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exploit spectral information regarding attenuation ability of tissues for diagnostic purposes. Despite conceived during '70s soon after the first clinical CT, the clinical endorsement and widespread application of DECT was initiated with the advent of dual-source CT systems in 2006. Providing the potential to improve CT image quality through artifact suppression and extracting valuable information regarding tissue composition and function, DECT is the new exciting field for the radiology community and the main driving force for CT technology evolution over the last decade. Currently, all CT vendors put considerable efforts in developing CT systems capable of performing DECT studies, while novel clinical applications of DECT are continuously introduced. However, comprehension of the basic physics of DECT and familiarisation with the advanced technological features of modern DECT scanners is prerequisite to fully exploit the advantages of DECT imaging.

Learning Objectives:
1. To learn about the underlying physics and today's technology.
2. To see potential advantages compared to single-energy CT.
3. To appreciate the rationale behind clinical applications.

A-035 08:58

B. Photon counting detectors in diagnostic CT

A. Altman; *Haifa/IL (ami.altman@philips.com)*

Recent years' advances in room-temperature semi-conductors, especially CZT and CdTe, have enabled the transformation from energy-integrated (EI) detectors to photon-counting (PC) detectors in diagnostic CT, enhancing significantly its clinical benefits. The higher signal per x-ray photon (X10) and the short rise time of ~10 nanoseconds enable spectral analysis of each counted photon, use of adjustable multi-energy bins, K-edge imaging, and increased CNR through different energy weightings, while reducing the dose significantly. The continuous sensitivity of a pixelated sensor and the elimination of electronic noise through a threshold above it enable using much smaller detection pixels than in a conventional EI CT and contribute to further lowering of the dose. Consequently, spatial resolution is improved compared to EI CT (> 20 lp/cm). Reduction of the detection pixel size is essential also for lowering photon rates per pixel to avoid pile-up effects. However, charge sharing and Kα escapes of Te and Cd cause severe distortions to the recorded x-ray spectrum. A forward model of the detector response is used to address it and restore spectral capability, using a projection domain material decomposition. It will be shown that this can be accomplished as long as the peak-to-tail ratio is not too large, namely, detection pixel of about 0.5 mm. HW and SW methods of pile-up corrections will be shown too. Phantom and pre-clinical verifications on the PHILIPS Spectral Photon-Counting CT (SPCCT) in Lyon demonstrate the capability of such a system achieving spectral results superior to dual-energy CT, and the advantage of dual-contrast injection in a single scan.

Learning Objectives:
1. To learn about the underlying physics and technological solutions.
2. To understand the potential advantages compared to dual-energy CT.
3. To appreciate how mature today's photon counting technology is.

Author Disclosure:
A. Altman: Employee; PHILIPS Healthcare.

A-036 09:21

C. Clinical need of multi-energy CT

S.T. Schindera; *Aarau/CH (sschindera@aol.com)*

During the last decade, dual-energy CT has gained increasing attention in clinical routine due to improved diagnostic performance from the quantitative analysis of different tissue composition. Various clinical indications for a dual-energy CT scan will be reviewed with a focus on the added value. Potential future opportunities of dual-energy CT, which still are viewed as research tools, will be also discussed.

Learning Objectives:
1. To learn about medical applications and potential benefits.
2. To understand which single-energy applications could be replaced by dual-energy applications, and why.
3. To learn which additional multi-energy CT applications could be developed.

09:44

Panel discussion: Are there sufficient benefits of this technique?

08:30 - 10:00 Room K

Radiographers

RC 114

Forensic imaging

A-037 08:30

Chairpersons' introduction (part 1)

J. McNulty; *Dublin/IE (jonathan.mcnulty@ucd.ie)*

Radiographers play an essential role in the provision of high quality forensic imaging services. This is recognised in many countries and forensic imaging has been recognised by the European federation of radiographer societies (EFRS) as one of nine specialist areas of advanced practice for radiographers. While the concept of optimisation is at the heart of the profession, there remains room for improvement in further advancing optimisation for forensic applications. As with all specialist areas, or areas of advanced practice, appropriate education and training, and continuous professional development are fundamental. Through international organisations such as the international society for forensic radiology and imaging (ISFRI) and the international association of forensic radiographers (IAFR), together with national organisations and groups, forensic imaging continues to move in the right direction.

Session Objectives:
1. To provide insights into the role of imaging, and radiographers, in forensic imaging and mass fatality incidents.
2. To appreciate the key aspects of a quality forensic imaging service.
3. To understand the challenges associated with forensic imaging.

