminating encephalomyelitis

F. Barkhof; *Amsterdam/NL (f.barkhof@vumc.nl)*

Background: acute disseminated encephalomyelitis (ADEM) is a post-infectious disorder that develops days to weeks after common (respiratory) infections. The relationship is often anecdotal, but in some cases it can be confirmed by serology. ADEM by definition is a mono-phasic disorder (unlike MS), typically presenting in children and young adults with multifocal signs and symptoms, often with encephalopathy (e.g. drowsiness) and spinal cord involvement. Imaging workup and findings: MRI is the modality of choice and brain scanning should include T1, T2 and FLAIR as well as post-gadolinium T1. DWI and MRA can be considered when the differential includes ischaemia, and spinal cord MRI to exclude mass lesions. Typical brain MRI findings consist of multifocal T2/FLAIR hyperintense lesions affecting the periventricular, infratentorial but also juxtacortical white matter. Lesions tend to be larger and more ill defined than in MS and have a greater propensity to affect the basal nuclei, especially the thalamus. Spinal cord lesions can be large and oedematous. Enhancement is variable, and can be restricted to a subset of lesions, falsely suggesting dissemination in time. Differential diagnosis: the most important differential is MS, where lesions tend to be more circumscribed. Most importantly, new lesions will not develop at follow-up in ADEM; in fact many lesions may resolve almost completely reflecting the inflammatory rather than demyelinating character of the disease. MS on the contrary, being multi-phasic, will typically produce new (enhancing) lesions at follow-up, while old demyelinated lesions tend not to resolve.

Learning Objectives:

1. To learn what ADEM is and how it occurs.
2. To learn what are the typical findings on imaging.
3. To learn how to differentiate ADEM from other diseases (tumours, demyelination, □).

16:00 – 17:30 Room D2

Urogenital Imaging

CC 1521

The patient with renal impairment

Moderator:
P. Aspelin; Stockholm/SE

A-447 16:00

A. Iodine and Gd-based contrast media in patients with renal impairment: a tale of two evils

S.K. Morcos; *Sheffield/UK (morcsk2@aol.com)*

Contrast agents, both iodine- and gadolinium-based, are generally safe and are very widely utilised. However, there is concern about inducing contrast-induced nephropathy (CIN) associated with iodinated contrast media (ICM) and nephrogenic systemic fibrosis (NSF) following the administration of certain types of gadolinium-based contrast media (Gd-CM) in patients with advanced renal impairment. CIN is associated with further deterioration in renal function, may speed the need for dialysis, and increase the morbidity and mortality of the affected patients. Unfortunately all ICM have the potential of inducing CIN in patients with reduced renal function. This complication can be minimised by volume expansion and reducing the dose of the contrast agent. Large volume of data indicates that NSF is caused by the release of free gadolinium from Gd-CM with low kinetic and thermodynamic stability such as the non-ionic linear agents. This complication can be avoided with the use of the lowest possible dose of the highly stable macrocyclic agents.

Learning Objectives:
1. To become familiar with the potential risks of using iodine or gadolinium-based contrast media in patients with renal impairment.
2. To know how to reduce the risk of these potential risks.
3. To become familiar with guidelines on the choice of which contrast-enhanced imaging technique should be considered in patients with advanced renal impairment.

A-448 16:22

B. Imaging the impaired kidneys

M. Claudon; *Vandoeuvre-les-Nancy/FR (m.claudon@chu-nancy.fr)*

The global prevalence of renal insufficiency (RI) in the population is increasing. RI may be classified depending on 1. the clinical type: acute, intermittent and chronic; 2 the stage: mild to severe; and 3. the cause: pre-renal, renal, post-renal or urinary obstruction. An appropriate management of RI may lead to decrease of morbidity and mortality, especially in intensive care units or among patients with end-stage renal disease (ESRD). The role of imaging is based on a multimodality approach, with ultrasound, CT, MRI and scintigraphy providing both morphological and functional information, including split renal function and glomerular filtration rate measurements. Several strategies in key clinical situations, including renal artery stenosis, parenchymal diseases, and obstructive uropathy will be discussed in the adult and paediatric population.In chronic ESRD, the development of acquired multicystic disease is frequently observed on native and transplanted kidneys. Primary malignancy of the kidney allograft is not an exceptional condition in the long term and may justify regular screening by imaging, with potential diagnostic difficulties in differentiating cysts and tumours. In case of a tumour, imaging is helpful in selecting the appropriate surgical or percutaneous procedure, with the objective of transplant nephron sparing.

Learning Objectives:
1. To be able to recognise the main etiologies of acute and chronic renal impairment to be known by radiologists.
2. To learn about several diagnostic strategies for the morphological and functional evaluation of an impaired kidney.
3. To learn about long-term complications of chronically impaired kidneys, including multicystic disease and tumours.

A-449 16:44

C. The transplanted kidney

I. Sjekavica; *Zagreb/HR (ivica.sjekavica@zg.htnet.hr)*

Imaging techniques are important to evaluate different situations in the field of kidney transplantation: the living and cadaveric donor, the recipient's evaluation, the diagnosis of graft dysfunction, the diagnosis and treatment of complications. Doppler ultrasound (DUS) and nuclear medicine examinations are the imaging modalities of choice after renal transplantation. MSCT and MRI are valuable when these techniques are inconclusive or when post transplantation complications are suspicious. Renal transplant complications may result in impaired renal function or graft loss, most occurring at predictable times post transplantation. Post transplant complications can be divided into four major categories: parenchymal abnormalities, collecting system abnormalities, perinephric collections, and vascular abnormalities. Main vascular complications are renal artery stenosis/thrombosis, renal vein stenosis/thrombosis, arteriovenous fistula and pseudoaneurysm. Parenchymal complications are acute tubular necrosis, acute and chronic rejection, infarct, pyelonephritis, renal cell carcinoma and post transplant lymphoproliferative disorder. Perinephric collections are urinoma, haematoma, lymphocele and abscess. Main collecting system complications are hydronephrosis, calculi, urinary leak and obstruction. DUS is excellent tool not only to assess anatomic abnormalities and vascular status, but also to establish a baseline for future follow-up. Radionuclide scans help to assess renal perfusion and function. CT or MR urography allows imaging of the entire course of ureteral and periureteral abnormalities. US and CT are very useful for guidance of renal biopsy and drainage of large fluid collections. CT or MR angiography may be useful in doubtful cases to evaluate renal artery stenosis. Treatment of choice in diagnosis of the renal artery stenosis is percutaneous transluminal renal angioplasty (PTRA) or PTRA with stent.

Learning Objectives:
1. To learn about the most common causes of transplanted kidney dysfunction.
2. To appreciate the role of imaging methods in the evaluation of renal transplant.
3. To become familiar with imaging findings in various pathologic conditions of renal transplant and understand their impact on treatment.

A-450 17:06

D. The AV shunts for haemodialysis: imaging and intervention

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

There are two types of AV shunts for haemodialysis: AV fistulas and AV by-pass. The former have the longest life duration and the latter are implanted when fistulas fail. No systematic follow-up of these shunts is required. But imaging plays a major role to define causes of dialysis dysfunction and to treat complications. Main dysfunctions are a decrease of pump flow, evocative for occlusive disease located up-stream the arterial needle, and an increased venous pressure, evocative for occlusive disease located down-stream the venous needle. Other problems are an increased dialysis time, difficulties in needle placement, clotting, etc. Clinical examination must focus on sites of anastomoses and along the shunt looking for decreased thrill, decrease of shunt tension, and abnormal thrill areas. Color Doppler must cover the entire shunt from the afferent artery to the subclavian vein, looking for stenoses, usually located on the venous side, aneurysms, mural thrombus, acute thrombosis, steel phenomenon or collections. When a stenosis is present, measurement of velocity ratio helps in quantifying its severity, being significant when > 3. The risk of thrombosis increases when flow decreases within the shunt. Angioplasty is required when stenosis is significant and/or when pressure increases or flow decreases on successive dialyses. Auto-expansive stents are implanted when stenoses recur. Acute thromboses are treated by mechanical thrombolysis using aspiration or mechanical devices.

Learning Objectives:
1. To understand the principles of function of hemodialysis shunts.
2. To understand the principles of US examination according to the type of dysfunction.
3. To be aware of the indications and techniques of endovascular management.

16:00 – 17:30 Room E1

Emergency Radiology

RC 1517

Polytrauma: redefining imaging issues for management priorities

Moderator:
P.-A. Poletti; Geneva/CH

A-451 16:00

A. Vascular trauma

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

In the trauma setting, the number of angiographic studies has substantially increased with the advent of multidetector CT. Particularly in dedicated trauma centres, CT angiography (CTA) is offered to evaluate multiple vascular territories, including the aorta and mesenteric, pelvic and cervical systems. In addition, in extremity trauma with suspicion for arterial injuries, CTA has proven accurate in helping diagnose significant vascular injuries. Yet digital subtraction angiography (DSA) is reserved for therapeutic intervention. This talk aims to discuss technical aspects as well as indications for CTA and DSA. In particular, the implementation of CTA in whole-body trauma CT is emphasised. In addition, typical imaging findings are reviewed.

Learning Objectives:
1. To become familiar with the most important imaging features and their impact on patient management.
2. To understand technical details, potential difficulties and pitfalls of demonstrating these findings.
3. To be familiar with the pertinent findings to report.

A-452 16:30

B. Chest and abdomen

M. Scaglione; *Castel Volturno/IT (mscaglione@tiscali.it)*

Thoraco-abdominal injuries are a significant cause of death in the polytraumatised patients. Early recognition and communication of life-threatening thoraco-abdominal injuries is the major task for the radiologists involved in the emergency room. Although, most of these patients reach the hospital prior to death, lethality continues to remain high. Heart, thoracic great vessels, trachea, bronchus, pleura, lung, diaphragm, abdominal/retroperitoneal vascular and solid organ injuries are potential causes of death. Any appropriate surgical/interventional management approach must be carried out "around the clock", before the thoraco-abdominal injuries reach the level of clinical evidence. On the other hand, non operative management has actually become the standard of care for the most serious thoraco-abdominal injuries. These goals become feasible if a correct contrast-enhanced MDCT diagnosis, in a dedicated facility in which the trauma team works effectively 24 hours a day, seven days a week, is performed. Thus, in this lecture, the most serious thoraco-abdominal injuries will be illustrated, with special emphasis on vascular injuries as well as the value of post-processing techniques, protocols, pitfalls, tips and tricks. Furthermore, the importance of a rational and integrated imaging approach will be pointed out and, finally, the role of the radiologist in emergency room will be emphasised.

Learning Objectives:
1. To become familiar with the most important imaging features and their impact on patient management.
2. To understand technical details, potential difficulties and pitfalls of demonstrating these findings.
3. To be familiar with the pertinent findings to report.

A-453 17:00

C. Extremities

U. Linsenmaier; *Munich/DE (ulrich.linsenmaier@med.uni-muenchen.de)*

Extremity injuries in patients after polytrauma can be very complex and are often difficult to be diagnosed comprehensively when patients undergo only an initial whole body CT (WBCT). Extremity injuries comprise: fractures of (1) long bones, (2) articular joints, (3) complex fractures of hands and feet; (4) vascular, (5) soft tissue and (6) nerval and plexus injuries and (7) amputations. The use of MDCT could replace conventional radiographs (CR) in many indications. MDCT is indicated in all major and complex bony fractures and should be carried out early. Many institutions include those extremity scans in the WBCT workup using the arterial contrast phase as CT angiography (CTA) providing an excellent workup of the vascular system. CR remains an important diagnostic mean; however, these CRs should only be carried out after completion of the initial WBCT to avoid any dangerous delays in diagnosis of life-threatening injuries. CRs are especially suitable for follow-up and postoperative controls. Magnetic resonance imaging (MR) is an adjunct to MDCT and CR in the diagnosis of extremity injuries. It is indicated in complex injuries with unstable articular injuries, those involving tendons or major ligaments and nerval and plexus injuries. However, MR should only be carried out after complete stabilisation of the patient. Finally, it has to be mentioned that the operative treatment of extremity injuries must be priority oriented and carefully planned in the context of possible concomitant injuries and a possible risk of multi-organ failure (MOF).

Learning Objectives:
1. To become familiar with the most important imaging features and their impact on patient management.
2. To understand technical details, potential difficulties and pitfalls of demonstrating these findings.
3. To be familiar with the pertinent findings to report.

16:00 – 17:30 Room E2

State of the Art Symposium

SA 15
Imaging hip joint replacement

A-454 16:00

Chairman's introduction

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

Total hip arthroplasty is one of the most effective orthopaedic reconstruction procedures and is predicted to have ever-increasing patient volumes. Outcome assessment has become a sub-specialty in its own right attracting a large volume of scientific research and coverage in leading orthopaedic journals. The goal is for the hip replacement to outlive its recipient! Imaging plays a pivotal role in the assessment of its clinical outcomes, detection of failure and assessment of complications. There are multiple risk factors including patient selection, patient age, gender, primary hip disease, body weight, geometry of prosthesis, surface texture, type of metal, durability of bearing surface, bearing surface coupling, type of prosthesis, etc., which the radiologist needs to be familiar with when called to interpret post-operative imaging. In addition, bone remodelling also takes place around the prosthetic components resulting in altered bone density and morphological changes, which although normal may also increase the risk of fracture. These risks do not only operate in isolation, but are also inter-related. Component position related to surgical technique and proficiency is crucial, as it has been consistently shown that proper positioning is critical for the stability of the implant, fixation durability and optimum bearing surfaces wear. The three speakers will address the role of imaging with a view of differentiating the expected "normal" changes and appearances from developing peri-prosthetic complications.

Session Objectives:
1. To learn about the current state-of-the-art prostheses.
2. To be familiar with the common problems of hip replacement.
3. To define the strengths and weaknesses of the imaging modalities in assessing hip replacement.

A-455 16:05

Radiography and ultrasound: how far can you go?

S. James; *Birmingham/UK*

Hip arthroplasty is an extremely common orthopaedic procedure and there is a wide array of implants which are in current use. It is important to understand the normal radiographic appearances following hip joint replacement, so complications can be appreciated and accurately reported. Radiographs still provide the mainstay for the initial diagnosis of component failure, both in the immediate post-operative period and at long-term follow-up. The relative significance of different patterns of radiolucency, bone sclerosis and component position is discussed. The normal or pathological significance of these findings is correlated with design, surface and fixation of the prosthetic components. It is of vital importance that serial studies are compared to early post-operative x-rays during follow-up to report accurately any sign of prosthetic failure and trigger prompt specialist referral. Ultrasound is quick to perform, inexpensive, does not suffer from susceptibility artefacts and can be used to guide treatment. The common soft tissue complications following hip arthroplasty are reviewed and illustrated.

Learning Objectives:
1. To become familiar with the radiographic appearances of different types of prosthesis design.
2. To recognise the normal radiographic appearances following hip joint replacement.
3. To learn about the common abnormal radiographic findings following hip replacement.
4. To understand the role of ultrasound in assessing the post-operative hip.

A-456 16:28

CT: when should you do it and how?

A. Blum, S. Lecocq, M. Louis, J. Wassel, B. Osemont, G. Lux, P. Teixeira;
Nancy/FR (alain.blum@gmail.com)

CT scan plays an increasing role in the evaluation of hip arthroplasty. This technique has wide indications, as it is more sensitive than radiographs in detecting osteolysis secondary to prosthesis loosening, it clearly shows the periprosthetic fluid collections suggesting infection, and is the best technique to guide their aspiration for analysis. It clearly shows the prosthesis components or screw fractures and demonstrates the contact between the acetabular cup and the iliopsoas muscle in case of iliopsoas inflammation. Some classic rules help to improve the image quality and reduce the metal artefacts. It is advisable to use x-ray tube potential of at least 120 kVp, thin-section acquisitions, thicker reconstructions and multiplanar reformat technique along certain planes and volumetric rendering techniques (VRT). The most innovative techniques to improve the image quality are the iterative reconstruction algorithms, which significantly reduce the metal artefacts and allow a dose reduction to the patient. DSA mode bone subtraction is also an innovative technique which reduces the metal artefacts and enhances the depiction of recurrent tumours. Finally, CT scan can be combined with arthrography to improve the detection of prosthesis loosening, acetabular wear or fistulas.

Learning Objectives:
1. To learn the best parameters to optimise a CT-scan of a hip prosthesis.
2. To be familiar with the diagnostic criteria of femoro-acetabular impingement.
3. To learn about the new technical refinements of CT-scans of hip joint replacements.

A-457 16:51

MRI: can it replace the above?

S.J. Eustace; *Dublin/IE (seustace@iol.ie)*

This talk will outline the role of MRI as a diagnostic tool in the assessment of failed hip prostheses. In particular, the talk will outline the advantages and disadvantages of MRI in this setting. Limited by metal artefact, the fine details immediately adjacent to the prostheses is limited and MRI is therefore most useful to assess the para-articular soft tissues and marrow.

Learning Objectives:
1. To become familiar with metal artefact reduction techniques at MRI (MARS).
2. To review safety aspects of MR imaging of prostheses.
3. To review specific diagnoses afforded by MRI in the assessment of prostheses.

Panel discussion:
Can we define an algorithm for assessment of the painful hip replacement? 17:14

16:00 – 17:30 **Room F1**

Organs from A to Z: Lung

MC 1522

Causation-based imaging review of lung disease

Moderator:
C. Mueller-Mang; Vienna/AT

A-458 16:00

A. Bacterial and viral pulmonary infections

T. Franquet; *Barcelona/ES (tfranquet@santpau.cat)*

Pulmonary infection is a major cause of morbidity and mortality. Several bacteria and viruses can cause lower respiratory tract infection in adults. Viruses such as human metapneumovirus, hantavirus, coronavirus, H1N5 and H1N1 have been reported as severe human pathogens. Combination of pattern recognition with knowledge of the clinical setting is the best approach to pulmonary infectious processes. A specific pattern of involvement can help suggest a likely diagnosis in many instances. The most common patterns seen at HRCT in acute bacterial and viral infections include consolidation, nodules, tree-in-bu pattern, ground-glass attenuation and airway disease. High-resolution CT can be helpful in the detection, DDx and management of patients with lung infections.

Learning Objectives:
1. To be able to recognise typical and atypical imaging manifestations of common bacterial lung infections, including mycobacteria.
2. To be able to recognise typical and atypical imaging manifestations of common viral lung infections.
3. To learn about the changing patterns of pulmonary infections and emergent pathogens, and their importance for the radiologist.

A-459 16:25

B. Non-infectious inflammatory lung disease

A.A. Bankier; *Boston, MA/US (abankier@bidmc.harvard.edu)*

This presentation will present imaging features of non-infectious inflammatory lung diseases. Pulmonary fibrosis, sarcoidosis and vasculitis will serve as prototypical examples. Epidemiological, clinical and imaging findings of these diseases will be discussed, and differential diagnostic features will be proposed. It will also be discussed as to how these diseases insert into the broader general context of lung diseases, and how imaging can contribute to a better understanding of their respective clinical characteristics.

Learning Objectives:
1. To learn about the imaging findings in pulmonary fibrosis.
2. To be able to recognise the imaging findings in pulmonary sarcoidosis.
3. To learn about the imaging findings in pulmonary vasculitis.

A-460 16:50

C. Neoplastic lung disease

H.-U. Kauczor; *Heidelberg/DE (Hans-Ulrich.Kauczor@med.uni-heidelberg.de)*

Imaging plays a pivotal role to conclusively stage lung neoplasms in order to guide the treatment decisions. Staging of non-small cell lung cancer is based on the recent 7th edition of the International Association for the Study of Lung Cancer (IASLCT). In this edition T1 is divided into T1a (≤ 2 cm); and T1b (> 2 – 3 cm). T2 is divided into T2a (> 3-5 cm) and T2b (> 5-7 cm). Nodules in the same lobe are categorisd as T3; nodules in a different lobe of the same lung as T4. N-staging is unchanged. Metastases are divided into M1a and M1b. Malignant pleural effusion and a metastasis to the contralateral lung are designated as M1a; metastases to regions outside the lung/pleura as M1b. A second nodule in the non-primary ipsilateral lobe, previously M1, is now T4M0. CT and MRI perform equally well for T-staging. There are some slight advantages for MRI in the differentiation of T3 and T4 stages as well as the assessment of resectability. PET/CT has its major asset in N-staging, whereas for M-staging whole body MRI is preferred over PET/CT. Randomisd studies on lung cancer screening using CT in heavy smokers indicate a significant reduction of mortality when compared with the use of chest x-ray. The impact of this observation for the broad potential use of CT for individual early detection is unclear. Pulmonary nodules should be followed according to the current recommendations of the Fleischner Society.

Learning Objectives:
1. To be able to stage lung neoplasms with imaging.
2. To understand the integrative role of CT, MRI, and PET in imaging and staging pulmonary neoplasms.
3. To gain practical information about lung cancer screening and pulmonary nodule follow-up according to the most recent guidelines and recommendations.

Discussion 17:15

16:00 – 17:30 **Room F2**

Breast

RC 1502

Evaluation of the treated breast and follow-up

A-461 16:00

Chairman's introduction

M. Sentís; *Sabadell/ES (melcior.sentis@gmail.com)*

A-462 16:05

A. Evaluation of residual disease after excisional biopsy

K.A. Frei; *Hinterkappelen/CH (ka.frei@gmx.ch)*

Breast-conserving surgery followed by radiation therapy and chemotherapy is the treatment of choice for early stage breast cancer. After lumpectomy of breast carcinoma, residual tumour is left in the breast in a reported 32 to 63%. Patients with complete removal of all tumour tissue achieve better local and systemic control of disease. Imaging after excisional biopsy might be helpful in the detection of residual disease and therefore guide further treatment. The three methods of choice for predicting residual cancer at the surgical site are the histopathological evaluation of the margins of the biopsy specimen for the presence of tumour and mammography after biopsy to identify residual microcalcifications. Mammographic evaluation of such breasts is frequently impaired by decreased compressibility, architectural distortion and locally increased density. MR imaging of the breast

Sunday

after surgery, unlike mammography, is not limited to the evaluation of lesions that contain microcalcifications. Imaging evaluation in patients with positive margins after lumpectomy is indicated to evaluate the extent of residual disease in order to decide whether reexcision or mastectomy might be indicated. MRI may be considered after breast-conserving therapy in three instances: first as an evaluation tool for residual disease after positive tumour margins, second as a method of evaluating suspected recurrence and third as an additional tool in patients who undergo breast-conserving therapy.

Learning Objectives:

1. To be familiar with the indications for imaging after excisional biopsy.
2. To understand the clinical needs of imaging findings in the treated breast.
3. To understand the indications of MRI in detection of residual disease.

A-463 16:28

B. Evaluation of response to neoadjuvant chemotherapy

L. Martincich; *Candiolo/IT (laura.martincich@ircc.it)*

Neoadjuvant chemotherapy is provided to patients with large or inoperable breast cancer in order to reduce tumour size for optimal local surgery. Breast MRI provides both morphological and functional findings, which have been demonstrated to be reflective of some hallmarks of cancer. Besides, the examination has showed capability in identifying changes in vascularisation, cellularity and tumour volume due to chemotherapeutic drugs and target-therapy. Among imaging modalities, MRI represents the most accurate examination in the identification of pathological complete response and in the assessment of the extent of residual disease after the treatment. However, several factors may affect the diagnostic performance of breast MRI in terms of under or overestimation of tumour response. Tumour histopathological features, patterns of enhancement before the treatment and type of shrinkage have been demonstrated to influence the accuracy of the examination. New MR techniques, such as H1MR Spectroscopy and Diffusion-Weighted Imaging, are showing potentials in the discrimination between responder and non-responder patients during and after the treatment. However, these techniques even if promising require further evaluation for the routine application in clinical setting.

