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Scientific programme abstracts Monday 8 June

0830–0930
MRI school I – Knee
0830 MRI knee: Menisci, ligaments and beyond

Raby, N.
Western Infirmary, Glasgow, UK

Meniscal tears: the reduction in waiting times for diagnostic imaging is welcomed by patients and clinicians alike. However, in the case of the knee many more patients are now imaged relatively soon after injury. This results in radiologists seeing knee injuries at a much earlier stage after the traumatic incident then was true in the past. This relatively acute imaging provides the radiologist with new challenges in interpreting knee MR. Meniscal tears are easily and commonly identified by MRI. There are some less common varieties of tear which can still cause diagnostic problems to both he radiologist and the arthroscopist. This presentation will concentrate on the less commonly seen meniscal tears including those with meniscal fragments or flaps which can overlooked. There will also be discussion on the significance of the common tears such as the oblique tear of the posterior horn. Recent research suggests that these may not necessarily explain the patients symptoms and that alternative diagnoses should be sought. Ligamentous injuries also can be thought of in 2 groups: those which occur commonly and are relatively easily recognized; and those which are less common and hence less well recognized. The supporting structures of the posterolateral corner are key to knee stability and must be fully evaluated in cases of acute trauma. Transient acute patellar dislocation is increasingly recognized on MRI when not suspected clinically. This diagnosis is valuable as there is now surgical enthusiasm for repairing the medial patello femoral ligament to prevent recurrent episodes. The radiologist must recognize this condition and be able to advise the surgeon where the ligament rupture has occurred.

0900 MRI knee: Joint surfaces, extensor mechanism and bursae

Robinson, P.
Chapel Allerton X-Ray Department, Leeds Teaching Hosptials, Leeds, UK

AIM: To describe the underlying processes that cause injury to the joint surfaces and extensor mechanism of the knee and illustrate the relevant imaging features. Objectives – Joint surfaces: 1. Osteochondral unit – normal structure and function. 2. Injury mechanisms. 3. Imaging techniques. 4. Imaging features. 5. Treatment options and post-operative imaging features. Objectives – Extensor mechanism and bursae: 1. Normal structure and function. 2. Injury mechanisms and relevance of bursae. 3. Imaging techniques. 4. Imaging features. 5. Treatment options including image guided intervention.

0830–0930
Tips and tricks in biopsy? Biopsy disasters and how to get out of them
0830 Top tips in biopsy: Optimizing yield and minimizing complications

Hatrick, A. and Hughes, N.
Frimley Park Hospital, Surrey UK

This talk will include a selection of tips to help improve biopsy technique, increase diagnostic yield and will include some discussion on ways of dealing with complications when they occur. The talk will concentrate on core biopsy but will also include some comments on fine needle aspirate, and will deal with biopsies in the neck, thorax and abdomen using both CT guidance and ultrasound guidance.

0830–0920
Optimizing the digital image: from exposure to presentation – CR
0830 The basics of the digital image and CR

Doyle, P.
Gartnavel Royal Hospital, Glasgow, UK

No abstract supplied

0855 Radiography practice with CR

Jones, T.
Swansea NHS Trust, UK

Wet developing chemicals and processor jams are fast becoming things of the past but radiographers still need to understand the basics involved in producing a good quality digital image for display on their PACS. This session will look at the processes involved in producing a digital image and will focus on workflow and common pitfalls.

0915–1015
Education and training scientific session I
0915 Trainee satisfaction with the Radiology Integrated Training Initiative

Chapman, P.J. and Bhatnagar, G
Peninsula Radiology Academy, Plymouth, UK

PURPOSE: To assess the current trainee satisfaction with the Radiology Integrated Training Initiative (R-ITI). R-ITI is a national online learning collaboration between the Royal College of Radiologists, the Department of Health and the NHS to provide an increased number of high-quality radiologists. MATERIALS/METHODS: "Work in progress study" E-mail questionnaire survey of all radiology trainees currently registered with the R-ITI. Data are being collected with Likert format questionnaire with a free text option and addresses all aspects of trainee satisfaction including site usability, site navigation issues, ability to customize to individual user and quality of educational content. INITIAL RESULTS: Despite the design brief that the R-ITI is an integrated learning environment that supports trainees through access to tutors, mentors and collaboration tools initial searches of the forums/chat rooms show no postings since 18 October 2006 and no mechanism of access to tutors or mentors. CONCLUSION: There may be scope for improvement in this valuable new training initiative.

0925 Development of a new Radiography Clinical Skills Facility

England, A., Ward, A.J., Burgess, K.
University of Liverpool, Liverpool, UK

PURPOSE: It was widely accepted that our current facilities for radiography clinical education were insufficient. The project will discuss how a new Radiography Clinical Skills Facility emulating that of any clinical X-ray room can enrich teaching, learning and assessment of diagnostic radiography students. METHODS: Following a grant application to the SHA, £600,000 was awarded to this institution to develop a new clinical skills facility. Following an 18-month project four rooms were redeveloped into a state-of-the-art digital X-ray room with adjacent image analysis laboratories. A careful R&D phase together with close collaboration with industry was utilized in order to design the best possible clinical facility which maximizing the opportunities for teaching and learning. RESULTS: Undergraduate radiography students will have timetabled activity in the Radiography Clinical Skills Facility from December 2008. This will be a combination of radiographic skills sessions using actors, clinicians and full body phantoms together with workshops analysing

the resultant images and cases from a hospital grade PACS system. CONCLUSION: A reliance on NHS resources for clinical skills training creates a multitude of problems. Replication of an X-ray facility within the academic environment has massive teaching and learning opportunities and should make students better equipped for clinical placements.

0935 Implementing a hybrid virtual environment for radiotherapy training (VERT) within the UK; one university's experience

Tuckey, M.J., Roe, B.
University of The West of England, Bristol, UK

KEY LEARNING OBJECTIVES: Radiotherapy within the UK has in recent years seen a radical development and expansion of patient treatment services. It is a concern that reductions in clinical access time for preparation may impact on attrition rates. In a bid to address these issues a virtual environment for radiotherapy training (VERT) initiative has been implemented within a number of Higher Education Institutes (HEIs) and clinical radiotherapy departments within the UK to supplement current academic and clinical training. DESCRIPTION: The University of the West of England was the first HEI to install a hybrid VERT. Research has found that students who had received a negative clinical placement experience in the first year were more likely to leave the course as a consequence. The introduction of VERT into the undergraduate radiotherapy curriculum will reduce the burden on the clinical departments to provide "out of hours" training prior to clinical practice placements. It is also hoped that it will enable students to get practical "hands on" experience of using and manipulating the machine parameters thus enhancing their psychomotor skills prior to embarking on a clinical practice placement. It is important that VERT does not replace clinical practice but is used to enhance and supplement a student's learning both prior to clinical practice but also throughout their degree training. CONCLUSION: The introduction of VERT is currently being evaluated at local and national level. It is hoped that its introduction will improve the student experience throughout their degree training.

0945 Lessons from the aviation industry for simulation in interventional radiology

Chapman, P.J., Will, M.
Peninsula Radiology Academy, Plymouth, UK

LEARNING OBJECTIVES: The team management models employed simultaneously with simulation technology within the aviation industry have the potential for application to improve interventional radiology training and by extension safety in the interventional radiology suite. BACKGROUND: The airline industry has long been a model for risk management and training using simulation for other high risk industries [1]. However, little specific application has been made of this relevant knowledge to interventional radiology training. The concept of "Crew resource management" is a management system developed for the aviation industry to promote safer and more efficient operation of complex team based tasks. It is not so much concerned with the technical knowledge and skills but rather with the cognitive and interpersonal skills needed to manage the complex human-to-human interactions central to any team performance [2]. Application of these concepts to the interventional radiology training has the potential to save lives and money, and prevent accidents and lawsuits. CONCLUSION: There is scope for improvement in training; management system experience from other industries exists which if used alongside the currently available interventional radiology simulation technology has the potential reduce the human errors which lead to accidents. REFERENCES: 1. Education and debate on error management: lessons from aviation. BMJ 2000;320:781–5. 2. Civil aviation authority (CAA) CAP 737 Crew resource management CRM) training.

0955 Preliminary face and content validation of ImaGiNe-S: The Cirse & Bsir 2008 Experience

Sinha, A.[1], Johnson, S.[2], Hunt, C.[2], Woolnough, H.[2], Vidal, F.P.[3], Gould, D.A.[1]
[1]Royal Liverpool University Hospital, Liverpool, UK, [2]Manchester Business School, Manchester, UK, [3]University of Bangor, Bangor, UK

KEY LEARNING OBJECTIVES: To determine preliminary face and content validity of a physics-based virtual reality (VR) training simulation of visceral interventional radiology needle puncture procedures. DESCRIPTION: Imaging-guided needle puncture procedures use hand-eye coordination to direct needles, wires and catheters to perform nephrostomy. The visuo-spatial and manipulation skills required are learnt in a traditional apprenticeship, though Working Time Directives are reducing the time and case mix available to train. Animal and fixed models reproduce some training objectives, though they are an imperfect substitute for the "real patient" experience. ImaGiNe-S is a computer-based VR training simulation, using variable virtual environments with stereo 3D visual representation and devices to convey feel, realistically mimicking a percutaneous nephrostomy procedure. With ethical approval, a prospective pilot study was conducted at two international conferences to assess validity of ImaGiNe-S. 53 subjects (49 male, 4 female: 30 trainees and 23 subject matter experts, underwent baseline testing on a simulated percutaneous nephrostomy. Face and content validation were assessed using a 5-point Likert scale. Outcomes showed that 41 of 53 (78%) participants thought that the design of ImaGiNe-S was moderately realistic with content validity being rated averagely for all critical task steps. 44 of 53 (83%) participants thought that ImaGiNe-S is a useful model for training skills for nephrostomy. CONCLUSION: ImaGiNe-S may be a useful model for training skills for nephrostomy. With further development it may allow trainees to develop basic skills of percutaneous renal collecting system access. Further assessment of face and content validity is needed.

1005 Interactive display of serial images in scientific presentations within PowerPoint

Dixon, I.
Royal Cornwall Hospital, Truro, UK

AIMS: Describe a new software tool for the interactive display of stacks of serial images for scientific and educational presentations using Microsoft PowerPoint. METHODS: Since the advent of digital imaging, 3D data have become standard, particularly in CT and MRI. Most 3D data are represented by a series of stacked 2D images. Radiologists typically scroll back and forth through the stack of 2D images for a finding, systematically displaying the appearance of a finding or an organ throughout its anatomic extent in relation to surrounding structures. This scrolling has become the standard for radiologists reviewing digital images at workstations, whether formally interpreting a case, teaching students and house officers, or reviewing cases with physicians. PowerPoint, the standard tool for digital presentations at national and international radiology meetings does not currently provide the basic functionality internally for easily displaying and interacting with stacks of 2D images. Thus, the effective representation of 3D information in radiological presentations has remained difficult and does not reflect the interactivity used routinely in clinical practice. CONCLUSIONS: A simple practical technique whereby multiple enormous serial Dicom datasets may be instantly demonstrated with the same immediacy, precision and control that a radiologist expects from a PACS workstation, all from within a simple small power point presentation.

1000–1200
BSTI chest radiology interactive session

1000 Update on the staging of lung cancer

Reynolds, J.[1], Entwisle J.[3]
[1]Birmingham Heartlands Hospital, Birmingham, UK, [2]Glenfield Hospital, Leicester, UK

No abstract supplied.

1100 Imaging of pulmonary embolism

Curtis, J.
University Hospital Aintree, Liverpool, UK

This session will summarise the imaging findings in pulmonary thromboembolic disease along with discussion of pitfalls and challenges.

1130 Imaging of mycobacterial infection

Ellis, S.M.
Barts and The London Hospital, London, UK

The purpose of this lecture is to review the plain film and axial imaging findings associated with both tuberculous and non-tuberculous mycobacterial infections of the lung. I will discuss the necessity for obtaining microbiological confirmation and sensitivities and the difficulty in distinguishing mycobactrial infections from other infections, sarcoid and lymphoma particularly in the absence of culture positivity and enlarging adenopathy. I will demonstrate the natural history of cavities in treated TB and highlight the numerous extra pulmonary manifestations of TB with particular reference to skeletal involvement and the necessity for a high index of suspicion when confronted with musculoskeletal symptoms in a proven TB case.

1000–1130
Revalidation, recertification and CPD across the imaging workforce

1000 Revalidation of doctors: Why and how?

Scott, F.
General Medical Council, London, UK

No abstract supplied.

1030 The future of CPD for radiographers

Paterson, A.
Society and College of Radiographers, London, UK

Continuing professional development (CPD) has been a professional obligation for radiographers for many years. It is now a statutory requirement also, with standards for CPD set by the Health Professions Council. Radiographers, along with other healthcare professionals regulated by the HPC, will be subject to random audit to ensure that they meet the required standards; the first audit of the radiography profession is due in early 2010. To remain on the HPC's register, radiographers must confirm that they have undertaken CPD each time they renew their registration. Renewal and so confirmation of relevant CPD activity takes place every two years. Changes to the statutory processes are unlikely in the near future and questions remain as to whether the process is sufficiently robust to assure competence or continuing competence to practice, or to address advanced and consultant practice 'regulation'. The radiography profession is addressing these questions through its own standards and processes for CPD, and by introducing a system to accredit individual advanced and consultant practitioners. The interlinked nature of the statutory and professional processes will be discussed. The importance of compliance with statutory requirements will be highlighted, as well as emphasising the need to seek and maintain professional accreditation. Both are important but the latter is particularly important for advanced and consultant practitioners, their patients and their employers. AIM: The aim is to illustrate the statutory and professional CPD systems that apply to radiographers, and to demonstrate the importance of these to individual, patients and employers. OUTCOMES: To develop understanding of the statutory and professional CPD systems and requirements; to show how these interlink, and why both are important; to consider how CPD provides assurance about competence and continuing competence to practice; to introduce the concept of individual professional accreditation at advanced and consultant levels, and to explore its importance to individuals, patients and employers.

1050 Revalidation of radiologists: how will we do it?

Adams, J.
St Georges Hospital, London, UK

No abstract supplied.

1110 The patient perspective of revalidation

Wiltsher, C.
Clinical Radiology Patients' Liaison Group, London, UK

According to the GMC's website in December 2008, the purpose of revalidation is "to give patients a regular assurance that licensed doctors are up to date and fit to practise". This presentation will address the following questions from a patient's perspective, with particular reference to recertification for radiologists: why do patients need regular assurance? What assurance might patients derive from revalidation? What mechanisms of revalidation will command patient and public confidence? Is revalidation as proposed beneficial to patients?

1000–1100
PACS Keynote lecture and scientific session

1000 The top five key elements in achieving a full clinical PACS

Siegel, E.
University of Maryland, Baltimore, MD, USA

The purpose of this presentation is to discuss five key elements in achieving a successful, full clinical Picture Archiving and Communication System. These elements include redesign, support/partnership, integration, performance/quality, and communication. Redesign involves taking advantage of the opportunity when making the transitional to a filmless environment to perform a comprehensive analysis and redesign of departmental workflow as well as a redesign of the department itself including the reading rooms. Support and partnership refer to the unique aspect of a PACS purchase unlike those of imaging modalities whereby the importance of the relationship with the vendor is more likely to be critical to the success of the system. A PACS can essentially be thought of as a tool for integration of various information systems and imaging modalities and peripheral devices and the degree of success in integration of various information systems correlates highly with the overall success of the PACS and its ability to improve departmental operations and patient care. The inclusion of performance and quality considerations is important in all phases of the PACS purchase, installation and implementation and the system offers the potential to improve monitoring of quality of services delivered. Finally, communication has been a relatively weak or underemphasised area with PACS and the ability of the system to either help or hinder communication with clinical colleagues is absolutely essential to the success of a PACS. AIM AND OUTCOMES: 1. Be able to list factors that impact the success and failure of a clinical PACS. 2. List some of the strategies that can be used to optimize integration of information systems. 3. Enumerate metrics that can monitor "quality" in a successful clinical PACS implementation. 4. Describe opportunities for redesign of the imaging department and of the reading and image acquisition environment.

1020 Globalization of radiology

Phelan, B.M.
Imaging On Call, LLC, Poughkeepsie, NY, USA

Advances in technology have changed the general practice of medicine and in the end the patient benefits are immense. There is no subspecialty in medicine that has been shaped by the advent of new technology like Radiology. The capabilities of today's imaging equipment have allowed the practice of radiology to extend beyond the limitations of the local community and improve the care provided to each patient. The standards in radiology interpretations have risen and the demand to have access to subspecialty readers has increased dramatically. The globalization of radiology allows us to practice better medicine and in turn demands that we change our business models to meet the

new standards of patient care. CONCLUSION: The globalization of radiology provides better patient care.

1030 Cross-border teleradiology enablers

Pohjonen, H.
Rosalieco Oy, Espoo, Finland

PURPOSE: eHealth community aims at creating a secure platform for the provision and consumption of clinical eServices by developing a new working environment for professionals and teams, a shared workspace for cross-border consultations and access to individual images and patient records. The purpose of this study was to show practical examples and benefits of cross-border workflow in Estonia, Finland, Denmark and France. MATERIALS/METHODS: eHealth community emphasises sharing of patient information and networking experts from different organizations and different countries. In this study the cross-border availability of professionals was ensured using two tools: eMarketplace for imaging (consultation portal; Estonia, Finland and Denmark) and a local workflow grid (France). The users were provided with a shared information space so that they were able to view and work on the same data. They were provided with tools for collaborative eWorking as well – including XDS-I compatible image repositories, shared workspaces and real-time shared discussion forums. RESULTS: The new generation cross-border team working reduces waiting times and gives access to a wide professional pool for consultations and second opinions increasing the quality of service. It also increases radiological effectiveness and gives financial savings. As an example, reporting of an extended MRI examination can be even five times less expensive. CONCLUSION: Cross-border eTeams can offer an efficient way to share resources by identifying the need and extra capacity for reporting and consultations.