A-038 08:33

Chairpersons' introduction (part 2)

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

Forensic radiology and imaging is a relatively new field within the realm of forensic science and medicine. This introduction provides a short overview of the scientific challenges facing the forensic radiological technician radiologist.

Session Objectives:
1. To provide insights into the role of imaging, and radiographers, in forensic imaging and mass fatality incidents.
2. To appreciate the key aspects of a quality forensic imaging service.
3. To understand the challenges associated with forensic imaging.

Author Disclosure:
R.R. van Rijn: Author; Author books published by Thieme and Springer.

A-039 08:35

A. Disaster victim identification

J. Kroll; *Maastricht/NL (j.kroll@mumc.nl)*

Forensic radiology, mainly as a tool for forensic odontology, has long been an essential discipline in the post-mortem identification of human remains. Because forensic radiology is a rapidly developing field due to the fast technical developments of CT scanners, the possible applications are increasing. A whole body CT contains a wealth of identification information that can be used in an identification process. This presentation will highlight the contribution of forensic radiology within a DVI process, discussing its applications, equipment, advantages and positioning within a DVI-process. It will also discuss future developments, opportunities and challenges which futures DVI processes will face.

Learning Objectives:
1. To appreciate the role of forensic radiology in a disaster victim identification process.
2. To learn about the methods using forensic radiology in a disaster victim identification process.
3. To discuss added value of forensic radiology in a disaster victim identification process.

A-040 08:58

B. The role of CT angiography in forensic imaging

A. Dominguez; *Lausanne/CH (Alexandre.DOMINGUEZ@hesav.ch)*

Multiphase post-mortem CT angiography (MPMCTA) has been set up almost ten years ago at the University Center of Legal Medicine of Lausanne-Geneva, Switzerland (CURML). A research project allowed the creation of the Virtangio® device: a specific injection system for post-mortem angiography. Nowadays, this setting is regularly used as almost a third of the autopsies benefit of this technique at the CURML. The indication to perform the MPMCTA is the suspicion of vascular lesions due to natural or traumatic origin, such as traffic accidents, homicides (stab wounds, ballistic), medical malpractice (especially in a post-surgery context), or unexpected adults death. This procedure allows examining vascular anatomy: analyses of the vascular lumen with potential stenosis or dilatation; analyse of the vascular walls with potential dissections or ruptures; characterization of the nature of an arterial and/or venous leakage. It also permits to obtain morphological information of the organs parenchyma. At the CURML, the MPMCTA is fully executed by the forensic radiographer. He is in charge of preparing the body, collecting samples before the angiography, denudating the arterial and venous vessels for the injections and proceeding the CT-scan acquisition. The duration of this technique lasting about 30 minutes won't disturb the investigation work flow. The MPMCTA is then interpreted by a team involving forensic pathologist and a radiologist. Limitations and pitfalls of this technique should be known to identify artefacts and pitfalls.

Learning Objectives:
1. To learn about the development of multiphase post-mortem CT angiography (MPMCTA).
2. To appreciate the benefits and limitations of MPMCTA examinations.
3. To understand the role of the radiographer in the MPMCTA.

A-041 09:21

C. The importance of the radiographer's role in forensic imaging

A.L. Brookes; *London/UK (amyleebrookes@outlook.com)*

Forensic imaging is an ever-expanding sub-speciality of both radiology and forensic medicine. The overall role of forensic imaging is to obtain evidence and answer legal questions associated with either living or deceased individuals. Forensic imaging can be utilised in a variety of cases including suspected physical abuse, medical negligence, drug trafficking and mass fatalities incidents. In forensic pathology, forensic imaging has established a role in the assessment of identification and establishment of cause of death, particularly in cases of severely decomposed or burnt remains. The role of radiographers within forensic imaging contrasts significantly with that of the routine clinical environment. Those individuals involved in forensic imaging must understand and be aware of the medico-legal features and professional guidelines that impact their practice.

Learning Objectives:
1. To appreciate the role of the radiographer in forensic imaging.
2. To learn about the importance of continuity of evidence and record keeping.
3. To discuss the various situations a radiographer can be exposed to during forensic imaging.