Learning Objectives:

1. To understand the principal mechanisms of tumour vascularisation and microstructure.
2. To understand the changes in tumour vascularisation and microstructure due to neoadjuvant chemotherapy.
3. To understand the accuracy and limitations of response monitoring with breast MRI.

A-464 16:51

C. Surveillance for and detection of recurrent disease after therapy

I. Schreer; *Kiel/DE (ischreer@email.uni-kiel.de)*

The long-term results of randomised controlled trials comparing mastectomy with breast-conserving therapy (BCT) have shown that patients treated with BCT are at continuous risk of ipsilateral breast cancer recurrence (IBR), even after 15 years, without reaching a plateau. This continuous and sustained risk of about 1% annually is accompanied by the risk of a synchronous or metachronous contralateral cancer development in 2 – 20% of the breast cancer patients. The cumulative risk of contralateral invasive or non invasive cancer is 0.6% per year and 10% after 20 years. One of four IBRs is the cause of distant metastases. The goal is to detect cancer recurrence within the ipsilateral as well as metachronous in the contralateral breast at the earliest opportunity, because the detection during regular follow-up examinations is beneficial on survival of the patients in comparison with symptomatic detection. Surveillance mammography after treatment for primary breast cancer is recommended by the American Society of Clinical Oncology for example and the National German Guideline on Breast Cancer Detection, Treatment and Aftercare. The recommendations are consensus-based and not evidence-based. Mammography is more sensitive than clinical examination (86.1% vs 56.7%); nevertheless, 13 – 22% is detectable by physical examination only. In case of inconclusive findings by conventional imaging CE-MRI is indicated and results in the highest sensitivity to detect or exclude ipsilateral recurrence. PEM and scintigraphy are considered methods under investigation.

Learning Objectives:

1. To understand the risk of recurrent disease and a second primary following the treatment of breast cancer.
2. To be familiar with the literature on surveillance mammography and other imaging methods for detection.
3. To appreciate the range of recommendations for surveillance mammography and clinical follow-up.

Panel discussion:
The new challenge in breast cancer: evaluation of response 17:14

16:00 – 17:30 **Room G/H**

Neuro

RC 1511

Advanced techniques: diffusion tensor imaging (DTI) in clinical practice

Moderator:
P.C. Maly Sundgren; Lund/SE

A-465 16:00

A. DTI technique, sequences, software and post processing

W. Van Hecke; *Antwerp/BE (wim.vanhecke@ua.ac.be)*

During this lecture, an introduction to Diffusion Tensor Imaging (DTI) will be given. This introduction will elaborate on the basics of the DTI technique, the acquisition and sequences of DTI data sets and the post-processing options to obtain quantitative DTI results. First, the underlying physical principles of DTI will be explained, including the Brownian motion of water molecules, diffusion anisotropy, and tractography. Then, information will be provided about the typical acquisition scheme of DTI data sets, with a short introduction to some important parameters. Once the DTI data sets are acquired, different techniques can be used to evaluate the quantitative DTI values, depending on the application. An overview of these different techniques, such as region-of-interest-based, tractography-based, and voxel-based analysis will be given and some crucial aspects and pitfalls of these techniques will be explained.

Learning Objectives:

1. To become familiar with the physical principles and different information provided by the DTI technique/sequence.
2. To learn about the most common techniques for quantitative assessment of DTI parameters and fibre tractography data.
3. To understand the most crucial aspects of DTI post-processing.
4. To recognise some of the most important pitfalls in DTI post-processing.

A-466 16:30

B. DTI in brain tumours

M. Essig; *Erlangen/DE (mediag@me.com)*

Diffusion-weighted MRI is used routinely in the assessment of cerebral diseases including the workup of cerebral tumours, enabling to assess the tumour cell density of lesions – the higher the tumour cell density, the lower the ADC. As diffusion is truly a three-dimensional process, molecular mobility in tissues may be anisotropic, as in brain white matter. With diffusion tensor imaging (DTI), diffusion anisotropy effects can be fully extracted, characterised, and exploited, providing even more exquisite details on tissue microstructure. The most advanced application is certainly that of fibre tracking in the brain, which, in combination with other functional MRI techniques, might open a window on the important issue of connectivity and tissue integration. Beside the ability to visualise the fibrous tracts, DTI has proved to be a valuable diagnostic tool in the assessment of intracranial neoplasm, e.g. to describe the infiltrative nature of a tumour. Quantitative fractional isotropy measurements enable to assess the tumour infiltration into areas with otherwise normal-appearing MRI. DTI proved also to be helpful in the differentiation of intraaxial and extraaxial lesions or to determine the grade of gliomas preoperatively. However, peritumoural DTI values were reported to be helpful in distinguishing solitary intraaxial metastatic lesions from gliomas. In addition, the method enables one to distinguish presumed tumour-infiltrated oedema from vasogenic oedema composed purely of extracellular water. These capabilities of DTI are helpful in current diagnostic scenarios and conceivably will be useful for broader applications in the future.

Learning Objectives:

1. To become familiar with the spectrum of qualitative and quantitative information provided by DTI for the evaluation of brain tumours.
2. To gain knowledge of the importance of DTI/tractography in the pretreatment assessment of brain tumours.
3. To learn the usefulness of DTI in the characterisation of tumours, peritumoral white matter tracks and in the differential diagnosis of brain tumours.

A-467 17:00

C. DTI in paediatric diseases

P.E. Grant; *Boston, MA/US (ellen.grant@childrens.harvard.edu)*

Diffusion tensor imaging plays an important role in the diagnosis and management of paediatric brain disorders as it provides important physiological information. This physiological information comes from the fact that water molecules diffuse approximately 10 microns using typical diffusion parameters, allowing interrogation of tissue properties at a micron level with this information volume averaged over a 8 cm3 image voxel. In our clinical experience we have observed that decreased diffusivity occurs in situations where there is 1. Metabolic failure (ex. acute necrosis) or compromise (ex. Status epilepticus), 2. Myelin vacuolization (ex. Maple Syrup Urine Disease), 3. Increased cellular density (pus, medulloblastoma). However, in hypoxic, ischemic insults it is important to remember that normal diffusivity does exclude a significant brain injury in the first few days after an event. In this situation, delayed cell death mechanisms may be activated, resulting in delayed decreases in diffusivity (delayed necrosis) or just long term volume loss (delayed apoptosis). Using the directional information, underlying tissue structure can be further interrogated. This is particularly helpful when assessing lesions of decreased diffusivity to determine if they are more likely to be metabolic compromise or myelin vacuolization as opposed to irreversible metabolic failure. In addition tractography can be used in preoperative planning, however, appreciation for limitations in regions of edema need to be understood to avoid underestimating the presence of axonal bundles. Research approaches use diffusion tractography to better understand structural connectivity and changes that occur in networks with development and disease.

Learning Objectives:

1. To recognise the specificities of DTI in the paediatric brain.
2. To gain knowledge of the importance of DTI in the assessment of brain maturation and white matter diseases.
3. To learn the DTI value in the evaluation of brain destructive lesions.

16:00 – 17:30 **Room I/K**

Cardiac

RC 1503

MRI and CT before cardiac interventions or surgery

A-468 16:00

Chairman's introduction

G.P. Krestin; *Rotterdam/NL (g.p.krestin@erasmusmc.nl)*

Advancements in CT and MRI technology have led to an increasing use of these modalities in the non-invasive assessment of coronary arteries, myocardial perfusion and cardiac function. While their role in detecting coronary artery disease and functional disorders has been widely accepted, it is still unclear whether they could be adopted in triaging patients for the best therapeutic approach. Large studies have already suggested that indication for surgery and percutaneous interventions cannot be solely based on the demonstration of morphological alterations and that such "cosmetic" interventions are not always leading to the expected outcomes. Therefore, non-invasive imaging techniques have to offer more than just the detection of grades of coronary artery stenosis, of areas of infarcted myocardium, or of valvular alterations. Adjustment of imaging protocols for additional evaluation of coronary flow reserve, of myocardial perfusion and contractility and of valve size, position and damage with subsequent quantification of degree of stenosis and/or regurgitation are necessary in order to allow choosing the most appropriate therapeutic approach and thus become the "gold standard" for prognosis and pretherapeutic diagnosis of cardiac diseases.

A-469 16:05

A. Can CT predict the outcome of percutaneous intervention?

C. Loewe; *Vienna/AT (christian.loewe@meduniwien.ac.at)*

The outcome of coronary revascularisation is not only defined by primary technical success, but also by improvement of symptoms and quality of life. Thus, despite the individual comorbidities, the outcome and thus the potential benefit of coronary revascularisation depends on many different factors, including morphology, distribution and severity of coronary lesions, myocardial viability, and ventricular function. Consequently, the detection of coronary stenosis is not sufficient for planning an optimised treatment, and more information is needed to personalise the treatment plan. It should be evaluated if the myocardial territory supported by the diseased artery is still vital and lesions at risk for plaque rupture (culprit lesions) should be identified and treated in advance to avoid major coronary events. Cardiac CT allows for the exact assessment of coronary morphology including length, calcification and severity of lesions. Based on these morphological information, success of a percutaneous revascularisation procedure can be anticipated with high prognostic accuracy. Additionally, the possibility of identification of lesion at risk by means of coronary CT has been described recently. By this, dedicated treatment of only the relevant stenosis should become possible avoiding multiple, potentially unneeded, stents. Finally, even the assessment of myocardial viability by means of CT becomes possible. Using all the possibilities of cardiac CT optimised treatment plan can be established, and outcome can be estimated. This presentation should give an overview about potential applications of cardiac CT for optimised treatment decisions and planning. Potentially useful algorithms for improving the outcome of coronary interventions should be provided.

Learning Objectives:

1. To understand the role of CT coronary angiography in the assessment of patients prior to percutaneous intervention.
2. To appreciate the role of myocardial imaging in patients prior to cardiac interventions.
3. To understand how to integrate coronary CT in the assessment of patients selected for cardiac interventions.

A-470 16:28

B. Can MRI predict the outcome of coronary revascularisation?

M. Francone; *Rome/IT (marco.francone@uniroma1.it)*

Prediction of coronary revascularisation outcome represents a major clinical target since a large number of medical and surgical options have become available for chronic ischaemic cardiomyopathy with need to identify more rigorous criteria for patient selection. The combination in a single examination of function, stress-perfusion and tissue characterisation with T2-weighted "oedema-sensitive" and late-gadolinium enhancement (LGE) techniques, supported the role of cardiac MR (CMR) as an important technique for the evaluation of patient candidates for revascularisation. Besides more "traditional" indicators like ejection fraction, end-diastolic wall thickness or end-systolic volumes, extent and distribution of myocardial scar depicted with LGE has been identified as one of the most important predictors of post-revascularisation outcome with direct influence on functional recovery and on major adverse cardiovascular events (MACE) due to the potential induction of arrhythmias from the scar. LGE technique has been shown to be superior to nuclear medicine for the assessment of myocardial viability due to the higher spatial resolution (up to 60-fold greater than SPECT) and an intrinsic high-contrast resolution. A further technique that could be adopted before revascularisation is stress imaging. Myocardial ischaemia detected by either CMR adenosine first-pass perfusion or dobutamine-induced wall motion abnormalities has been shown to predict subsequent cardiac death, whereas normal stress perfusion showed a high negative predictive value for MACE. In conclusions, although as a relatively new diagnostic modality prognostic evidence is predominantly derived from single-centre studies, CMR is increasingly becoming an important tool for risk stratification before revascularisation, offering indications about outcome and mortality.

Learning Objectives:

1. To appreciate the diagnostic value of MRI in CAD.
2. To understand the important prognostic factors that MR is able to provide.
3. To learn about the advantages of performing cardiac MR prior to coronary revascularisation.

A-471 16:51

also EPOS

C. The value of CT before percutaneous aortic valve replacement

R. Salgado; *Antwerp/BE (rodrigo.salgado@uza.be)*

Cardiac valve diseases are an important public health problem, with an increasing incidence strongly linked to the increasing age of the Western population. The most frequent valve disease is aortic stenosis, for which percutaneous aortic valve replacement (PAVR) is currently evolving as an alternative therapy in high-risk patients. Nevertheless, careful evaluation of all aspects of this new approach is still required to avoid uncontrolled diffusion. Imaging plays a key role in selecting patients who may be eligible for PAVR, focusing on the evaluation of leaflet anatomy, severity of valve dysfunction, haemodynamic consequences and potential problems in the access route. While echocardiography is commonly used for both the anatomical and functional evaluation, multidetector CT (MDCT) has important intrinsic advantages providing state-of-the-art 3D imaging with a high spatial resolution over a large anatomic coverage. During this course, we will discuss the advantages and disadvantages of MDCT compared with other imaging modalities. The relevant anatomy of the aortic valve and annulus will be reviewed, with emphasis on correct alignment of the imaging planes, and its implications for correct reporting of the necessary measurements targeted at the clinicians' need. Furthermore, MDCT scan protocol design will be reviewed, focusing not only on optimal implementation of common scan parameters but also on the need of ECG-triggering and its consequences. Finally, we will present the current status of evidence on using MDCT in PAVR procedures, and discuss future challenges and perspectives.

Learning Objectives:
1. To understand how to optimise the imaging protocol for aortic valve imaging.
2. To learn how to report the findings and what to include in the report.
3. To understand the impact of this approach on patient management.

Panel discussion:
Improve your interaction with your colleagues 17:14

16:00 – 17:30 **Room L/M**

Physics in Radiology

RC 1513

Novel developments in CT and impact on dose

Moderators:
M. Kachelrieß; Heidelberg/DE
J. Vlahos; London/UK

A-472 16:00

A. Patient dose assessment in CT
P.C. Shrimpton; *Didcot/UK (paul.shrimpton@hpa.org.uk)*

CT remains a particular focus for efforts in radiological protection owing to its steadily increasing clinical application and the relatively high patient doses. Dosimetry is an essential element within good CT practice in order to allow the assessment of typical radiation risks in support of the justification of procedures and the routine monitoring and comparison of typical doses in pursuit of the optimisation of patient protection. The practical basis for dosimetry in contemporary CT remains the (updated) CT dose index (CTDI100), measured in either free air or the standard CT dosimetry phantoms. These latter measurements underpin the dose indicators commonly displayed by the CT scanner: volume-weighted CT dose index (CTDIvol) and dose-length product (DLP). Whereas these quantities are not patient doses, they nevertheless provide useful characterisation of each CT exposure in order to allow comparison of practice and facilitate improvements in patient protection. Typical levels of CTDIvol and DLP at each CT centre, periodically determined as the mean values observed for representative samples for each patient group and type of examination (and associated clinical indication), should be adopted as local diagnostic reference levels (DRLs). These should be subject to periodic review and compared with both corresponding national DRLs and also practice at other CT centres in pursuit of optimised patient protection. When required, estimates of typical organ and effective doses to reference patients from standard CT examinations can be made on the basis of appropriate dose coefficients normalised to the dose indicators (CTDIair, CTDIvol or DLP).

Learning Objectives:
1. To be familiar with technical dose parameters in CT.
2. To understand how to assess patient dose.
3. To be informed about the role of diagnostic reference levels in CT.

A-473 16:30

B. New frontiers in CT: functional and spectral imaging
N. Pelc; *Stanford, CA/US (pelc@stanford.edu)*

Recent advances have generated renewed interest in dual energy CT. This presentation will discuss the basic principles, and the strengths and limitations of the techniques and implementations, of multi-energy methods for material characterisation. Conventional CT is at best an image of the linear attenuation coefficient at one energy and cannot uniquely identify tissue. Materials with different atomic numbers have different energy-dependent attenuation. Multi-energy imaging measures attenuation at different energies to more fully characterise materials. An important limitation is the fact that in the diagnostic energy range the attenuation of all materials is dominated by Compton scattering and photoelectric absorption, and unless there is a K-edge in the spectrum used, these phenomena have the same energy dependence for all materials. Thus, there are only two "basis functions" and spectral CT essentially measures effective atomic number and electron density. While there is residual ambiguity, it still provides important information. The main requirement for dual energy CT is to measure data using two spectra using multiple kVp and/or filtration or methods in which the x-ray energy discrimination is performed at the detector. These various approaches to obtaining energy-dependent measurements have different dose efficiency and different sensitivity to subject motion. The simplest method to process the multi-energy data reconstructs CT images from each spectrum and performs the multi-energy analysis on the reconstructed images. A somewhat preferred method performs energy-dependent processing on the raw projections prior to reconstruction. Hybrid methods are now available.

Learning Objectives:
1. To learn about new developments in functional and spectral CT imaging.
2. To be able to assess their impact on patient dose.

A-474 17:00

C. New image reconstruction techniques
J. Nuyts; *Leuven/BE (johan.nuyts@uz.kuleuven.be)*

Filtered backprojection (FBP) is currently the standard reconstruction algorithm in CT. FBP is fast and performs very well in many cases. FBP assigns the same certainty to all projections. In reality, the reliability of the projection data depends on the attenuation along the projection lines. As a result, FBP is suboptimal for noisy data. Performance in the presence of noise can be improved either by certainty based preprocessing of the projection data or by using iterative reconstruction algorithms based on a more realistic noise model. If the number of projection angles is limited, FBP suffers from artefacts. In contrast, iterative reconstruction is more robust against angular sampling issues. Nonetheless, if the number of projection angles is too low, there is not enough information for perfect reconstruction, and any algorithm will have problems finding the true solution. The problem can be alleviated by using prior knowledge about the object to be reconstructed. An example is the currently very popular total variation prior, which assumes that the reconstructed object should be piecewise uniform. One can improve the performance of image reconstruction using more accurate models of the acquisition physics (e.g. finite resolution, energy spectrum: "MBIR"). However, this makes the reconstruction task also more complicated. Many methods have been proposed, which combine preprocessing based on physics with fast reconstruction using FBP. Even better reconstructions can be obtained by integrating the model into the iterative reconstruction algorithm, but at the cost of increased computation times.

Learning Objectives:
1. To understand the impact of iterative reconstruction techniques in CT.
2. To learn about novel algorithms.
3. To be able to assess their impact on patient dose.

16:00 – 17:30 **Room N/O**

Head and Neck

RC 1508

Post-treatment head and neck management: the diagnostic dilemma

A-475 16:00

Chairman's introduction
R. Maroldi; *Brescia/IT (maroldi@med.unibs.it)*

Major changes in the treatment of head and neck neoplasms encompass the advances of endoscopic-based surgical techniques, mainly for nasosinusal and laryngeal tumours, and the application of sophisticated radiation therapy techniques, combined with chemotherapy. As most tumours arise from the mucosa of the upper aero-digestive tract, clinical surveillance is necessary to detect superficial recurrences, while morphological and 'functional' imaging techniques are indispensable to detect subclinical extra-mucosal and nodal recurrences. How can imaging techniques discriminate recurrence, inflammation, necrosis or scar? Key points include the knowledge of the normal appearance of tissues (morphology & signals) on CT and MRI after surgery and chemo-radiotherapy. Specifically, when non-surgical treatment has been used, it means to become familiar with the expected changes both of tumour and adjacent tissues. Changes that can be asymmetric as extremely precise techniques of dose delivering are used, like tomotherapy. Morphology-based imaging techniques are often inadequate to discriminate small recurrences from vascularised scar tissue (enhancing). CT or MRI requires to be integrated by information provided by functional-based imaging techniques, FDG-PET-CT being the most established. Recently, a great interest among radiologists is focused on the application of DCE-CT or DCE-MRI and DWI-MRI in the follow-up of head and neck neoplasms. In fact, several studies have credited these techniques for providing functional information about tissues (perfusion, water exchange) that help to discriminate scar from recurrences. Obviously, the horizon pursued is to combine morphology and functional data in a single examination.

A-476 16:05

A. Expected changes after treatment

A.S. McQueen; *Newcastle upon Tyne/UK (andrewmcqueen7@hotmail.com)*

For any radiologist involved in the multidisciplinary care of head and neck cancer patients, the interpretation of post treatment imaging can be challenging. Recurrent or residual malignancy is often clinically occult; therefore, the radiologist has an important role to detect and delineate neoplastic disease so that salvage therapy might be considered. A range of imaging changes can be expected following treatment with the main modalities of surgery and radiotherapy and these often prove difficult to differentiate from malignancy. The surgical management of head and neck cancer involves primary resection, lymph node dissection and reconstructive surgery and these procedures are often extensive, resulting in an altered anatomical landscape for the radiologist to interpret. A spectrum of changes can also be anticipated following treatment with radiotherapy, although recent developments in image-guided radiation therapy aim to improve target delineation and avoid adjacent organs at risk. The expected CT, MRI and ultrasound appearances following surgery and (chemo)radiotherapy will be reviewed in this session.

Learning Objectives:

1. To learn about the current treatment options in head and neck cancer.
2. To understand the expected tissue changes after radiotherapy.
3. To appreciate the expected imaging findings after surgery.

A-477 16:28

B. Surveillance imaging, tumour recurrence and treatment complications

F.A. Pameijer; *Utrecht/NL (f.a.pameijer@umcutrecht.nl)*

In post-treatment imaging in head and neck malignancy it can be difficult to differentiate between signs of tumour recurrence and expected changes and/or complications. Patients at risk for local failure after radiation therapy (RT) can be successfully identified by a post-RT CT (or MR) study between 1 and 6 months after RT. The optimal time-point to perform such a ‚base-line study‘ seems to be about 3 to 4 months post-RT. Patients with indeterminate findings are candidates for ‚imaging surveillance‘; i.e. follow-up imaging every 3 to 4 months up to a period of 2 years after RT. Chondronecrosis is an uncommon treatment complication after RT. In laryngeal chondronecrosis, the larynx is not able to maintain its structural integrity without clear signs of persisting or recurrent tumour. However, extensive soft tissue changes surrounding the necrotic laryngeal framework can be seen, making differentiation from tumour recurrence virtually impossible. In fact, tumour recurrence and chondronecrosis may coexist. Certain imaging findings proved to be suggestive of radionecrosis, and these will be discussed using examples from daily practice. Ongoing studies suggest that metabolic imaging (FDG-PET) may detect local recurrences with a higher accuracy than ‚conventional‘ anatomically based imaging techniques, such as CT and MR.

Learning Objectives:

1. To become familiar with the ideal time for follow-up.
2. To become familiar with the patterns and appearance of tumour recurrence.
3. To understand treatment complications and to differentiate them from tumour recurrence.