1040 Sustained improvement in radiology reporting times after the introduction of PACS and speech recognition

Mackinnon, A.
St George's Hospital NHS Trust, London, UK

PURPOSE: Prompt radiological report turnaround is critical in providing good quality patient care and becoming increasingly relevant with the NHS 18-week patient pathway. We have recently demonstrated improvements in reporting times and productivity with PACS implementation. This study evaluates the impact of speech recognition (SR) on reporting times. MATERIALS/METHODS: Reporting time, defined as time taken from patient registration to report availability to the referring clinician, has previously been studied, for 2 years pre- and 3 years post-PACS (2002-2006).[1] We have extended the study to assess 3 years pre- and 1 year post SR implementation (2005-2008). Mean and median reporting times were calculated for plain radiographs and specialist modalities (CT, MRI, Ultrasound and Nuclear Medicine). Total department workload, and unreported films rates were also assessed. Pre- and post-SR findings were compared. RESULTS: Between 2005-2008 the number of radiological episodes increased by 17% form 14,080/month to 16470/month. This was accompanied by a smaller increase in reporting radiologists, form 36 to 38 (6%). Both mean and median reporting times have improved substantially post-SR; specialist modalities mean reporting time decreased by 19% (3.1 to 2.5 days; $p< 0.01$, median form 1.5 to 0 days) and plain radiographs by 21% (4.7 to 3.7 days; $p< 0.01$, median form 2.7 to 1.0 days). Unreported plain films have decreased form 2.8% to 1.5% and are steady for specialist modalities (<1%). CONCLUSION: We have shown that the introduction of PACS independently, and now in conjunction with SR has led to significant reduction in reporting times. [1]*Clin Rad*. 2008;63(7):796-804

1050 Impact of PACS in fracture clinics

Shuen, V.[1], Gray, R.[1], Conroy, D.[2], Cooper, J.[2]
[1]Plymouth Hospitals NHS Trust, Plymouth, UK, [2]University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK

PURPOSE: Picture Archiving and Communications System (PACS), enables images to be stored electronically and viewed on screens, so that images can be accessed and compared conveniently. Current literature suggests conflicting evidence on whether PACS can improve business efficiency and productivity gain. The aim was to determine the efficiency of PACS in an imaging dependent fracture clinic by measuring patient journey time pre and post introduction of PACS. METHODS: A prospective observational study from the fracture clinic of a teaching hospital. Two weeks of patient journey times were recorded pre-introduction of PACS, 2 and 18 weeks post-introduction of PACS. RESULTS: 1454 patients were seen in the fracture clinics in this 6 weeks period. 453, 516, 485 patients were seen in the pre-introduction, 2 and 18 weeks post introduction of PACS respectively. Using analysis of covariance, the total number of patients seen in these three different periods had a p-value 0.18. The difference in the total patient journey time in these three periods had a p-value 0.821. CONCLUSION: From this study, there is no significant difference in patient journey time pre and post introduction of PACS. The benefits of PACS in terms of no lost films, the ease of locating and comparing images, does not increase the efficiency of fracture clinic. Thus, it raises the question of cost-effectiveness of implementing PACS in the clinical setting.

1100 Improving efficiency in a radiology department – the North Cheshire experience

Odetoyinbo, T.O., Gopal, K.
North Cheshire NHS Trust, Warrington, UK

KEY LEARNING OBJECTIVES: To illustrate how we have improved both efficiency and productivity in our department following the implementation of various measures. DESCRIPTION: Background. Despite the increase in cross sectional imaging, plain film reporting still constitutes a large proportion of the workload in the typical radiology department in the UK. GPs increasingly require the results of these examinations urgently. There were no local, regional or national guidelines covering turnaround times for General Practitioner plain film requests. Following discussions with local GPs, a target of one week was set as the target time from when examinations are requested and when the general practitioner gets the report of the examination. PROCEDURE DETAILS: We performed an audit in March 2007 assessing the turnaround time for plain film examinations requested by local general practitioners. Only 48% of the reports were being delivered within one week. We implemented a number of measures, including the introduction of a PACS system and re-audited our system to assess the effects of our changes. We were able to very significantly improve the percentage of reports delivered within the target time. CONCLUSION: Efficiency and productivity was improved in our department following the introduction of a PACS system as well as the implementation of a few relatively simple measures.

1110 E-learning in radiological education: Should we believe the hype?

Thain, C.[1], Tolan, D.[2], Kessel, D.[2], Roberts, T.[1], Mirsadraee, S.[2]
[1]University of Leeds, Leeds, UK, [2]Leeds Teaching Hospitals, Leeds, UK

PURPOSE: E-learning has been introduced to address shortages in undergraduate radiology teaching. E-learning devices (ELDs) are a cheaper, more accessible alternative to traditional teaching methods. The purpose of this review was to study the different types of ELDs currently available for undergraduate radiology teaching and examine the evidence for their efficacy. MATERIALS AND METHODS: A post-1996 literature search was performed using Medline, EMBASE and CINAHL. Included MeSH words were: Education, Medical, Undergraduate; Computer-Assisted Instruction; Radiology; Diagnostic Imaging; Radiography. Only papers in English examining a diagnostic imaging ELD were included. The search returned 30 papers. RESULTS: The ELDs came in different layouts. They included hyper-textbooks, linear PowerPoint style modules, interactive web-styled modules, interactive case libraries, and even one ELD which taught through

the use of a game. The main advantages of ELDs were the ability to include larger quantities of high-resolution radiographs and to add a more interactive element to radiology teaching. Disadvantages included poorer accuracy and speed in reading material from computer screens compared with paper copies. Several articles concluded that ELD use was just as efficacious as traditional teaching methods. However, the quality of the evidence used to come to these conclusions was poor. Most evaluations were based on qualitative questionnaire analysis and some articles even question the validity of the earlier evidence for the effectiveness of ELDs. CONCLUSION: This review's findings suggest that more rigorous, quantitative analysis needs to be done in radiology e-learning in order to determine how to best use technology to teach medical students radiology.

1120 User satisfaction survey of soft copy reporting facilities

Wan, M.Y.S.[1], Reddy, S.[2], Hawnaur, J.[3]
[1]Victoria Hospital, Blackpool, UK, [2]Hope Hospital, Salford, UK, [3]Manchester Royal Infirmary, Manchester, UK

PURPOSE: Full implementation of soft copy reporting has brought welcomed changes to our department at the Manchester Royal Infirmary last year. Reporting staff share four communal reporting rooms, each accommodating three to seven workstations. We aim to evaluate the level of user satisfaction of these facilities and identify areas requiring attention. MATERIALS/METHODS: A paper questionnaire comprising 20 closed ended and 2 open ended parts was sent to all staffs whom regularly used the reporting facilities. It was designed to take less than 10 minutes to complete. For the development of the questionnaire, we reviewed existing literature on soft copy reporting environment and general computer workstation ergonomics. Relevant concerns raised by our staff about the existing local facilities were also incorporated in the questionnaire. RESULTS: Of the 37 staff surveyed, 31 (84%) responded. Key findings included: (1) 58% of respondents rated themselves as 'satisfied' or 'very satisfied' with current reporting facilities. (2) 77% of the respondents thought that even better set up of the work environment would lead to improved efficiency. (3) Temperature, amount of distraction by others and general noise level emerged as the least satisfied aspects of the reporting environment. CONCLUSION: Most of our respondents thought better set up would improve work efficiency. Our study had provided us with new ideas and highlighted specific areas of deficiency to help us to achieve this. Other departments contemplating developing purpose built soft copy reporting facilities or upgrading existing facilities may find similar exercise useful in identifying local needs.

1000–1200
BAMRR – Hot topics

1000 Stroke imaging – Overview and current recommendations

Garas, K.
Society of Radiographers, UK

The presentation will give an overview of the impact of the stroke and TIA strategy on imaging departments with particular reference to the impact on MRI. There will be some background on why and how the particular recommendations were arrived, the research base at and a look at various strategies to deal with service delivery.

1030 Advances in breast imaging (sponsored by Philips)

Richardson, C.L.
Royal Marsden Hospital, London, UK

No abstract supplied.

1100 Foetal, neonatal and post mortem imaging – the Sheffield experience

Darwent, G.
University of Sheffield, Sheffield, UK

INTRODUCTION: *In utero*, foetal and neonatal MRI has been expanding since 1983, the first foetal MRI. Sheffield has carried out this type of work since 1998. Approximately 8 *in utero* and 4 neonates are scanned per week. All carried out at 1.5 T or 0.2 T – no ethics approval at 3 T. AIMS: 1. *In utero* MRI: Most studies show 30–45% increase in diagnostic information where ultrasound is inconclusive. Techniques of *in utero* MR scanning will be presented, difficulties discussed. Main clinical conditions referred will be discussed, examples of MR images, importance of diagnosis. 2. Neonatal technique of scanning neonates will be presented, difficulties encountered including importance of immobilisation. Main clinical conditions referred will be shown, examples of MR images presented. Follow up from *in utero* MR scans, examples of further research studies discussed along with why MR is performed. 3. Post mortem (PM): the developing technique of PM MRI will also be discussed, difficulties encountered. Reasons for referral, causes of death discussed. Examples of MR images presented, why MR is performed in addition to/instead of post mortem. OUTCOMES: 1. *In utero* MR knowledge of why *in utero* MRI is performed, main difficulties in scanning these patients and knowledge of main clinical conditions seen. 2. Neonatal knowledge of why neonatal MR is performed, what the main difficulties are in scanning these patients and knowledge of main clinical conditions seen. 3. PM knowledge of why PM MR is performed, reasons for referral, causes of death and knowledge of techniques used.

1130 MRI safety update

Condon, B.
Institute of Neurological Sciences, Glasgow, UK

This being a yearly MR safety update to reflect current concerns, subjects discussed may be subject to change but presently are expected to include: Trapped in the magnet room: how significant are positive pressure issues following a superconducting quench? The quench pipe: to inspect or not? How general can "local" rules be? Imaging patients with electronic implants: can we do it and under what circumstances? Fire and "Funny Noises" from the magnet: what to do if you hear them and what you should have done beforehand.

1000–1150
Advances in technology scientific session

1000 Characterization of the effects of the FineView algorithm on full field digital mammography

Urbanczyk, H.J.[1,2], Castellano, D.A.[3], Marshall, N.W.[4], McDonagh, E.T.[3]
[1]Imperial College Healthcare NHS Trust, London, UK, [2]King's College Hospital NHS Foundation Trust, London, UK, [3]The Royal Marsden Hospital NHS Foundation Trust, London, UK, [4]Barts and the London NHS Trust, London, UK

PURPOSE: To characterize the effect of the FineView algorithm available on the Senographe DS (GE Medical Systems, BUC) on quantitative image quality parameters. MATERIALS/METHODS: The signal transfer property (STP), pre-sampled modulation transfer function (MTF), normalized noise power spectrum (NNPS) and detective quantum efficiency (DQE) of the system were evaluated with and without FineView at four detector air kerma levels from 10 μGy to 350 μGy. Two sets of beam conditions were used: 28 kV/Mo/Mo and 29 kV/Rh/Rh to simulate clinical conditions. The images were acquired with the anti-scatter grid in place, and with 2 mm of aluminium filtration. RESULTS: FineView did not affect the linearity of the system. The MTF at 50% Nyquist (2.5 mm^{-1}) with FineView decreased at detector air kerma below 20 μGy. It increased by 12% at 35 μGy, 31% at 100 μGy and 38% at 350 μGy for the Mo/Mo spectrum and 12% at 35 μGy, 29% at 100 μGy and 43% at 350 μGy for the Rh/Rh spectrum. The NNPS at 50% Nyquist with FineView decreased at detector air kerma below 20 μGy. It increased by 16% at 35 μGy, 66% at 100 μGy and 100% at 350 μGy for the Mo/Mo spectrum and 34% at 35 μGy, 70% at 100 μGy and 110% at 350 μGy for the Rh/Rh spectrum when FineView is activated. However, FineView did not have any effect on the system DQE at any detector air kerma level. CONCLUSION: FineView generally improves MTF and increases NNPS except at very

low detector air kerma; the magnitude of the effect increases with increasing detector air kerma. However, FineView has no effect on the system DQE.

1010 A ROC performance study of digitization versus film display of previous mammograms in digital mammography

Taylor-Phillips, S.[1], Wallis, D.G.[2], Duncan, A.[3], Gale, A.G.[1]
[1]Loughborough University, Loughborough, UK, [2]Addenbrooke's Hospital, Cambridge, UK, [3]University Hospital, Coventry, UK

PURPOSE: To compare cancer detection performance in breast screening using digital mammograms and previous mammograms either in film or digitized formats. MATERIALS/METHODS: Six qualified mammography readers (two radiologists and four radiography advanced practitioners) read a set of 162 difficult cases (41% malignant) twice, once with the previous mammograms digitised and displayed digitally, and once with the previous mammograms displayed in film format on a multi-viewer. Case selection was random from historic cases from the study hospital which fitted the inclusion criteria. Suitability of each case was assessed by a radiologist with over 20 years experience in breast screening, who was not a participant in the study. Each participant recorded the probability of malignancy for each case on a scale from 0 to 100%, and a Students *t*-test was used to compare the area under the ROC curves for each participant in each modality. RESULTS: There was a trend towards improved performance of the radiography advanced practitioners using digitized previous mammograms (p=0.06). However, this trend was reversed for the radiologists. Analysis of participant behaviour from video-tapes of the sessions is currently being conducted with the aim of explaining this discrepancy. Two additional radiologists will complete the study in December 2008. CONCLUSION: Previous research has suggested that digitizing prior mammograms may lead to improved performance. This current work indicates that this is not always the case, and factors such as background and experience of the mammography readers also must be taken into account.

1020 Mammography CR: Comparison of needle crystal image plate with conventional technology

Oduko, J.M., Young, K.C., Gundogdu, O., Asad, M.
National Coordinating Centre for the Physics of Mammography, Guildford, UK

PURPOSE: To compare the performance of a new type of image plate for mammography CR, incorporating columnar ("needle") phosphor crystals, with that of an image plate of conventional technology, using the same CR reader. METHODS: Contrast-to-noise ratio (CNR) was measured for different thicknesses of polymethyl methacrylate (PMMA), simulating breasts, and contrast-detail measurements were made, following the European Protocol. Contrast-detail measurements were repeated at a range of doses. The mean glandular dose (MGD) needed to reach minimum and achievable image quality was determined. The modulation transfer function (MTF) and detective quantum efficiency (DQE) were determined according to IEC methodology. RESULTS: Contrast-detail measurements at 60 mm equivalent breast thickness showed that the needle crystal image plate was capable of reaching minimum acceptable image quality at MGD 1.5±0.1 mGy. This represented a dose reduction of 21% when compared with the conventional technology plate. For the needle crystal image plate, the MTF in the subscan direction was 0.38±0.01 at 5 cycles mm^{-1} and the DQE was 0.087±0.02 at 5 cycles mm^{-1} (entrance surface air kerma 0.22 mGy). The MTF for the needle crystal image plate was 43% higher, and the DQE was 53% higher, than for the conventional technology plate. CONCLUSION: The needle crystal image plate had improved MTF and DQE, which resulted in the acceptable image quality standard being reached at a dose of 1.5 mGy, which is 21% lower than for the image plate of conventional technology.

1030 Digital radiography technique selection based on a contrast-to-noise ratio model

Kotre, J., Daniel, J.
Freeman Hospital, Newcastle-upon-Tyne, UK

PURPOSE: To provide advice to radiographers wishing to transfer established technique factors between different digital radiography technologies. MATERIALS/METHODS: Experimental contrast-to-noise ratio measurements were carried out to investigate the variation in image quality with tube potential for a fixed receptor dose for CR and DR. The experiments approximated the conditions for abdominal imaging. A numerical simulation incorporating the physical characteristics of the CR and DR receptors was developed and compared with the experimental results. The experimental and simulated results were used to explore the question of how to produce equivalent quality images on the two receptors by changing technique factors, whilst minimising effective dose to the patient. RESULTS: The poor performance of CR compared with DR at higher tube potentials was demonstrated by both the experimental and simulation results. Changing tube potential to compensate is the best option for keeping patient dose optimized. This implies that there may be a one-to-one mapping between optimized technique factors transferred between imaging technologies. CONCLUSION: Our preliminary results indicate that the use of contrast-to-noise ratio models could be helpful in establishing standard technique factors in departments where different digital radiography technologies are used in parallel.

1040 Correlations between clinical and physical measures of image quality in a CR optimization study

McMahon, A.[1], Honey, I.D.[2], Emerton, D.P.[3], Mackenzie, A.[3]
[1]Cork University Hospital, Cork, Ireland, [2]Guy's Hospital, London, UK, [3]KCARE, London, UK

PURPOSE: The aim of the study is to compare optimization methods using quantitative and qualitative methods with anthropomorphic phantoms for chest examinations. MATERIALS/METHODS: The signal-difference-to-noise ratio (SdNR) of a 0.8 cm thick PMMA disc on an 8 cm PMMA block was measured. PMMA discs were placed on the back of a chest phantom to simulate pulmonary nodules. The features in each image (noise, lungs, heart, bone, overall image quality) were scored against a standard image and analysed using visual grading analysis scoring (VGAS). Images were collected for a range of doses, kilovoltage, use of anti-scatter grid and patient size using a Kodak CR800 computed radiography system. RESULTS: SdNR and VGAS measures of image quality (IQ) decreased with increasing tube kilovoltage for all patient sizes, and IQ increased with grid use for the standard patient (8 cm PMMA), at matched effective doses. Trends show the optimal conditions for imaging the standard patient (8 cm PMMA) to be 60–80 kV independent of anti-scatter grid use. Larger patient sizes (10 cm, 12 cm, 14 cm PMMA) showed high correlation between SdNR and overall VGAS score; with 60–80 kV producing optimum IQ, again independent of grid use. CONCLUSION: Correlations were found between the two IQ metrics, with a general trend towards superior IQ with lower tube kilovoltage, and anti-scatter grid use. Significant correlations between the two methods could lead to protracted clinical trials being replaced by simple physical measures of image quality.

1050 Optimized imaging conditions for modern digital subtraction angiography equipment

Workman, A.
Northern Ireland Regional Medical Physics Agency, Belfast, UK

PURPOSE: Modern angiographic equipment uses features such as additional filtration and different image detector materials. This investigation explores the optimization of imaging parameters for such systems. MATERIALS/METHODS: An analytical projection computer model was constructed to simulate the angiographic imaging scenario. Adjustable model parameters included the X-ray kVp, added beam filtration (material and thickness), patient thickness, image detector characteristics and dose to the image receptor. Optimized imaging conditions were determined for iodine contrast imaging using a figure of merit parameter (CNR2/D) where CNR is the contrast to

noise ratio of the iodinated vessel and D is the patient dose measure. Optimized parameters were determined in the cases where D was skin dose and energy imparted. The model predictions were verified on a modern angiography system. RESULTS: The results indicate that the optimised imaging parameters (kVp and beam quality) are different depending on the dose quantity used in the optimization meaning that optimisation conditions may be different for different examination types. In general optimised imaging occurs when lower kVp and increased filtration is used. However, the use of copper filtration much greater than 0.3 mm thickness is of limited additional value. Greater patient thicknesses shift the optimum imaging point toward higher kVp settings. CONCLUSION: The computer model predicts the optimized conditions for angiographic imaging, with different conditions required depending on the dose measure to be optimized.