09:44

Panel discussion: Developing a service/getting involved in forensic imaging

08:30 - 10:00 Room M 1

Vascular

RC 115

Peripheral vascular malformations: what every radiologist should know

A-042 08:30

Chairperson's introduction

J.A. Reekers; *Amsterdam/NL (j.a.reekers@amc.uva.nl)*

Vascular malformations are rare and therefore the diagnosis is often unknown to a general radiologist. It is important to differentiate a congenital vascular malformation from an infantile hemangioma. Congential vascular malformations a have a specific anamnesis, which is often the major clue to the final diagnosis. There are 3 main types of congenital vascular malformations. Arterial (high flow with direct fistula), venous (low flow) and lymphatic. There are some related vascular tumours like capillary malformation and port-wine stains. There are several syndromes in relation to vascular malformations. The most known is Klippel-Trenaunay-Weber syndrome. For a general radiologists it is important to recognise a vascular malformation. Treatment and further work-up diagnosis should only be undertaken in centres of expertise. Only malformations that give complaints like pain, bleeding or cosmetic issues should be treated. Both embolisation (for high flow) and local sclerotherapy (for low flow) are used to treat vascular malformations.

Session Objectives:
1. To review classification and description.
2. To identify the role of imaging modalities.
3. To understand the role of interventional radiologist in management and treatment.

A-043 08:35

A. The diagnostic assessment

M. Köcher; *Olomouc/CZ (martin.kocher@seznam.cz)*

Vascular malformations are categorised into the low-flow malformations and high-flow malformations. From imaging methods is expected to distinguish between the low-flow lesions and high-flow lesions, localisation, volume and range of lesion and relationship to the surrounding tissues and organs. Color doppler ultrasonography (DUS) can offer good differentiation between high-flow and low-flow lesions. Magnetic resonance (MR) offers good differentiation between high-flow and low-flow lesions also, and moreover good evaluation of volume and extent of lesion, good interpretation of anatomical relationship to the surrounding tissues and organs. On DUS the low-flow malformations are demonstrated as hypoechogenic or heterogeneous lesions with minimal flow inside, flow during augmentation and normal arterial flow volumes and normal high arterial resistance flow. The high-flow malformations are heterogeneous lesions with tortuous feeding arteries, high velocity and low-resistance flow in feeding arteries, multiple arteriovenous shunts and pulsatile flow in draining veins. On MR the low-flow malformations typically have low signal intensity in T1 weighted images in abnormal vascular structures and high signal intensity in T2 weighted images, whereas the high-flow lesions usually demonstrate a signal voids in abnormal vascular structures on most sequences. At follow-up DUS demonstrates thrombosis and fibrosis of the low-flow lesion. In the high-flow lesion the waveform will be normalised and the resistive indexes and the flow volumes will become normalised as well. MR demonstrates thrombosis and fibrosis of low-flow malformation by the loss of high signal in T2 weighted images and loss of signal voids in high-flow lesions.

Learning Objectives:
1. To learn about classification and terminology.
2. To understand the role of US, CT and MRA in diagnostic assessment.
3. To learn the optimal imaging algorithm for diagnosis and follow-up.

A-044 08:58

B. Percutaneous or endovascular treatment: when and how?

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

Vascular anomalies, are divided in two different categories which carry different prognosis and management: "Vascular tumors" and "Vascular malformations" (VM). Their precise identification is crucial and involves a good knowledge of the biological classification published by Mulliken and Glowacki and that has recently been updated by the International Society for the Study of Vascular Anomalies (ISSVA). Vascular malformations are always congenital and grow with the child. They can involve type of vessels solely or combined with others. A rheologic differentiation between low and high flow malformations is essential to characterise the seriousness of the lesion. Interventional radiology (IR) plays major role in both curative and palliative treatments of these VM. Once understanding the nature and high/low flow characteristics of VM, transcatheter/endovascular (transarterial or transvenous) or direct percutaneous puncture under imaging guidance are the 2 main techniques for treating these lesions. Depending on the type, nature, location and surroundings of the VM, one should decide the best strategy for treatment. Another key point is to decide whether to use embolisation or sclerotherapy. Again, the type, location of the VM is vital and the patient based decision is to be made carefully by a multidisciplinary team. Operator's experience is of most importance in determining all of the above variables, together with the local circumstances. There are many different types of embolic and sclerotherapy agents available around the world.

Learning Objectives:
1. To recognise the indications and the real need for treatment.
2. To learn about technical approach and how to plan the intervention.
3. To understand possible limitations and the final result prediction.

A-045 09:21

C. Paediatric vascular malformations: diagnosis and treatment

A. Barnacle; *London/UK (Alex.Barnacle@gosh.nhs.uk)*

Haemangiomas are by far the most common type of vascular anomaly that present in childhood. Haemangiomas are benign vascular tumours; several subtypes exist. Infantile haemangiomas are the commonest subtype and the vast majority of these require no intervention at all, because they involute spontaneously over the first few years of childhood. These well defined vascular masses have a highly characteristic growth pattern and typical