A-478 16:51

C. Predicting outcome of radiation therapy in head and neck cancer: clinical reality?

V. Vandecaveye; *Leuven/BE (vincent.vandecaveye@uz.kuleuven.ac.be)*

Concomitant chemoradiotherapy (CRT) increases locoregional control and overall survival in locally advanced head and neck squamous cell carcinoma (HNC) compared with radiotherapy alone and allows for comparable disease-free survival (DFS) post surgery. Cure rates and survival may be further improved by tailoring treatment strategies on an individual basis, but this requires early diagnostic biomarkers. The identification of prognostic biomarkers prior to treatment may potentially have highest impact as it would allow guiding initial treatment decisions and thus individualise treatment from the start. The aim of the presentation is threefold: to discuss the prognostic significance of MRI determined tumour parameters, CT-determined parameters and to discuss evidence-based facts and future applications. Next to anatomical parameters that may influence treatment outcome, including tumour volume, T-stage and involvement of certain anatomic subareas such as the laryngeal cartilage, the pre-epiglottic space and subglottic area, CT and MRI also allow for determination of functional predictive parameters using perfusion-CT, dynamic contrast-enhanced MRI (DCE-MRI) and diffusion-weighted MRI (DWI). Although functional parameters are still mainly subject of research, the combination of perfusion-CT or functional MRI with positron emission tomography (PET) tracers and biological parameters such as p16 positivity or presence of human papilloma virus may allow in future for more accurate prediction of response to treatment.

Learning Objectives:

1. To become familiar with the prognostic significance of MR imaging-determined tumour parameters.
2. To become familiar with the prognostic significance of CT imaging-determined tumour parameters.
3. To learn what is evidence-based, including future perspectives.

Panel discussion:

Recurrence, inflammation, necrosis or scar: is imaging useful? 17:14

16:00 – 17:30 **Room P**

Radiographers

RC 1514

Breast screening programmes: roles and issues for radiographers

Moderators:
G. Forrai; Budapest/HU
K. Haller; Wiener Neustadt/AT

A-479 16:00

A. Establishing competencies of radiographers in national screening programmes

J. Hammond; *Dublin/IE (joanne.hammond@cancerscreening.ie)*

Mammography continues to be the diagnostic tool for breast screening programmes and the radiographer is closely involved with both the technical quality of the imaging and with each client's satisfaction with the service. Establishing the necessary competencies of the individual radiographer is a core requirement within the breast screening process and essential for a national breast screening programme. The purpose of this session is to provide an overview of the quality assurance structure within a breast screening programme and in particular how the role of the radiographer and radiographic quality assurance contribute towards this. The importance of national quality assurance guidelines and programme standards, methods of establishing the individual skills and competencies of radiographers and how these are subsequently measured and maintained through regular review and audit will be discussed. Individual factors will also be considered including the importance of performing high-quality mammography technique with minimal discomfort and radiation dose, peer review and appraisal and ensuring appropriate communication and messages about breast cancer screening are delivered. Establishing and maintaining the competence and skill of the individual radiographer is essential to the quality and success of the breast screening service and to ensure the required standard of mammography is constantly achieved.

Learning Objectives:

1. To become familiar with the concept of a breast screening programme.
2. To understand the role of the radiographer within a breast screening programme.
3. To learn about the competencies of radiographers in a breast screening programme and how these might be established.

A-480 16:30

B. Quality control and quality assurance of breast screening programmes from the radiographers viewpoint

A. Kostiov; *Ljubljana/SI (anamarija.kostiov@gmail.com)*

Quality control (QC) and quality assurance (QA) in Slovenian screening programme Dora are done by radiographers, radiologists and medical physicists. Radiographers perform daily and weekly equipment testing, radiologists perform positioning control and pathology double reading control and medical physicists perform half annual testing of the equipment and overview results of daily and weekly tests done by radiographers. Important parameter of QA and QC in breast screening programme is received mean glandular doses (MGD). They can easily be calculated and in the calculations we can evaluate the influence of breast thickness on the MGD. The purpose of the refresher session is to present procedures of QA and QC done by radiographers and some procedures that are in Slovenia now done by radiologists but with the tendency that they be done by radiographers. The calculations of MGD will be presented with average manual values of MGD in Slovenian breast screening programme Dora, along with the effect of breast thickness on MGD and

most common mistakes in positioning of the breast in our screening programme. Radiographers are responsible for appropriate condition of x-ray machine. In the future radiographers will take control over the positioning from radiologists and make a larger impact on QA and QC in breast screening programme. With the knowledge of how MGD is calculated, radiographers would be able to observe and understand the impact of breast thickness on MGD with preserving image quality regularly.
Learning Objectives:
1. To understand the importance of QC and QA of breast screening programmes.
2. To learn how to calculate and apply the MGD/AGD (mean glandular dose/average glandular dose) in practice.
3. To be aware of the effect breast positioning has on QA of breast screening programmes.
4. To become familiar with the role of radiographers in QA and QC of breast screening programmes.

A-481 17:00

C. The radiographer's role in optimisation of dose and image quality in mammography

D. O'Leary; *Dublin/IE (desiree.oleary@ucd.ie)*

Efforts to reduce radiation dose in mammography should be linked to and limited by image quality and the radiation dose should only be lowered to levels compatible with image quality for adequate diagnosis; this is optimisation of mammography. In order to achieve this goal, radiographers should become familiar with dose and image quality in mammography and understand the benefits of identifying and addressing dose and image quality issues in mammography. The purpose of this refresher session is to learn how to optimise dose and image quality in mammography. The concept of diagnostic reference levels in mammography will be examined and European / International dose limits will be compared. The link between image quality and mean glandular dose (MGD) will be explored as will the link between compression (force and depth) and MGD in current research and previous publications. Suggestions for lowering of the mean glandular dose and raising image quality in mammography will be made based on current research. This session will examine methods for lowering radiation especially in digital imaging by greater training of radiographers to consistently achieve perfect mammography images. It is only through standardisation of the undertaking of the mammographic projections with regard to achievable compression depth and the application of compression force delivered to the breast that this can be achieved. Scoring of image quality by removing subjectivity from the scoring systems may also aid in the achievement of high image quality goals for all mammography departments.
Learning Objectives:
1. To become familiar with dose and image quality in mammography.
2. To understand the benefits of identifying and addressing dose and image quality issues in mammography.
3. To learn how to optimise dose and image quality in mammography.

16:00 – 17:30 **Room Q**

Paediatric

RC 1512

Abdominal emergencies in children

Moderator:
F.E. Avni; Brussels/BE

A-482 16:00

A. Non-traumatic abdominal emergencies in childhood

P. Tomà; *Rome/IT (paolo.toma@opbg.net)*

Investigation of paediatric abdominal emergencies represents approximately 20% of the radiological demand in primary care. Ultrasound of the abdomen is extremely helpful in both establishing and excluding disease: all authors agree on the primary role of sonography in the setting of acute abdominal conditions, a very common cause of presentation to the hospital for children. More and more, radiologists try to avoid abdominal x-rays, because they usually are of limited value in establishing the cause of acute abdominal pain as an isolated symptom. In paediatric practice, radiation protection is of outmost importance. Therefore, CT scanning should be reserved to specific or complex problems. Actually, CT scan is more extensively performed in the U.S. than in Europe. The high cost of MRI, in addition to its limited availability and long examination times, has been a major limitation to its use in the emergency setting: it can supplement sonography in selected cases, e.g. cholangiopancreatography magnetic resonance in jaundice, pelvic MRI in adnexal torsion, pelvic inflammatory disease and haematometra due to an imperforate hymen. Ultrasound is the most suitable first-line radiological examination in children with abdominal emergencies. Despite many other imaging modalities can provide helpful information, they should be reserved to the small percentage of cases in which the diagnosis still remains uncertain after sonography.
Learning Objectives:
1. To understand the role of sonography in acute digestive disease.
2. To become familiar with the specific imaging findings of intussusception and appendicitis.
3. To learn about the acute pathology of the liver, biliary tract and pancreas.

A-483 16:30

B. GU emergencies in children: kidney, ovary, testis

M. Riccabona; *Graz/AT (michael.riccabona@medunigraz.at)*

This lecture will discuss the role of emergency imaging in acute paediatric GU conditions, with particular focus on the potential of ultrasound (US). Besides GU tract trauma conditions such as urosepsis, renal failure, renal colics, ovarian or testicular torsion with all the respective relevant differential diagnoses have to be considered and urgently addressed adequately. Particularly with respect to radiation protection and due to the superb US potential in childhood, US is often used as the primary imaging tool and will – in many conditions reveal all treatment relevant information. However, in other conditions such as severe (multiple) trauma age-adapted paediatric CT remains the best primary imaging tool. Work-up and follow-up may require imaging, usually achievable by US and partially by MRI, scintigraphy and/or cystography. Thus the imaging algorithms differ from adults. The most important conditions, their imaging appearance, the potential pitfalls and some important methodical details will be presented, also discussing recommended paediatric imaging algorithms. In most acute paediatric GU conditions US is adequate as the first and often sufficient imaging modality. Rarely other imaging is necessary particularly in the acute setting – except for CT in severe (multiple) trauma. All imaging should be indicated with respect to therapeutic consequences and the ALARA principle, and proper paediatric protocols as well as methododical skills (e.g., dedicated paediatric US) should be provided 24 hours throughout the year.
Learning Objectives:
1. To learn about the diagnostic imaging approach in acute urinary tract disease.
2. To become familiar with the sonographic aspects of ovarian emergencies.
3. To understand the role of sonography in acute scrotum diseases.

A-484 17:00

C. Abdominal trauma in children

M.P. García-Peña; *Barcelona/ES (plgarciapena@gmail.com)*

Trauma is a leading cause of morbidity and mortality in children. The clinical evaluation of children with potential blunt abdominal injury presents a difficult and challenging task. Therefore diagnostic imaging plays an important role in the evaluation of injured children. The most common indication for abdominal imaging following trauma in children is haematuria. The majority of children with haematuria do not have urinary tract injury. Certain clinical variables have been associated with a higher risk of abdominal injury. These include gross haematuria, abdominal tenderness, ecchymoses, and a low Trauma Score. Lap belt ecchymoses represent an important high-risk marker for injury. They are associated with complex of injury. Sonography has limited utility in the assessment of paediatric abdominal trauma. Computed tomography (CT) is the imaging method of choice in the evaluation of abdominal injury after blunt trauma in haemodynamically stable children. An unstable patient needs to be stabilised prior to CT or to proceed directly to surgery. Evaluation with CT allows for accurate detection and quantification of injury to solid and hollow viscera and can also identify an active haemorrhage. CT can help prioritise optimal management by diagnosing the major or most life-threatening site of haemorrhage or injury. CT can also demonstrate associated bony injury to ribs, spine and pelvis. A normal CT examination may prevent other unnecessary explorations. The decision for operative intervention in the small percentage of children who require surgical haemostasis is primarily made based on clinical criteria and not on CT findings.
Learning Objectives:
1. To learn about traumatic lesions of the abdomen in children.
2. To learn the diagnostic strategy for abdominal trauma.
3. To appreciate the improvement of diagnosis with new technology.

Monday, March 5

08:30 – 10:00 **Room A**

Special Focus Session

SF 16a

The role of advanced imaging in musculoskeletal neoplasms

A-485 08:30

Chairman's introduction

J.C. Vilanova; *Girona/ES (kvilanova@comg.cat)*

In the past few years there has been an important progress in the different imaging modalities. It is vital for radiologists involved on skeletal tumours to be familiar and understand the new advanced techniques in order to improve the work-up for patients with musculoskeletal neoplasms. Different functional MRI sequences are evolving and are used on different decision-making. The emergence of PET/CT has revolutionised the staging of a wide range of solid tumours but the role of PET/CT in musculoskeletal tumours is not well understood. Ultrasound has demonstrated the increasing role to manage skeletal tumours, especially using contrast-enhanced technique. This session will review and update the current application of the advanced image techniques, combined with the conventional ones, to manage musculoskeletal neoplasms in the diagnosis, staging and increasingly in the treatment of selected bone tumours. It is hoped that the session will encourage a better understanding of this important role in the care of patients with skeletal neoplasms.

Session Objectives:

1. To learn about advanced imaging applied to skeletal tumours.
2. To learn about the role of different imaging techniques in managing musculoskeletal neoplasms.
3. To be familiar with the application and benefits of each modality.

A-486 08:35

Advanced MR techniques

J.L. Bloem; *Leiden/NL (j.l.bloem@lumc.nl)*

The MR parameters needed to emphasize various functional parameters such as diffusion and dynamic Gd-enhanced MR will be discussed. The current and potential impact of these techniques are compared to novel ways to analyse tumor biology. The specific parameters of tumor biology such as angiogenesis, apoptosis, etc. can be visualized with several imaging techniques, of these MR is the most universal one today. The relationship with other preclinical imaging techniques is illustrated. Conclusion. MR imaging has not yet reached a plateau phase. MR offers new inroads in visualizing tumor biology. Technical developments are not only in the field of data acquisition, but also in post-processing

Learning Objectives:

1. To learn how to perform an advanced clinical MR protocol.
2. To explore the potential of new MR techniques.
3. To learn if the impact of MR in tumour imaging has reached a plateau.

A-487 08:58

also EPOS

PET/CT and scintigraphy

J.R. Garcia; *Barcelona/ES (jrgarcia@cetir.es)*

Bone and soft-tissue sarcomas represent a group of malignancies with highly variable history. Although the extent of the disease may be delineated in anatomical images, Nuclear Medicine techniques offer unique information regarding tumour biology. Multimodality imaging, integrating helicoidal CT to SPECT or PET, combines the advantages of both techniques: high-resolution (morphology) and high sensitivity (metabolism). There is a wide range of tracers that can be used to study biological characteristics of sarcomas. Bone scintigraphy is very sensitive for the detection of primary bone tumours and bone metastases. Blood-flow and blood-pool phases of three-phase bone scan improve the detection of soft tissue involvement. A high 201Tl (thalium) uptake is frequently seen in malignant tumours but quantitative assessment (lesion to normal tissue ratio) has not been helpful in differentiating sarcomas from benign lesions. Multidrug resistance (MDR), which is due to the overexpression of P-glycoprotein, is a major problem in neoadjuvant chemotherapy. Wash-out rate (WR%) of 99mTc-MIBI (methoxyisobutylisonitrile) is correlated with MDR-expression. 18 F-FDG-PET (18 F-fluorodeoxyglucose) is helpful in tumour grading but cannot discriminate between low-grade tumours and benign lesions. 18 F-FDG accurately detects primary tumours, lymph node and bone metastases. Changes in 18 F-FDG uptake correlate significantly with histopathologic response. Standard Uptake Value (SUVmax) is an independent predictor of survival. Evaluation of 18 F-FDG kinetics (dynamic-PET) allows to differentiate response or non-response. PET tracer that quantifies tumour proliferation (11C-thymidine), drug-resistance activity (11C-verapamil) and tissue hypoxia (18 F-fluoromisonidazole) may contribute to clinical risk assessment for tumour-aggressive behaviour. Combined information, obtained with new devices PET/MRI, will probably change diagnostic algorithms.

Learning Objectives:

1. To learn the common indications for conventional nuclear medicine tracers (99mTc-MDP, 99mTc-MIBI) in musculoskeletal tumours using hybrid imaging (SPECT/CT).
2. To be familiar with the current evidence and clinical applications of 18 F-FDG PET/CT in musculoskeletal tumours.
3. To be aware of the future developments of novel PET tracers and integrated PET/MRI.
4. To learn the common indications for conventional nuclear medicine tracers.

A-488 09:21

Sonography: diagnostic developments

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

Imaging of musculoskeletal tumours is inherently complex and presents unique challenges and continuing integration of morphological and functional capabilities as technology progresses. In the past years, ultrasound is rapidly advancing and refining and its development is essentially aimed at both increasing image quality and introducing new biomarkers. High-resolution volume imaging with matrix transducers and introduction of isotropic-voxel acquisition are opening perspectives in providing more reliable and accurate quantification of soft-tissue tumour volumes and estimating the fractional amount of intratumour vasculature. In addition, the storage of serial volume datasets with time would allow better comparison of findings in longitudinal studies, providing new insights into assessment of the patient outcome and evaluation of the results of therapy. Based on the latest advancements, measurement of tissue strain with elastography and introduction of specific techniques to detect signals from microbubble-based contrast media at the high frequencies used to image superficial tissues are providing new parameters of analysis of soft-tissue masses. In contrast imaging, depiction of intratumour blood flow distribution, quantification of the fractional moving blood volume and analysis of intensity/time curves would also improve the sensitivity to change of ultrasound and contribute to a better characterisation of musculoskeletal tumours.

Learning Objectives:

1. To learn the value of US in the diagnostic work-up of musculoskeletal tumours.
2. To be familiar with the most recent advances and trends in the development of US technology.
3. To be aware of pros and cons and potential pitfalls of US in this field.

Panel discussion:
The role and guidelines of the imaging techniques on the management of MSK neoplasms 09:44

08:30 – 10:00 **Room B**

Interactive Teaching Session

E³ 1620

Breast cancer

A-489 08:30

A. Detection

C.S. Balleyguier; *Villejuif/FR (balleyguier@igr.fr)*

Breast Cancer detection relies almost exclusively on the radiologist. Mammography is the basic tool for screening. Sonography and MRI are complementary techniques. Sensitivity of Mammography is very high (close to 90%) in case of fatty breast. However, accuracy declines in case of dense breast. The most challenging cancers are infiltrative lobular carcinoma and cancers presenting only with architectural distortion. Mammography is by far the best examination for the detection and characterisation of microcalcifications. Sonography is not a screening tool, but is a useful complement to questionable mammograms. MRI is very powerful and might become the primary screening tool in selected populations like high-risk women, but should not replace mammography in all cases due to the risk of false positive findings. A combined report of both MRI and mammogram is desirable. The radiologist should be familiar with the most common traps: lesions seen on only one view, cancer seen only as a mild asymmetry of breast density, identification of neoplastic calcification in the middle of uneven microcalcifications and mildly enhancing images in MRI or lesions masked by a severe background enhancement. The radiologist should be fully aware of BIRADS terminology and should be able to propose the correct indications for biopsy, as well as the preferred guidance.

Learning Objectives:
1. To know the respective role of each imaging technique in the diagnosis of breast cancer.
2. To learn common pitfalls in the diagnosis of breast cancer.

A-490 09:15
B. Follow-up
G. Forrai; *Budapest/HU (forrai.gabor@t-online.hu)*

The role of radiologist is to provide detailed preoperative assessment and post-therapy follow-up including detection and differential diagnosis of recurrence and post-therapy sequelae. Diagnostic tools are combination of clinical examination, mammography, sonography, MRI, PET/CT and guided biopsy. Additional diagnostic help is obtained by comparison with prior films. The quality of the postoperative imaging depends also on preoperative assessment. All the congenital and benign conditions must be known before surgery in order to avoid postoperative interpretation problems. Pathology results and preoperative films as well as prior surgical and/or needle biopsy results must be present. Post-therapy conditions are sometimes challenging because post-therapy changes may mimic recurrent disease. Breast cancer is a heterogeneous disease; therefore, the spectrum of morphology and progression dynamics may be very different. Follow-up is chosen when the post-therapy changes are stable or show typical benign morphology features. Progressing or indeterminate lesions have to be biopsied if all imaging modalities fail to provide an equivocal diagnosis. Monitoring neoadjuvant chemotherapy by prediction of response is a new step towards individualised therapy of breast cancer.

Learning Objectives:
1. To understand the common features of recurrent breast cancer.
2. To learn how to establish imaging follow-up protocols for breast cancer.

08:30 – 10:00 Room C

CLICK (Clinical Lessons for Imaging Core Knowledge): Common Clinical Cases

CC 1618
Surprise in the liver
Moderator:
M. Lewin; Villejuif/FR

A-491 08:30
A. Clinical considerations
E. Szabó, A. Palkó; *Szeged/HU*

Focal liver lesions are part of our everyday practice since radiologists performing various types of examinations may encounter them without being aware of any clinical condition raising the suspicion of these changes. In a situation like this several important decisions are to be made by the radiologists, based on several issues: is the lesion clinically significant? Is the lesion benign or malignant? Are additional imaging examinations necessary? Does it require medical, surgical or interventional radiological action? Should it be, and if yes, how frequently followed up, etc. For providing a well-established answer to these questions the reporting radiologist has to be familiar with medical history and results of former examinations (physical, laboratory, imaging, etc,); consider the age, gender, physical condition, eating and drinking habits, and potential drug abuse by the patient, bearing in mind the prevalence and statistical probabilities of different pathologic conditions. With all this information at hand the thorough analysis of images obtained by different modalities will allow a rather reliable differential diagnosis and a well-established planning of therapy of the incidentally detected lesions.

Learning Objectives:
1. To learn more about the clinical conditions that may result in the appearance of focal liver lesions.
2. To be informed about the clinician's way of thinking in the process of differential diagnosis.
3. To become familiar with the potential role of imaging in the establishment of the final diagnosis and planning of therapy.

A-492 09:00
B. Imaging techniques and typical findings
C.J. Zech; *Munich/DE (Christoph.Zech@med.uni-muenchen.de)*

The spectrum of differential diagnoses is broad in the liver. Therefore, incidentally discovered liver lesions represent a challenging clinical situation. Fortunately, there are specific imaging features for the most common benign and malignant liver lesions (like, e.g. haemangioma, FNH, cysts, vascular pseudolesions, HCC, metastases) so that a minimal-invasive diagnosis with a biopsy in not needed in a lot of cases. In ultrasound the echogenity and recently also the contrast agent behaviour is used for liver lesion characterisation. In CT attenuation and also contrast agent behaviour are used for characterisation. MR imaging offers several options including T1- and T2 weighted images, use of chemical shift imaging, GRE sequences with long echoes and diffusion weighted images, so that tissue components like fat, water, glycogen, iron, etc. can be evaluated already in the pre-contrast examination. Beside the evaluation of dynamic signal characteristics in the early dynamic phase after contrast agent application, MR can utilise also tissue-specific contrast agents dedicated to the RES or to the haepatocytes. Other modalities like angiography, PET or other nuclear medicine methods usually only play a minor role nowadays in the evaluation of incidental liver lesions in non-oncological patients. In oncological patients the clinical consequences and also the range of diagnoses and pre-test probabilities are different from those of the non-oncological group; therefore, the demands to imaging are even higher. In case of atypical presentation of otherwise benign liver lesions like sclerosed haemangioma close follow-up or even biopsy can be necessary in such a setting.

Learning Objectives:
1. To learn about the available imaging modalities for the evaluation of patients with incidentally detected focal liver lesions.
2. To become familiar with the technical imaging considerations and the proper diagnostic algorithm.
3. To know more about the typical imaging findings.

A-493 09:30
C. Interactive case discussion
G. Brancatelli; *Palermo/IT (gbranca@yahoo.com)*

Incidental lesions are frequently discovered during routine radiographic evaluations. Correlation with clinical history and additional confirmatory imaging is essential to the development of an accurate, focused differential diagnosis and for appropriate management. The objective of this presentation is to describe the imaging findings associated with incidentally found liver lesions and to review those clinical and radiological features, which should be considered in development of an ordered and accurate differential diagnosis.

Learning Objectives:
1. To review typical cases illustrating the role of imaging modalities in the differential diagnosis of unexpected liver lesion cases.
2. To get involved in the diagnostic process by the use of electronic voting pads.
3. To understand the conclusion that may be drawn on the basis of the discussed cases.