1100 Initial clinical experiences in the use of digital tomosynthesis in plain film radiography

Hughes, N.J., Kulkarni, K., Stephenson, J., Gupta, R.
Queen's Hospital, Burton on Trent, UK

Digital tomosynthesis (DTS) is a relatively new plain film imaging technique utilizing a stationary digital detector and a tomographic sweep to acquire a volume of tissue for electronic reconstruction using specialised software (VolumeRAD; GE Healthcare, UK). With 130 worldwide units and 9 currently in the UK (as of December 2008), this paper presents an overview of our initial clinical experiences in a district general hospital type setting for this emerging technique, over the past 12 months. The technique has been utilized for chest, musculoskeletal, urology and trauma work and has been found to be a useful adjunct to CT, in many cases providing a lower dose alternative. DTS has in our experience been demonstrated to be a useful problem solving tool in plain film imaging, at times preventing recourse to pressurised CT or MR resources. The paper is illustrated with examples of use in the clinical setting, together with a discussion of some of the limitations we have found in use clinically and comparison of radiation doses. DTS has proven within our clinical setting to be a useful additional tool within the diagnostic armoury.

1110 The incorporation of scattered radiation into a radiographic imaging model

Orr, P.A., Johnston, G., Workman, A.
NIRMPA, Belfast, UK

PURPOSE: The purpose of this work was to develop a means to accurately and rapidly incorporate the effects of scattered radiation into an analytical computer model for radiographic projection simulations. A visual computer application has previously been developed by NIRMPA for simulating optimization in radiography and as a training tool. The current model is based only on primary transmission. The aim of this research was to investigate methods of incorporating the effects of scatter into the current simulation. MATERIALS/METHODS: A computer radiographic projection model was used to simulate the primary radiation image of Perspex slabs. The scattered radiation component was simulated by convolving the primary component with scatter spread functions generated using an analytical scattering model. The simulated images were compared with radiographic images of Perspex slabs captured using a Computed Radiography system and Monte Carlo (MCNP) simulations of the imaging setup. RESULTS: Comparison between the three methods (analytical simulation, real image capture and MCNP) indicated good qualitative agreement between the techniques. A modification of the spread function convolution technique significantly improved the agreement of the analytical technique with the other two methods at edges and boundaries. CONCLUSION: From initial studies, it seems possible to accurately include scatter into the model by convolving single or multiple point spread function(s) with the primary radiation image. This technique provides advantages in terms of reduced computer resources and/or processing time compared to Monte Carlo techniques.

1120 Detection of vertebral fractures using appearance model classifiers with a semi-automatic segmentation

Roberts, M.G., Cootes, T.F., Pacheco, E., Adams, J.E.
University of Manchester, Manchester, UK

PURPOSE: Quantitative morphometric methods of osteoporotic vertebral fracture detection lack specificity, particularly with mild fractures. We used detailed shape and texture information to develop quantitative classifiers. In previous studies this method has been applied to manually segmented vertebrae. In this study we applied the classifiers to automatically segmented vertebrae. MATERIALS/METHODS: The vertebrae in a training set of 360 lateral dual energy X-ray absorptiometry (DXA) scans were manually segmented. Shape and image texture of vertebrae were statistically modelled using appearance models. Linear discriminant classifiers to detect fractures were trained on the appearance model parameters, given a gold standard classification using a consensus reading by two radiologists using the algorithmically based qualitative (ABQ) method. During testing, the classifier input parameters were obtained from (semi)automatically segmented vertebrae, located by using active appearance models (AAMs). The AAMs were derived from the same training set, using a miss-8-out train/test loop, where the user clicks on the approximate vertebral centres. Classifier performance was evaluated for miss-1-out experiments using both manual and automatic segmentations for the appearance classifier method and compared with height ratio morphometry. RESULTS: Given the manual segmentation, false positive rate (FPR) at 95% sensitivity were: 5% (appearance); 18% (morphometry). With automatic segmentations the sensitivities at 5% FPR were: 88% (appearance), 79% (morphometry). CONCLUSION: Specificity is improved by using an appearance-based classifier, rather than standard morphometry. The method is reasonably sensitive when combined with an AAM-derived automatic segmentation, although occasional segmentation failures do occur. This allows computer aided diagnosis of vertebral fracture.

1130 Automatic segmentation of lumbar vertebrae on digitized radiographs using active appearance models

Roberts, M.G., Cootes, T.F., Pacheco, E., Adams, J.E.
University of Manchester, Manchester, UK

PURPOSE: Manual point placement for vertebral morphometry is time-consuming and imprecise, and morphometric methods for vertebral fracture diagnosis are non-specific. In previous studies we developed automatic segmentation and classification methods for DXA images. In this study we applied similar segmentation methods to digitised lumbar radiographs, which can be more challenging due to projective tilting. MATERIALS/METHODS: The shape and appearance of vertebrae on 250 digitized lumbar radiographs were statistically modelled, using a sequence of active appearance models (AAMs) of overlapping triplets of vertebrae from L4 to L1 (and including T12 in the L1-centred model). A dual-rimmed shape model was used around the endplate, to cope with projective tilting. To automatically locate the vertebrae, the sequence of models was matched to previously unseen scans by using a miss-25-out train/test cycle. RESULTS: Accuracy results (0.64 mm mean point-to-line error) were found to be similar to previously published results for dual-energy X-ray absorptiometry (DXA), but a low fracture prevalence meant that the shape models were undertrained for the few moderate and severe fractures. However, mild fractures were fitted with good accuracy (mean 0.84 mm). Work on better training for fractured cases is continuing. CONCLUSION: A detailed and accurate shape segmentation can be obtained semi-automatically for lumbar radiographs, despite the projective effects of the X-ray beam. Use of the shape and appearance parameters of the models could in future provide a quantified form of some of the more subtle aspects of visual or semi-quantitative expert reading of vertebral fractures.

1140 The optimal smoothing level and appropriate thresholds for SPM analysis of small-animal PET images

Awikunprasert, P., Goatman, K., Welch, A.
University of Aberdeen, Aberdeen, UK

The choice of reconstruction techniques, pre-processing steps and thresholding methods are important when applying statistical

parametric mapping (SPM) to the analysis of small-animal PET images. Both simulated and experimentally acquired phantom images were used in this study were used to determine the optimum parameters for analysis of preclinical PET/CT data. Simulated activation images with noise levels similar to those found in preclinical PET studies were used to ascertain the smallest size of object that SPM can detect when the difference in activity was 5% and 15% above or below the background. A two-sample statistical test at each voxel was used to compare the simulated images between the "uniform" and "activation" conditions. The results showed that SPM was able to detect changes in regions as small as two pixels in diameter at these activation levels. However, careful selection of the threshold method is required. The effect of three different reconstruction algorithms: filtered backprojection (FBP), 2D order subsets expectation maximization (OSEM) and 3D OSEM, was also investigated using phantom images acquired on a GE eXplore Vista preclinical PET/CT scanner. For each reconstruction method six levels of smoothing ranging from 0 to 2.0 mm FWHM were tested at different threshold levels. The results showed that images reconstructed with 3D OSEM, smoothed with 0.4 mm FWHM allowed SPM to detect the highest number of activation areas. These parameters allowed SPM to detect foci of diameter 2.4 mm, which is comparable with features in the real mouse brain.

1030–1200
How to image the spine

1030 The imaging of cervical and lumbar radiculopathy

Rowland-Hill, C.A.
Hull Royal Infirmary, Hull, UK

During the 1990s MRI largely replaced contrast myelography and CT as the imaging investigation of choice for patients with suspected radiculopathy. Despite technological advances in MRI over the last decade, particularly improvements in axial T_2* weighted 2D and 3D gradient echo sequences in the cervical spine, relatively little progress has been made in refining the diagnosis of radiculopathy by MRI. Imaging cervical radiculopathy is more demanding than lumbar radiculopathy because of the smaller size and scale of the structures involved and the greater pulsatility of CSF flow. Patients are often in pain or discomfort, a further limiting factor on image quality. MRI provides clinically useful information in many cases, particularly in younger patients with acute presentations and single level disease. In the older population with multilevel degenerative changes, findings on MRI frequently lack specificity. It is clear that structural considerations alone are insufficient to explain symptoms and signs in many cases. It is likely that inflammatory and reactive changes are important in determining the presence or absence of symptoms but imaging of such changes has, to date, not been fruitful. The effects of changes in posture and load bearing are a factor in some cases but conventional MRI scanners have limited ability to accommodate postural changes and open or standing MRI scanners are not widely available. Imaging findings must always be interpreted in the context of detailed clinical information and management of difficult cases should be discussed at a multidisciplinary team meeting.

1100 The imaging of myelopathy including vascular causes

Straiton, J.
Leeds General Infirmary, Leeds, UK

No abstract supplied.

1130 Current status of interventional techniques in spinal disease

Wilson, D.
Nuffield Orthopaedic Centre, Oxford, UK

INTRODUCTION: Minimally invasive techniques for the treatment of spine disease are increasing in their application and frequency of use. PAIN: Guided injections including root block, facet infiltration and rhysolysis are established techniques although there is debate regarding their efficacy. VETEBROPLASTY: Approximately 120 000 vertebral fractures occur in the UK each year due to osteoporosis. Around 2000 of these are treated whilst around 10 000 could be treated by percutaneous techniques. Vertebroplasty and kyphoplasty are being used for more complex cases and the advent of coblation and distraction methods allow us to treat patients in whom the techniques would have been contraindicated in the recent past. DISC THERAPY: Coblation, radiofrequency and other techniques have been used to treat prolapsed intervertebral discs with mixed results. Electro thermal therapy and coblation have been advocated for discogenic pain. Most recently innovative methods percutaneous disc replacements have been investigated. INFECTION: Percutaneous debridement of infective spinal osteomyelitis has been undertaken in a few centres including our own. TUMOUR: Radiofrequency ablation is now the definitive method for treating osteoid osteoma. Cryotherapy and coblation followed by cementoplasty have a role in managing malignant bone lesions in the spine.

1030–1200
Vascular intervention keynote and scientific session

1030 Developing a clinical practice; an evolving role of the radiologist

Gaines, P.A.
Sheffield Vascular Institute, Sheffield, UK

The fortunes of the interventional radiologist have waxed and waned over the years, much like any other clinical speciality. There are forces that we have little control over. For example some of our more ingenious interventions will be shown by history or trials to be without benefit. Other clinical specialities may develop therapies that render ours redundant. However, there are certain aspects of our practise that are within our ability to change and modify to our advantage. Such adaptations to will ensure not only that interventional radiology will survive as a speciality, but that the practise of an individual will remain vibrant. Core to many aspects of managing change is the need to be a clinical specialist and not simply a service specialist, for to do so, will surely result in the demise of IR. History has made this clear. Radiologists in the UK developed cardiac catheterization. The skills were shared with our cardiology colleagues and within a few years the technique was entirely dominated by cardiologists. Interventional radiologists developed percutaneous renal stone removal in this country. Within a short period of time again this technique is no longer in our hands. Why? Other specialists had clinical control of the patient and therefore, having developed the competencies themselves, no longer needed to refer the patient to interventional radiologists. During that same period interventional radiologists were not receiving direct referrals and simply had to watch their renal practise shrink. If this pattern of change is not to continue radiologists must escape from simply undertaking procedures and learn to resume clinical control of patients. For that to happen requires a number of steps. In the short term this requires that the interventional radiologists remove himself from the comfort and security of the interventional suite to outpatients and the wards. There patients can be assessed, informed risk modified, and consented by the doctor who will be undertaking the immediate and future management. Such practise is not only common sense but recommended by the GMC and underpinned by the Joint Academy of Colleges. In addition, this is what patients want. Some radiology chairmen may not wish their interventionalists to be spending so much time away from the department, many in the belief that "core" work is then being sidelined. This is to deny the clear benefits to the patient, speciality and to ignore change that has already occurred elsewhere. To ensure that interventional radiology remains viable for the future requires financial security and adequate numbers. But it also requires that interventional radiologists undertake clinical work in training programmes, that outcomes are clearly demonstrated so that we can justify our work, and that research is undertaken that will seed the future.

1100 Optimization of the contrast dose and delivery rate in whole body angiography at 3 T

Waugh, S.A., Gandy, S.J., NicholasR.S., Ramkumar, P.G., Jagpal, B., Houston, G.J.
Ninewells Hospital, Dundee, UK

PURPOSE: To optimize the contrast dose and injection rate for whole body MRI angiography (WBA) carried out at 3 T. METHODS: Six groups of 20 asymptomatic volunteers underwent WBA on a Siemens 3 T Trio MRI scanner. Contrast-enhanced images were acquired in two stages – the head and lower leg station after the first injection of contrast and the abdomen and upper legs after the second. Contrast doses and injection rates were systematically altered, and each volunteer group received a different contrast protocol. Total contrast doses were 40 ml, 30 ml, 25 ml or 20 ml with injection rates of 1.0 ml s^{-1} or 1.5 ml s^{-1}. Regions of interest were drawn on the MIP images to assess contrast to noise (CNR) and signal to noise (SNR) in 16 different arterial segments covering the entire vascular tree. RESULTS: It was found that decreasing the total contrast dose from 40 ml to 25 ml resulted in a significant increase in CNR (p=0.03), with no significant deterioration in SNR. Whilst there was no statistical CNR differences in any station between an injection rate of 1.0 ml s^{-1} and 1.5 ml s^{-1}, the SNR was slightly higher in the upper leg station for an injection rate of 1 ml s^{-1} relative to 1.5 ml s^{-1}, although this did not reach significance (p=0.09). CONCLUSION: The optimal contrast delivery regime for maximising the CNR in WBA imaging at 3 T was determined to be a total dose of 25 ml injected at a rate of 1 ml s^{-1}.

1110 Can death from pulmonary embolism be reduced by making better use of caval filters?

Kopcke, D., Hay, C., Benbow, E., Chalmers, N.
University of Manchester, Manchester, UK

Pulmonary embolism is widely quoted to cause or contribute to 10% of deaths in hospital patients. Caval filters have been available for about 20 years and are believed to be effective in preventing fatal pulmonary embolism yet are infrequently used in the UK. Are we missing the opportunity to use caval filters to prevent death from pulmonary embolism? All death notification records and autopsy reports at this hospital for 2007 were reviewed to identify deaths associated with pulmonary embolism. Case notes of these patients were reviewed for relevant pre-mortem information and in particular for indications for caval filter placement according to current guidelines. There were 95 732 inpatient admissions and 1309 (1.4%) inpatient deaths during 2007. Of these 342 underwent autopsy. Pulmonary embolism contributed to death in 9 of 342 (2.6%) autopsy proven cases. Pulmonary embolism was given as a cause of death on the certificate of a further 7 patients who did not undergo autopsy. Thus pulmonary embolism caused 16 of 1309 (1.2%) deaths representing 0.02% of all inpatients. Most common risk factors were immobility and malignancy. Only one patient had a possible specific indication for filter placement, according to guidelines. Our data suggests that the death rate from pulmonary embolism is substantially lower than the widely accepted figure. This could be attributed to the modern application of thromboprophylaxis. Very few deaths could be prevented by use of caval filters according to guidelines. A more liberal policy of filter use based on non-specific risk factors might have limited benefit at substantial cost.

1120 Deep inferior epigastric artery anatomical variance on CT angiography

Sharma, M.-P.
Royal Sussex County Hospital, Brighton, UK

PURPOSE: In the UK the incidence of breast cancer is two per 1000 women per annum. 40% of these women will require a mastectomy. Currently, the accepted gold standard for breast reconstruction is free tissue transfer from the abdomen, based on a deep inferior epigastric artery perforator (DIEP flap). The DIEA is the dominant vascular supply to the anterior abdominal wall, but it has an unpredictable and variable branching pattern, which makes surgical planning difficult. We reviewed the accepted anatomical cadaveric classification and correlated this with CT angiography in patients being considered for DIEP flap reconstruction. MATERIALS/METHODS: A retrospective cohort study of 143 consecutive patients was undertaken, who had had a mastectomy for breast cancer and were being considered for elective DIEA perforator flap reconstruction. CT angiogram scans of the abdominal wall were reviewed using Moon and Taylor's classification (1988) of branching patterns of the DIEA. RESULTS: Each half of the abdominal wall was reviewed as an individual vessel (286 DIEAs). The results are as follows: 57% were type I, 35% were type II and 7% were type III branching pattern. 1% had no viable DIEA on CT angiography. CONCLUSION: The first formal classification system for the branching vessels of the DIEA was created on cadavers. We have re-validated these figures using CT angiogram. Although this classification is widely accepted, CT angiography allows a "real-time" assessment of the surgical anatomy beyond this. This is of considerable practical value in the pre-operative planning of breast reconstructive surgery.

1130 Accuracy of Doppler ultrasound compared with fistulogram in arteriovenous haemodialysis fistulae

Nayeemuddin, M., Au-Yong, K.J., Pherwani, A.D., Oxtoby, J., Richard, J.
Asquith University Hospital North Staffordshire NHS Trust, Stoke-on-Trent, UK

PURPOSE: To compare the accuracy of Doppler ultrasound (DUS) with fistulography in detecting problematic arteriovenous fistulae (AVF) and grafts. MATERIALS & METHODS: Patients who underwent both DUS and fistulography were retrospectively identified from the radiology information system. Doppler findings were compared with fistulography provided the duration between the two studies was <9 weeks. RESULTS: Over a 6-year period (2002–2008), 60 patient investigations were available for analysis. Mean age was 63.5 years (26–89 years). Mean duration between the two studies was 4.3 weeks. Of these, 57 (95%) were native AVFs and 3 (5%) were grafts. Both DUS and fistulogram findings exactly matched in 45 (75%) patients, partly matched in 4 (6.5%) and did not match in 11 (18.5%). DUS correctly identified all the normals (9/9), aneurysms (3/3) and anastomotic occlusions (3/3). DUS missed 24% (9/37) of significant venous stenoses (stenosis of 50% or greater). Doppler also missed 50% (1/2) of arterial stenoses, 33% (1/3) anastomotic stenoses and 50% (2/4) of central venous stenoses or occlusions. Flow volume was measured by DUS in 25 (42%) patients and had a range of 40–1800 ml min^{-1}. Below 390 ml min^{-1} all the measured flow volumes were associated with at least one significant vascular lesion. CONCLUSION: DUS should be the primary investigation because it is non-invasive and has a relatively high detection rate. Fistulography is recommended when flow volume on Doppler ultrasound is low with or without identification of the underlying vascular lesion. Flow volumes should be routinely measured in all AVFs and when <400 ml min^{-1} should alert the clinician about the possibility of a significant vascular lesion affecting fistula function.

1140 Stenting for malignant SVC obstruction: Outcomes in a non-specialized radiology and oncology centre

Reddy, S.M.V., Zealley, I.A., Munro, A.J.
Ninewells Hospital and Medical School, Dundee, UK

OBJECTIVE: To assess the superior vena cava (SVC) stenting outcomes for malignant SVC syndrome (SVCS) in a general radiology department and compare with the data supporting NICE guidelines. MATERIALS/METHODS: The setting included a hospital providing general radiology and oncology services. Over a 7-year period, 21 of 27 malignant SVCS patients who were referred for SVC venography proceeded to SVC stent insertion. Retrospective analysis of computerized radiology and oncology records with individual patient case notes was performed. Outcome data included technical success, complications, symptom relief and symptom recurrence during complete follow up. RESULTS: Initial procedural technical success was achieved in 21 of 21 cases (100%). Symptomatic relief was achieved in 19 of 20 cases (95%) where early clinical response

was recorded. Complications occurred in 3 of 21 patients (14%): that included two minor stent migrations and one symptomatic pulmonary embolism. Mean follow-up was 5.6 months (1 day = one early patient death to 45 months). SVCS symptoms recurred once prior to death was noted in 5 patients (24%). The mean symptom free survival period was 5.5 months (2 days to 45 months). CONCLUSION: In at least one non-specialized centre the outcomes of SVC stenting are comparable with results published from large specialized cancer centres which underpin NICE guidelines on SVC stenting. Endovascular stenting for malignant SVCS appears to be a safe and effective procedure in a general radiology department providing that outcomes are audited to ensure that quality standards at this level are met.

1045–1145
Education and training scientific session II

1045 Can neuro linguistic programming skills be used to enhance clinical practice?

Henwood, S.M.
Unitec New Zealand, Auckland, New Zealand

Neuro linguistic programming (NLP) is not yet well known within healthcare, despite being used extensively in areas such as business and sport to enhance performance to enable individuals and teams to achieve their full potential. This paper will share some case studies of healthcare staff who have undertaken NLP training. Using a phenominological approach the paper will outline their experience of NLP training and its impact on them as individuals, as well as any impact on their professional practice. A number of staff, following NLP training with Henwood Associates, were contacted to see if they would like to reflect on their experience. Using a range of guided questions, a reflective account from each participant was created, which was analysed qualitatively, using thematic analysis, to identify any perceived changes. Issues arising included improved confidence, increased range of skills to draw on and a greater sense of focus and direction for individuals in their professional careers. The small purposive sample showed that there is apparently great benefit from introducing NLP training in health care and in radiography specifically and the paper suggests a more in depth study of impact to establish whether NLP training for health care professionals should be more widely available.

1055 Communicating with patients: The missed opportunity in ultrasound

Hauptfleisch, J.[1], Fernandes, C.[2], Graham, N.[2]
[1]John Radcliffe Hospital, Oxford, UK, [2]Milton Keynes General Hospital, Milton Keynes, UK

In performing ultrasound examinations the radiologist has a unique interaction with the patient in their role as bedside diagnostician with immediate access to diagnostic and prognostic information, often the culmination of multiple examinations and investigations. In this role the doctor has an opportunity to communicate important information to the patient in a limited period of time. Previous studies have shown that in patient-doctor communication, the most negative influence on the patient is when the doctor's evaluation of the process is better than that perceived by the patient, suggesting a communication problem. METHOD: 150 patients completed a questionnaire immediately following an ultrasound examination performed by a consultant radiologist. The questionnaire comprised 12 questions assessing three parts of the examination. Namely: patient's expectations and level of anxiety prior to the examination; communication during and satisfaction after the examination. The questionnaire remained anonymous. RESULTS: 81 abdominal scans, 43 neck and musculoskeletal and 17 testicular scan were performed. 56% of the patients felt anxious prior to the examination and more than 90% were expecting immediate verbal results. 82% of the patients were satisfied with the doctors' deliverance of their results and level of communication. However, after the examination 23% of the patients felt anxious and determined to see their referring doctor for a full diagnosis and explanation. CONCLUSION: One fifth of patient feel anxious and ill-informed following an ultrasound examination performed by a radiologist suggesting that there is scope for improvement in radiologist's on-site communication skills.

1105 The SCoR/Cardiff University information management and technology survey

Pratt, S.D.
Cardiff University, Cardiff, UK

PURPOSE: An audit was undertaken to identify the current Information Management and Technology (IM&T) knowledge and skills of the radiography workforce on behalf of The Society and College of Radiographers (SCoR). MATERIALS/METHODS: An online survey was completed by radiographers, academics, educators and radiography managers, primarily employed in the NHS, the independent sector or higher education in the UK. RESULTS: 1443 responses were received. Engagement with IM&T was variable between applications. The work highlighted a lack of formal training. Small groups or one-to-one training delivered on site was preferred. Transmission of data was widespread within trusts. Barriers that may jeopardise the success of IM&T in ensuring optimization of workflow were seen in both financial and time constraints. Most radiographers rated their IM&T skills as good to excellent, there were some radiographers who felt under confident and that they lacked the ability to carry out their roles efficiently. This may be linked to a reported lack of formal training, with most skills being self-taught. CONCLUSION: The need for a standardized form of training involving generic and radiography specific IM&T skills, integrated into undergraduate radiography courses initially, but also maintained by the NHS, in ongoing specialized training was identified. IM&T training must incorporate data governance and security issues. Training should be band specific, in keeping with particular roles. A strategic approach to overcoming the barriers identified is required to support radiographers in their professional duties.

1115 Producing websites for student assessment: evaluating this assessment strategy within an undergraduate radiography degree programme

Tuckey, M.J., Messer, S.
University of The West of England, Bristol, UK

KEY LEARNING OBJECTIVES: Student radiographers are exposed to the internet throughout the degree programme. This can involve tasks such as answering e-mails, searching for literature, online learning and assessment activities to name a few. The Higher Education Academy (HEA) is committed to developing and improving the student learning experience (HEA 2008). This also follows the guidelines laid down by the Society of Radiographers (SoR 2007). One of the assessment strategies that has recently been employed by staff at the University of The West of England is for students to undertake an e-poster assessment in the form of a group website supported by a presentation. The aim of the assessment is for students to investigate an area of health education/promotion applicable to their practice and to develop an understanding of website design with a view to being able to transfer this learning into their clinical practice. DESCRIPTION: The assessment required each group to construct a website with a home page linked to pages written by the individual group members. Each group undertook a presentation evaluating their website, including how they constructed their individual web pages and the learning that had been undertaken. CONCLUSION: Overall, the introduction of this innovative form of assessment within the radiography programme was favourably received. Students liked learning about new technology and enjoyed researching a health education topic applicable to their practice. The evaluation has enabled the students to gain an improved understanding of the use of IT within a healthcare setting.

1125 A European survey of continuing professional development (CPD) within radiography

Dodgeon, J.[1], Sykes, A.[1], Huber, S.[2], Bajinskis, A.[3]
[1]University of Salford, Salford, UK, [2]Ludwig Maximilians University, Munich, Germany, [3]P. Stradins Health and Social

Care College, Jurmala, Latvia

PURPOSE: To determine the extent of mandatory or voluntary radiographer CPD within EU member states, and the regulation and enforcement of this. MATERIALS/METHODS: A questionnaire was designed by the CPD sub-group of the HENRE 2 (Higher Education Network for Radiography in Europe) project, and was sent out to radiography societies representing 29 countries in Europe. The subjects covered included the existence of a national CPD system for radiographers in each country, whether this was voluntary or compulsory, and the enforcement of these systems. RESULTS: Responses were received and analysed from 22 countries, giving an overview of differing systems and regulations throughout Europe. It was found that 23% (*n*=5) countries do not have a CPD system (least strict), while 18% (*n*=4) enforce CPD by not permitting radiographers to practice (most strict). Other data obtained included how CPD is measured in different countries, the amount that is recommended/required for practice and over what time period, and qualitative information on compliance and accreditation for CPD. All participants said they regarded radiographer CPD as important. CONCLUSION: Many countries within Europe do provide CPD for radiographers, some do not, although many of the latter are planning or would wish to have CPD. This survey proves there is value in developing a European CPD system, and this will facilitate the aim of free movement of labour in the future. There is a need for a co-ordinating body to standardize and regulate CPD, and HENRE has a role to play in this.

1135 The battle for PET-CT reporting experience: An e-learning approach

Tatlow, M.
Lanmark Medical Education, Oxted, UK

KEY LEARNING OBJECTIVES: The Lanmark Medical Education (LME) e-portal will: Enable clinicians to acquire appropriate PET-CT reporting skills; Provide a repository for PET-CT education. DESCRIPTION: PET/CT reporters need to review a minimum of 300 examinations a year as recommended by ARSAC. There is a danger that there will be insufficient PET/CT examinations carried out to support the number of clinicians wishing to gain reporting skills, along those requiring the 600 for ARSAC re-accreditation. A key feature of the success of the Southern Sector PET/CT scheme is how the reporting process is managed and its requirement for independent auditing of 10% of all clinicians reports. This audit is resource intensive, and requires that the most experienced discipline clinicians are used to support this auditing mechanism. The electronic system will permit those requiring testing to report alongside a "standardized report", against which they can scored. Those reporters identified as falling below the required accuracy, are mentored by a member of the audit team in what is viewed as a developmental process. The process of distributed reporting employed as an integral part of the scheme, has generated a source of examinations which will be anonymised, and reported as the "gold standard". The acquisition of reporting skills will be gained by provision of anatomical, physiological and clinical learning materials, and mentor support if required. CONCLUSION: LME has developed an electronic learning portal which supports the previously described competency process and allows the reporters to gather experience in reporting to the required standard.

1230–1315
RCR Tesla Lecture

1230 The growth of percutaneous ablation in the USA and Europe over the last 20 years: Where have we been? Where are we going?

Mueller, P.
Massachusetts General Hospital, Boston, MA, USA

PURPOSE: To review the history and direction of percutaneous methods of liver and kidney ablation over the last 20 years. MATERIALS/METHODS: This talk will review some of the early history and struggles with the development of ablation methods for treatment of liver and kidney tumours; it will trace the initial methods of ethanol ablation to the multiple methods used to day including radiofrequency, cryotherapy, microwave, focused ultrasound etc. The lecture will highlight the individuals and methods behind these developments as they evolved.

1345–1515
E-Learning: Its place in radiology training and CPD

1345 The radiology integrated training initiative: Past, present and future

Fowler, R.
Leeds General Infirmary, Leeds, UK

This presentation will initially look briefly at the history of the Radiology Integrated Training Initiative (R-ITI) and its initial drivers for change. It will look in some detail at the educational design and aims behind R-ITI and how the e-learning materials were designed to be incorporated into more traditional training methods. We will examine how the learning cycle can be accelerated, particularly in the early years of radiology training. We will stress the importance of having material mapped to a visible curriculum. We will review the current status of the e-learning material and discuss how this can best deliver the educational design, looking in some detail at some aspects of the learning solution with reference to the learner's experience. Finally, we will outline how the R-ITI resources can be best utilized and developed in the future. Some of these topics will be expanded and dealt with in more detail by subsequent speakers in this session.

1405 Trainees' experience with R-ITI: What is good? What should be better?

Goldstone, T.
Leeds Teaching Hospitals NHS Trust, Leeds, UK

The Radiology Integrated Training Initiative (R-ITI) is a pioneering project led by the Royal College of Radiologists and Department of Health to provide an e-learning database (eLD) solution, primarily for trainee radiologists. The project was originally targeted at the 3 Radiology Academies (Leeds, Plymouth and Norwich) and subsequently rolled out to allow access to all radiologists. The project facilitated a unique opportunity for the creation of a complete learning system, by a broad spectrum of UK based radiologists, covering the full gamut of radiology. Moreover the content is specifically written for trainees, with the examinations in mind. A number of trainees have had the opportunity to contribute towards module creation alongside consultant trainers. The content currently comprises 742 modules with each module taking between 20 min and 1 h to complete. Unlike textbook learning, or lectures that are all too frequently didactic, the eLD allows a degree of interactivity and assessment that is difficult by other means. The electronic nature of the resource also means they can be continually updated. Unlike much of information available on the internet, quality control is maintained by a strict editorial chain, and "Amazon" style star ratings by trainees (which can be anonymous). The system benefits from being accessible from any internet computer, which means trainees and others are able to access it at study times, during a list or on-call, or at home. Trainers may set learning paths for trainees to follow, or trainees may work at their own pace. I will explore and demonstrate some of the key benefits of the system based on my own experiences and those of other trainees. I will also discuss how the R-ITI complements the other teaching resources within a training scheme, together with a discussion of potential future improvements to the system.

1425 How to successfully incorporate R-ITI into a training scheme – Learning pathways

Fox, B.
Plymouth Hospitals Trust, Plymouth, UK

No abstract supplied.

1445 The validated case archive (VCA) – Our route to successful national image sharing and forward to CPD and revalidation

Cook, P.
Royal Cornwall Hospital (Treliske), Truro, UK

PURPOSE: To discuss the drivers for and to encourage the development, population and use of a national case archive. METHODS: Presentation and discussion of the evidence that case-based assessment and learning are useful methods for self-directed learning, for dissemination of good practice, for continuing professional development and ultimately for providing evidence that professional knowledge and skills are being kept up to date for the purposes of revalidation. Evidence from medical educational resources will be discussed, confirming that assessments are a powerful driver for learning. Further evidence from a variety of studies designed to rapidly assess competence and improve practice, demonstrates that case-based learning, in association with assessments, provides a powerful tool for imparting knowledge and skills, maintaining skills, and disseminating good practice both within a single profession and within a multidisciplinary environment. These results add weight to the argument for a national case archive for use within the health providing community, to promote and disseminate good medical practice.

1400–1530
Trauma imaging: Head, face and craniocervical junction

1400 Head injuries: Patterns of injury

Adams, W.
Derriford Hospital, Plymouth, UK

The primary effects related to the immediate impact and the secondary effects relating to the impact of intra-axial and extra-axial head trauma are described. Traumatic vascular injury can be unrecognized and underdiagnosed. CT remains the mainstay imaging modality because of its speed, accessibility and sensitivity to bony injury and acute haemorrhage. MRI provides additional soft tissue information and is more sensitive at detecting different stages of haemorrhage. It may also provide prognostic information.

1430 Facial trauma: What makes a difference?

Connor, S.
King's College Hospital, London, UK

This presentation will review the techniques and protocols used in the imaging of facial and skull base trauma together with the imaging appearances of facial and skull base fractures and their complications. Accurate identification and characterization of facial, craniofacial and skull base fractures is achieved using a combination of clinical examination, targeted plain film radiography and CT, whereas imaging modalities such as ultrasound, MRI and CT cisternography provide additional information in selected cases to demonstrate soft tissue and fracture complications. Mandibular, central midface, lateral midface, orbital, craniofacial, central skull base and temporal bone fractures will be discussed and illustrated and an anatomical classification of these fractures will be formulated. Typical fracture patterns and specific features that aid treatment planning will be emphasised.

1500 Imaging the craniocervical junction

Shanmuganathan, K.
University of Maryland Hospital, Baltimore, MD, USA

This lecture will attempt to discuss three important cervical spine injuries that occur at the cranocervical junction including: Dens fracture, Hangman fracture, and atlanto-occipital dislocation. The radiographic and CT findings that are helpful to diagnose these injuries will be discussed.

1400–1530
Management of acute chest pain: What every radiologist needs to know

1400 Acute coronary syndromes and their management: What the radiologist needs to know

Hill, J.
King's College Hospital, London, UK

No abstract supplied.

1420 Acute aortic syndromes

Ettles, D.
Hull Royal Infirmary, Hull, UK

The term acute aortic syndrome (AAS) refers to patients presenting with chest pain due to disruption of the layers of the wall of the thoracic aorta. This includes penetrating atherosclerotic aortic ulcer, intramural haematoma and aortic dissection. Although the pathophysiological processes underlying each of these entities differs, some patients exhibit several or all of these lesions, providing evidence of a link between them. In such cases it can be difficult to determine, based on imaging findings alone, which was the initiating event. Recognition and classification of AAS has important prognostic and management implications. Proximal aortic dissection has a mortality of up to 2% per hour and requires immediate repair, while distal dissections are initially managed conservatively in the absence of distal ischaemia. The recognition of penetrating atherosclerotic ulcers as a precursor to aortic dissection or rupture has prompted a more proactive approach to their management. While echocardiography and MRI demonstrate excellent sensitivity and specificity for thoracic aortic pathology, MDCT offers significant advantages in terms of access, speed of examination and multiplanar analysis and has come to the forefront as the investigation of choice in AAS. The detection of early or subclinical lesions presents significant management problems and increases the cohort of patients requiring surveillance. Although the incidence of AAS is relatively low in comparison with acute coronary syndromes, detection and classification by MDCT is straightforward and is part of the remit of most general radiologists. This presentation will review the important imaging findings in the context of current clinical management.

1440 Cardiac CT angiography: Its role in acute chest pain

Roobottom, C.
Derriford Hospital NHS Trust, Plymouth, UK

PURPOSE: To explain the role of CT angiography in the patient with acute chest pain. MATERIALS/METHODS: CT angiography has become central in the management of patients with acute chest pain suspected of having pulmonary embolus and acute aortic syndromes. It is now becoming a robust tool in patients with suspected acute coronary syndromes. The presenter will illustrate the optimal protocols to use and will explain how to interpret scans. Examples will be presented to illustrate the technique. The evidence available will be reviewed. CONCLUSION: CT angiography is a robust clinical tool that can be performed at low dose in patients with acute chest pain. Its role will continue to expand.

1510 Cardiac MRI: Its role in the management of the patient with acute chest pain

Bellenger, N.
Royal Devon and Exeter Hospital, Exeter, UK

Cardiac MRI is rapidly establishing itself as the gold standard investigation in a wide variety of cardiac conditions, utilizing the broad spectrum of anatomical, functional and metabolic information obtained non-invasively with no ionising radiation. During this talk I will explore its role in the cardiological management of acute chest pain, illustrating several areas with case histories. For example: (a) STEMI: Many centres, like ours in Exeter, run 24 hour 7 day a week primary angioplasty service. When definitive treatment is delivered so

rapidly there is little role for CMR prior to intervention but following stenting the degree of ventricular dysfunction, size of MI and, in particular, microvascular obstruction by CMR are powerful indicators of successful treatment (and the influence of trial drugs/devices) and prognostic predictors. Patients frequently have other bystander lesions and CMR can be used to determine which lesions are ischaemic and which segments of myocardium are viable. (b) NSTEMI: Currently defined by chest pain +/- ECG changes + troponin rise; yet 20% of cases have normal coronaries at emergency angiography. These patients require a definitive diagnosis (psychologically, for health insurance, to guide the correct pharmacological treatment). CMR readily identifies patients who have had an MI, those with myocarditis, or normal myocardium. (c) Cardiogenic shock: CMR can help predict which patients will survive CABG in the presence of poor LV function, and from the degree of viability who will really benefit. (d) Unstable or new onset angina: CMR can guide appropriate revascularization by determining which myocardial segments are truly ischaemic and which are viable. (e) CMR can rule out confounding conditions such as aortic dissections.

1400–1700
Delivering imaging after 18 weeks: A no-wait service?