08:30 – 10:00 Room D1

Emergencies in Neuroradiology

CC 1619
Acute onset of cranial nerve dysfunctions
Moderator:
M.A. Papathanasiou; Athens/GR

A-494 08:30
A. Acute loss of vision
S. Pedraza; *Girona/ES (sapedraza@gmail.com)*

Acute vision loss is a symptom of great concern. There are multiple causes of acute blindness and Diagnostic radiology is essential to determine the cause. The aetiology of acute blindness could be located at different anatomic areas such as ocular globe, optic nerve, the suprasellar/optic chiasm region and optic tracts, geniculate bodies, and visual cortex. Differential diagnosis of cortical blindess are cerebrovascular disease, surgery (paricularly cardiac surgery) and cerebral angiography. CT and MRI iImaging protocol will be presented with discussion of tips and tricks.

Learning Objectives:
1. To become familiar with lesions, involving the optic nerve which can cause sudden loss of vision.
2. To understand how lesions in the suprasellar/optic chiasm region can cause loss of vision.
3. To become familiar with lesions involving the optic tracts, geniculate bodies, and visual cortex.

A-495 09:00

B. Hearing loss

C. Colosimo; *Rome/IT (colosimo@rm.unicatt.it)*

Diagnostic imaging plays a crucial role in evaluating patients with sudden onset of hearing loss (HL). CT and MRI are the basic imaging tools, but the choice of the imaging strategy is largely based upon a preliminary clinical evaluation that must differentiate between conductive hearing loss (CHL) and sensoryneural hearing loss (SNHL): in acute CHL CT is by far the preferred diagnostic tool, while MRI represents the 1° choice approach in SNHL. High-quality CT/MRI technique is mandatory in investigating patients with acute HL; basically multidetector CT units and high field MRI warrant detection of even subtle/tiny changes in the middle ear, labyrinth, internal acoustic canal and brain. In CHL multiplanar HR CT is generally able to detect findings consistent with acute bacterial otitis and post-traumatic changes commonly responsible for the sudden onset of CHL. In SNHL MRI, by combining unenhanced T1, T2 and post-contrast T1 WI sequences, provides an excellent sensitivity in recognition of the intralabyrinthine fluid changes, small intracanalicular mass, brainstem/brain alterations. Thus MRI is able to detect acute haemorrhagic labyrinthitis and other inflammatory/infective involvement of the labyrinth (on the basis of the labyrinthine fluid signal changes and/or abnormal contrast-enhancement), to demonstrate tiny intracanalicular and intralabyrinthine schwannomas as well the other by far less common primary and metastatic tumours and to show directly and characterise small/subtle intraparenchymal brain changes in critical location with respect to auditory pathways. Only in few selected cases is CT required to confirm/ complete the evaluation of the bone labyrinth.

Learning Objectives:
1. To appreciate the imaging strategies and findings for patients with sudden onset of hearing loss.
2. To understand the choice of imaging technique: for CT scanning versus MRI.
3. To become familiar with causes of hearing loss involving the middle ear, labyrinth, internal auditory meatus, brainstem and brain.

A-496 09:30

C. Facial nerve paralysis and trigeminal neuralgia

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

Facial and trigeminal nerve palsies have a devastating clinical impact. Causes for palsy are several fold including trauma, stroke, inflammation, neoplasm and neurovascular conflicts. Detailed neurological examination is mandatory as it may help tailoring imaging studies to specific segments of these long cranial nerves, from their brainstem nuclei to their peripheral branches. Appropriate imaging requires a thorough understanding of the anatomy and physiology of these cranial nerves. Whereas the brainstem nuclei and intracranial segments are best imaged by MRI, CT still plays a role in the depiction of the long and tortuous intratemporal segments of the facial nerve. Bell's palsy is by far the most common cause of acute FNP. The role of imaging relies mainly on the exclusion of other potential causes requiring therapeutic intervention and providing prognostic information. The most common acute symptom related to the trigeminal nerve is trigeminal neuralgia with neurovascular conflicts being increasingly recognised as its main cause with the increasing use of high-resolution MRI, including angiographic sequences. Cranial nerve palsies may be the first presentation of a malignancy either due to direct nerve compression or through perineural spread. Facial nerve palsy is seldom the first presentation of a parotid malignancy and may even antedate the depiction of a parotid mass. Strategically located strokes, vascular malformations and multiple sclerosis are among the most common causes of central palsies by affecting cranial nerves' nuclei. High-resolution imaging tailored to the different segments of these nerves has undoubtedly increased the diagnostic yield and improved patients' management.

Learning Objectives:
1. To become familiar with the anatomy of the facial and trigeminal nerves.
2. To understand the imaging strategies in patients with trigeminal neuralgia.
3. To consolidate knowledge of the difference between central and peripheral facial nerve paralysis, and how this affects imaging strategies.
4. To become familiar with the choice of imaging technique.

08:30 – 10:00 Room D2

Urogenital Imaging

CC 1621

Prostate and urinary bladder

Moderator:
N. Papanicolaou; Philadelphia, PA/US

A-497 08:30

A. State-of-the-art imaging of prostate cancer: which technique should I use?

A.R. Padhani; *Northwood/UK (anwar.padhani@stricklandscanner.org.uk)*

Multiparametric MRI is of proven value in the assessment of prostate cancer at presentation and for relapsed disease. Key elements for evaluation are morphological T2W sequences, diffusion-weight MRI, dynamic contrast-enhanced MRI and proton MR spectroscopic imaging. In order to use these techniques, it is necessary to understand the biological basis for observations and to understand how methods of data acquisition and analysis affect the results obtained. Evidence regarding histological and clinical validation of each technique also needs to be known. Artefacts and limitations of each technique will be presented. Indications for their use will be introduced.

Learning Objectives:
1. To appreciate current limitations of MRI for prostate cancer patients.
2. To understand that limitations can be addressed by advanced MRI techniques (diffusion-weighted MRI (DW-MRI), MR spectroscopic imaging (1H-MRSI) and dynamic contrast-enhanced MRI (DCE-MRI)).
3. To learn about the use of scoring schemes for imaging analysis and structured reporting of scans.
4. To become familiar with indications for advanced MRI.

A-498 09:00

B. Prostate cancer: how to be successful for clinicians

J.O. Barentsz; *Nijmegen/NL (J.Barentsz@rad.umcn.nl)*

Multifunctional MRI techniques are increasingly being used to address bottlenecks in prostate cancer patient management. These techniques yield qualitative, semi-quantitative and fully quantitative biomarkers that reflect on the underlying biological status of a tumour. These techniques have the potential to provide unique information which can be used for tumour detection in the treated and untreated gland, for predicting future tumour behavior and for monitoring and predicting the likelihood of response to treatment. It is now widely recognised that the multi-parametric MRI approach for evaluating the prostate goes beyond what can be achieved using any single functional MRI technique. If these techniques are to have a role in patient management, effective communication of results by the use of scoring systems, structured reporting and a graphical interface that matches prostate anatomy are key elements. Practical guidelines for integrating multiparametric MRI into clinical practice including new indications, via case examples are presented.

Learning Objectives:
1. To learn how and when state-of-the-art multimodality MRI (including T2-w, DWI, DCE and MRSI) should be performed.
2. To understand what indications are most important to urologists, radiation oncologists and patients.
3. To be able to recognise where multi-modality MRI is likely to be most helpful in this respect.

A-499 09:30

C. Bladder cancer: state-of-the-art aiming and staging

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

Tumours of the urothelium (transitional cell carcinomas) are by far the most common bladder malignancies, comprising approximately 95% of all such lesions. Squamous cell carcinomas or mixed transitional and squamous cell tumours, adenocarcinomas and undifferentiated lesions represent approximately 4% of malignant bladder lesions. Patients with bladder cancer usually present with painless haematuria, either gross or microscopic. A sense of false security may arise by the spontaneous disappearance of bleeding. Locally advanced tumours present with pelvic or abdominal pain due to ureteric obstruction, pelvic side wall muscle invasion, or invasion of adjacent organs. When a clinical diagnosis of bladder cancer is suspected initial investigation includes lower urinary tract endoscopy. Flexible cystourethroscopy allows assessment of the entire urethra and the entire urinary bladder. Usually after endoscopic visualisation of a bladder tumour, the histopathological diagnosis and initial treatment of the tumour are achieved by TUR (transurethral resection). Limitations of conventional cystoscopy include diminished visualisation of the bladder neck and within diverticula and technical difficulties in patients with urinary diversion. Cystoscopy is contraindicated in patients with bacteriuria, acute cystitis, urethritis, prostatitis, obstructive prostatic hypertrophy, and stricture or rupture of the urethra. In rare cases complications like iatrogenic injury to the urethra and bladder as well as urinary sepsis may occur due to cystoscopy. Imaging studies are required both in patients with negative cystoscopic findings and in patients with proven bladder cancer. In this talk the strengths and limitations of various imaging techniques in evaluation of bladder cancer will be given.

Learning Objectives:
1. To learn about the clinical presentation and management of bladder cancer.
2. To understand the clinical goals of imaging in bladder cancer.
3. To be able to assess the strengths and limitations of various imaging techniques in staging of bladder cancer.

08:30 – 10:00 Room E1

Special Focus Session

SF 16b
How should we image the patient with haematuria?

A-500 08:30
Chairman's introduction
A.T. Turgut; *Ankara/TR (ahmettuncayturgut@yahoo.com)*

Haematuria, ranging from an incidental finding to a significant symptom necessitating urgent treatment, is one of the most commonly encountered indications of disease in clinical practice. It may simply be macroscopic, referring to its visibility on gross examination, or microscopic. Importantly, haematuria can be a sign of a number of various benign and malignant underlying diseases of the urinary system, including renal or ureteral calculus, urothelial neoplasms, trauma, infection and haemorrhagic cystitis. Among these, assessment for urological malignancy is probably the most important reason for evaluating these patients, which necessitates the use of diagnostic tools with a high accuracy. In general, the cause of haematuria can be appropriately diagnosed by physicians on the basis of a detailed patient history, clinical presentation, cytological findings and serological findings though invasive diagnostic tools like conventional cystoscopy and ureteroscopy may be required for a proper diagnosis. Nevetheless, the evaluation of patients with haematuria frequently requires complete evaluation of the entire urinary tract by several imaging modalities, including intravenous urography, retrograde ureterography and pyelography, ultrasonography, computed tomography or magnetic resonance imaging. In this regard, familiarity with the evolving role of the aforementioned imaging modalities in the diagnostic algorithm for haematuria and knowledge about the imaging characteristics of various diseases are crucial for radiologists.

Session Objectives:
1. To become familiar with the current status of imaging in the management of patients with haematuria suspected of having urologic origin.
2. To learn about the evolving role of different imaging modalities in the diagnostic algorithm for haematuria.
3. To appreciate the significance of a proper imaging strategy in different clinical situations involving variable degrees of risk for urothelial cancer.

A-501 08:35
Ultrasound and intravenous urography: what is the new role?
S. Moussa; *Edinburgh/UK (sami.moussa@luht.scot.nhs.uk)*

In recent years there has been a major change in the way patients presenting with haematuria are investigated, particularly in relation to imaging. This has been mainly influenced by the significant advances in CT and MR technology, and the introduction of CT Urography which is now considered one of the reliable imaging modalities. The role of IVU and ultrasound has been relegated to a complementary role, to some extent problem solving rather than their past essential role. The role of IVU in imaging patients with haematuria is therefore limited to very specific circumstances as follows: a) lack of access to CT or MR, b) stone localisation in some cases to demonstrate the calyceal anatomy and c) chronic pyelonephritis. Ultrasound imaging remains, however, the first line investigation for patients with microscopic haematuria and a useful adjunct to CT in the investigation of frank haematuria: a) characterisation of renal lesions, b) follow-up of known lesions and c) follow-up of renal trauma.

Learning Objectives:
1. To become familiar with the changing role of conventional imaging techniques.
2. To learn about the current indications for ultrasound and intravenous urography in imaging patients with haematuria.
3. To learn about the technique and imaging features of causes of haematuria on ultrasound and intravenous urography.
4. To appreciate the current complementary role of these techniques in relation to CT urography.

A-502 08:58
CT urography
M.N. Özmen; *Ankara/TR (mozmen@hacettepe.edu.tr)*

Computed tomography urography (CTU) is defined as diagnostic examination optimised for imaging the kidneys, ureters and bladder with thin-slice multidetector CT imaging, intravenous administration of a contrast medium and imaging in the excretory phase which is a mandatory part of any CTU protocol. A typical CT urographic protocol has three phases that allow complete evaluation for the most common urological causes of haematuria. After an initial unenhanced phase, nephrographic phase images are acquired with the highest sensitivity in the detection of renal masses. Pyelographic phase images are acquired to evaluate the urothelium. Besides investigation of haematuria, other indications of CTU are evaluation of patients at increased risk for having upper or lower tract urothelial neoplasms, urinary diversion procedures following cystectomy, hydronephrosis, planning of percutaneous nephrolithotomy, traumatic and iatrogenic ureteral injury and complex urinary tract infections. CTU can be justified as a first line test for the upper and lower urinary tract in haematuria patients with a high pre-test probability for TCC. For lower risk groups, CTU can be used as a problem solving test if traditional work-up remains negative and symptoms persist. Radiation dose has been one of the most important driving factors in optimisation of CTU techniques and in selecting justified indications. Radiation doses in CT urography can be reduced by limiting the number of imaging phases through the use of dual energy CT or split-bolus technique. In general, CTU should be tailored towards the clinical question based on clinical information in order to achieve the lowest possible radiation dose.

Learning Objectives:
1. To discuss the current role of CT urography in evaluation of patients with haematuria.
2. To become familiar with the main techniques of CT urography and its limitations and strengths.
3. To learn about the key imaging features of the urothelial disease.

A-503 09:21
MR urography
T. El-Diasty; *Mansoura/EG (teldiasty@hotmail.com)*

Magnetic resonance urography (MRU) is the only study, alternative to MDCTU, which can thoroughly image all the anatomical components of the urinary tract, including renal parenchyma, pelvicaliceal systems, ureters and the bladder in a single test. MRU, using either heavily T2-weighted pulse sequences or gadolinium-enhanced T1-weighted sequences, has shown potential to detect, localise and characterise collecting system abnormalities in the patient with haematuria. There are developing MR nephrourography (MRNU) techniques to obtain structural and functional renal data simultaneously. Because neither iodinated intravenous contrast nor ionising radiation is used, it is safe in patients with contraindication to iodinated contrast media, in young patients, and without contrast in the pregnant patient. The main disadvantages of MR urography, which have hindered its widespread usage in the evaluation of the patients with haematuria are its limited ability to reliably detect urinary tract calcifications and air and limited availability in comparison with MDCTU. Another disadvantage of MRU is that spatial resolution of MRU does not approach MDCTU or IVU, and therefore, subtle ureteric or collecting system abnormalities could potentially be missed. High spatial resolution imaging is currently used for 3D-volume rendering and for better depiction of renal collecting system and ureters.

Learning Objectives:
1. To appreciate the role of MR urography as an alternative, complementary, or primary imaging study for patients with haematuria.
2. To understand the clinical value of different MR techniques used to image patients with haematuria.
3. To become familiar with the imaging features of different causes of haematuria on MR urography.

Panel discussion:
Which modality in which patient with haematuria? 09:44

08:30 – 10:00 **Room E2**

Oncologic Imaging

RC 1616

Imaging the complications of cancer treatment

A-504 08:30

Chairman's introduction

P. Brader; *Vienna/AT (peter@brader.md)*

Patients being treated for malignancy are vulnerable to a unique set of complications that are often urgent and are first identified or clarified on radiologic imaging studies. As advances in cancer therapy have resulted in an improved prognosis for the patient, an awareness of the consequences of treatment becomes increasingly important. All cancer treatment modalities are associated with a spectrum of toxic effects that may involve all organ systems. This session will discuss and illustrate the complications of a range of cancer treatments and their effects on the lung, abdomen, pelvis and CNS. The panel will discuss common complications that develop after the completion of cancer treatment and emphasise the importance of radiologists' awareness of these complications. This will permit more effective patient surveillance, which may afford patients the opportunity for earlier intervention and an improved quality of life.

Session Objectives:

1. To learn what the radiologist should know about complications of cancer treatments.
2. To understand the role of imaging in identifying some of these complications.
3. To be familiar with the diverse spectrum of these complications and their radiological features.

A-505 08:35

A. Pulmonary complications of the treatment of malignancy

S. Diederich; *Düsseldorf/DE (s.diederich@marien-hospital.de)*

In patients undergoing therapy for malignant disease with new pulmonary abnormalities, differentiation between pulmonary manifestations of malignancy, i.e. progressive disease and non-neoplastic changes associated with the therapy may be challenging. The consequences, however, are usually very important as therapy-associated abnormalities may be treated with discontinuation of the therapy whereas progressive malignancy often requires more intense therapy. The knowledge of typical imaging findings of therapy-induced changes as well as strategies to further clarify this dilemma are, therefore, of utmost importance. This presentation will demonstrate the chest radiographic and CT-findings of common therapy-associated pulmonary abnormalities including opportunistic infection with uncommon organisms due to immunosuppression, radiation pneumonitis, pulmonary toxicity due the chemotherapy, graft versus host disease in bone marrow transplant recipients, rejection in pulmonary transplantation and vascular disorders.

Learning Objectives:

1. To be familiar with pulmonary complications that may arise in patients being treated for malignancy.
2. To be aware of the possible infectious aetiologies.
3. To learn the appearances of typical and atypical infections, including fungal infection.

A-506 08:58

B. Imaging the effects of cancer treatment in the abdomen and pelvis

J.A. Spencer; *Leeds/UK (johnaspencer60@hotmail.com)*

The effects of cancer treatment can be desired, i.e. a treatment response or undesired, i.e. complications which may harm or even kill the patient. Complications are classified as acute, defined as those encountered up to 3 months; sub-acute, between 3 and 12 months; and delayed or late complications after 12 months. However, there is variation in susceptibility among individuals and there may be overlap of the acute, sub-acute and early delayed effects in the first few weeks to months following treatment. Radiological manifestations are often non-specific and thus the clinical context and temporal relationship to induction of therapy are important considerations. Good communication between the radiologist and the oncologist is vital for the early recognition and accurate diagnosis of complications related to treatment. The role of the radiologist is to help clinical colleagues to make a distinction between the effects of the cancer and the effects of its treatment so that ineffective or toxic therapies can be discontinued. Cancer patients with treatment complications usually present with common and non-specific symptoms such as diarrhoea, vomiting, constipation and abdominal pain. The differential diagnosis includes acute complications of treatment, complications or progression of the primary tumour, metastatic spread of tumour and problems related to co-morbid conditions. In this presentation I will illustrate these principles in two situations, one generic and acute and one more specific with subacute and chronic problems; the neutropaenic patient after chemotherapy or bone marrow transplantation; following radical chemoradiotherapy for cervical cancer.

Learning Objectives:

1. To be familiar with the range of complications that may arise following chemotherapy/radiotherapy.
2. To understand how these changes can simulate active disease.
3. To learn how to distinguish between these changes and active disease.

A-507 09:21

C. Complications of treatment in the CNS

P. Demaerel; *Leuven/BE (philippe.demaerel@uz.kuleuven.ac.be)*

Radiotherapy and chemotherapy are the common central nervous system cancer treatments. Other possible treatments, including recombinant humanised monoclonal antibodies and autologous dendritic cell-based immunotherapy have been used. Complications can occur soon after initiating a treatment, but delayed complications several months or years after treatment are increasingly being recognised. One of the difficulties concerns the differentiation between progressive disease/tumour recurrence and treatment-related changes, e.g. radionecrosis or inflammatory/immune-mediated changes. The term "pseudoprogression" is often used for the latter. The Response Assessment in Neuro-Oncology working group has recently updated the response criteria. Advanced MR imaging techniques are being used in an attempt to find imaging biomarkers and to gain more insight into this difficult differential diagnosis. Diffusion and perfusion imaging and MR spectroscopy have shown promising results. Elevation of choline and depression of N-acetyl aspartate is usually associated with the presence of tumour. Post-therapy necrosis is often characterised by the presence of lipid/lactate and the absence of other metabolites. Measurements of the apparent diffusion coefficient on diffusion imaging and cerebral blood volume on perfusion imaging have been investigated as potential biomarker too. Cancer treatments may also affect the central nervous system and cause neurotoxicity by direct injury to the glial cells, vascular injury or through immune-mediated mechanism. The imaging findings can include entities such as posterior reversible encephalopathy syndrome, progressive multifocal leukoencephalopathy and Wernicke encephalopathy.

Learning Objectives:

1. To be aware of the complications of chemotherapy and radiotherapy on the CNS.
2. To be able to recognise the specific imaging features of these complications.
3. To understand the optimal use of imaging techniques for evaluating these complications.

Panel discussion:
How can the radiologist make sure not to miss complications of cancer treatment? 09:44

08:30 – 10:00 **Room F1**

Abdominal Viscera

RC 1601

The cystic lesions of the pancreas

Moderator:
D.J. Breen; Southampton/UK

A-508 08:30

A. How can we differentiate cystic neoplasms from pseudocysts?

H.-J. Brambs; *Ulm/DE*

Cystic lesions of the pancreas are increasingly being detected due to the wide use of CT and MRI. They encompass a broad spectrum of benign, premalignant, and malignant tumors. The primary challenge is to differentiate pseudocysts from cystic neoplasms, particularly intraductal papillary mucinous neoplasms, mucinous and serous cystic neoplasms, and solid pseudopapillary neoplasms. Pseudocysts develop as a consequence of acute pancreatitis. The imaging appearance may evolve over a period of several weeks from an irregularly marginated formation to a well circumscribed lesion with a thickened smooth wall. Necrotic material is commonly present in early phases of the development. Most frequently pseudocysts are unilocular without internal septa and without solid contrast-enhancing components.

Other less commonly encountered unilocular cysts include IPMNs, mucinous cystic neoplasms, solid pseudopapillary neoplasms, and the very rare unilocular types of serous cystic neoplasm. These cystic lesions lack clinical, laboratory, and imaging evidence of pancreatitis. Mucinous cystic neoplasms predominantly involve the tail of the pancreas and occur almost exclusively in females in the 4.-5. decade. They have a thick wall, a smooth contour, and lack a communication to the pancreatic ductal system. Solid pseudopapillary neoplasms occur predominantly in young females and have most frequently solid components. Serous cystic neoplasms have a microcystic sponge-like appearance with a lobular contour and dense septations. Only, the rare oligocystic type has striking similarities with side branch type IPMN. Because there is a considerable overlap among the imaging findings of pseudocysts and neoplastic cystic lesions, history, clinical presentation, age, and gender have to be regarded. CT and MRI are excellent modalities for the detection of cystic lesions, but MRI including MRCP is superior in the characterization of these lesions.

Learning Objectives:
1. To learn the most common cystic lesions of the pancreas.
2. To know typical imaging findings of pseudocysts and cystic tumours.
3. To become familiar with imaging elements that differentiate cystic lesions.