1400 Imaging in the DH after 18 weeks

Denton, E.
Norfolk & Norwich University NHS Hospital, Norwich, UK

AIM: To describe the Department of Health Imaging Work Programme following the successes for Imaging as part of the 18 weeks target. OUTCOME: 1. To understand the need for a "no wait" imaging service. 2. To understand the processes required for this at a local level and the support which will be provided centrally. 3. To understand the new structures and lines of accountability for imaging and diagnostics within the Department of Health within the 18 weeks.

1440 Delivering imaging services to support the cancer reform strategy

Wallis, M.G.
Addenbrooke's Hospital, Cambridge, UK

The challenge for imaging is to be able to provide rapid reassurance for the tide of worried well, as well as providing care in a planned and safe environment for those with real disease. The challenge for imaging managers is to juggle the competing demands of politics and cost while remembering we are here for the patients. We have survived "18 weeks" by a combination of redesign and investment. This is not the end just a "milestone" on a longer journey. "no wait" is a political shorthand, however cynical we are about achieving this we must remember it is the sort of service, we would want/expect for ourselves and our relatives. In cancer it does not necessarily mean instant access. It is about providing seamless planned care in an appropriate time frame. Where possible we should be offering some investigations immediately. For the rest the patients should be able to book an appointment that offers choice within the pathway. Aspirational targets to have verified reports on line instantly are an irrelevance if the next decision point is a Multi Disciplinary Meeting (MDT) in 4 days time. The key is to ensure that the report is available for the next step in the care pathway. However, when management decisions need to be made "now" then the report has to be available instantly. Using examples of good practice (i.e. other peoples) I will try and show what can be achieved. Many of these examples can be found at http://www.radiologyimprovement.nhs.uk.

1500 An imaging strategy for paediatrics

Somers, J.
Nottingham University Hospitals NHS Trust, Nottingham, UK

Paediatric radiology and radiography is a small almost "Cinderella" speciality. Most full time paediatric radiologists and radiographers work in the specialist children's hospitals or large teaching centres. The majority of radiology and radiography for children is performed in district general hospitals either by general radiologists/radiographers or radiologists/radiographers who have an interest in paediatric radiology. Few trainees express an interest in becoming paediatric radiologists or radiographers. This is recognized by the DH as a problem for the implementation of the NSF for Children, Young People & Maternity Services. As a result a working group has been set up to look at children's imaging services within this context and also the Cancer Reform Strategy and NICE guidance. This talk will update the current position and thinking around the future of children's imaging services.

1600 Delivery of imaging services for the stroke strategy

White, P.
Western General Hospital, Edinburgh, UK

PURPOSE: To review the recent stroke guidelines with reference to imaging and to review and discuss the initiatives underway around the UK to deliver improved stroke and transient ischaemic attack (TIA) imaging. The NICE guidelines and imaging guide produced by Department of Health will form the main starting point and I will review progress to date, problems encountered and technical/clinical solutions. I will also look ahead to the routine use of advanced stroke imaging techniques and discuss what the effects might be and the challenges posed.

1625 AAA Screening – How will we implement it?

Director of the AAA Screening Programme tbc

No abstract supplied.

1400–1530
Radiation protection

1400 CT scanning – Justification and optimisation in acute care and in the community

Gibson, C.
Oxford Radcliffe Hospitals NHS Trust, Oxford, UK

CT scanning has increased rapidly during recent years, and now accounts for a significant proportion of population radiation dose. Both legislation and national guidance draw attention to the extra care needed when justifying and optimizing CT scans. The vast majority of these are performed in the acute sector, where it is common to find that individual CT scan referrals are justified by a Consultant Radiologist. Optimization often takes the form of scan protocols targeted at the detection of specific pathologies, or providing optimal imaging for localized anatomical regions. More recently CT scanning has also been made available in a community setting, advertised directly to members of the public, who are invited to present with an initial request for a CT scan. Clearly the same principles and methods for justification and optimization apply, but the much lower prevalence of disease, and the lack of any specific symptoms, markedly affect both of these processes. In some jurisdictions CT scanning without a prior referral by a medical practitioner is excluded by legislation. In the UK the Department of Health has recently undertaken a consultation exercise on this issue. There are several principles involved: the balance of radiation risk and benefit; technological changes which alter that balance; the detriment from false positive and false negative diagnoses; the benefit (or possible detriment) from true positive or true negative diagnoses; the impact on the NHS of any further investigations needed; and the key issue of individual choice versus overall public health effects.

1430 e-lfH IRMER training

Evans, S.
Northampton General Hospital NHS Trust, Northampton, UK

PURPOSE: The talk will present information on the proposed web-based training scheme for referrers, operators and practitioners in accordance with the requirements under the Ionising Radiation

(Medical Exposure) Regulations 2000. MATERIALS/METHODS: This training will be provided as part of the e-Learning for Health (e-LfH) Department of Health funded training programme. It will have core basic knowledge elements and more practical modular components relevant to various medical disciplines. It will endeavour to cover all medical fields that use ionizing radiation, principally: radiotherapy (tele, brachy and unsealed therapies), diagnostic radiology (diagnostic and interventional) and nuclear medicine. RESULTS: Participation in the training modules will be free to all NHS staff and progress through the training will be tracked and learning will be assessed. Delegates' feedback on the draft details of the training programme will be welcomed. CONCLUSION: The need for improved training provision for staff is one of the key national priorities for the NHS. The changing workforce and increasing complexity of systems and protocols provide interesting new challenges. The web based training proposed should not be seen in isolation; it is being developed to bridge any gaps between existing training provisions and the need for more training.

1500 Radiation protection in radiotherapy: Recent matters

Aird, E.
Mount Vernon Cancer Centre, Middlesex, UK

The application of IRMER to radiotherapy has taken some time to bring fully into use and for all professions to agree on some of the concepts and responsibilities (since the main thrust for IRMER when it the regulations were formed was for diagnostic examinations). Recently the RCR has produced an excellent document to assist the understanding of IRMER to radiotherapy "A Guide to Understanding the Implications of the Ionising Radiation (Medical Exposure) Regulations in Radiotherapy". Several interesting points, concerning roles and principles, within this document will be discussed. "Justification" under these regulations will also be discussed, with particular reference to dealing with concomitant doses for verification imaging of radiotherapy treatments. Examples of concomitant dose levels, particularly for portal imaging and cone-beam CT, will also be given in the context of the actual radiotherapy dose levels. The reporting and investigation of radiotherapy errors, together with some examples of errors that have occurred in the UK and elsewhere, will be discussed.

1400–1530

Imaging in stroke and TIA

1400 Why and when to image in stroke and TIA? How do I comply with these "targets"?

White, P.
Western General Hospital, Edinburgh, UK

No abstract supplied.

1430 Imaging methods and findings in acute stroke – CT and MR based: what do I need to report?

Gillard, J.H.
University of Cambridge, Cambridge, UK

No abstract supplied.

1500 TIA – Why, when and how to investigate and how should they be treated?

Rothwell, P.
John Radcliffe Hospital, Oxford, UK

About 15–20% of stroke patients report a preceding TIA, and a similar proportion have a preceding minor stroke. These "warning" events provide an opportunity for prevention, but the time window is short – cohort studies report overall stroke risks of up to 10% at 7 days, with risks of up to 30% in high risk subgroups. Several treatments are effective in preventing recurrent stroke in the long-term, including aspirin, other antiplatelet agents, blood pressure lowering drugs, statins, anticoagulation for atrial fibrillation, and endarterectomy for ≥50% symptomatic carotid stenosis. Assuming that these treatments are similarly effective in the first few days and weeks after a TIA, use of all of these interventions in appropriate patients would be predicted to reduce the risk of recurrent stroke by 80–90%. Randomized trials of early versus delayed management are probably unethical and are unlikely to be feasible (few patients would consent to be randomized to delayed treatment) but two high-quality observational studies (EXPRESS and SOS-TIA) have both shown that urgent initiation of standard secondary prevention treatment after TIA and minor stroke did indeed reduce the 90-day risk of recurrent stroke by about 80%. The results of these studies justify emergency treatment of high-risk TIA and minor stroke, and most major clinical management guidelines have now been updated accordingly. Urgent brain and vascular imaging are essential to reliable diagnosis and treatment of TIA and minor stroke in the acute phase and there is increasing evidence that an MR-based approach is most appropriate.

1430–1630

History session

1430 The retro-digitization of the *British Journal of Radiology*

Thomas, A.
Princess Royal University Hospital, Kent, UK

The *British Journal of Radiology* is one of the great medical journals and has chronicled the development of radiology from its earliest days. The project of making the journal available online is an exciting one and is a major achievement. The online content starts with the New Series of the *British Journal of Radiology*, which was published from 1928 as the journal of the then recently amalgamated British Institute of Radiology and Röntgen Society. The older journals will follow online in due course. The journal started its life in May 1896 as the *Archives of Clinical Skiagraphy*. There were three issues and for the fourth the title was changed to the *Archives of Skiagraphy*. The journal was adopted by the Röntgen Society which developed into the British Institute of Radiology. The journal developed into the modern *British Journal of Radiology*. Both the Institute and the Journal have changed their natures to ensure that they meet the special needs of each generation. In 1987 the Presidential Address was given by Professor Roger Berry from the Middlesex Hospital who said "We are here today because the basic framework is right. Our strength is in our diversity, our future is in our enthusiasm." This has remained true throughout the long history of the *British Journal of Radiology* and will continue into the future. The development of the *British Journal of Radiology* will be reviewed and discussed.

1450 X-rays, the Braggs and the Royal Institution in Australia – A South Australian perspective

George, R.
The Bragg Heritage Group, Sturt, Australia

Following the discovery of X-rays by Roentgen in November 1895, many physicists and University laboratories around the world replicated his experiments and helped develop the technology and its applications. Few however, can match the record of William Henry Bragg and his son William Lawrence Bragg who, in Adelaide, Australia in 1896, produced some of the earliest radiographic images in Australia, and commenced their ground breaking research into the structure of crystals using X-rays. Their work in X-ray crystallography can be directly linked directly to some of the greatest discoveries in science and to the latest developments in molecular imaging. Theirs is a remarkable story not only at a scientific level but at a personal level as well. The Bragg's connection and contribution to the Royal Institution in Great Britain is well recognized, but the recent decision to extend the RiGB to Australia and indeed Adelaide, based on the Bragg connection, is an interesting and exciting story and completes the circle started by Roentgen in 1895. A small dedicated group of scientists in Adelaide is supporting and assisting the State Government of South Australia to ensure that these internationally renowned, but generally unknown scientists are recognized for their significant part in the history of science.

1510 Radiology on the Salonika front

Lividas, G.
A & L Medical Supplies Ltd, Athens, Greece

Military radiology was born during the Greco-Turkish war of 1897 and further advanced by British medical forces in consecutive wars in Afghanistan, Sudan and South Africa while Americans used X-rays in the Spanish American war of 1898. World War I was the war that mobilized 65 million fighting men, while producing vast number of casualties and 10 million dead. Radiology equipment by then, were much more advanced and radiology personnel had acquired considerable experience. Radiology played a considerable role on the fields of war and X-rays had already been accepted as a necessary department in any hospital. Only in the Commonwealth forces there were 520 radiology machines operating in 122 General hospitals, 79 Stationary hospitals and 66 hospital ships, taking more than one million X-rays per year. The Gallipoli Campaign, an effort to relieve pressure on the Western Front, was followed by the Salonika Front, a result from an Allied attempt to aid Serbia fighting against the Central Powers. This was a rather quiet front in comparison with the bloody Western Front. The multi-national Army of the Orient, half a million soldier strong, concentrated around Salonika and turned the whole area into a huge fortified camp. Malaria hit 40% of the forces and other diseases invalidated more cases than gun wounds that were treated in the dozens of military hospitals. Despite the fact that all hospitals were equipped with X-rays and famous radiologists served in Salonika, the standard of radiology was pour due to lack of training.

1530 A brief history of radiotherapy provision at the Christie Hospital

Pitt, A.
Christie Hospital, Manchester, UK

No abstract supplied.

1550 Radiology in Argentina

Buzzi, A.
University of Buenos Aires, Buenos Aires, Argentina

No abstract supplied.

1610 100 years of the Radiology section of the RSM, 1907–2007

Banerjee, A.K.
Birmingham Heartlands Hospital, Birmingham, UK

The first British radiology society was the Roentgen Society which was founded in 1897. This was essentially a society for medical and non medical men. In 1901 a breakaway group of exclusively medical men formed the British Electrotherapeutic Society. The last president of this organization was Hall-Edwards, a Birmingham radiologist and in 1907 this society along with several other organizations became incorporated into the newly formed Royal Society of Medicine in London. The first president of the Radiology Section or the Electrotherapeutic section, as it was known, was William Deane Butcher. He was named by Finzi as was of the 11 radiotherapy pioneers in the UK. He subsequently became the president of the Roentgen Society in 1909. His interest was primarily in radium treatment and protection for X-ray workers. Papers presented at the Electrotherapeutic Section were often published in the *Proceedings of the Royal Society of Medicine*. One of the particularly important presidents of the early period was Sir Archibald Reid who became President of the Electrotherapeutic Section in 1911 and played a major role in founding the British Institute of Radiology in 1924. The last president of the Electrotherapeutic Section was Woodburn Morrison in 1930. He also held the first Chair of Radiology at the Royal Cancer Hospital in London. In 1931 there were 159 Fellows in the Electrotherapeutic Section. The name was changed to the Radiology Section in 1931 and the first president of this newly named section was RR Reynolds. He pioneered X-ray cineradiography.

1430–1730
Interventional oncology: state-of-the-art minimally-invasive treatment of tumours

1430 Locoregional therapies for hepatocellular carcinoma

Karani, J.
King's Healthcare NHS Trust, London, UK

The association of cirrhosis and the histological cascade that results in the development of hepatocellular carcinoma is well established and results in approximately 1500 deaths per annum in the UK. There is strong epidemiological evidence that the incidence is rising and the prevalence of HCC worldwide parallels that of viral hepatitis. The only proven potentially curative therapy remains surgical, either hepatic resection or transplantation. The opportunity for resection is limited by the presence of cirrhosis and the risk of post surgical decompensation and many patients present with a tumour bulk outside inclusion criteria for liver transplantation. Therefore, the techniques of ablation and embolisation are used in the majority of patients for palliation or neo-adjuvant to resection or transplantation with curative intent. The evidence base is that these techniques result in improved survival with low morbidity with robust selection criteria. The selection criteria, practical technique and outcome of the key analyses of these therapies will be presented with reference to the current national guidance on the treatment of HCC.

1455 When to ablate liver metastases

Kane, P.
King's College Hospital, London, UK

Image guided ablation of liver metastases is an established therapy as part of the treatment of colorectal cancer, with less common but increasing utility in the management of breast, neuroendocrine and other metastatic diseases. Although effective for the treatment of small liver lesions, ablation remains only one of the tools available in the oncological management of these patients. This presentation will review the current literature on the performance of image guided ablation in these tumour groups and outline its place compared to and in conjunction with resective liver surgery when aiming for cure.

1520 Minimally-invasive techniques for tumours in bone

Gangi, A.
University Hospital Strasbourg, Strasbourg, France

No abstract supplied.

1615 Minimally-invasive techniques for breast tumours

Wilson, R.
King's College London, London, UK

PURPOSE: To describe the currently available techniques for imaged guided breast biopsy and excision. MATERIALS/METHODS: Surgery to the breast for diagnosis is now considered the last resort and is only undertaken when percutaneous needle sampling has failed to achieve a definitive diagnosis. Automated core biopsy has now largely replaced fine needle aspiration for cytology as the technique of first choice for breast lesion sampling as it provides detail of tissue morphology and is more reliable for both benign and malignant lesions. However, there remain a significant proportion of lesions that require larger volumes of tissue to achieve accurate diagnosis. To tackle this problem vacuum assisted and radiofrequency large volume and intact biopsy sampling devices have been developed for use under ultrasound, X-ray stereotactic and MR guidance. RESULTS: These large volume devices are increasingly been used to remove several grammes of breast tissue such that non-surgical diagnosis of breast lesions is achieved in up to 98% of cases, avoiding unnecessary surgery in benign disease and facilitating fully informed treatment planning for malignancy. The diagnostic success of these devices has lead to there routine use for therapeutic complete excision of benign and borderline breast lesions. CONCLUSION: Breast biopsy technology is now available to facilitate approaching 98% accuracy in breast diagnosis and the therapeutic

removal of selected breast lesions, dramatically reducing the need for surgical intervention.

1640 Ablation of lung tumours

Gilliams, A.
University College Hospital, London, UK

Radiofrequency, laser, microwave and cryotherapy have all been used in lung tumours. Radiofrequency ablation (RFA) is the most widely used technology although there are theoretical advantages for some of the other ablative modalities. RFA has been successfully applied to <3.5 cm tumours, either primary or secondary. The complication profile is well understood, pneumothorax occurs in 40%. Tube insertion is required in 10%, depending on the size and speed of development of the pneumothorax and baseline lung function. Other less common complications include pleural effusion, haemorrhage and infection. Lung function recovers to pre-ablation values following an initial reduction. On CT scans the ablation zone is initially seen as a subtle area of ground glass opacification. Over the next few months the ablation zone becomes progressively denser and more homogeneous and then reduces in size. Currently ablation is offered to patients with small volume but inoperable lung tumours. Median, 1-, 2- and 3-year survival of 33 months, 85%, 64% and 46% has been reported in one cohort of 55 patients with inoperable colorectal metastases. In primary lung cancer, ablation can be used in isolation or in conjunction with radiotherapy. 1-, 2- and 3-year survival figures in 41 patients with inoperable Stage I/II lung cancer treated with RF and radiotherapy were 87%, 70% and 57% with a mean survival for tumours <3 cm of 44 months. In conclusion ablation is both safe and effective for the destruction of small tumours. The role of ablation relative to other modalities is to be established.

1705 Small renal masses: Image-guided ablation

Breen, D.J.
Southampton University Hospitals, Southampton, UK

Both increased incidence and improved survival in renal cancer are considerably attributable to the incidental radiological detection of early stage disease and the advent of safe nephrectomy in the 1970s. Small kidney cancers should not, however, be dismissed as unimportant indolent cancers in an ageing population. Whilst, the 5-year survival has improved dramatically since the 1950s there has been a rise in the overall age-standardized mortality from kidney cancer from 3 to 4.5 per 100 000 population between 1971 and 2006 in the UK, for example. This equates with a rise in mortality attributable to kidney cancer of some 47% between 1971 and 2006 amongst those over 65 years of age. With regards to individual tumours the available natural history papers for small renal tumours indicate that there is a cohort of 15–20% which grow much more aggressively and as yet we have no simple method for identifying this subset. Urologic outcome data has clearly shown that partial nephrectomy can achieve identical oncological outcomes to standard/radical nephrectomy. Preservation of background renal function is an important consideration in this population and ablative procedures are increasingly being shown to have equally effective oncologic outcomes at 3–4 year follow-up. A number of different thermal energies including radiofrequency and cryoablation have been shown to be effective in the ablation of sub-4 cm (T1a) tumours. With careful image guidance and other interventional manoeuvres almost all sub-4 cm renal tumours are amenable to image-guided ablation with very low morbidity. The relative safety of image-guided ablative procedures now favours biopsy and ablation of smaller renal tumours as a contribution towards reduced mortality related to kidney cancer. These techniques will be discussed.

1545–1730
Accreditation for UK imaging services

1545 Accreditation

Garvey, C.
Royal Liverpool & Broadgreen University Hospital, Liverpool, UK

No abstract supplied.

1620 Providing professional leadership for accreditation

Paterson, A.
Society and College of Radiographers, London, UK

The Royal College of Radiologists (RCR) and the College of Radiographers (CoR) have spent three years working together to develop an accreditation scheme for imaging services in the UK. The resulting scheme, the Imaging Services Accreditation Scheme (ISAS), is beginning to roll out. Some might argue, therefore, that the job of the two colleges is now done. In reality, their work has simply moved from significant, detailed, technical work that was relatively straightforward to manage and control, to a point where the colleges need to exercise considerable joint responsibilities. At least, these responsibilities include leading the scheme through the initial accreditations, the first re-accreditation round, and review and revision of the standards that have been set for the accreditation process. In doing so, the colleges will need to ensure that the principles underpinning the scheme become wholly embedded in practice. To embed those principles (putting patient safety and experience at the heart of the scheme, playing a key role in improving clinical outcomes, assisting services to develop and use their workforce and resources effectively and, overall, to drive up the quality of imaging services across the UK) requires considerable leadership and, more difficult still, joint leadership by the two colleges. Key joint leadership matters include engagement with the professions and workforce; all imaging services, regardless of size and nature; and patients and the public. In addition, careful attention needs to be paid to relationships with the four health departments of the UK, strategic health authorities and service commissioners, and regulatory authorities and bodies. Early progress is promising; the Joint Accreditation Services Committee (JASC) has been established as the vehicle through which the two colleges will exercise its leadership and other responsibilities for imaging services accreditation. The work of JASC to date and the challenges that lie ahead will be discussed. AIM: To develop understanding of the continuing joint work of The Royal College of Radiologists and the College of Radiographers (the colleges) in relation to roll out of their imaging services accreditation scheme (ISAS). OUTCOMES: To outline the joint structures the colleges have established to enable them to provide the necessary joint leadership of ISAS; to explore the scope and the challenges of the leadership work required to ensure the scheme is successful, welcomed and valued by those who purchase, provide and use imaging services in the UK.

1640 Transition from project to reality

Beaumont, J., Glean, E.
UK Accreditation Service, UK

The speakers will outline briefly UKAS's credentials as the national accreditation body and its international reputation as a provider of assessment and accreditation services. Details will be given of the specific processes and structures, including web-based self-assessment and lay assessors as integral part of assessment teams, that have been put into place to enable UKAS to deliver competent and fair and assessments for ISAS customers in line with ISAS principles. The presentation will conclude with a brief outline of the route to accreditation and the key benefits that patients, healthcare professionals, managers and commissioners can expect to realise from imaging providers that participate with UKAS assessment and accreditation.

1600–1730
Trauma imaging: Bowel injury, CT signs of vascular injury and paediatric considerations

1600 Abdominal trauma: active bleeding, pseudoaneurysms and AV fistulas

Shanmuganathan, K.
University of Maryland Hospital, Baltimore, MD, USA

This lecture will discuss the diagnosis and management of posttraumatic vascular lesions including active bleeding, pesudoaneurysms, and AV fistula in patients undergoing contrast enhanced MDCT following trauma. These lesions have a major impact on management and outcome. The importance of differentiating active bleeding from vascular injury will also be discussed.

1630 Abdominal trauma: Bowel injury

Fox, B.
Plymouth Hospitals Trust, Plymouth, UK

No abstract supplied.

1700 Special considerations in children

Broderick, N.
Nottingham University Hospital, Nottingham, UK

LEARNING OBJECTIVES: At the end of the session participants will: appreciate the different patterns of injury between children under 10 years of age and older children/adults; understand the limitations and risks of excessive reliance on imaging, particularly CT; be aware of alternative imaging strategies in the injured child, especially in blunt abdominal injury. KEY REFERENCES: Brenner DJ, Elliston CD, Hall EJ, Berdon WE. Estimated risks of radiation-induced fatal cancer from pediatric CT. *Am J Roentgenol* 2001;176:289–96. Browning JG, Wilkinson AG, Beattie T. Imaging paediatric blunt abdominal trauma in the emergency department: ultrasound versus computed tomography. *Emerg Med J* 2008;25:645–8. Sivit CJ, Taylor GA, Bulas DI, *et al*. Blunt trauma in children: significance of peritoneal fluid. *Radiology* 1991:178:185–8.

1600–1700
Chest scientific session

1600 Digital dual-energy chest radiography does not compromise image quality

Stannard, M.J.[1], Gill, R.W.[1], Clarke, S.M.[1], Utting, S.[2], Hunt, A.[2], Knapp, K.M.[1]
[1]University of Exeter, Exeter, UK, [2]Poole Hospital, Poole, UK

PURPOSE-MATERIALS: Digital dual energy capabilities have recently been introduced by GE with the aim of improving soft tissue and bone visualization. Three images are produced from a low and high energy exposure; the standard chest radiograph, a lung image with the bones subtracted and a bone image with the lungs subtracted. The aim of this study was to evaluate the dose increase associated with digital dual energy chest radiography and any changes to image quality on the standard chest image. A chest phantom and GE definium 8000 were used to acquire digital single and dual energy chest radiographs. METHODS: 20 repeated exposures were made of the chest phantom and the dose–area product reading recorded for the standard protocol single-energy digital radiography (with and without grid) and dual energy digital images. 21 radiographers compared the single and dual energy images using a 7-point scale based on the European Commission's quality criteria for diagnostic radiographic images. All the reviewing radiographers were blinded to acquisition technique of the images. Statistical differences between the two images were tested using a paired *t*-test. RESULTS: The dual energy doses were significantly greater than the single energy doses at 1.59 dGY cm^2 and 0.46 dGy cm^2 (0.73 dGy cm^2 with grid), respectively. The mean image scores were 6.14/7 for the dual and 5.62/7 for the single energy images ($p<0.01$). CONCLUSION: The dual energy image resulted in a significant dose increase to the patient. However, improved image quality was yielded for the dual energy image when compared with the standard chest image.

1610 Are clinical parameters and biomarkers predictive of severity of pulmonary emboli as seen on CTPA?

Singh, L.K., Jeebun, V., Doe, S., Worthy, S., Forrest, I.
Royal Victoria Infirmary, Newcastle Upon Tyne, UK

PURPOSE-MATERIALS: CTPA findings including an estimation of clot burden and signs of pressure overload relate to outcome in PE. Little data exists correlating these findings with biomarkers. The aim of this study was to compare CTPA findings to clinical parameters and biomarkers. METHODS: Retrospective case note analysis of consecutive cases presenting to a large teaching hospital. CTPAs were reviewed by an independent radiologist and clot burden quantified using an obstruction index [1]. RESULTS: 137 cases were reviewed. Correlation was seen between clot burden and systolic blood pressure (BP) (r =-0.29, p=0.009) and heart rate (r=0.23, p=0.009). Median (range) obstruction index was greater when BP<90 mmHg (38.75 (2.5–65) *vs* 15 (2.5–70); p=0.002). Significant correlation between clot burden and D-dimer was seen (r=0.36, p=0.0002). Location of thrombus was associated with significant differences in D-dimer level. There was significant correlation between Troponin I and clot burden (r=0.41; p=0.04) and RV/LV ratio (r=0.65, p=0.003) (n=24). CONCLUSION: These findings suggest that clinical parameters and biomarkers have a role in predicting clot burden and support the need for further studies of risk stratification in patients presenting with PE. Reference: 1. Qanadli, *et al*. *Am J Roentgenol* 2001;176:1415.

1620 Impact of British Thoracic Society guidelines for patients with suspected pulmonary embolus, a comparison of 2003 and 2008

Jepson, S.L., Raj, J.V., Entwisle, J.J.
Univeristy Hospitals of Leicester, Department of Radiology, Leicester, UK

KEY LEARNING OBJECTIVES: We reviewed the implementation of British Thoracic Society Guidelines for Patients with Suspected Pulmonary Embolus and assessed if this had changed imaging practice and diagnostic yield. DESCRIPTION: All reports of CTPA and VQ scans ($^{99}Tc^m$ ventilation perfusion) for suspected PE in January 2003 and January 2008 were reviewed on the trust Radiology Information System. 2003: 107 patients, 108 investigations, 21.3% were positive for PE. 68 CTPAs in 67 patients: 1 indeterminate (repeated), 17 positive for PE, 5 out of hours. 40 VQ scans in 40 patients: 29 low/normal, 5 indeterminate, 6 high probability. 2008: 175 patients, 179 investigations, 22.3% were positive for PE. 173 CTPAs in 169 patients: 5 indeterminate (repeated), 39 positive for PE, 23 out of hours. 6 VQ scans in 6 patients: 3 low/normal, 2 indeterminate, 1 high probability. In patients with repeated imaging, ultrasound demonstrated central venous thrombus after a negative CTPA in a single 2003 patient. In 12 patients who had negative CTPA (1 in 2003, 11 in 2008) a subsequent CTPA repeated within the next 6 months was always negative. Further work is required to evaluate this subgroup. CONCLUSIONS: An increased number of patients investigated has led to an increased number of patients diagnosed with PE with minimal increase in the overall diagnostic yield. More were performed out of hours. Increase in patients having subsequent CTPA in subsequent 6 months, these have a very low diagnostic yield.

1630 Chest radiograph reporting terminology can delay management of bronchogenic carcinoma

Griffiths, G.J.[1], Perez, N.[1], Owen, R.[1], Bleehen, R.[2], Adams, H.[2]
[1]University Hospital of Wales, Cardiff, UK, [2]University Hospital of Llandough, Cardiff, UK

PURPOSE: To assess how phrasing of the initial abnormal chest radiograph report influenced referral time to a lung cancer multidisciplinary team (MDT). MATERIALS/METHODS: Chest radiographs of 100 patients with lung cancer presented to an MDT were reviewed by two radiologists who graded the radiographic appearance by consensus. Radiographic appearance, reporting terminology and report conclusion were each scored on separate 3-point scales. Report terminology and conclusion were correlated with the radiographic appearance and time to MDT presentation.

RESULTS: 53% of all patients had a chest radiograph assessed as showing probable malignancy (radiographic grade 3), in 16% there was judged to be possible malignancy (grade 2) while in 31% the appearance was regarded as non-specific (grade 1). Only 34 % of patients had cancer reported in definite terms (report grade 3), in 26% the possibility of cancer was raised (grade 2) but in 40% specific cancer terminology was not used (report grade 1). There was delay in presentation to MDT of report grade 1 patients (interval 64 days) compared with report grade 2 patients (49 days) and report grade 3 patients (36 days). The interval difference between groups 1 and 3 was statistically significant (p<0.001). CONCLUSION: Reasons for choice of reporting terminology are multifactorial. Even when lung cancer is radiographically apparent and recognized as such, use of imprecise reporting terminology contributes to delay in presentation to MDT.

1640 Does integrated PET-CT accurately stage non small cell lung cancer?

Harryman, O.A.[1], Hassan, M.[1], Zacharias, J.[1], Coffey, J.[2], Hill, J.C.[2], Kane, T.[1]
[1]Victoria Hospital, Blackpool, UK, [2]Royal Preston Hospital, Preston, UK

PURPOSE: To evaluate retrospectively the accuracy of integrated PET-CT for the pre-operative staging of non-small cell lung cancer (NSCLC), with surgical and histological staging as the reference standard. MATERIALS/METHODS: All patients (n=104) who had a pre-operative PETCT and surgery for potentially resectable NSCLC at Victoria Hospital, Blackpool between January 2006 and December 2007 were included. Post-operative staging was obtained from the cardiothoracic lung cancer database and case notes. All PET-CT reports were reviewed. The PET-CTs were double- or triple-reported by three radiologists. RESULTS: T-staging: The primary tumour was correctly staged in 71 of 98 patients (72.4%). Ten patients were overstaged and 14 patients were understaged by PET-CT. N-staging: 72/101 (71.3%) were correctly staged. 23 patients were overstaged and five patients were understaged. The sensitivity and specificity of regional lymph node staging were 70.6% (12/17) and 72.0% (59/82), respectively. The positive predictive value is 34.3% (12/35) and the negative predictive value is 92.2% (59/64). CONCLUSION: This study has confirmed results from previous studies, showing that PET-CT has a measurable and significant error rate in nodal staging of non-small cell lung cancer. The most common source of error is overstaging of nodal disease due to positive fluorine18 fluorodeoxyglucose uptake in inflammatory or reactive nodes secondary to infection. Our results support the continuation of surgical practice to confirm nodal staging by mediastinoscopy in patients reported as N2 but who are otherwise operable. Our results would support proceeding to attempted curative resection in PET-CT staging of N0 disease.

1650 Computed tomography follow up following radical radiotherapy for lung cancer: Utility of baseline scan

Musson, R.[1], Fisher, P.[2], Matthews, S.[1]
[1]Northern General Hospital, Sheffield, UK, [2]Weston Park Hospital, Sheffield, UK

PURPOSE: Debate surrounds imaging follow up after radical lung cancer treatment. Our current practice is to perform a contrast enhanced CT at 3 months post treatment. The rationale is to obtain a baseline, assess treatment response and detect recurrent disease. Our aim is to ascertain the subsequent impact of this scan on further management. MATERIALS/METHODS: 136 consecutive patients received radical treatment for lung cancer between January 2006 and December 2007. A baseline post treatment CT scan was performed in 85 patients (43 post radiotherapy; 42 post surgery). RESULTS: Post radical radiotherapy scans were performed in 43 patients (Mean time to scan 4.3 months, range 3–6 months). 12 of 43 (28%) scans were considered useful: 3 showed unsuspected metastases and 3 progressive disease thus guiding palliative treatment. One incidental pulmonary embolism was diagnosed. One case revealed suspicious pleural thickening requiring follow up. In 4 patients the scan provided a valuable baseline enabling the differentiation of fibrosis from recurrence on investigation of new symptoms. A further 9 of 43 (20%) had extensive radiotherapy change or residual mass and the baseline may be useful in the future. In 22 of 43 (51%) patients the scan did not provide information affecting management. In this group, 6 patients had subsequent metastatic disease that was readily diagnosed without reference to a baseline scan. CONCLUSION: In 28% of patients the post radiotherapy scan affected patient management and permitted an informed choice on further treatment options. Therefore, a baseline scan was considered beneficial for the small overall proportion of patients suitable for radical therapy.

1600–1730
Neuro/head & neck keynote and scientific session

1600 A white matter lesion! Help! Do I report it?

Quaghebeur, G.
John Radcliffe Hospital, Oxford, UK
(On behalf of Hourihan, M.)

PURPOSE: To describe a practical approach to diagnosis white matter diseases. MATERIALS/METHODS: The imaging appearances of white matter lesions caused by many different pathologies is often non specific. MRI is the preferred technique for imaging white matter lesions, but its sensitivity is not matched by its specificity. Categorising the appearances of white matter lesions based on cross-sectional imaging and with the knowledge of the clinical context they occur in, provides a practical approach to their diagnosis. RESULTS: White matter lesions will be categorised into: 1. multifocal; 2. confluent or diffuse; and 3. lesions that have a geographic predilection for involvement of specific white matter. CONCLUSION: Using a strategic approach to reviewing MR scans and with knowledge of the clinical context, the radiologist will be able to provide a limited and accurate differentiate diagnosis for white matter lesions in the adult patient.

1630 Evaluating lingual carcinoma for surgical management. What does volumetric measurement with magnetic resonance imaging offer?

Boland, P.W.[1], Watt-Smith, S.R.[2], Pataridis, K.[1], Alvey, C.[1], Golding, S.J.[1]
[1]Nuffield Department of Surgery, Oxford University, Oxford, UK, [2]John Radcliffe Hospital, Oxford, UK

PURPOSE: MRI plays a crucial but underutilized role in the surgical management of lingual squamous cell carcinoma (SCC). This work studied the value of the MRI-measured tumour volume (Tv) as a predictor of 2-year disease-related survival (DRS) and disease-free survival (DFS), as well as occult cervical lymph node metastasis, in lingual cancer. Tv was also compared with the more established measure of tumour thickness (Tt). MATERIALS/METHODS: 40 patients presenting with lingual squamous cell carcinoma and undergoing surgical resection with curative intent between 1998 and 2006 were identified retrospectively. The Tv (cm^3) was determined using manual segmentation while Tt (mm) was defined as the distance from the tumour surface to the deep margin. All measurements were done using T_2-weighted coronal and axial studies. RESULTS: Significant differences in DRS ($chi^2(1)=7.7$, p=0.005) and DFS ($chi^2(1)=5.6$, p=0.02) at 2 years were found using a cut-off of 8.0 cm^3. Similarly, a significant relationship between Tv and occult cervical lymph node metastasis was discovered when the Tv data was dichotomized using a 3.0 cm^3 cut-off (p=0.02, Fisher's Exact Test). Contrary to the currently predominant view, Tt as measured on MRI was not found to predict survival or occult cervical lymph node metastasis. CONCLUSION: Tumour volume measured on MRI can play a role in the staging of lingual squamous cell carcinoma and offers an avenue for refinement of current TNM staging criteria. Volume can better identify patients with clinically occult cervical lymph node metastases during the surgical planning phase of treatment.

1640 Prospective study of normal patterns of FDG uptake in the head and neck seen with PET-CT

Nasoodi, A., Hughes, S.
Belfast Trust, Belfast, UK

PURPOSE: To describe in detail the normal patterns of [F18]2-fluoro-2-deoxy-D-glucose (FDG) uptake in high quality combined positron emission tomography and computed tomography (PET-CT). MATERIALS/METHODS: 40 prospective PET-CT scans were assessed during a routine oncological PET-CT service over 1 year. Patients with movement misregistration, a history of head and neck or chest disease and patients with a history of treatment for head and neck or chest disease were excluded. If there was evidence of chest disease, including emphysema, on the CT component of the PET-CT then these patients were also excluded. The patterns of FDG uptake and their anatomical position were described including the mean and range of normal of the maximum standardized uptake value (adjusted for body weight – the SUV_{max}) and the asymmetrical index. RESULTS: The dominant patterns in the head and neck are defined by salivary glands (including the hard palate), lymphoid tissue (including the fossa of Rosenmueller), obligate glucose somatic musculature (*e.g.* orbital recti) and variable somatic muscles of the neck. Focal uptake is also seen in particular regions of the skin (*e.g.* posterior to the pinna). CONCLUSION: The patterns of FDG uptake seen in a high quality PET-CT scan are clearly definable, some are normally variable and many are in important regions for the assessment of epithelial cancers in the head and neck. This detailed appreciation of normal patterns will aid reporters in helping prevent under-reporting and over-reporting of FDG PET-CT in this region that is often considered difficult and complex.