A-509 09:00

B. IPMN: diagnostic and staging criteria

R. Manfredi; *Verona/IT (riccardo.manfredi@univr.it)*

Intraductal papillary mucinous neoplasms (IPMNs) of the pancreas originate from the mucinous epithelium of the pancreatic duct system and are characterised by papillary growth, hyper-production of mucin causing ductal dilatation. The gross appearance of these tumours depends on the site of origin, along the pancreatic duct system: we can distinguish IPMNs of the main pancreatic duct (MPD) (both with segmental or diffuse involvement), IPMNs of the side branches (SB) or IPMNs of both MPD and SB (mixed type). Histologically, IPMNs are classified into adenomas, border-line tumours and carcinomas, depending on the basis of the degree of cytoarchitectural atypia. Malignancy can occur in 30-88% of IPMNs, as an in situ or invasive cancer. A stepwise progression from adenoma to carcinoma has been hypothesised, because of the coexistence of different degrees of dysplasia in the same tumour. The risk of malignant degeneration correlates with the site of origin of the tumour. IPMNs typically produce radiographically identifiable ductal dilatation secondary to production of large amounts of mucin, which may predominantly involve the main pancreatic duct, branch ducts or both. Different imaging modalities including computed tomography (CT), magnetic resonance (MR) imaging or MR cholangiopancreatography, endoscopic retrograde cholangiopancreatography (ERCP), transabdominal ultrasonography (US) and endoscopic US have been used to evaluate IPMNs, and each modality has advantages and disadvantages that will be illustrated.

Learning Objectives:
1. To know how to display the CT and MR findings of IPMN.
2. To learn the limitations and complementary roles of CT and MR.
3. To become familiar with imaging staging elements that suggest management of different lesions.

A-510 09:30

also EPOS

C. How to manage incidental findings

C. Triantopoulou; *Athens/GR (ctriantopoulou@gmail.com)*

Definitive diagnosis and differentiation between benign and malignant cystic pancreatic lesions is often possible when the lesion has a typical radiological appearance, but in many cases characterisation with imaging alone is impossible. Microsyctic adenoma is the only type of cystic neoplasm that can be diagnosed with almost complete certainty, while diagnosis of mucinous cystic tumours is often hypothetical. CT and MRI are reasonably and similarly accurate in the characterisation of cystic pancreatic masses as benign or malignant. Small lesions are more susceptible to misdiagnosis. Concerning correct management of unclassified cystic lesions at imaging one should keep in mind that even small morphologically benign-appearing cysts present moderate frequency of malignancy. Most “authorities” agree that no imaging modality is sufficiently accurate to differentiate among the multiple benign, premalignant and malignant cystic lesions that are visualised by US, CT or MRI. A dedicated examination protocol is mandatory while the level of diagnostic certainty depends on experience. In cases of typical findings (microcystic adenomas, IPMN, cystadenocarcinomas) no further imaging is required. In any case one should use a method with high sensitivity for the diagnosis (MDCT) and a method with high specificity for the differential diagnosis (EUS guided FNA). DWI and CEUS show promising results. Surgical resection has been suggested for cases where the main pancreatic duct is > 6 mm in diameter, lesion size is > 30 mm, or intramural nodules are seen, given that the patient is a good candidate with reasonable life expectancy.

Learning Objectives:
1. To learn how to differentiate between benign and malignant cystic lesions.
2. To know the correct management of unclassified cystic lesions at imaging.
3. To become confident with the reference imaging criteria suggesting treatment.

08:30 – 10:00 **Room G/H**

Neuro

RC 1611

Spine: update on spinal disorders

Moderator:
M. Sasiadek; Wroclaw/PL

A-511 08:30

A. Imaging algorithm for degenerative spinal disease and spondyloarthropathies in 2012

J. Van Goethem, C. Venstermans, F. De Belder, L. van den Hauwe, P.M. Parizel; *Antwerp/BE (johan.vangoethem@ua.ac.be)*

Seronegative spondylarthropathy consists of a spectrum of chronic inflammatory disorders that lacks the presence of rheumatoid factor and that are clearly distinct from rheumatoid arthritis. Whereas rheumatoid arthritis involves predominantly the synovial joints, significant abnormalities in the cartilaginous joints, entheses, as well as synovial articulations are seen in spondylarthropathic processes. The age of onset ranges from 20 to 40 years and the overall prevalence is estimated to be as high as 0.2 to 2 %, ankylosing spondylitis (AS) and psoriatic arthritis (PA) being the most prevalent. Moreover, both AS and PA may cause severe functional disability of the affected patients. Ankylosing spondylitis has a predilection for the axial skeleton, resulting in progressive stiffness, flattening of the lumbar lordosis and exaggeration of the thoracic kyphosis, together with a limitation in spinal flexion. A peripheral polyarthritis with predilection for the lower limbs occurs less commonly. Psoriatic arthritis may involve both the appendicular and the axial skeleton and is characterised by a chronic course. Other less frequent spondylarthropathies consist of Reiter’s syndrome, Enteropathic arthropathies and SAPHO (Synovitis, Acne, Pustulosis palmoplantaris, Hyperostosis and Osteitis); spondylarthropathies have a different appearance than degenerative changes. Not only the pattern of involvement and the specific imaging findings, but also the age of the patient and the clinical symptoms allow the differentiation between the two entities.

Learning Objectives:
1. To recognise the imaging features of degenerative spinal disease.
2. To recognise the imaging features of spondyloarthropathies.
3. To differentiate the imaging findings of degenerative spinal disease and spondyloarthropathies.
4. To recognise the importance of establishing an imaging algorithm for the differential diagnosis between degenerative spinal disease and spondyloarthropathies.

A-512 09:00

B. Myelitis, myelopathy and spinal cord tumours

M.M. Thurnher; *Vienna/AT (majda.thurnher@meduniwien.ac.at)*

Despite its high sensitivity but low specificity magnetic resonance imaging (MRI) is the modality of choice for diagnosis of spinal cord diseases. Spinal cord examination is one of the more challenging MR examinations from a technical, interpretative, and differential diagnostic standpoint. It usually shows T2WI hyperintensity, focal or extensive, gadolinium enhancement and sometimes cord swelling. Demyelinating diseases, primary and secondary tumours, infections, acute transverse myelitis, spinal cord infarct, and compression myelopathy are only few possible causes of signal abnormalities of the cord. Transverse myelitis is the default diagnosis for an unexplained myelopathy evolving over the course of days to three weeks with subsequent stabilization or improvement. In practice there are no satisfactory ways to distinguish among different forms of myelitis and also in some cases from neoplastic conditions. Astrocytomas and ependymomas are tumors of the spinal cord, which are pathologically very different tumors and the therapy is likewise also different. Differentiation between these tumors is crucial for patient´s management. This lecture will review typical imaging findings in major categories of spinal cord diseases on conventional and advanced MR sequences. Possible pitfalls, helpful clinical information, and recognition patterns will be discussed.

Learning Objectives:
1. To become familiar with the epidemiology and clinical manifestations of the most common types of myelitis, myelopathy and spinal cord tumours.

2. To learn the imaging patterns of and to differentiate between myelitis, myelopathy and spinal cord tumours.
3. To consolidate knowledge of the best neuroimaging protocols for evaluating patients with suspected myelitis, myelopathy and spinal cord tumours.
4. To be aware of the importance of advanced neuroimaging techniques for the evaluation of spinal cord diseases.

A-513 09:30

C. Percutaneous treatment of spinal diseases

M. Muto; *Naples/IT (mutomar2@gmail.com)*

Spinal diseases include a wide range of pathologies causing spine pain. The pathogenesis of spinal pain is multifactorial due to disk diseases, vertebrogenic diseases articular diseases; clinical approach represents the basis for the correct therapy. The ganglium is the station of control of the pain receiving fibers by multiple structures. Each kind of these pathologies can be treated by mini-invasive percutaneous technique. Those include disk treatment at cervical or lumbar level by many different techniques such as nucleoplasty, percutaneous ablation, O2-O3 infiltration, discogel or percutaneous decompression; vertebral augmentation is also useful to treat vertebral compression fracture due to osteoporosis, metastasis or vertebral haemangioma to stabilise the metamer with antalgic effect and different techniques such as vertebroplasty, kyphoplasty and vertebral body stenting; facet joint syndrome can be treated with radio-frequency and direct steroid infiltration plus O2-O3; back pain due to spinal stenosis and black disk syndrome can be treated by the positioning of intraspinous device. Kyphoplasty can also be used in selected traumatic fractures avoiding bed rest and orthesis devices. The key point of the success of those treatments is the correct patient's selection with appropriate inclusion-exclusion criteria based on clinical evaluation and diagnostic imaging. It is important to perform all those techniques with high-quality angio-suite to avoid complications.

Learning Objectives:

1. To become familiar with the most important percutaneous treatment options for spinal diseases.
2. To learn of the common techniques of percutaneous disk treatments.
3. To learn of the common techniques of percutaneous pain relief treatments.
4. To learn of the common techniques of percutaneous spinal bone treatments.

08:30 – 10:00 **Room I/K**

Chest

RC 1604

Patterns in chest radiology: diffuse lung diseases – what the radiologist should know

A-514 08:30

Chairman's introduction

D.M. Hansell; *London/UK (davidhansell@rbht.nhs.uk)*

Readily understood and clearly defined descriptors are a prerequisite for the characterisation of diffuse lung disease. Over the years terms have fallen in and out of favour but there has been a gradual refinement, and arguably improvement, in the definitions employed so that phrases such as "inflammatory shadowing" are less widely used and more reproducible terms have increasingly been adopted. The Fleischner Society's glossary of terms for thoracic imaging (2008) contains definitions of the common descriptors (relatively few) that are used for diffuse lung diseases. In this session the modified and newer definitions included in the Fleischner glossary will be discussed. Thereafter, some key terms including ground glass opacity, mosaic attenuation, nodular and reticular patterns will be explored in detail. Particular attention will be paid to the correct identification of these patterns and their subgroups/variants. The way in which a differential diagnosis is synthesised, centred on these basic patterns, will then be explored.

A-515 08:35

A. The glossary of terms for thoracic imaging: old and new definitions

J.A. Verschakelen; *Leuven/BE (johny.verschakelen@uz.kuleuven.ac.be)*

Most radiological reports consist of a ‚descriptive part' in which the radiologist describes the findings and a short ‚conclusion part' containing the interpretation of what is seen. Both parts are filled with ‚jargon'. Some terms are typical radiological ‚language' while others refer to terminology also used by clinicians and pathologists. Some terms are purely descriptive but others may contain already some interpretation and hence narrow the differential diagnosis. The meaning of a term may also change over time. It is very important that both radiologists and the readers of their reports speak the same language and know and understand the meaning and the full content of each term. This is especially important when radiological findings in patients with diffuse lung diseases are described and interpreted. Diagnosis of diffuse lung disease is indeed largely based on the recognition and description of the appearance pattern of the disease because this often allows developing an appropriate list of differential diagnosis. Members of the Fleischner Society have introduced a glossary of terms for thoracic imaging. This presentation will emphasise on the importance of such a glossary for both describing and interpreting chest images.

Learning Objectives:

1. To understand the importance of a glossary of terms for thoracic imaging.
2. To become familiar with the new definitions introduced in the last glossary of terms proposed by members of the Fleischner Society.

A-516 08:58

B. From pattern recognition to disease diagnosis: a practical approach (part 1)

A. Devaraj; *London/UK*

Ground-glass opacification and mosaic attenuation are two signs that are frequently observed on HRCT. While the identification of these signs is usually not challenging, their interpretation can be more difficult. This is because in isolation there is a wide differential diagnosis for these abnormalities. For example, conditions as disparate as hypersensitivity pneumonitis, connective tissue disease related lung disease and pulmonary oedema may all give rise to these signs on HRCT. However, by searching for additional information such as the distribution of disease and the presence of ancillary features, and by integrating with clinical information, the differential diagnosis may be refined. This presentation will review the causes of mosaic attenuation and ground-glass opacification on HRCT and will provide a practical approach on how to deal with these signs and formulate a diagnosis.

Learning Objectives:

1. To understand the different patterns on HRCT scans of the chest.
2. To learn about a systematic approach to differential diagnosis of diffuse lung diseases.
3. To review key imaging findings.

A-517 09:21

C. From pattern recognition to disease diagnosis: a practical approach (part 2)

N. Howarth; *Chêne-Bougeries/CH (nigel.howarth@grangettes.ch)*

HRCT imaging has an established role in the management of patients with diffuse lung disease and is recommended for all patients at initial diagnosis and during follow-up. HRCT provides information essential for diagnosis and prognosis, for choice of management and monitoring of treatment and for the detection of complications. Radiologists should benefit from an understanding of important aspects of gross lung anatomy. Knowledge of the pattern and distribution of disease processes improves the quality of the radiology report and our contribution to patient management. Basic HRCT patterns (reticulation, nodules, ground-glass opacities and/or cysts) are common to many disease processes and usually non-specific. However, their distribution and temporal evolution can be characteristic enough for diagnostic purposes. The principles and good practices of HRCT pattern recognition will be explained. Specific examples will be discussed to demonstrate how the combined information of high-resolution images of the lung parenchyma with clinical, functional and biological information improves disease diagnosis, can guide surgical biopsy and monitor treatment response. Advances in the understanding of the pathophysiology of diffuse lung disease result in new training requirements for radiologists who should promote close collaboration with chest medicine specialists and pathologists.

Learning Objectives:

1. To understand the different patterns on HRCT scans of the chest.
2. To learn about a systematic approach to differential diagnosis of diffuse lung diseases.
3. To review key imaging findings.

Panel discussion:
How do we report CT of diffuse lung disease? 09:44

08:30 – 10:00 Room L/M

Professional Challenges Session

PC 16

Upcoming challenges in radiation protection

A-518 08:30

Chairmen's introduction

E. Vaño[1], P. Vock[2]; [1]*Madrid/ES*, [2]*Berne/CH (elivano@terra.es)*

Radiological Protection (RP) represents a substantial part of the quality management system in clinical practice for many medical specialties, especially in those using ionising radiation for imaging. The most important international and national organisations have dedicated significant efforts to improve radiation safety in medicine in the past years. The International Commission on Radiological Protection (ICRP) and its Committee 3, focussed on the aspects of RP in medical diagnosis, therapy, or biomedical research is producing documents on recommendations to help in the progress of a safer medicine. Imaging in asymptomatic individuals represents a challenge in RP. Several aspects (individual rights and benefits, radiation risks, ethical issues, regulations, etc) and several stakeholders need to be considered and ICRP has recently decided to launch a Task Group to produce recommendations on this topic. Another challenge to be discussed in the session is the justification and optimisation of some of the hybrid imaging systems using radionuclides for single photon emission computed tomography (SPECT) or positron emission tomography (PET) combined with x-ray computed tomography (CT). New systems combining some of these imaging modalities with magnetic resonance imaging (MRI) need also to be considered when patient radiation doses are one issue. The combination of the three presentations in this joint session of the ESR and ICRP should allow a fruitful discussion on the limits of optimisation and the relative role of optimisation and justification, with a need of a more strict selection of medical indications when the expected radiation doses could be significant.

Session Objectives:

1. To analyse the need for radiological protection in view of the increase in medical radiation exposure from imaging.
2. To understand new challenges, such as imaging in asymptomatic individuals.
3. To critically justify and optimise hybrid imaging by PET-CT and SPECT-CT.

A-519 08:35

Challenges in radiation protection for imaging: work in progress by ICRP

E. Vaño; *Madrid/ES (elivano@terra.es)*

Radiological Protection (RP) represents a substantial part of the quality management system in clinical practice for many medical specialties, especially in those using ionising radiation for imaging. The most important international and national organisations have dedicated significant efforts to improve radiation safety in medicine in the past years. The International Commission on Radiological Protection (ICRP) and its Committee 3, focussed on the aspects of RP in medical diagnosis, therapy, or biomedical research is producing documents on recommendations to help in the progress of a safer medicine. Imaging in asymptomatic individuals represents a challenge in RP. Several aspects (individual rights and benefits, radiation risks, ethical issues, regulations, etc) and several stakeholders need to be considered and ICRP has recently decided to launch a Task Group to produce recommendations on this topic. Another challenge to be discussed in the session is the justification and optimisation of some of the hybrid imaging systems using radionuclides for single photon emission computed tomography (SPECT) or positron emission tomography (PET) combined with x-ray computed tomography (CT). New systems combining some of these imaging modalities with magnetic resonance imaging (MRI) need also to be considered when patient radiation doses are one issue. The combination of the three presentations in this joint session of the ESR and ICRP should allow a fruitful discussion on the limits of optimisation and the relative role of optimisation and justification, with a need of a more strict selection of medical indications when the expected radiation doses could be significant.

Learning Objectives:

1. To get an insight into ongoing activities of ICRP Committee 3 (Protection in Medicine).
2. To learn about the approaches of the ICRP to new challenges.
3. To get a preview of upcoming recommendations.

A-520 08:55

To understand new challenges, such as imaging in asymptomatic individuals

K. Åhlström Riklund; *Umea/SE (katrine.riklund.ahlstrom@diagrad.umu.se)*

Imaging takes a more advanced role in patient care and makes personalised medicine possible for some diagnosis. Modern technologies such as SPECT, CT, MR and hybrid imaging with SPECT or PET/CT and PET/MR give new opportunities to find and follow diseases at earlier stages. This results in the possibility to find some diseases even before symptoms. Even a low possibility to find diseases creates a need from the population, and „wild screening" is an increasing issue in the western world. Cardiac imaging, search for oncologic diseases, i.e. lung cancer or colonic cancer are probably the most common „indications" for imaging of asymptomatic individuals. Imaging of asymptomatic individuals with ionising radiation is a new challenge and still scientific results are sparse. Risk factors increase the benefits of imaging. Besides finding treatable diseases also benign diseases will be found and might introduce complementary imaging and treatment. Radiation protection issues might be even more important in this new challenge and the radiation risk component has to be taken into consideration. All use of imaging with ionising radiation has to be justified also in asymptomatic individuals. Guidance to referring doctors is needed and one of the challenges is to address the balance on the risk and benefits. Another issue where guidance is needed, is information to the individuals and which consideration should be taken. Guidance would best come from the professionals, and in these guidelines there should also be a consideration of radiation protection and risk assessment. The talk will review work of ICRP in this area.

Learning Objectives:

1. To get an insight into imaging in diagnostic and screening purposes.
2. To review work of imaging in asymptomatic individuals.
3. To learn about the approaches of the ICRP to new challenge, imaging in asymptomatic individuals.

A-521 09:15

Hybrid systems and growing challenge posed by CT

M.M. Rehani; *Vienna/AT (m.rehani@iaea.org)*

Hybrid imaging systems combine x rays with other form of imaging like nuclear imaging or MRI. The most often used systems are PET/CT; SPECT/CT and more recently MRI/CT. PET and SPECT contributes to radiation dose to patient in addition to dose from CT. Typical radiation dose to an adult patient from PET scan depends on the activity of the injected FDG (18F-Fluoro deoxyglucose) and is typically 8 mSv for adult using 400 MBq and is the same whether a part of the body or the whole body is imaged. Nearly similar situation and dose are for SPECT. The CT dose varies widely (5 to 20 mSv) depending upon area scanned and whether the scan is for localisation or a diagnostic scan. A number of ways have been developed to reduce radiation dose to the individual patient and to population using principles of justification and optimisation. The highest contribution in coming years is expected to be many-fold reduction in CT dose by development of sub-mSv CT. Next is large scope of reducing inappropriate examinations. At policy level, there is growing emphasis on individual patient dose reduction (without losing the diagnostic efficacy), whereas in the past the significant emphasis was on population dose. In many developing countries there is need to increase use of modern imaging and thus population dose will justifiably increase and that is not bad thing. The talk will review work of IAEA and ICRP in this area. Significant material and information are available at http://rpop.iaea.org.

Learning Objectives:

1. To understand the types of hybrid systems, applications and the exposure involved.
2. To review work of international organisations on dose management.
3. To learn about ways to keep the medical population exposure stable despite the growth of CT.

Panel discussion:

Optimisation vs justification: range of 1-10 mSv CT examination vs more strict selection of indications 09:35

08:30 – 10:00 **Room N/O**

Special Focus Session

SF 16c
Paediatric head and neck imaging

A-522 08:30
Chairman's introduction
B. De Foer; *Wilrijk-Antwerp/BE (bert.defoer@gza.be)*

The evaluation of paediatric head and neck pathology requires a thorough knowledge of head and neck anatomy as well as of the normal variants in the head and neck region in children. Knowledge of embryology and background clinical information is of utmost importance to narrow differential diagnosis in the paediatric population. It should be noted that adult pathology in the head and neck region cannot simply be projected as such onto the paediatric population. Also, imaging strategies differ from the adult approach. It is important to realise that several entities can be regarded as benign or as an anatomical variant in children, whereas the same imaging appearance in adults should be regarded as pathological. In the following lectures, normal anatomy, anatomical variants and pathology in the head and neck region in the paediatric population will be highlighted emphasising the difference with the adult population as to normal anatomy, pathology and imaging strategies.

Session Objectives:
1. To become familiar with the specific head and neck anatomy in children and normal appearance for age.
2. To understand the imaging strategy.
3. To learn about the most important head and neck abnormalities in children.

A-523 08:35
Imaging of temporal bone pathology in children
B. De Foer; *Wilrijk-Antwerp/BE (bert.defoer@gza.be)*

The imaging aspect of the temporal bone in children differs from its aspect in adults. A structural analysis of the temporal bone in children on a point-to-point basis with knowledge of the specific temporal bone anatomy in children is required. Congenital anomalies should be evaluated using both CT and MRI. On CT, assessment of the external auditory canal, middle ear and mastoid, ossicular chain as well as the bony delineation of the membranous labyrinth should be performed. The membranous labyrinth as such, nerves and central vestibular and auditory pathways are mainly evaluated using MRI. In tumoural and infectious pathology, CT and MRI are complementary. Again CT will demonstrate the bony delineation of external and middle ear as well as the inner ear and temporal bone pyramid. MRI allows better soft tissue and membranous labyrinth evaluation. Several pathological entities are only seen in children both in the infectious (e.g. coalescent mastoiditis) as tumoural subgroup (e.g. histiocytosis X and rhabdomyosarcoma). A vast majority of pathologies are caused by infectious-inflammatory lesions, such as chronic middle ear infection, tympanosclerosis and cholesteatoma. Whereas at the onset, CT has been the primary imaging tool, MRI has become more and more important in the evaluation of patients with chronic middle ear infection and/or cholesteatoma, especially in the post-operative follow-up. Normal anatomy, variants, imaging techniques and protocols will be discussed. On overview of the most important congenital, tumoural and infectious and inflammatory pathologies will be given.

Learning Objectives:
1. To become familiar with congenital malformations.
2. To learn about the imaging findings of inflammatory and space occupying lesions.
3. To understand the imaging strategy.

A-524 08:58
Imaging approach for a child with a neck mass
N.J.M. Freling, A.M.J.B. Smets, E.E. Deurloo; *Amsterdam/NL (n.j.freling@amc.uva.nl)*

A swelling in the neck of a child may be due to a congenital lesion – cystic, vascular or solid – due to acute / chronic inflammatory disease – in which clinical data are important to consider -, or due to a neoplasm – benign or malignant. Ultrasound remains the first-line imaging modality in all children presenting with a subacute / chronic or slowly progressive swelling in the neck. It is quick, widely available and non-invasive and no deleterious effects to this young population are known. In an acute life-threatening situation, however, CECT or even MRI might be considered to depict the upper airways, the deep spaces of the face, the skull base and/or the orbit. Enlarged lymph nodes may be a sign of inflammatory disease, but it may also be the first expression of malignant disease such as nasopharyngeal cancer, malignant lymphoma, rhabdomyosarcoma, neuroblastoma and should be interpreted with caution. In case of doubt, revision of findings and/or repeating the US examination within a short space of time (days) is mandatory. When US is inconclusive, further imaging with MRI should be advised. In young children MRI requires general anaesthesia or sedation for optimal results. In this presentation cases will be shown and difficult decisions will be highlighted. Differential diagnostic considerations will be discussed.