1650 Salivary gland ultrasound and fine needle aspiration cytology: Adequacy and accuracy

Winfield, A.E., Hansmann, A., Remedios, D.
Northwick Park Hospital, Harrow, UK

PURPOSE: Head and neck lump clinics play a major role in the early detection and accurate diagnosis of potential cancers. A considerable proportion of referrals are patients with salivary gland masses. There is a paucity of good quality data in the literature to inform medical professionals of the standards to be achieved for adequacy of fine needle aspiration (FNA) specimens or for accuracy of ultrasound diagnoses specifically for salivary pathology. METHODS: Consecutive patients underwent ultrasound and FNA by a single operator over 15 months. Retrospective review of the ultrasound reports and cytology results was performed. FNA specimens were considered adequate if the cytology was diagnostic. Accuracy of ultrasound diagnosis was assessed by comparing the ultrasound diagnosis/differential with the gold standard of cytological diagnosis. Histopathology was used as an arbiter wherever possible in discrepant cases. RESULTS: Of the 53 cases collated, 46 (86.7%) had parotid pathology, 6 (11.3%) had submandibular pathology and 1 (2%) had both parotid and submandibular pathology. 1 case in which an ultrasound diagnosis of mucoepidermoid carcinoma was not confirmed on cytology was later proven on surgical pathology. The FNA specimen adequacy rate was 46 of 53 (87%). The accuracy of ultrasound diagnosis was 44 of 47 (94%). CONCLUSION: FNA adequacy rate of 87% is comparable with published series for thyroid and nodal FNA. Ultrasound diagnostic accuracy of 94% is in line with the subjective diagnostic impact of this modality. We suggest these figures could be used as an aspirational standard for audits of head and neck lump clinics.

1700 Primary hyperparathyroidism – testing a strategy for imaging and surgery

Ng, F., Bhattacharyya, M., Hirji, H.F.M., Remedios, D.
Northwick Park Hospital, Middlesex, UK

PURPOSE: In primary hyperparathyroidism, focused or minimally-invasive parathyroidectomy with excision of a single gland enables day surgery. We have previously suggested that such surgery has a high success rate when there is concordance of sestamibi and ultrasound findings. This study aims to test the protocol for using these modalities to guide surgery and to assess the accuracy in identifying the position of adenomas. MATERIALS/METHODS: Parathyroid imaging with ultrasound and sestamibi scintigraphy was performed in consecutive patients with primary hyperparathyroidism who went on to have parathyroid surgery. Imaging results were correlated with surgical technique (focused *vs* bilateral exploration), intraoperative findings and pathology reports. Postoperative normocalcaemia was used as an indicator of surgical success. RESULTS: In 23 of 29 (78%) patients undergoing surgery, imaging reports agreed on the side of the adenoma. 19 of 23 patients were suitable for focused surgery, with 17 (89%) achieving postoperative normocalcaemia and subsequently confirmed to have parathyroid adenoma on pathology. Reasons for open surgery in 4 of 23 patients with concordant imaging were: a low intra-thymic adenoma, suspected carcinoma, removal of a thyroid nodule during the same procedure and technical difficulty due to habitus. CONCLUSION: For parathyroid adenoma the protocol using ultrasound and sestamibi can reliably predict which patients may be selected for focused or minimally-invasive surgery with 89% success when imaging findings are concordant. The protocol is less helpful in guiding focused surgery in cases where: sestamibi findings are equivocal for example in hyperplasia, if carcinoma is suspected or atypical biochemical profile for example hypercalcaemic hypocalciuria.

1710 A review of the jugular foramen covering anatomy: Pathology and image optimization

Sandhu, V., Senthil, L.
University Hospital Birmingham, Birmingham, UK

KEY LEARNING OBJECTIVES: To review the anatomy of the jugular foramen and to understand the common disease processes of this complex region so that correct diagnoses are made. DESCRIPTION: Jugular foramen lesions may spread either cranially to involve the brain, or caudally to involve the neck spaces. In addition, the jugular foramen becomes the route of transmission for infective and neoplastic processes from above and below the skull base, which frequently result in radiological changes. We present a series of multimodality images, demonstrating a spectrum of common and complex disease processes involving the jugular fossa. We discuss the relevance of optimizing the imaging modalities using techniques like flow sensitive angiographic sequences, and fat saturation sequences in aiding the diagnosis. High resolution MR and CT imaging are necessary and often complementary. Surgery complicating anatomical factors such as relationship with major vasculature and cranial nerves influencing the surgical approach are discussed. Normal variants and ways to avoid the diagnostic pitfalls are reinforced. CONCLUSION: Knowledge about the signal characteristics, vector of the growth pattern and morphology of the jugular fossa lesions are essential in making the correct diagnosis. Involvement of adjacent vital structures is more important than characterizing the lesions.

1720 A comparison of computed tomography and magnetic resonance imaging in the diagnosis of jugular foramen lesions

Christie, A., Teasdale, E.
Institute of Neurosciences, Glasgow, UK

PURPOSE: There are currently no comparative studies of CT and MRI in the diagnosis of jugular foramen lesions. The preferred modality is often at the discretion of the radiologist, with many patients having both studies performed. MATERIALS/METHODS: 17 patients were included with lesions predominately at the jugular foramen. 15 had imaging with both modalities, and post-operative pathology was available for 13. CT was performed at arterial phase and MRI with contrast enhancement. An experienced neuroradiologist blindly re-reported all the images retrospectively. Enhancement (with Hounsfield unit values for CT), jugular vein involvement and the presence of enlarged feeding vessels were documented in addition to a diagnosis. RESULTS: Pathology reported 7 neuromas and 6 glomus

jugulare tumours, which were all correctly diagnosed on CTA. Only glomus tumours showed enhancement at arterial phase. However, in 6 (86%) of the neuromas, the MRI showed enhancement and the report included neuroma and glomus in the diagnosis. The 6 proven glomus tumours showed enhancement on MRI, with 5 showing the characteristic "salt and pepper" appearance. CTA allowed confident assessment of the jugular vein in all cases, but MRI was inconclusive in 33%. CONCLUSION: The diagnosis of neuroma can be made more confidently with CTA. Furthermore, CTA is more reliable is assessing the jugular vein patency, which is useful information for the surgeon pre-operatively. Also, in the 9 cases of glomus tumour diagnosed on CTA, an enlarged feeding vessel was identified in 8. This information can be used when therapeutic embolisation is being considered.

1600–1730
Radiation protection scientific session

1600 Testing the shielding of the first CyberKnife Stereotactic Radiosurgery Unit in the UK

Hosseini-Ashrafi, M.[1], Khan, S.[2]
[1]Portsmouth Hospitals NHS Trust, Portsmouth, UK, [2]Radiation Consultancy Services Ltd, London, UK

The emergence of new megavoltage radiation therapy systems with novel approaches to dose delivery has created new challenges to radiation shielding design and radiation protection management. The facility which will be described in this presentation, houses the CyberKnife robotic radiosurgery systems manufactured by Accuray™ and has been built in the basement of an historic building located in central London. Due to space limitations and restrictions caused by permanent construction features, the primary shielding material of choice was lead and a direct-shielded door was incorporated. Also influencing the shielding design were the existing activities and occupancies around the treatment room. These included various offices, waiting areas, treatment and examination rooms, utility rooms, corridors, lifts and service shafts. The testing programme, the results of which will be detailed in this presentation, included a full shield integrity test using the 6 MV X-ray beam from the CyberKnife. The presentation will detail various aspects of the design and testing of this first UK megavoltage robotic radiosurgery systems facility. As well as describing the approach to the shielding design, special recommendations including for area designation and incorporation of a programme of passive area monitoring will be discussed.

1610 Radiation protection of the operator when using a handheld dental X-ray device

Eaton, R., Johnson, B., Gallacher, D.
Guy's & St Thomas' NHS Foundation Trust, London, UK

PURPOSE: The Aribex NOMAD (Orem, USA) handheld X-ray unit (60 kVp, 2.3 mA, exposure time 0.01–0.99 s) is marketed as a simple-to-use portable device for intra-oral radiography. The operator holds the X-ray tube casing during exposure, contravening various paragraphs of the Medical and Dental Guidance Notes (IPEM, 2002). This work assesses operator doses due to tube leakage and backscattered radiation. Radiation protection implications, such as the extent of the controlled area, are discussed. MATERIALS/METHODS: Leakage and scatter doses were measured using an 1800 cm^3 ionization chamber (Radcal, Monrovia, USA). For scatter measurements, the beam was directed at a Rando phantom head. RESULTS: The maximum leakage dose rate at the device surface was 13 μSvh^{-1} (averaged over 1 minute) giving an annual finger dose of approximately 0.6 mSv under an assumed workload of 100 films per week. The estimated annual whole body effective dose was 0.2 mSv if the in-built lead plastic shield is used correctly. This rises to 0.6 mSv if shielding was used incorrectly. The instantaneous dose rate was less than 7.5 μSvh^{-1} at 1.5 m from the source of scatter. CONCLUSION: Estimated operator hand and whole body doses were within annual dose limits. However, use of the system must be clinically justified over the use of a conventional static or mobile dental X-ray tube. A controlled area should be defined extending within the primary beam and to 1.5 m from the source of scatter. Operators must be trained in the correct use of the unit and integral shielding.

1620 Ceretom mobile CT scanner in neuro-intensive care; Aspects in regulatory compliance and radiation protection

Stevens, G.C.[1], Rowles, N.P.[1], Foy, R.T.[2], Loader, R.J.[1], Barua, N.3, Palmer, J.D.[3]
[1]Plymouth Hospitals NHS Trust, Plymouth, UK, [2]Royal Cornwall Hospitals NHS Trust, Truro, UK, [3]Plymouth Hospitals NHS Trust, Plymouth, UK

PURPOSE: To outline methodologies used to produce a radiation policy for the use of the Ceretom in an open ward environment, and ensure regulatory compliance to UK radiation regulations. MATERIALS/METHODS: Novel shielding was designed and incorporated into the Ceretom. The scatter distribution was measured with a Perspex CT head and chest phantom to mimic patient attenuation/scatter, using a single slice at maximum rated tube current (7 mA), with the shields *in situ*. The scatter distribution was measured at sequential 0.5 m and 1 m distances from the unit's bore to build a matrix showing the secondary scatter over 8 m × 8 m. This matrix was then used to simulate the dose distribution across the ward, (assuming an inverse square relationship to dose for points outside the measured area). The dose to adjacent patients and staff members was used with a planning dose constraint of 0.3 mSv to find the number of scans allowed per bed per year. RESULTS: The shielding significantly reduced scatter laterally and to the rear of the unit; without this, a practicable solution was impossible. The simulation showed a maximum of 42 scans per bed per year could be permitted whilst adhering to the planning dose constraint of a 0.3 mSv dose to the public (using a 4 m bed separation and 60 day maximum patient stay). CONCLUSION: It is possible to provide a practical radiation policy for the use of the Ceretom in an open ward. However, there are severe constraints on this use.

1630 Image quality and dose in computed tomography, a regional audit

Bate, N.S, Weir, N.
NHS Lothian, Edinburgh, UK

PURPOSE: To compare image quality in a number of CT examinations for radiology departments across NHS Lothian and NHS Fife, and establish whether there is any correlation with dose, identifying potential for dose optimization. MATERIALS/METHODS: Dose audits were carried out across the region, whereby DLPs were collected for patients of standard weight 50–90 kg. This gave an average DLP for each scanner for three examinations (head, chest-liver, abdo-pelvis). Noise levels in clinical images were also audited by accessing patient images. Noise was measured as the standard deviation of CT number in the descending aorta (chest/abdo) or ventricles (head). Both DLPs and measured noise were then compared between seven scanners. RESULTS: We had expected that DLP values vary from scanner to scanner. However, we had hoped that these differences could be justified by equal image quality. The study found that radiologists were accepting a significant range of image quality across the region. Noise levels varying significantly can be attributed to a combination of factors, including imaging parameters, directly related to dose (*e.g.* tube current) and those not directly related to dose (*e.g.* kernel, slice thickness) CONCLUSION: At centres where higher DLPs are leading to below average noise levels the image quality data provide evidence to challenge whether these higher dose protocols are clinically justified. Changes could be made to protocols to ensure images quality is consistent across the region and doses as low as reasonably achievable. This approach offers a further step in dose–image quality optimisation beyond simple comparison against existing DRLs.

1640 A language for effective communication between surgeons and radiographers in trauma theatre

Chaganti, S.R.[1], Kumar, D.[1], Patil, S.[2], Alderman, P.M.[1]

[1]Royal Gwent Hospital, Newport, UK, [2]Princess of Wales Hospital, Bridgend, UK

KEY LEARNING OBJECTIVES: To familiarise with the nomenclature of various movements of the Image Intensifier and possible precise commands for various movements. DESCRIPTION: The advent of the Image Intensifier (II) has revolutionized trauma surgery since its development in 1955. The manufacturers have given names to various movements of the machine in the operating manual but it has not been popular among the orthopaedic surgeons or the radiographers. Lack of knowledge of names of various movements and ambiguity in command often leads to confusion between the surgeon and the radiographer regarding which way to move the II. A questionnaire based study was conducted to assess the efficacy of communication between orthopaedic surgeons and radiographers while using the image intensifier intra-operatively. Diagrams depicting the movements of the image intensifier were used in the questionnaire. Fifty questionnaires were given to orthopaedic surgeons and 50 to radiographers to name the various movements. Ninety questionnaires were returned, 45 from surgeons and 45 from radiographers. Five questionnaires from surgeons and five from radiographers were returned blank. 97% could name the vertical movement, 68% the horizontal movement, 12% the swivel and 29% the angulation movement. None (0) could name the orbital movement. CONCLUSION: knowledge of the movements of the image intensifier can improve the efficacy of communication between surgeons and radiographers. A common language and precision in command can avoid confusion and has the potential to improve theatre time utilisation and also reduce the unnecessary radiation exposure to patients.

1650 An investigation into the use of the exposure index value in Irish X-ray departments

Butler, M.-L., Brennan, P.C., Rainford, L., Last, J.
University College Dublin, Dublin, Ireland

PURPOSE: The exposure index (EI) offered by manufacturers indicates whether appropriate exposure levels have been selected. This study investigates the use of EI in Irish Radiology Departments across a range of manufacturers. METHOD: A nationwide survey questionnaire was distributed to 294 radiographers. The survey examined awareness of radiographers regarding EI, both as a dose reducing and image quality tool and explored factors that may influence awareness such as education, on-call duties, use of multiple manufacturers and staff training. RESULTS: Preliminary results show that a varied approach towards this tool exists. 96% of radiographers surveyed are aware of EI. However, only 45% know the value of EI for common projections. 43% claim to always use EI as a guide for image quality, with 10% never using the EI. Almost 60% of radiographers stated they were equally likely to use the EI as an aid in an on-call situation compared with regular working hours. 51% thought manufacturers guidelines accurately represent optimum exposures, and 16% thought only in few or no circumstances. Specific projections where guidelines were considered not optimal were lumbar spine, thoracic spine, portable chest and Swimmers. 55% of clinicians felt that the use of EI, with any manufacturer, aided in dose reduction whilst 34% did not think EI was an effective dose-reducing tool. CONCLUSION: Variations in the understanding of the aim and employment of EI reduce their dose monitoring efficacy. Greater emphasis on the correct usage of EI should be evident within all training, departmental inductions and staff manuals.

1700 IRMER – What is it? Assessment of foundation trainees

Gafoor, N.F.[1], Nensey, R.R.[1], Pinder, A.[2], Rowles, N.[2], Mukonoweshuro, W.[2]
[1]Peninsula Radiology Academy, Plymouth, UK, [2]Derriford Hospital, Plymouth, UK

LEARNING OBJECTIVES: To make foundation trainees aware of IRMER and its implications on modalities involving radiation DESCRIPTION: To improve the awareness of IRMER among the new foundation trainees, an electronic learning module has been designed. The module has information about the radiation risks, the doses of common examinations and referrer/practitioner's responsibilities. At the end of the session the trainees were provided with self-assessment questions. The trainees were assessed before and after the electronic learning module training. CONCLUSION: The electronic module training helped the trainees to improve their knowledge about IRMER and apply it appropriately in their daily practice.

1710 The compliance with IRMER of the radiographs that are the responsibility of clinicians

Bano, F., Khan, S.H.
East Lancashire NHS Trust, Blackburn, UK

PURPOSE: In the busy radiology department many radiographs are not reported by the radiologists but are the responsibility of the requesting clinician to report and document them in the notes. To assess the percentage of such radiographs reported and documented in a large hospital. MATERIALS/METHODS: 100 radiology request cards, from five departments covering inpatients, chest, fracture, dental and rheumatology clinics. These were collected over a fortnight and the case notes reviewed a month later to assess the documentation and interpretation of these radiographs. RESULTS: 52% had documentation of the radiographs and interpretation in the notes. All the cases that had documentation of the radiograph, also had interpretation. The best specialty complying with IRMER was fracture clinic (85%) and the worst dental clinic (31%). The Consultants comprised 31% of the clinicians documentation. CONCLUSION: the documentation of radiographs and the interpretation is poor despite IRMER requirement of full compliance. Some specialties are more compliant than others. This indicates need for educating the clinicians the about the responsibility they shoulder as per IRMER.

1720 Constrained by R&D dose limits?

Rawson, M.H., Foley, M., Howard, H.P.
Royal Wolverhampton Hospitals NHS Trust, Wolverhampton, UK

PURPOSE: IR(ME)R 2000 [1] regulations 4 and 7 require research programmes to set dose constraints for diagnostic exposures where there is no individual benefit to the patient and target dose levels for those who are expected to receive benefit. Various approaches have been taken by medical physics experts (MPEs) to ensure compliance with the legislation. This paper focuses on the multi-region drugs trials with national ethical approval processes. The general procedure followed is for a lead MPE to set the constraint or target; with each site then responsible for ensuring compliance using advice from a local MPE. This paper presents one medical physics centre's perspective on the methods in use. METHOD: The authors have undertaken both lead and local MPE roles. A number of different approaches from the different lead MPEs have been identified by the authors. These approaches are compared and contrasted with an emphasis on the relevance and practicalities of the methods and consequences to the research proposals. RESULTS: An analysis of the MPE work in over 30 ethical approval processes is presented. CONCLUSION: There are two motivations for deriving dose levels during the ethical approval process: estimating risk to volunteers and compliance with legislation. This work examines whether current practice meets these objectives in an efficient manner. REFERENCE: 1. The Ionising Radiation (Medical Exposure) Regulations 2000 (SI 2000 No 1059). HMSO, 2000.