Learning Objectives:
1. To learn about the most frequent neck space occupying lesions.
2. To understand diagnostic imaging protocols.
3. To become familiar with the main differential diagnosis.

A-525 09:21
Imaging of maxillofacial and sinonasal pathology in children
S. Bisdas; *Tübingen/DE*

Paediatric masses in maxillofacial and sinonasal spaces are not a rare finding and a challenging diagnostic dilemma. The patient's age provides important diagnostic information in cases of congenital lesions while age-related changes should be carefully appreciated. Attention to clinical history and physical examination, as well as knowledge of the embryological features and anatomy of these regions, can provide clues for accurate diagnosis. The radiological evaluation of paediatric patients usually begins with conventional and colour Doppler US to depict superficial structures, often at bedside, to confirm their cystic or solid nature. X-rays demonstrate the osseous nature of a mass and are particularly useful in the maxillofacial region. X-ray findings may not allow definitive characterisation, especially in deeply situated lesions, and thus, CT aids in the morphological characterisation by precise visualisation of fine bone structures, calcifications and deep soft-tissue. However, a more detailed depiction of the soft-tissue masses can be achieved by MR imaging, which offers superior contrast resolution, especially in the gadolinium-enhanced and fat-saturated sequences. Common paediatric pathologies in the sinonasal and maxillofacial regions will be presented with emphasis on the characteristic for each disease imaging findings.

Learning Objectives:
1. To learn about age-related changes that should not be misinterpreted.
2. To understand the role of x-rays, CT and MRI.
3. To become familiar with the imaging findings.

Panel discussion:
How best to image the principal head and neck abnormalities in children 09:44

08:30 – 10:00 **Room P**

Physics in Radiology

RC 1613
Simulations help us understand x-ray imaging

Moderators:
H. Bosmans; Leuven/BE
A. Persson; Linköping/SE

A-526 08:30
A. Monte Carlo simulations of x-ray tubes and x-ray spectra
M. Koutalonis; *London/UK (Manthos.Koutalonis@bartsandthelondon.nhs.uk)*

Simulation of x-ray spectra using computers is a very important tool for the investigation of patient dose and image quality in diagnostic radiology. Since experimental measurement of x-ray spectra requires specialised equipment and is not always feasible, simulation has become a popular method. The several general purpose codes that have been developed during the past decades, the databases with particle interaction cross sections available and the substantial increase in computing power (with a considerable fall in cost) have played a crucial role to this end. When simulating an x-ray tube, various complex phenomena need to be taken into account, such as the electron multiple scattering, bremsstrahlung interactions, characteristic x-rays emitted from the K-shell and Auger electrons emitted during a photon interaction. Together with the simulation of the target material and the filtration of the x-ray beam through permanent (e.g. a Be window) and added filtration (e.g. Al, Mo, Rh, Ag etc)., this technique can lead to a good estimation of the emitted x-ray spectrum. This review will provide an overview of the basic knowledge necessary to start the simulation of an x-ray tube as well as of how to accelerate the calculations. Emphasis will be given to mammographic x-ray tubes. Applications on the use of simulated x-ray spectra, such as for x-ray tube shielding calculations and for the investigation of the effect of anode surface roughness on patient dose and image quality will also be presented.

Learning Objectives:

1. To understand the basics of Monte Carlo simulations of x-ray tubes and x-ray spectra.
2. To learn why and how to start a Monte Carlo software platform.
3. To learn how to accelerate Monte Carlo calculations.

A-527 09:00

B. Monte Carlo simulations of virtual patients (anthropomorphic phantoms)

M. Zankl; *Neuherberg/DE (zankl@helmholtz-muenchen.de)*

As doses in the human body cannot be measured, Monte Carlo simulations of medical exposures are being used as a means for patient dosimetry since many years. This requires models of the radiation source, the patient and the radiation transport through the patient. The phantoms of the human body need to represent all relevant organs, and these have to be assigned properties relevant for radiation transport, such as elemental composition and radiation cross-sections. For dose calculations for mammography, specific breast phantoms have been designed. With the advances in computer technology, all these models have been improved and sophisticated over the years. The development of virtual phantoms ranges from the early stylized phantoms that described the human anatomy rather schematically with simple geometric bodies over much more realistic voxel phantoms segmented from medical data of individual persons to boundary representations of the body and its organs that can be readily adapted to different sizes and statures. Since boundary representations, such as NURBS (non-uniform rational B-splines) and meshes, cannot be directly used by most contemporary radiation transport codes, they have to be converted again into voxel phantoms for performing simulation calculations after having been modified, respectively. The results of the simulations are mostly so-called organ dose conversion coefficients that normalise organ doses to measurable quantities, such as air kerma free in air, dose-area product or CTDIvol. Multiplication of the conversion coefficient with the actual value of the normalisation quantity as measured during the examination under consideration results then in absolute organ doses.

Learning Objectives:

1. To learn about requirements for anthropomorphic phantoms (virtual patients).
2. To understand the value of anthropomorphic phantoms for breast imaging.
3. To be able to compare advantages and disadvantages of several types of anthropomorphic phantoms.
4. To learn how to estimate typical patient doses from simulations with virtual phantoms.

A-528 09:30

C. Monte Carlo simulations of x-ray detectors and x-ray images

N. Marshall; *Leuven/BE (nicholas.marshall@uz.kuleuven.ac.be)*

This lecture concentrates on the Monte Carlo (MC) simulation of diagnostic radiology x-ray detectors and images, with the emphasis on detectors in the mammography energy range. We begin with a review of the various simulation possibilities for x-ray detectors and a discussion of the physical properties and parameters that can be simulated. The detailed simulations possible for quantitative aspects of detector performance are contrasted against the more limited options available when having to simulate large area x-ray images. There will be a brief discussion of a number of available MC codes, such as Geant4, MCNP and Penelope/MANTIS, along with the detector modeling capabilities of each code. This will be followed by some example detector models for MCNP: the standard semi-deterministic radiography tally, often used in image simulation studies and two alternative detector models, a perfect energy integrating detector and a detector based on the energy absorbed in the detector material. Options for generating large area x-ray images are discussed and a hybrid (deterministic and MC) image simulation method of modifying images generated using the MCNP image detector models to include the physical characteristics of the x-ray imaging system. Deterministic detector corrections include intensity variations from the heel effect, the spatial resolution characteristics of the imaging system and detector noise. The MC simulations are validated as a function of energy and x-ray attenuator thickness using measurements of scatter-to-primary ratio (SPR) and scatter fraction (SF), along with some simple image quality parameters such as signal difference to noise ratio (SDNR).

Learning Objectives:

1. To learn basic methods for simulating imaging detectors.
2. To learn how to simulate x-ray images.
3. To learn how to validate Monte Carlo simulations of an x-ray imaging system.

08:30 – 10:00 **Room Q**

Computer Applications

RC 1605

New PACS architecture: decoupling image management from image navigation

A-529 08:30

Chairman's introduction

H.U. Lemke; *Berlin/DE (hulemke@cars-int.org)*

Image-based diagnostic and therapeutic workflows, particularly in interventional suites, are essential for the health care of patients but they are also a very cost-intensive component in clinical settings. The understanding of workflows and ICT tools for image management beyond radiology, and in particular, for image-based interventional suites has become not only of concern to radiologists but also to other healthcare providers, managers, and administrators. Communication, simulation, visualisation and navigation with images are becoming essential features in the planning and implementation of complex PACS infrastructures in support of diagnostic and interventional procedures (e.g. interventional radiology, minimally invasive surgery, computer assisted surgical procedures and image guided therapy). While the full potentialities of multidisciplinary image sharing within health care settings are being further explored, it is now increasingly common to see intense cooperation between radiologists and other clinicians for planning and guiding interventions. During the session on "New PACS architectures: decoupling image management from image navigation", the lecturers – exceptional experts in their respective fields – will give insights into image sharing: from hospital-based PACS applications to remote consultation, with specific reference to the support of surgeons (training and intraoperative guidance).

Session Objectives:

1. To introduce models of image management and workflow.
2. To present the evolution of image management outside of radiology (surgery, interventions etc).
3. To discuss the technical requirements for better image sharing and distribution.

A-530 08:35

A. Image navigation and new PACS architecture

J. Reponen; *Raahe/FI*

Picture archiving and communication systems (PACS) have become an instrumental tool for storing and distributing medical images, not only within radiology but also in other medical domains. Typically a PACS consists of imaging modalities like computed tomography (CT) and magnetic resonance imaging (MRI), image storage device and reading workstations all connected with a secure data network. New challenges are introduced when more and more images are distributed over wide area networks, even utilising mobile and web technologies. Thin clients are becoming more widely used especially in clinical setting. When PACS is used outside radiology (e.g. in operating theatre or in clinical wards) and for other modalities than radiology (e.g. for ECG or photographs) different types of user interfaces are needed. A radiology information system (RIS) is mandatory in order to manage the information stored into the archive. As more and more hospitals utilise comprehensive electronic patient record, a seamless integration is necessary. Standardisation of the modules and pre-defined workflows through Integrated Healthcare Enterprise (IHE) profiles will make interoperability easier. Regional image archives and shared access to images make it possible to distribute workload remotely and also decrease repetitive examinations for moving patients. Teleradiology offers a means to share medical expertise. Legal aspects have to be discussed if PACS storage is outsourced to a cloud-based PACS. Stored information should be backed up, so that a full disaster recovery without unwanted breaks in service is possible.

Learning Objectives:

1. To learn about recent changes in PACS design and infrastructure.
2. To understand the role of data management in PACS architecture.
3. To become acquainted with different PACS architectures.
4. To understand technical, workflow and legal aspects of innovative technologies.

A-531 08:58

B. Intraoperative imaging for surgeons

A. Pietrabissa, L. Pugliese, A. Peri, F.P. Tinozzi, V. Ferrari; *Pavia/IT (andrea.pietrabissa@gmail.com)*

Modern radiological scanners allow the acquisition of volumetric datasets describing human anatomy, functionality and pathology, with high level of detail. On the other hand, minimally invasive surgery offers excellent views of surface anatomy but is unable to provide details on deeper or hidden structures and bears the limit of a low-grade tactile feedback. The highly detailed information contained in radiological images, which are partially lost when passing to the surgical room, can be expressly used to overcome these limitations. In this setting, computer-assisted technologies allow to augment real views of the patient, taken by means of cameras and optical tracking systems, with virtual information obtained from pre-operative or intra-operative radiological images, coherently mixing them in order to obtain an accurate superimposition of both. This augmented-reality, or in general mixed-reality technique, introduces many advantages for some tasks where the surgeon has to interact with the patient (localisation of target lesion, sharp definition of nodule's margins, identification of vascular or other relevant adjacent anatomic structures, introduction of biopsy needle, etc). improving the physician's perception of deep or unexposed tissues and consequently the precision level of the procedure. The surgical robotic platforms currently available, as computer-assisted systems provided with 3D stereoscopic vision, may support the application of these techniques in many fields of surgery. Further technological development should be claimed since the relevant implications involved with the clinical use of this promising new approach to enhance intra-operative visualisation during minimally invasive surgery.

Learning Objectives:
1. To understand why surgeons will need more intraoperative guidance.
2. To learn the role of robotics and augmented reality for the general surgeon.
3. To become familiar with patient-specific simulation.
4. To appreciate the place of surgical training and credentialing.

A-532 09:21

C. Dismantling PACS: separating the image viewing from the data storage and sharing

L.N. Sutton; *Halifax/UK (laurence.sutton@cht.nhs.uk)*

Traditionally, healthcare organisations have implemented a PACS solution in which all the components, including image processing, image viewing, image data sharing and storage and both software and hardware, have been provided and managed by one PACS Vendor.There is now an increasing trend to consider and purchase these components separately, particularly the aspects of data storage and sharing. In part, this approach is driven by the need to achieve better value for money and, by allowing more open competition for the provision of PACS components, will stimulate greater flexibility and innovation in the market. A more pressing requirement, however, is to accommodate changing approaches to the delivery of diagnostic imaging services across healthcare organisations and indeed across regional and national boundaries. It is in this area, where the logistics of storing data, viewing data and sharing data become critical areas of debate, not only in terms of cost-effective methods but in terms of clinical governance and patient safety. A multi vendor approach to all aspects of image data management will become the norm, the success of which will be predicated upon the adoption of international data sharing standards and frameworks. This presentation will reflect upon the current issues with respect to the above which are providing challenges and opportunities in England, UK, where the provision of PACS services will be transferred from a national programme approach to local healthcare organisations.

Learning Objectives:
1. To learn about strategic issues of generic image archiving and distribution.
2. To understand new concepts of independent 'front ends' of PACS.
3. To become familiar with new examples of PACS implementation based on component architecture.
4. To be informed about new strategies of PACS architecture and migration.

Panel discussion:
How should we manage our images today? 09:44
1. New challenges for large-scale image sharing and image distribution.
2. Use of imaging outside radiology.
3. Regulatory issues of image sharing.
4. Practical and workflow issues of image distribution and management.

10:30 – 12:00 Room B

Interactive Teaching Session

E³ 1720a
Common radiological problems: cardiovascular

A-533 10:30

A. Looking at the heart in chest x-rays

J. Andreu; *Barcelona/ES (jandreus@gmail.com)*

Despite the advance of cross-sectional techniques, the chest radiograph remains a basic tool for the initial approach to heart diseases. In this lecture we will present our current approach to evaluate cardiac pathology in conventional radiography illustrating it with selected cases. The basic approach consists of seven steps, evaluating the size and shape of the cardiac silhouette, cardiac calcifications, pulmonary circulation and lung changes, great vessels and implanted devices, all of them correlated with the clinical findings.

Learning Objectives:
1. To learn how to detect and characterise cardiac abnormalities in the chest radiograph.
2. To learn when further evaluation is required.

A-534 11:15

B. Looking at the heart in chest CT

F. Laurent; *Pessac/FR (francois.laurent@chu-bordeaux.fr)*

Looking at the heart on a chest film may be considered at a first glance as wasting time since, today, many other techniques are available to offer an impressive array of details of the morphological and functional evaluation of heart. Nevertheless, the chest film remains often the first modality performed in many situations in which symptoms can be either of pulmonary or cardiac origin and then, careful analysis of heart may avoid rough mistakes in patient management. Acquired and congenital pericardial or cardiac abnormalities may be responsible for a deformity of the cardiac silhouette and might lead to examination of patient by a chest CT. CT with fast scanning capabilities can acquire images of the thorax with reduced cardiac motion artefacts, improving the evaluation of the heart in the course of a thoracic CT. Unexpected findings of cardiac structures on both unenhanced and enhanced acquisition can dramatically influence the patient's clinical management. In many situations, a chest CT is performed without cardiac gating and it may be necessary to complement the initial examination by a gated acquisition to provide a more dedicated analysis. The normal appearance of cardiac structures and the most common cardiac abnormalities should be known by all the radiologists. Various conditions such as idiopathic and acquired cardiomyopathy, ischaemic heart disease and valvular dysfunction can be identified even on non-gated scans. Pulmonary diseases may also involve pericardium and cardiac structures and this should be clearly identified.

Learning Objectives:
1. To learn how to detect and characterise cardiac abnormalities in chest CT.
2. To learn the limitations of the interpretation of cardiac abnormalities on ungated chest CT.
3. To learn when further evaluation is required.

10:30 – 12:00 Room C

Interactive Teaching Session

E³ 1720b
Common radiological problems: palpable lower neck mass – thyroid or not?

A-535 10:30

A. Thyroid nodule

H. van Overhagen; *Den Haag/NL (h.voverhagen@hagaziekenhuis.nl)*

Thyroid nodules are common. Nodules can be palpated in 4-8% and are seen with ultrasound in 10-41% of adults. Most nodules are benign. In patients who present with a palpable nodule, carcinoma is eventually diagnosed in only 5% of cases. The incidence of thyroid carcinoma is low compared with other malignancies. Papillary carcinoma is by far the most common (75-80%) type. Lymph node metastasis in

thyroid carcinoma is primarily to the paratracheal and prelaryngeal nodes (Level VI), and the upper (Level III) and lower (Level IV) jugular nodes. In patients with a palpable nodule, malignancy should be suspected with rapid growth, a firm or fixated mass, in case of enlarged lymph nodes or vocal cord paralysis. In patients with multiple thyroid nodules the cancer risk per patient is not altered. Ultrasound is the primary imaging technique in patients with a palpable thyroid nodule. It is best performed with the patient supine, the neck slightly extended and using a high-frequency linear-array transducer. Several ultrasonographic features are more often associated with benign or malignant nodules. However, while some ultrasonographic features may strongly suggest malignancy it may be very difficult to rule out malignancy by means of these features alone. Ultrasound-guided fine needle biopsy can be performed in an attempt to differentiate between benign and malignant nodules but is non-diagnostic in up to 20% of cases. Use of ultrasound, thin needles and avoidance of suction can increase numbers of diagnostic biopsies. A reserved approach is advised regarding biopsies of non-palpable nodules.
Learning Objectives:
1. To learn about the optimal settings for US examination of the thyroid.
2. To be able to identify morphologic characteristics of benign and malignant thyroid nodules.
3. To be able to identify the most common pathways of lymph node metastases in the thyroid.
4. To learn about the role of US-guided fine needle aspiration cytology in the thyroid.

A-536 11:15
B. Outside the thyroid
N.J.M. Freling; *Amsterdam/NL (N.J.Freling@amc.uva.nl)*

The neck is host to a large variety of benign and malignant diseases ranging from simple cysts to acute inflammation with complications to highly malignant sarcomas, and imaging plays an important role to assess the nature and the extension of disease. Patient history and clinical findings will decide which imaging technique is best suited to resolve the diagnostic dilemma. Ultrasound is recommended to differentiate between a cystic or solid lesion, to guide FNA, being quick and accurate. Pathologic flow within or around a lesion can be assessed adding Doppler technique. In acute illnesses with anticipated complications, such as a deep neck abscess, contrast-enhanced CT is required to evaluate local extension and demonstrate spread from the neck deep to the mediastinum. MRI is indicated to assess non-inflammatory, subacute or chronic diseases, such as vascular malformations, branchial cleft cysts, benign and malignant soft tissue tumours, brachial plexus pathology and neurologic diseases. Vascular malformations are easily depicted with MRI using T2 sequences in different image planes. Persistent fistulas of the branchial system also can be depicted by MRI running from the anterior border of the sternocleidomastoid muscle to the lateral pharyngeal wall. Assessing the origin of a soft tissue tumour has major implications for surgery. Staging a malignant soft tissue tumour must comprise the skull base and upper mediastinum including local extension, pathologic neck nodes and perineural spread. Follow-up during chemotherapy and postoperative monitoring of malignant disease is an important indication for (MR) imaging, the more so in young patients, diminishing ionising radiation.
Learning Objectives:
1. To be familiar with the anatomy of the neck.
2. To be able to choose the optimal imaging technique.
3. To become familiar with the most common abnormalities in adults and children.
4. To be able to address a short list of differential diagnoses.

11:00 – 12:00 Room Z

The Beauty of Basic Knowledge: Interpretation of the Chest Radiograph

MC 27E
The diaphragm

A-537 11:00
The diaphragm
J. Cáceres; *Barcelona/ES (josecac@gmail.com)*

The diaphragm is a frontier organ and changes in its position may be secondary to intrinsic abnormalities (paralysis, relaxation) or be due to alterations in neighbouring structures (loss of volume of the lung or upper abdominal processes). Diaphragmatic hernias may simulate an elevated hemidiaphragm; diagnosis can be accomplished with cross-sectional imaging or barium studies
Learning Objectives:
1. To review the most common causes of elevated hemidiaphragm.
2. To evaluate alterations in diaphragmatic contour.
3. To recognise false causes of diaphragmatic elevation.

12:30 – 13:30 Room Z

Molecular Imaging

MC 23E
Theranostics: combining imaging and treatment
Moderator:
H.C. Steinert; Zurich/CH

A-538 12:30
A. MR and US-guided drug delivery
C. Moonen; *Ultrecht/NL (C.Moonen@umcutrecht.nl)*

The goal of ultrasound-triggered, image-guided drug delivery is to increase the therapeutic index of drugs and decrease adverse effects of drugs. The bio-effects of ultrasound can lead to local tissue heating, cavitation and radiation force, which can be used for 1) local drug release from nanocarriers circulating in the blood, 2) increased extravasation and cellular uptake of drugs and/or carriers and 3) enhanced diffusivity of drugs. Thermo-sensitive liposomes have been suggested for local drug release in combination with local hyperthermia more than 25 years ago. Microbubbles may be designed to enhance cavitation effects. Real-time imaging methods, such as magnetic resonance, optical and ultrasound imaging have led to novel insights and methods for ultrasound-triggered drug delivery. Image guidance of ultrasound can be used for 1) target identification and characterisation; 2) spatio-temporal guidance of actions to release or activate the drugs and/or permeabilis membranes; 3) evaluation of biodistribution, PKPD; and 4) physiological read-outs to evaluate the therapeutic efficacy. Liposomes may carry both hydrophilic and hydrophobic drugs in their aqueous interior and lipid bilayer membrane, respectively. The circulation half-life may be increased by incorporating polyethylene glycol (PEG)-lipids in the bilayer. Recent publications have shown that ultrasound-triggered delivery is feasible (reviewed by 1.2). Real-time imaging methods, such as Magnetic Resonance, optical and ultrasound imaging may lead to novel insights and methods for ultrasound-triggered drug delivery.
Learning Objectives:
1. To understand the role of ultrasound in local drug extravasation, intracellular uptake and release from nanocarriers.
2. To become familiar with the role of multi-modality imaging in evaluating biodistribution, pharmacokinetics and pharmacodynamics of local drug therapy.
3. To understand the potential of MR-guided focused US in local drug delivery.

A-539 12:50
B. Imaging-guided cell-based therapy
O. Clément; *Paris/FR (olivier.clement@inserm.fr)*

Cellular therapies have been long used successfully in haematological disorders. New applications of cell transplantation in organ regeneration are envisioned. Imaging has to play a major role in this research, to monitor, optimise and eventually enhance local cellular deposition and grafting. Cell labelling methods using superparamagnetic nanoparticles have been developed, showing no adverse effect on cell proliferation and functionalities, while conferring magnetic properties to various cell types. Magnetic labelling of living cells creates opportunities for numerous biomedical applications as individual cell manipulation, magnetic control of cell migration and intracellular heating or MRI cell tracking. External magnet placed over the targeted organ can create local field gradient to induce a magnetic targeting. This presentation will review the different methods for cell labelling, high-resolution cellular MRI and cellular manipulations.
Learning Objectives:
1. To learn about potential clinical applications of cell based biotherapies.
2. To understand how imaging can be used for therapy monitoring.
3. To become familiar with methods of labelling and tracking cells using MRI.

A-540 13:10
C. Imaging-guided gene-based therapy
M. Neeman; *Rehovot/IL (michal.neeman@weizmann.ac.il)*

Imaging has always played a key role not only in pre-therapy detection and diagnosis and in post therapy monitoring of response to therapy, but also in providing critical

support to guide therapy itself. Classical examples include the use of minimally invasive surgical tools and the use of imaging for planning of surgery and radiation therapy. With the development of genetic tools for therapeutic intervention, the challenges and expectations from imaging are expanding. Imaging can be used for guidance of the delivery and cargo release for nanoparticles carrying precious genetic material for specific induction or silencing of gene expression in the target cells. Through the use of light- or heat-sensitive promoters, or using image-guided delivery of viral particles, imaging can be used to induce expression of target genes with precise spatial and temporal control. Finally, reporter genes can be used as biomarkers for monitoring accurate cellular response to therapy by monitoring cellular decisions such as cell death, cell differentiation and cell proliferation.
Learning Objectives:
1. To understand the use of imaging to guide delivery of gene therapy.
2. To get an introduction to the use of imaging-guided activation of gene expression.
3. To become familiar with the use of reporter genes for image-guided delivery of therapy.

16:00 – 17:30 **Room C**

GI Tract

RC 1901
Crohn's disease of the small bowel: which test when?

A-541 16:00
Chairman's introduction
J. Stoker[1], J. Rimola[2]; [1]*Amsterdam/NL,* [2]*Barcelona/ES (j.stoker@amc.uva.nl)*

Detection of intestinal inflammatory lesions is crucial for management of patients with Crohn's disease (CD). Awareness of the shortcomings of mere clinical evaluation for assessment of disease activity has grown. Ileocolonoscopy has been the gold standard for evaluation of lesions in the colon and terminal ileum. However, ileocolonoscopy cannot always be complete, lacks evaluation of the complete small bowel and there are several drawbacks related to the invasiveness. Over the past few years, cross-sectional imaging techniques, including ultrasonography (US), computed tomography (CT) and magnetic resonance imaging (MRI) have been increasingly used for evaluation of patients with CD, allowing objective assessment of location, extension and severity of CD-related lesions. Imaging techniques are also the accepted reference for detection of complications including strictures and penetrating lesions such as fistulas and abscesses. Objective assessment of inflammatory lesions is required for guiding therapeutic interventions and for assessing the efficacy of these interventions. The choice between imaging techniques is often determined by local availability and expertise and technical details of these examinations are also subject to considerable variation, which may affect accuracy.

A-542 16:05
A. Detection and classification
M.A. Patak; *Zurich/CH (michael.patak@usz.ch)*

The aim of this lecture is to give an overview of the techniques and typical findings for imaging Crohn's disease (CD) and its subtypes with either multidetector row 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 an optimal examination. This can be done either invasively, i.e. enteroclysis or orally, which is named enterography. For the administered intraluminal contrast, best is water with some additives, which displays as neutral in CT and biphasic in MR. IV contrast hast to be administered and dedicated imaging technique for MDCT and MR has to be applied, which will be proposed. Image data are reconstructed in axial, coronal and sagittal planes. Typical findings for CD are firstly within the bowel wall: submucosal ulcerations, thickening, layering, increased contrast uptake (on different anatomical segments) and motility alterations. Secondly, there are extraluminal findings: mesenterial fat alteration, intraabdominal free fluids, abscess and fistula. Furthermore, both imaging modalities are able to identify the type of the disease, being either the active / inflammatory, the fistulising /perforating, the fibrostenosing or the reparative / regenerative type. Both modalities have their strength and weaknesses which will be discussed.

Learning Objectives:
1. To become familiar with the pros and cons of each of the main imaging modalities in assessing a patient with (i) suspected and (ii) newly diagnosed Crohn's disease with emphasis placed on diagnostic accuracy, practicability and patient acceptability.
2. To learn the appearance of Crohn's disease on each modality, with emphasis on subtle disease.
3. To learn the different disease subtypes and their relevance to subsequent disease management.

A-543 16:28
B. Disease activity assessment
F. Maccioni; *Rome/IT (francesca.maccioni@uniroma[1].it)*

The assessment of Crohn's Disease (CD) activity is essential for the therapeutic planning and monitoring of drugs' effects. It is usually based on a variable combination of clinical indexes, laboratory parameters, endoscopic, histological, nuclear medicine and imaging findings. Clinical indexes include CDAI (Crohn's Disease Activity Index), Harvey-Bradshaw index and PCDAI for children. Biological activity (BA) is based on CRP, ESR, WBC, Orosomucoid plasmatic levels or faecal calprotectin quantification. The Endoscopic Index of Severity (CDEIS) reflects the endoscopist's judgment of lesions' severity, whilst histological indexes (as the Geboes index) estimate the architectural changes and increase of inflammatory cells in wall layers. Several US parameters are used as activity indexes, including wall thickening and layering, Color Doppler and contrast-enhanced patterns (intraparietal, submucosal, transparietal outward and inward enhancement). CT is valuable in detecting activity, though it can be used occasionally, due to radiation exposure. Finally, MRI provides the largest number of morphological and functional parameters to assess disease activity. These include wall thickening, increased wall Gd-enhancement, patterns of wall enhancement, kinetics of Gd-enhancement, increased T2-signal of the wall and mesenteric fat, increased mesenteric vascularity and increased number and enhancement of local lymph nodes. All these parameters were statistically correlated to clinical, endoscopic and histological indexes of activity. Diffusion Weighted Imaging can differentiate and quantify the motion of hydrogen linked to water molecules in intra and extracellular spaces. The feasibility of DWI in the detection and quantification of CD activity has been recently tested, with preliminary satisfactory results.
Learning Objectives:
1. To become familiar with the various clinical criteria for defining active disease (clinical indices, endoscopic and histological).
2. To learn the features on MRI, US and CT that reflect disease activity and become familiar with the evidence base for their use.
3. To appreciate the available techniques and learn an integrated paradigm applicable to clinical practice.
4. To become familiar with new techniques, notably diffusion and contrast-enhanced US, and understand their potential roles.

A-544 16:51
C. Complications and follow-up
L. Curvo-Semedo; *Coimbra/PT (curvosemedo@gmail.com)*

Crohn's disease usually has a chronic and relapsing evolution. During the course of the disease, some complications and extra-intestinal manifestations may arise. The follow-up of this disease should be aimed not only to assess the disease activity but also to detect possible complications. Among the intestinal complications, the most important include obstruction, perforation, sinus formation and an increased risk of malignancy. Rarely, haemorrhage or complications due to malabsorption may supervene. Other abdominal, extra-intestinal complications include intra-abdominal abscess, hepatic abscess, gallbladder and kidney stones, primary sclerosing cholangitis and hepatic steatosis. Among extra-abdominal complications, metabolic bone disease, arthropathy or oculo-cutaneous manifestations may be found, as well as an increased risk of deep venous thrombosis and pulmonary embolic disease. An association with other autoimmune diseases (such as psoriasis, rheumatoid arthritis or multiple sclerosis) has been also unraveled. Traditionally the imaging methods used for assessment of the complications and to follow-up patients with Crohn's disease include conventional small bowel follow-through or enteroclysis, but these examinations are unable to demonstrate extra-enteric pathology. As a result, cross-sectional methods such as CT and MRI have been gaining their place and are now increasingly used in this setting, since they manage to provide additional information in comparison with the conventional modalities. In the paediatric population, US may also play an important role in this regard. Imaging can also be of help in the treatment of some complications, such as abscesses or haemorrhage, through interventional techniques.

Learning Objectives:
1. To learn the common complications in Crohn's disease and appreciate examples of each on the common imaging modalities.
2. To appreciate the available techniques and learn an integrated paradigm applicable to clinical practice.
3. To become familiar with the evidence for imaging use in assessing treatment response.

Panel discussion:
How can imaging change patient management in Crohn's disease? 17:14

16:00 – 17:30 **Room D2**

Contrast Media

RC 1906
How I optimise contrast media administration

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

A-545 16:00
A. CT
P. Leander; *Malmoe/SE (peter.leander@med.lu.se)*

There are different reasons for optimising contrast media (CM) use in computed tomography (CT). The first and maybe most obvious is to obtain a highly diagnostic procedure and we are all familiar with terms as, e.g. arterial and portovenous phase. Different CM phases in CT is to a high extent based upon an understanding of the pharmacokinetics of iodinated CM. As small water-soluble non-protein bound molecules these CM are distributed by the blood circulation and throughout the extracellular space. With modern CT-systems there are often more CM phases employed in protocols for gaining even more information, e.g. tumour vascularity, pancreatic parenchymal enhancement and mucosal delineation. In early CT, mostly of technical reasons, protocols seldom took advantage of using lower voltage than 120 kV. As iodine is not ideal for the photon spectrum obtained from such high energy nowadays lower kV is more often included in protocols. Another important reason for optimisation of CM use is the risk of CM-induced nephropathy (CIN) and how this could be balanced but still obtaining diagnostic information. By taking all above into consideration the lecture will give an overview about the patient, CM, scanning factors and CM enhancement. The lecture will give few protocols, if any, ready to bring home, but instead understanding with "longer half-live" how CM protocols are setup on the basis of factors as CM distribution, iodine attenuation, risk of adverse events and more. By this approach one can become familiar and understand any CM protocol for CT.
Learning Objectives:
1. To understand the pharmacokinetics of iodinated contrast media.
2. To learn about patient, contrast medium and scanning factors associated with contrast enhancement and scan timing.
3. To become familiar with protocols for optimised contrast enhancement.

A-546 16:30
B. MRI
G.M. Bongartz; *Basle/CH (gbongartz@uhbs.ch)*

Contrast media for Magnetic Resonance Imaging are mainly based on Gadolinium (Gd) or other metallic compounds like Iron (Fe) or Manganese (Mn). All of these do not actively alter the magnetic signal upon intravascular application but rather enhance relaxivity of neighbouring molecules. The strength of its impact on the signal intensity is strong and thus the overall amount of contrast media given is much less compared with iodinated contrast media. Gd is by far most frequent in clinical use. Due to its toxicity it must be fixed in stable chelates. Recently, Nephrogenic Systemic Fibrosis (NSF) as an unexpected side-effect of Gd-compounds in renally impaired patients has been detected and led to certain Gd-specific restrictions or contraindications for medical use. As a key consequence, restrictive use of Gd-compounds in renally impaired patients is mandatory. Special preparations of Gd compounds enable tissue-specific application (like hepatocyte-specific contrast). Following the injection of this contrast media both, documentation of the vascular perfusion as well as of cellular activity is possible. Similarly, Fe compounds may be applied to characterise the reticulo endothelial system. Mechanisms for contrast and examples for typical application will be given.
Learning Objectives:
1. To understand the differences between iodinated contrast agents and gadolinium chelates and their impact on contrast medium administration.
2. To learn about injection and scanning protocols for optimised vascular and parenchymal enhancement.
3. To review the influence of tissue-specific contrast media on the injection and scanning protocols.

A-547 17:00
C. PET/CT
X. Montet; *Geneva/CH (xavier.montet@hcuge.ch)*

Optimisation of iodinated contrast media administration during PET-CT acquisition. When a CT scan of a combined PET/CT is performed as a full diagnostic CT, including iodinated contrast media administration, the diagnostic quality of the examinatioin is improved. Nevertheless, the possibility that contrast-enhanced CT used for attenuation correction may introduce errors in the standardised uptake value (SUV) will be discussed during this lecture. Different optimised contrast-enhanced CT protocols will then be discussed.
Learning Objectives:
1. To understand the role of contrast-enhanced CT in PET/CT.
2. To understand the influence of contrast-enhanced CT on attenuation correction of PET images.
3. To learn about the injection protocol for optimised enhancement in PET/CT.

16:00 – 17:30 **Room E1**

Musculoskeletal

RC 1910
The knee

A-548 16:00
Chairman's introduction
F.M.H.M. Vanhoenacker; *Antwerp/BE (filip.vanhoenacker@telenet.be)*

MRI of the knee joint is one of the most requested examinations in most MR departments. Most MRI exams are performed for evaluation of internal derangement of the joint due to trauma or (degenerative) cartilage lesions. Inflammatory disorders and infectious processes about the knee may cause significant morbidity and therefore early detection is of utmost importance. Soft tissue tumours (STT) and pseudotumours around the knee joint comprise a heterogeneous group of benign and malignant lesions. This integrated RC on the knee will provide an up-to-date overview of the role of imaging in the diagnosis and planning of treatment strategy of knee trauma, inflammation and soft tissue lesions. Current controversies and remaining clinical questions include the role of high field MR imaging, imaging evaluation of clinical instability patterns, evaluation of disease activity of inflammatory disorders and response to Disease Modifying Anti Rheumatic Drugs treatment and the role of functional imaging in the evaluation of STT.

A-549 16:05
A. Patterns of injury
P. Van Dyck; *Antwerp/BE (pieter.van.dyck@uza.be)*

Traditional classification systems for knee joint instability include straight, rotational and combined types of knee instability. The basic consideration in this classification is the status of the posterior cruciate ligament after injury. Correct diagnosis of knee instability is not a simple matter. Much controversy remains as to which ligaments are being tested during the standard clinical knee laxity tests. This sometimes leaves the clinician, even the most experienced ones, confused as to what the laxity tests really show. Also, the arthroscope cannot fully assess the unstable knee. Thus, the addition of the information provided by magnetic resonance (MR) imaging can be extremely helpful in order to establish prognosis and plan for definitive treatment. Therefore, a thorough knowledge and recognition of the different knee ligament instability patterns by radiologists is essential to accurately report the findings on MR and to heighten awareness for specific injuries to improve their detection.
Learning Objectives:
1. To learn the imaging appearances of soft tissue injury.
2. To learn the imaging appearances of osteoarticular injury.
3. To be familiar with the patterns of bone and soft tissue injury in the knee.

A-550 16:28

B. Inflammatory disease

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

Inflammatory disorders of the knee are mainly related to infectious or rheumatic diseases, but other disorders can be associated with a similar clinical, biological or radiological presentation, including degenerative and crystal-induced diseases, and tumours. The bone, the joint and / or the soft tissue can be affected. The aims of this lecture are to present the main radiological features of the different inflammatory disorders encountered at the knee, the usefulness of each imaging modality and the more frequent misdiagnoses when such a condition is suspected.

Learning Objectives:

1. To learn the imaging appearances of soft tissue inflammation.
2. To learn the imaging appearances of osteoarticular inflammatory change.
3. To be familiar with imaging findings of specific inflammatory conditions.

A-551 16:51

C. Soft tissue tumours/tumour-like lesions

J.C. Vilanova; *Girona/ES (kvilanova@comg.cat)*

Because MRI of the knee is the most frequent examination, so does the frequency of encountering incidental soft tissue tumour/tumour-like lesions in and about the knee. Although sometimes imaging techniques are requested due to symptoms related to a soft tissue lesion around the knee, it is important for the radiologist to be aware of the imaging appearance to avoid misdiagnosis and inappropriate treatment. Soft-tissue tumours/tumour-like lesions about the knee include a wide variety of entities, ranging from cysts or anatomical variants to aggressive high-grade sarcomas. Special vigilance in evaluation is warranted when a soft-tissue mass is not in the typical position or does not have other characteristic features of a cyst, when the size of the mass or the accompanying symptoms seem out of proportion to the injury or underlying degenerative process, and when symptoms persist beyond what is expected. It is essential to be familiar with the imaging characteristic appearance of these lesions to allow a confident diagnosis as most of these lesions are benign. A complete review of the spectrum of soft tissue lesions will be performed: sarcomas, lipoma, haematoma, haemangioma, chondroma, synovitis, bursae-cysts like lesions intra and para-articular, haematoma, ossifications, aneurysms, adventitial disease or anatomical variants such as accessory gastrocnemius muscle. Not only the most common lesions will be discussed but also less common but important lesions with characteristic US and/or MRI appearance.

Learning Objectives:

1. To learn the spectrum of intra and para-articular soft tissue tumours.
2. To learn the spectrum of intra and para-articular soft tissue tumour-like lesions.
3. To be familiar with US and MRI findings of specific soft tissue lesions.

Panel discussion:
What are the remaining clinical questions that imaging currently cannot answer and how will we answer them in the future? 17:14

16:00 – 17:30 **Room F2**

Special Focus Session

SF 19
Spinal intervention

A-552 16:00

Chairman's introduction

T. Sabharwal; *London/UK (Tarun.Sabharwal@gstt.sthames.nhs.uk)*

In this session several important areas within musculosketal radiological interventions will be discussed: herniated disk, vertebroplasty, spinal neoplasms and facet joint pathologies. Clinical symptoms, presentations, imaging and treatment options will be reviewed.

Session Objectives:

1. To review clinical symptoms and radiological investigations of back pain.
2. To learn various techniques for spinal pathology treatment.
3. To be aware of recent and potential future advances in this field.

A-553 16:03

Herniated disk?

X. Buy, A. Gangi; *Strasbourg/FR (xavier.buy@chru-strasbourg.fr)*

Pain related to disc herniation is not only due to physical compression but also to biochemical factors. Pain management in disc herniation relies mainly on conservative care combining rest, physiotherapy and oral analgesics. If conservative treatment fails, selective image-guided periradicular steroid injection is first considered, aiming to reduce the inflammatory reaction irritating the nerve root. Image-guidance is based on CT, fluoroscopy and MRI. Precise needle positioning is systematically confirmed by periradicular contrast injection to obtain the best clinical results and to avoid complications. When steroid injections fail, disc decompression is considered. Conventional open surgery produces suboptimal results and is associated with a high risk of epidural fibrosis. In opposition, percutaneous nucleotomy techniques offer a minimally invasive alternative. Their principle is to remove a small amount of the central nucleus to achieve a drop of pressure inside the herniation, considering that the disc is a closed hydraulic space. Thus, percutaneous disc decompression is only indicated for contained disc herniations. Many nucleoplasty techniques are available. However, thermal nucleotomy devices including Laser nucleotomy and Radiofrequency Nucleoplasty seem to offer better clinical results as they combine mechanical decompression and thermal destruction of intradiscal pro-inflammatory proteins. Compared with other percutaneous disc treatment devices, thermal techniques show a higher level of evidence with longer experience; moreover, there is no contra-indication in case of annular perforation and no implant is left inside the disc. Percutaneous nucleotomy techniques are associated with a very low rate of complications. However, a successful treatment is based on a strict patient selection.

Learning Objectives:

1. To understand the clinical and radiological investigations.
2. To learn the radiological management for herniated disk.
3. To learn how to avoid potential complications.

A-554 16:21

Vertebroplasty

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

It is a fact that 80% of the European population will experience at some point in their life an incidence of back pain. Part of the back pain incidence is attributed to vertebral fractures. As minimal interventional procedures are gaining momentum in musculoskeletal interventional pain procedures, clinical evaluation of patients with back pain becomes a necessity, prior to treatment. The interventional radiologist involved in pain management, specifically with vertebral augmentation, should not only be able to interpret imaging findings, but to correlate those to clinical findings and establish a comprehensive patient treatment. In this course we will try to analyse the imaging characteristics relative to vertebral fractures and integrate them to the treatment plan in order to achieve a successful outcome. Part of the course will be to develop algorithms that will include the whole armamentarium of vertebral augmentation and its relation to other techniques, thus establishing faster pain control, stabilisation and possible healing of painful osteoporotic lesions. Discussion will include the present controversial situation on spine augmentation and current literature will be analysed. The aim of this presentation will be to help the interventional radiologist to comprehend and be able to develop a "one stop" treatment that will include diagnostic procedures, clinical correlation and a final comprehensive therapeutic treatment for vertebral lesions.

Learning Objectives:

1. To understand the indications for vertebroplasty.
2. To learn the technique for vertebroplasty.
3. To understand the recent advances.

A-555 16:39

Treatment of neoplasm

A. Gangi, X. Buy, G. Tsoumakidou, J. Garnon; *Strasbourg/FR (gangi@rad[6].u-strasbg.fr)*

Different image-guided percutaneous techniques can be used for curative treatment or pain palliation in patients with primary or secondary spinal tumours. Curative ablation can be applied for the treatment of specific benign or in selected cases of malignant localised spinal tumours. Pain palliation therapy of primary and secondary bone tumours can be achieved with safe, fast, effective and tolerable percutaneous methods. Ablation (chemical, thermal, mechanical), cavitation (radiofrequency ionization) and consolidation (cementoplasty) techniques can be used separately or in combination. Each technique has its indications, with advantages and drawbacks. A multidisciplinary decision is required to choose the more efficient and less disabling technique.

Learning Objectives:
1. To learn the imaging criteria and advances for planning cases.
2. To learn different treatment options in tackling bone neoplasms.
3. To understand complications and limitations.

A-556 16:57
Facet pathology
N. Karunanithy; *London/UK (nara[121]@doctors.org.uk)*

Clinical and imaging evaluation of facet joint syndrome. To describe the relevant anatomy and techniques of facet joint injection. To describe the relevant anatomy and techniques of medial branch of dorsal ramus injection and denervation (rhizotomy). Critical evaluation of the available evidence for these techniques. Discussion: Facet joint syndrome is a common cause of back pain. Although the typical clinical presentation is with low back pain that may radiate to the buttocks, considerable variation is symptoms can occur. Also there is often a mismatch between clinical and imaging findings. Plain film radiography and MRI form the mainstay in the imaging evaluation. However, there has been recent interest in the role of SPECT-CT. Facet joint injections can safely be performed under fluoroscopy or CT guidance. The choice of agent used for the injection is variable and includes local anaesthetic alone (diagnostic), steroid and local anaesthetic or sodium hyaluronate. Medial branch nerve denervation has been proposed as an alternative to joint injections for the management of facet syndrome to achieve longer term symptom relief. Techniques for denervation include radiofrequency ablation, cryoablation and chemical ablation. Conclusion: Image-guided interventional techniques have a number of applications in the treatment of facet joint syndrome. Appropriate patient selection and understanding of the benefits and limitations of the various techniques can optimise outcome for our patients.
Learning Objectives:
1. To learn about the clinical symptoms of back pain.
2. To become familiar with the anatomy and related technique.
3. To be informed about potential advances in this field.

Panel discussion:
What are the new advances in the above fields that may change current practice? 17:15

16:00 – 17:30 **Room G/H**

Neuro

RC 1911
How I report
Moderator:
M. Mechl; Brno/CZ

A-557 16:00
A. MRI in microvascular and inflammatory diseases
P. Vilela; *Almada/PT (ferrovilela@sapo.pt)*

Small-vessel cerebrovascular disease is the most frequent disorder of the adult brain, systemic hypertension being its commonest cause. The small-vessel cerebrovascular disease manifestations comprise ischaemic and haemorrhagic lesions. The former include focal lesions, as the lacunes, and diffuse lesions like the subcortical white matter changes (also known as leukoaraiosis). The haemorrhagic lesions may manifest as lobar haematomas and/or as microhaemorrhages. The imaging patterns of small-vessel cerebrovascular disease are described. One of the major differential diagnoses of small-vessel cerebrovascular disease is the white matter changes associated with normal ageing. Although the task of defining the normal and abnormal white matter changes in the elderly population is difficult, the normal MRI brain findings found in this age group are discussed. The different rating scales for age-related and small-vessel white matter changes are also reviewed. The other main differential diagnoses include white matter lesions associated with dementia and other neurodegenerative disorders, with inflammatory disorders (vasculites), with vasculopathies, with adult-onset leukodystrophies and with demyelinating disorders. Vasculitis is a heterogeneous group of inflammatory disorders that cause a vessel wall inflammation. The vasculitis can be primary, like the Primary Angiitis of the Central Nervous System, or secondary to several causes, as systemic, malignancy and infectious disorders and drug-induced. The most common vasculitis MR imaging patterns are reviewed. Finally, an algorithm of magnetic resonance imaging pattern recognition in distinguishing different microvascular and inflammatory diseases is presented.

Learning Objectives:
1. To be aware of the epidemiology and clinical manifestations of the most common microvascular, vasculitis and inflammatory diseases in the immune competent adult patient.
2. To learn about imaging patterns of microvascular diseases.
3. To learn about imaging patterns of vasculitis, autoimmune and inflammatory diseases.

A-558 16:30
B. MRI in common neurodegenerative diseases
F. Barkhof; *Amsterdam/NL (f.barkhof@vumc.nl)*

Indications and imaging modality: Many neurodegenerative disorders exist, the most common being Alzheimer's disease (AD) and Parkinson's disease. Abnormal protein accumulation can sometimes be shown using PET or SPECT, but MRI (or CT) is used first to exclude structural lesions or other (vascular) pathology. Routine MRI protocol for neurodegeneration and dementia should include 3D T1-weighted images with coronal reformats, and axial T2, FLAIR and T2*-gradient-echo. Structured description of findings: Reporting should include a) possible focal/mass lesions, b) vascular pathology, c) global and regional atrophy and d) additional features like calcification or microbleeds. Vascular lesions include territorial/strategic infracts (e.g. thalamic lesions), lacunes and small vessel white matter changes; such WMC can be graded using, e.g. Fazekas scale, and involvement of basal ganglia should be discussed especially in Parkinson's disease. WMC can occur in specific locations in CADASIL (temporal pole) and FXTAS (cerebellar peduncle). Simple rating scales exist for global and regional (mediotemporal and posterior cortical) atrophy; age-dependent cut-off values need to be taken into consideration. Infratentorial atrophy should be evaluated separately for mesencephalon, pons and cerebellum, especially for movement disorders. Interpretation and Conclusion: The report should summarise relevant findings supporting or refuting the suspected diagnosis taking normal ageing phenomena into consideration. Co-morbidity (e.g. vascular loading in Alzheimer) should be mentioned. Suggestion for additional imaging should be made if the exam is negative, e.g. amyloid PET in the work-up of Alzheimer of dopamine SPECT in suspected Parkinson or Lewy-body dementia.
Learning Objectives:
1. To be aware of the epidemiology and clinical manifestations of the most common adult neurodegenerative diseases.
2. To learn about imaging patterns of dementias.
3. To learn about imaging patterns of movement disorders.
4. To be aware of some specific imaging features of rare neurodegenerative disorders.

A-559 17:00
C. Neuroimaging in the acutely ill/ICU patient
M. Gallucci, M. Anselmi; *L'Aquila/IT (massimo.gallucci@cc.univaq.it)*

Importance of bedside, clinical neurological examination on hospitalized patients is universally recognized. Nevertheless, in ICU Patients, is often challanging or even impossible to rule out a clinically based diagnosis or follow the clinical status due to the presence of paralysis, the frequent compromission of consciousness, or deep sedation. Therefore, diagnostic neuroradiology plays a major role. Most of the acutely ill ICU pts present vascular complications, edema or intracranial hypertension/hydrocephalus. All these pathologies can be accurately evaluated by means of CT scan. On the other hand, metabolic complications need to be evaluated by MRI, being CT not sufficient in almost all cases. In a recent review, it was estimated that 16.6 % of ICU patients needed at least one brain neuroradiological exam, and that in 21% of cases new lesions were detected. As a consequence of the matter, diagnosis changed in 42% of cases and treatment in 23. However, transporting the critically ill patients out of the ICU constitues a potential risk, mostly for haemodinamically unstable subjects. Therefore, it is common practice that neuroimaging is reserved to selected cases, while potentially more could benefit of such tests. Recently, mobile CT scans had been introduced, optimized for performing good quality non contrast and contrast enhanced CT, CT angiography and CT perfusion exams at the patient's bed, thus letting to overcome transport related risks. More advanced neuroimaging studies, like MRI, MRS or catheter angiography, can be reserved as a second level exam for selected pathologies, including the diagnosis of brain death.
Learning Objectives:
1. To learn about the most common neuroimaging findings in the acutely ill/ICU patient.

2. To comprehend 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 knowledge of the best neuroimaging protocols for the acutely ill/ICU patient and establish the imaging protocol accordingly to the clinical setting.

16:00 – 17:30 **Room I/K**

Chest

RC 1904

Phenotypes in obstructive airway disease: how do I image, analyse and report?

Moderator:
P.A. Grenier; Paris/FR

A-560 16:00

A. Asthma and associated conditions
P.-Y. Brillet; *Bobigny/FR*

Asthma is a chronic inflammatory disorder of the airways responsible for recurrent episodes or airflow limitation. It is associated with airway hyperresponsiveness and remodelling. The role of CT is limited to patients with severe disease or for differential diagnosis. CT is important for the diagnosis of associated conditions (mainly, allergic bronchopulmonary aspergillosis and Churg Strauss syndrome). Special attention should be paid to acquisition protocols in young patients. Usual findings include bronchial (thickening of bronchial wall, decrease of lumen and distal bronchiectasis) and bronchiolar (mucoid impactions, air trapping) abnormalities. The role of imaging for characterisation of phenotypes will be discussed.
Learning Objectives:
1. To learn more about the imaging findings in asthma and associated conditions, especially at low-dose and expiratory CT.
2. To be informed about the potential to grade the severity of the disease from CT.
3. To learn how to report findings indicative of asthma and associated conditions.

A-561 16:30

B. Chronic obstructive pulmonary disease (COPD)
N. Sverzellati; *Parma/IT*

Chronic obstructive pulmonary disease (COPD) is one of the leading causes of morbidity and mortality worldwide. It is a heterogeneous disease affecting the airways, the parenchyma as well as the vasculature with different severities during the course of the disease. Computed tomography (CT) with the aid of dynamic expiratory scanning has become the standard modality to objectively visualise and quantitate emphysema, airway wall thickening and air trapping. In addition, recent evidences suggest that CT can provide useful measures of the presence and severity of pulmonary vascular disease for clinical correlation. An appropriate CT examination based on the use of the minimum possible radiation dose allows a phenotypical definition of COPD patients. Thus, differentiating between an emphysema-predominant and an airway-predominant phenotype via CT may clearly impact follow-up strategy and therapeutic decision making in clinical practice.
Learning Objectives:
1. To learn more about the imaging findings in COPD, including low dose and expiratory CT.
2. To become familiar with the concept of CT phenotyping: airway obstruction vs. alveolar destruction.
3. To be informed about the radiological findings of remodelling of airways and pulmonary vasculature.

A-562 17:00

C. Cystic fibrosis and other bronchiectatic diseases
M.U. Puderbach; *Heidelberg/DE (m.puderbach@dkfz.de)*

Several different diseases go along with the development of bronchiectasis. Bronchiectasis may result from chronic infection, proximal airway obstruction, or congenital bronchial abnormality. In cystic fibrosis bronchiectasis is one of the key features of lung involvement. Bronchiectasis can present with a variety of nonspecific clinical symptoms, including haemoptysis, cough and hypoxia. Bronchiectasis is defined as localised or diffuse irreversible dilatation of the cartilage-containing airways or bronchi. The imaging gold standard for bronchiectasis is thin-section CT. Morphologic criteria on thin-section CT scans include bronchial dilatation with respect to the accompanying pulmonary artery (signet ring sign), lack of tapering of bronchi and identification of bronchi within 1 cm of the pleural surface. Bronchiectasis may be classified as cylindric, varicose or cystic, depending on the appearance of the affected bronchi. It is often accompanied by bronchial wall thickening, mucoid impaction, and small-airways abnormalities. Besides CT nowadays MRI of the lung is able to image the relevant morphological features of bronchiectasis. Additionally functional changes due to bronchiectasis can be studied.
Learning Objectives:
1. To learn more about the imaging findings in bronchiectasis, especially at MRI.
2. To be informed about the role of imaging in primary diagnosis, surveillance and therapy monitoring.
3. To become familiar with the role of imaging in surgical planning.

16:00 – 17:30 **Room N/O**

Head and Neck

RC 1908

Differentiating skull base lesions

Moderator:
C.R. Habermann; Hamburg/DE

A-563 16:00

A. Olfactory apparatus lesions
T.P.J. Duprez; *Brussels/BE (thierry.duprez@uclouvain.be)*

Medical imaging has nowadays integrated the diagnostic armamentarium of anosmic patients regarding not only qualitative assessment of the olfactory tract but also quantitative evaluation of olfactory bulb volumes which are known to closely correlate to the olfactory function. Many clinical studies in various pathological conditions have evidenced the value of such measurements in the work-up of olfactory dysfunction for both aetiological and prognostic purposes. Imaging work-up also plays a role in the medico-legal evaluation of post-traumatic anosmia together with electrophysiological and clinical olfactory testings. Technical improvements in fibre tracking (FT) using diffusion-tensor imaging (DTI) and appropriate designs of olfactory stimulation at BOLD-based functional MRI (fMRI) are expected to allow insights into the neurophysiological processes and circuitry of olfaction in a very near future. Imaging work-up of the anosmic patients will be the corner stone of this lecture. The relevance of the different imaging techniques will be detailed. Optimisation of MR sequences parameters will be discussed. Beyond the work-up of anosmia, a comprehensive overview of the most common lesions of the olfactory tract seen in clinical practice will be given.
Learning Objectives:
1. To learn how to image the olfactory apparatus.
2. To become familiar with olfactory anomalies.
3. To learn differentiating lesions in anosmic patients.

A-564 16:30

B. Cavernous sinus and pterygopalatine fossa lesions
A. Borges; *Lisbon/PT (borgalexandra@gmail.com)*

The central skull base (CSB) makes up the floor of the middle cranial fossa and is mainly composed by the sphenoid and temporal bone anterior to the petrous ridge. Two important structures constitute potential crossroads for disease spread between the intra- and extracranial compartments: the cavernous sinuses, located intracranially, lateral to the body of the sphenoid bone and the pterygopalatine fossa, in the extracranial head and neck, squeezed between the posterior wall of the maxillary sinus and the pterygoid plates. The cavernous sinuses are paired venous dural-lined structures traversed by the cavernous carotid artery and cranial nerves III, IV, V1, V2 and VI, bordered posteriorly by Meckel's cave and anteriorly by the orbital fissures. The pterygopalatine fossa resembles an inverted pyramid tapering superiorly into the inferior orbital fissure and opening inferiorly into the oral cavity through the palatine canals. It laterally communicates with the infratemporal fossa, medially with the nasal cavity and posteriorly with foramen rotundum and the vidian canal. Meningiomas, neural tumours and cavernous carotid aneurysms are the most common pathologic processes originating primarily from the cavern-

ous sinuses. The pterygopalatine fossa is mainly afflicted by disease spread from neighbouring structures namely infectious and malignant processes via perineural spread. Primary lesions are much less common, the most important of which is juvenile nasopharyngeal carcinoma. CT and MRI depict the bony and soft tissue anatomy of these structures and according to location, pattern of spread and imaging features can differentiate the most common lesions in this area.
Learning Objectives:
1. To learn the anatomy of the middle cranial fossa.
2. To become familiar with different types of middle cranial fossa lesions.
3. To learn how to differentiate such lesions.

A-565 17:00
C. Jugular fossa lesions: how to differentiate?
H. Tanghe; *Rotterdam/NL (tanghe@planet.nl)*

The jugular foramen is an opening in the skull base between the temporal and occipital bone. Asymmetry between left and right is the rule because of the asymmetry of the intracranial venous drainage. Despite several studies the exact anatomy is uncertain. Several anatomical structures go through the foramen: arteries, veins and cranial nerves. The radiological evaluation of the foramen requires high-quality thin-section imaging with both CT and MR. Angiography is seldom used for diagnostic purposes without preoperative embolisation. It is important to recognise the "pseudo lesions" of the foramen, like the normal asymmetry and the flow artefacts. The most common tumour of the jugular foramen is the paraganglioma. This benign tumour is locally aggressive, hyper vascular and causes significant erosion and enlargement of the jugular foramen. The extension follows fixed pattern. When one of these hallmarks is not present, consider another diagnosis. The schwannoma of the lower cranial nerve causes a smooth enlargement of the foramen, with intact cortical outline. Frequently the largest part of the tumour is located in the cerebellopontine angle. Cystic components are frequent. The jugular foramen meningioma also causes a smooth enlargement of the foramen. Its extension pattern is different from a schwannoma. It is the most common tumour that can give calcifications in the foramen. Sometimes the imaging characteristics are atypical and do not match any of these three most common tumours. Consider then a diagnostic angiography and a biopsy. In children, a common lesion of the foramen is histiocytosis.
Learning Objectives:
1. To learn the anatomy of the jugular fossa using CT, MRI and angiography.
2. To learn what lesions can be seen in this fossa.
3. To learn how to differentiate these lesions on a topographic basis.

16:00 – 17:30 **Room P**

Vascular

RC 1915
Non-traumatic acute aortic dissection

A-566 16:00
Chairman's introduction
A.-M. Belli; *London/UK (Anna.Belli@stgeorges.nhs.uk)*

Aortic aortic dissection is a life-threatening condition with a high mortality rate. The epidemiology, aetiology, risk factors, clinical signs, classification and complications of aortic dissection will be discussed. As acute aortic dissection is increasingly managed by endovascular means, it is important for all radiologists to understand the relative merits of various imaging modalities in making the diagnosis, the anatomical requirements for assessing suitability for endovascular repair as well as understanding the indications for endovascular intervention. The session will be followed by a panel discussion of imaging strategies which give the best information for endograft planning.

A-567 16:05
A. Etiology, clinical signs and prognosis of acute non-traumatic aortic dissection
V. Bérczi; *Budapest/HU (Berczi@hotmail.com)*

Aortic dissection, a highly lethal disease, is defined as longitudinal cleavage of the aortic media by a dissecting column of blood. The mortality rate of untreated aortic dissection is 1-2% per hour for the first 24-48 hours, or 75% within the first 2 weeks and 90% at 1 year. Predisposing factors include hypertension, inherited arteriopathies characterised by cystic medial necrosis, pre-existing aortic aneurysm, a bicuspid aortic valve, aortic coarctation, different vasculitides and the use of cocaine (due to its effect on aortic connective tissue and also by producing severe hypertension). Hereditary diseases include Marfan`s syndrome (dedifferentiation of vascular smooth muscle cells, enhanced elastolysis of aortic wall components, defective fibrillin in the extracellular matrix), Ehlers-Danlos syndrome (hereditable connective tissue disorders leading to tissue fragility), annuloaortic ectasia and familial aortic dissection (elastolysis, deposits of mucopolysaccharid-like materials, cyctic medial degeneration). Acquired conditions, such as hypertension, inflammation, autoimmune processes, alter arterial wall composition in numerous ways, causing smooth muscle cell necrosis and fibrosis of elastic structures, leading to stiffness and vulnerability to pulsatile forces, thereby creating a substrate for aneurysms and dissections. Clinical signs include severe chest pain, severe back pain, diastolic murmur, multiple pulse deficits, hypotension/shock; abdominal pain, syncope and stroke may also occur as less common clinical signs. Beside discussion of the predisposing factors, clinical signs and prognosis of acute aortic dissection, a brief description of variant anatomy (aortic spindle, ductus diverticulum) and structures causing diagnostic dilemma (pericardial recess, left inferior pulmonary vein, left superior intercostal vein, right atrial appendage) will be given.
Learning Objectives:
1. To learn about epidemiology and etiology of acute non-traumatic aortic dissections.
2. To learn the clinical signs, pathologic changes, consequences, and natural history of aortic dissection.
3. To learn the classification systems for aortic dissections.

A-568 16:28
B. Acute aortic dissections: imaging and image-based classification
J. Lammer; *Vienna/AT (johannes.lammer@akhwien.at)*

The most commonly used classification is the Stanford classification. In type A dissections the ascending aorta is involved, and in type B dissection the ascending aorta is not involved. The De Bakey classification subdivides the dissection in a type I dissection which involves the entire aorta, a type II dissection which involves the ascending aorta and a type III dissection of the descending aorta only. In 2001, Erbel et al. published (European Heart Journal; 22: 1642-1681) a new classification: class 1: classical aortic dissection with an intimal flap between true and false lumen; class 2: intramural haematoma; class 3: discrete dissection without haematoma, eccentric bulge at tear site; class 4: penetrating aortic ulcer; class 5: iatrogenic and traumatic dissection. Clinical symptoms: the typical patient with aortic dissection is male in his 60s with a history of hypertension who suffers with abrupt onset of a sharp, ripping chest pain. Malperfusion of organs: compression of the true lumen may cause malperfusion of the coronary and cerebral arteries, the spinal cord, all abdominal organs and the limbs. This malperfusion may change the symptoms. Imaging: contrast-enhanced CT is the imaging modality of choice. The report has to describe the classification, the entry site, the grade of true lumen compression, organ malperfusion, pericardial and pleura effusions and false lumen ectasia. However, aortic valve insufficiency which can be a complication of type A dissections is demonstrated by echocardiography, transesophageal ultrasound or MRI.
Learning Objectives:
1. To learn how to diagnose aortic dissection.
2. To understand the pros and cons of different imaging modalities.
3. To learn how to classify aortic dissections by use of CTA and MRA.
4. To learn the indications for treatment.

A-569 16:51
C. Acute aortic dissections: imaging of complications
M.H.K. Hoffmann; *Ulm/DE (martin.hk.hoffmann@googlemail.com)*

Complications occurring after acute aortic dissections should be separated into those related to the disease per se and those related to post-treatment conditions. Life-threatening complications related to the disease should be familiar as immediate consequences for treatment may ensue. Most of these are either located in the aortic root or related to mal-perfusion syndromes. The aortic root with very thin walled structures of the sinus of valsalva is located within the pericardial sac. The structure is prone to rupture and may produce life-threatening pericardial tamponade or present clinically as sudden onset of severe aortic regurgitation. All imaging modalities suitable for diagnostic workup in such conditions have to be rapidly accessible and performable. This precludes lengthy MR imaging procedures and renders ultrasound and CT as the mostly used modalities. The condition that has to be recognised as the most important inductor of malperfusion syndromes in the descending aorta is progression of dissection into aortic branches and the true lumen collapse. Both conditions are easily discernible with CT imaging. Complications related to treatment should be sub-classified into those after pure surgical treatment and those related to endograft repair. The acute surgical com-

plication with most deleterious effects is related to spinal cord ischaemia. The condition also applies to endograft repair. It is therefore beneficial for the radiologist involved either in pre-surgical imaging or interventional treatment to acquire thorough knowledge of the spinal cord blood supply. Endograft complications of interest encompass endoleak formations, stent migrations and endoluminal stent collapse.
Learning Objectives:
1. To learn the most common complications of aortic dissection.
2. To learn the most appropriate imaging strategy for diagnosis of complications.
3. To understand the clinical significance and treatments of the most common complications.

Panel discussion:
Which imaging modality is best for planning of endovascular management? 17:14

16:00 – 17:30 **Room Q**

Paediatric

RC 1912

Chest imaging: what to use and when to use it

Moderator:
W. Hirsch; Leipzig/DE

A-570 16:00

A. Thoracic trauma and foreign body inhalation
M.L. Lobo; *Lisbon/PT (mluisalobo@gmail.com)*

Thoracic trauma in children is most commonly seen in a polytrauma context and is associated with significant morbidity and mortality. Blunt trauma accounts for the majority of cases, often resultant from motor vehicle accident and pedestrian crash. Common thoracic injuries include pulmonary contusion, rib fractures, pneumothorax and haemothorax. Diaphragmatic and mediastinal injuries, such as aortic rupture and tracheobrocheal tear, are rare but potentially life threatening. Different patterns of injury are seen in children due to anatomical and physiological differences, and these should be recognised. Chest radiography is the first and most important imaging modality. MDCT allows accurate diagnosis for most traumatic injuries and is usually performed for severe chest and/or polytrauma. Adapted paediatric protocols are essential. Foreign body inhalation is a common paediatric domestic accident, with potential serious or even fatal consequences. Clinical history is the key for the diagnosis. With a definite history, bronchoscopy is the modality of choice for both diagnosis and treatment. However, in many cases the aspiration event is not witnessed and the diagnosis is often delayed or overlooked. The majority of aspirated foreign bodies are non-opaque and imaging findings largely result from complete or incomplete airway obstruction. Chest radiography is the first imaging modality. Expiratory films (or lateral decubitus or fluoroscopy) are very useful to demonstrate air-trapping. Chest MDCT offer excellent details of the tracheobronchial tree and pulmonary parenchyma and is usually reserved for more complex cases and/or long-standing foreign bodies.
Learning Objectives:
1. To become familiar with lesions observed in thoracic trauma.
2. To learn about strategies for imaging.
3. To become familiar with the classical and atypical signs of foreign body inhalation.

A-571 16:30

B. Infiltrative diseases of the chest
G. Staatz; *Mainz/DE (staatz@radiologie.klinik.uni-mainz.de)*

High-resolution CT of the chest is the imaging technique of choice for the evaluation of most infiltrative diseases of the chest. In children dose-adapted protocols should be used and recommendations for suitable protocols will be given in the course. The typical HRCT features of interstitial lung disease are ground-glass opacity, consolidation, pulmonary nodules, tree-in but sign, bronchiolar wall thickening, mucoid impaction, air trapping, septal thickening, mosaic perfusion and honey combing. Most frequent diseases in children to be dealt with are bronchiectasis, cystic fibrosis, asthma, constrictive bronchiolitis, bronchiolitis obliterans and extrinsic allergic alveolitis and they will be demonstrated with use of a systematic approach.
Learning Objectives:
1. To understand the role of chest CT.
2. To learn about the typical CT findings of interstitial lung disease.
3. To become familiar with the most frequent diseases and learn about a systematic approach.

A-572 17:00

C. Imaging of neonatal chest emergencies
A. Paterson; *Belfast/UK (anniep@csi.com)*

In this talk, the differences between term and premature infants presenting with acute respiratory distress will be reviewed. The imaging diagnosis and follow-up of both “medical” and “surgical” chest diseases will be presented. There is a wide spectrum of conditions to be covered, and these include surfactant deficiency disease (and complications of its treatment), retained fetal lung fluid, meconium aspiration syndrome, neonatal pneumonia, chylothorax and persistent pulmonary hypertension. Structural lung abnormalities that may require urgent surgical intervention include congenital lobar overinflation, congenital pulmonary airway malformation, congenital diaphragmatic hernia and oesophageal atresia ± tracheo-oesophageal fistula. For all of these conditions, the chest radiograph remains the most commonly used and important imaging modality. Due to time constraints, congenital upper airway malformations and neonates with congenital heart disease will not be discussed.
Learning Objectives:
1. To learn about the etiologies of respiratory distress syndrome.
2. To become familiar with imaging findings.
3. To learn about the differential diagnoses.