Notes

Scientific programme abstracts Tuesday 9 June

0830–0930
MRI school II – Ankle
0830 Ankle pain and instability

Gafoor, A.
Derriford Hospital, Plymouth, UK

Multi-planar imaging and superior resolution of MRI makes it an ideal tool for investigating and identifying the causes of ankle pain and instability. Although radiographs have a role in identifying bony pathology, especially fractures and bone tumours, MRI is superior in identifying subtle bone and soft tissue abnormalities. We will discuss the bone and ligamentous anatomy and discuss common abnormalities that cause pain and instability including bone bruising, osteochondral fractures and ligament disruptions. We will also discuss the role of MRA (MR arthrography) in evaluating the ankle ligaments. We will also discuss some congenital pathology (e.g. tarsal coalition) that predispose to pain. By the end of the session one will be able to: 1. identify bones and ligaments that constitute the ankle joint; 2. understand the role of MRI and MRA in evaluating the ankle; 3. identify the causes of ankle pain and instability.

0900 MRI ankle – Tendons and other soft tissues

Khan, S.H.
East Lancashire NHS Trust, Blackburn, UK

Ankle soft tissue disorders are common in radiology practice. Ligamentous injuries of the ankle are the most common sports injury. Although ultrasound is useful in the hands of skilled operator but MRI has the advantage of three dimensional assessment of the soft tissue as well as bony structures. MRI is the preferred modality of choice in the assessment of the structures such as sinus tarsi. The presentation will include imaging strategies and MR sequence protocols. Recognition of normal variants which are frequently found in the ankle and avoid the pitfalls. The presentation will focus on the practical aspects of MRI of ankle and the kind of information that the surgeons' expect from such examinations.

0830–0930
Cardiac imaging for the non-cardiac radiologist
0830 Important cardiac pathology that may be seen on MRI

Harden, S.
Southampton General Hospital, Southampton, UK

MR is a very useful clinical tool for assessing the presence of cardiac pathology. This presentation will demonstrate some of the pathology that can be identified incidentally, such as when performing MRI of the thoracic aorta, and then show how these abnormalities can be further characterized with dedicated cardiac MR sequences. The important aspects of imaging technique will be explained.

0900 Important cardiac pathology that may be seen on chest CT

Sparrow, P.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: To encourage general radiologists to examine the heart as part of any cross sectional examination of the thorax; Describe the important pathologies potentially visible on non-gated thoracic CT. DESCRIPTION: A brief overview of relevant cardiac anatomy. Brief descriptions of relevant pathophysiology and relationship to imaging findings. Presentation of appropriate representative images. CONCLUSION: The heart is literally central to cross sectional thoracic images. As with any branch of diagnostic imaging an understanding of anatomy and the pathophysiological processes likely to affect an individual organ is crucial to identification of same. However, the first and most vital step to this process is to actively seek abnormalities.

0830–0920
Optimizing the digital image: From exposure to presentation – DR
0830 The basics of the digital image and DR

Kotre, J.
Newcastle General Hospital, Newcastle-upon-Tyne, UK

PURPOSE: To discuss the physics of direct digital radiography with particular emphasis on optimization. MATERIALS/METHODS: There is a rapid market move towards direct digital radiography (DR) as the receptor of choice. The practical advantages of high throughput coupled with the technical advantages of wide dynamic range, good spatial resolution and excellent detective quantum efficiency combine to offset the high capital cost of these devices. The response of these receptors is, in general, different from the screen–film systems they replace, and markedly different from their main digital competitor; computed radiography. This may mean that experience with optimizing screen–film will not transfer directly to DR, and that the optimization for CR and DR may well involve different approaches. RESULTS: The results from optimization studies and feedback from radiographer experience will be presented. CONCLUSION: The physics of DR leads to a route to optimization that will be different from that for screen-film and for CR.

0855 Radiography practice with DR

Cosson, P.
University of Teesside, Middlesbrough, UK

No abstract supplied.

0900–1000
Service delivery scientific session I
0900 Practical implementation of changes using lean in radiology

Martin, A.J.
Royal Bolton Hospital NHS Foundation Trust, Bolton, UK

PURPOSE-MATERIALS: Lean has a long and interesting history. The reference model for lean and quality is the Toyota Production System, developed in the motor industry. The fundamental principles of lean production can be used in any industry and healthcare is no exception. As Fillingham highlights, there are often long delays in diagnostics suggesting that the use of lean could be extremely beneficial in this service. METHODS: Lean methodologies were used to streamline processes within the radiology department. This presentation reviews the journey so far within CT, ultrasound, plain imaging and the appointments cell at the Royal Bolton Hospital, exploring the challenges faced and the successes achieved through using lean methods to help us provide a better service. RESULTS: Using lean we have: reduced GP reporting from 7 weeks to 2 days maximum; changed templates in ultrasound and CT to create better flow with more capacity and ability to image one stop patients from ENT; third HCA in ultrasound has improved flow; speedier diagnosis, reduced admissions and bed nights by developing ultrasound service in the Emergency Department; stroke patients scanned within 30 mins during daytime; reduced waits for orthopaedic patients; developed dedicated orthopaedic radiology department; reduced the appointing process from max. 9 days to min. 3 days; projected savings of £35 000 in clerical staff; created a better working environment; increased staff morale; improved patient satisfaction; reduced waiting time for ultrasound by 1 week. CONCLUSION: Lean has successfully improved radiology services.

0910 Beating the odds – Hinchingbrooke's challenge

Vosper, R.C.
Hinchingbrooke Healthcare NHS Trust, Cambridgeshire, UK

OBJECTIVE: Despite being faced with significant challenges including the possible franchising out of the trust to the private sector and the large historic debt we also had a rapid reduction in our radiologist staffing which raised operational issues in out of hours work and multidisciplinary staffing issues during the working day. DESCRIPTION: Dwindling radiologist numbers caused a sudden increase in the on-call to 1:2 rota, creating issues with cover during the normal working day impacting into radiologist skill mix. Approximately 50% of radiographic reports are issued by reporting radiographers – these skills had to be fully deployed and included the appointment of a consultant radiographer. The daytime radiologist rota was disassociated from the appointment schedules, allowing radiologists to have fewer interruptions and increased throughput. The out-of-hours on-call CT service was outsourced to allow the radiologists to have at least a 1:4 on-call rota. Several policies had to be rewritten, e.g.: IV out-of-hours contrast policy to accommodate such change. Plans had to be made for the long term sustainability of the imaging service with reduced radiologist numbers. Included in these plans are 7 day working, radiographer CT head reporting, further development of the radiographer MRI reporting service and an ultrasonographer led vascular service. CONCLUSION: Although we encountered significant staff challenges we have been able to remain well within the waiting list targets of 6 weeks and imaging services are being developed as we meet our ongoing yearly increase in referrals to medical imaging.

0920 Out-of-hours spinal magnetic resonance imaging: Does it alter patient management?

Awad, D.M., Amonkar, S., Hughes, D.G.
Salford Royal Foundation Trust, Manchester, UK

PURPOSE: Few trusts in the UK routinely offer an out-of-hours MRI service for the investigation of acute spinal pathologies such as cauda equina syndrome (CES) and spinal cord compression (SCC), often necessitating interhospital patient transfer. The benefit of immediate surgery in these patients is disputed, raising questions about the necessity of out of hours scanning. Our aims were to review the use of the out of hours MRI service in our institution (regional neurosurgical centre) and assess its influence on subsequent patient management. METHODS: This was a retrospective review of all patients undergoing out-of-hours spinal MRI scanning during 2007. Outcome measures were type and times of scan requested, accuracy of clinical diagnosis, subsequent patient management, and where appropriate, time interval between scan and surgery. RESULTS: 73 patients underwent out-of-hours spinal MRI, the most common indication for which was suspected CES (66%), followed by suspected SCC. 57 (78%) scans did not correlate with clinical suspicion, with 38 (52%) scans negative for any form of neurological compromise. MRI scan led to out-of-hours surgery in 3 patients (5%), 2 of which were for post operative haematoma causing neurological compromise, 1 for CES. All other patients requiring surgical intervention were managed electively. CONCLUSION: With the exception of early post operative complications, our results suggest that delaying out-of-hours spinal MRI scans until the following morning may not change patient management or outcome.

0930 The implementation of forthcoming NICE stroke guidelines for MRI "how to do it" first impressions

Bailey, W.M.
Manchester Royal Infirmary, Manchester, UK

PURPOSE: National clinical guidelines for the initial management of acute stroke and transient ischaemic attack (TIA) were published in July 2008. These guidelines will dramatically increase the use of MR and establish this modality at the forefront of diagnostic imaging for the early detection of stroke and TIA. These requirements will increase pressure on already busy MR departments adding to the governments existing waiting list targets. This paper shows how an acute city centre hospital trust has implemented the guidelines. METHOD/MATERIALS: A retrospective analysis of referral data was used to assess the number of patients who required "rapid access" MR scans. A protocol was established to manage these referrals within the normal working day (8–8 Mon–Fri). These data were analysed retrospectively and impact on the daily work load assessed. RESULTS: Patients were referred to the MR department per week over a 6 month period for rapid access MR stroke/TIA protocol imaging. The impact on the working day was minimal, in that all patients were imaged within the recommended time scales and disruptions minimal. CONCLUSION: MR imaging including DWI are more accurate in the assessment of acute stroke and are "well tolerated" by the patient. Rapid access MR scanning can complement initial CT scanning thus streamlining patient care pathways. This technique being both practical and achievable whilst causing minimum disruption to MR scanning lists.

0940 Embedded radiology within a large acute admissions unit, preliminary experience

Boxer, D.I.
Watford General Hospital, Watford, UK

KEY LEARNING OBJECTIVES: A new model of the provision of diagnostic imaging for acute medical and surgical patients is described. The methods by which this has been achieved are discussed and the lessons learnt highlighted. The benefits realised both to the patients and the organization are described. DESCRIPTION: As part of a major reconfiguration of acute hospital services, within West Hertfordshire, a 120 bedded Acute Admissions Unit (AAU) opened at Watford General Hospital in March 2009. Early in the strategic review culminating in this it was appreciated that integrated diagnostic services would be advantageous. The AAU is the largest such facility in the UK and is believed to be the first to be designed from the beginning to incorporate complex diagnostic imaging facilities. It is provisioned with dedicated plain film, CT and ultrasound equipment as well as 2 cardiac catheter rooms together with appropriate recovery areas, reporting rooms, conference rooms, offices etc. Radiologists provide imaging services during an extended working day and at weekends. This presentation describes the process by which radiology was able to influence the design of the building, the nature of the services to be provided and how it would be staffed. The early impact of this on patient care and the function of the radiology department as a whole are discussed. CONCLUSION: The AAU at Watford General Hospital demonstrates the advantages to healthcare of integrating diagnostic imaging within acute hospital care.

0950 Introduction of a "same-day" ultrasound service: Effect on patient referral by general practitioners

Hameed, S., Hawtin, K., Ramachandran, R., Roddie, M.E.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: To assess the effect on workload of changing from an "appointment" to a "same-day" ultrasound service. MATERIALS/METHODS: In order to reduce our ultrasound waiting time of 3 weeks for routine scans, we have offered all GP patients a "same-day" service since September 2006. To examine the effect of this change in practice we performed a detailed assessment of patients scanned in the last week in June 2006 (appointments only) and the same week in June 2008, 22 months after implementation of the "same-day" service. As well as measuring the numbers of GP patients scanned each week, we recorded the patients' home post codes and calculated the distance they travelled. RESULTS: In 2006 105 GP patients were scanned, all with appointments. In 2008 379 GP patients were scanned, only 20% of whom had appointments (a 260% increase). In 2006 the mean distance travelled was 3.6 km (range 0.1–13.4 km) and 79% of patients came from 5 local post codes. In 2008 the mean distance travelled was 6.3 km (range 0.2–44.3 km) with only 50% of patients from local post codes. The increase in workload from local GPs was 112% and from non-local GPs was 814%. Most of this workload had previously been

performed at adjacent hospitals that run an appointment only service. CONCLUSION: There is demand from GPs for "same-day" ultrasound and we have demonstrated that this is feasible. Unless adjacent local hospitals offer a similar service, however, continuing rise in demand may overwhelm the service.

0945–1145
Genitourinary keynote and scientific session

0945 Imaging prostate cancer: State of the art

Padhani, A.
Mount Vernon Hospital, Middlesex, UK

It is widely recognized that there is currently a crisis in prostate cancer diagnosis and management calling for new innovative methods to address clinical issues. Conventional MRI has many limitations and its role is controversial. Advanced imaging techniques including diffusion weighted MRI (DW-MRI), MR spectroscopic imaging (^{1}H-MRSI), dynamic contrast enhanced MRI (DCE-MRI) and MR lymphography have the potential to address many of the clinical bottlenecks. This talk will discuss the biological basis for observations and practical analysis of these techniques. I will show that using more than one tool improves imaging performance but the relative importance/reliability of techniques remains unresolved for any given clinical setting. A simple scheme for reporting findings back to surgeons/oncologists will be presented and illustrated. Advanced functional tools will enable us to tackle new indications including suspected cancer due to raised serum PSA levels with negative TRUS biopsies and for patients undergoing active surveillance.

1015 Diffusion-weighted imaging in the assessment of tumour grade in endometrial cancer

Bharwani, N.[1], Malietzis, G.[2], Narayanan, P.[3], Sahdev, A.[1], Reznek, R.[1], Rockall, A.[1]
[1]Barts and The London NHS Trust, London, UK, [2]East Midlands Healthcare Workforce Deanery, Mansfield, UK, [3]Chelsea & Westminster NHS Trust, London, UK

PURPOSE: To determine if there is a correlation between tumour grade and apparent diffusion coefficient (ADC) in endometrial cancer. MATERIALS/METHODS: 15 patients with endometrial cancer underwent DWI-MR imaging (Philips Achieva 1.5 T system, torso phased array coil) using 6 b-values (50, 100, 150, 250, 500, 750). ADC maps were produced and the tumour ADC values were correlated with histological tumour grade obtained at hysterectomy (14 patients) or endometrial biopsy (1 patient). MRI images were independently reviewed by 2 experienced readers and intra- and inter-observer variability documented. RESULTS: The mean ADC value (10–3 $mm^2 s^{-1}$) of grade 1 (n=6), 2 (n=2) and 3 (n=3) tumours was 0.85 (SD 0.06), 0.94 (SD 0.002) and 0.79 (SD 0.08), respectively. Using linear regression analysis, a good correlation (R=0.60) was obtained between tumour grade and ADC value. There was a significant difference (p<0.05) between ADC values of grade 1 and grade 3 tumours. No significant difference was seen between ADC measurements for grade 1 versus 2 and grade 2 versus 3 tumours. One patient had benign endometrial hyperplasia, the endometrial ADC value was 1.45. CONCLUSION: High tumour grade is an adverse prognostic factor in endometrial cancer. This study is on-going but preliminary data suggests a good correlation between ADC values and histological grade. Potentially this information, taken in conjunction with a biopsy, may improve pre-operative prognostication and thereby optimize patient management.

1025 Uterine artery embolisation: Can MRI characteristics predict outcome?

Albazaz, R.[1], Simpson, J.O.[2], Montgomery, H.[2], Sonwalker, H.A.[2]
[1]Leeds Radiology Academy, Leeds General Infirmary, Leeds, UK, [2]Huddersfield Royal Infirmary, Huddersfield, UK

PURPOSE: To investigate MRI characteristics on T_2-weighted sequences of symptomatic fibroids prior to uterine artery embolisation (UAE) and any relation to outcome. MATERIALS/METHODS: 45 consecutive patients who underwent UAE were included in the study. MRI was performed prior to UAE in all cases and patients were followed up by serial ultrasound at 1, 6 and 12 months post UAE. MR characteristics in comparison to normal surrounding myometrium were noted for dominant fibroids and compared with changes in fibroid volume on follow up ultrasound post-UAE. RESULTS: A total of 55 dominant fibroids were identified. On T_2-weighted sequences, the signal intensity was low in 38 of 55 (69.1%) and high/isointense in 17 of 55 (30.9%) fibroids. Following UAE, in the low signal intensity group there was a reduction in fibroid volume in 26 of 38 cases (68.4%), whilst a higher response of 15 of 17 (88.2%) was seen in the high/isointense group. Reduction in fibroid volume as measured at 1 year post-UAE was greater for the high/isointense group than the low signal intensity group (mean = 76.6% vs 66.5%). CONCLUSION: MRI characteristics of symptomatic fibroids pre-UAE can help predict response to treatment. Fibroids that are high/isointense in signal intensity on T_2-weighted sequences show the best response to UAE.

1035 Diffusion weighted MRI in bladder cancer – Initial experience

Ganeshalingam, S., Koh, D., Lalondrelle, S., Huddart, R., Sohaib, A.
Royal Marsden NHS Foundation Trust, London, UK

PURPOSE: To assess the feasibility of performing DW-MRI and to define the apparent diffusion coefficient (ADCs) values in pathological proven bladder cancer. MATERIALS/METHODS: 14 patients (mean 67 years, range 55–82 years, M:F 12:2) with transitional cell cancer (confirmed at biopsy) were investigated. DW-MRI of the bladder was performed using 6 b-values (0, 50, 100, 250, 500 and 750 s mm^{-2}). T_1- and T_2-weighted axial/coronal images were also acquired. DW-MRI images were analysed offline using IDL-based software. ROIs were drawn on the b = 500 s mm^{-2} images and transferred onto the corresponding ADC maps to record their median values. The median ADC of tumours was correlated with histopathological tumour grade; and compared before and after treatment using the Wilcoxon signed-rank test. RESULTS: The lesions were 1.7–3.9 cm in maximum size. The mean bladder tumour wall thickness was 1.37 cm. The median ADC value was 133.2 $mm^2 s^{-1}$ (54–201 $mm^2 s^{-1}$). There was no relationship between the median ADC value and tumour grade. All patients underwent treatment with neo-adjuvant chemotherapy and repeat imaging showed residual lesions in 7 patients. 5 of those 7 patients showed partial response by RECIST criteria. The median ADC value had increased consistent with decreased cellularity (although not statistically significant). In 2 of the 7 patients who had stable disease there was no increase in the median ADC value. CONCLUSION: This initial study suggests that it is feasible to assess bladder cancer using DW-MRI. Further studies need to validate our finding and to assess the role of diffusion MRI in bladder cancer.

1045 MRI-derived computational modelling of bladder filling mechanics to investigate prostate displacement effects relevant to radiotherapy

Brunt, J.N.[1], Krywonos, J.[2], Elkut, F.[2], Malik, Z.[1], Eswar, C.[1], Fenwick, J.[1], Ren, X.J.[2]
[1]Clatterbridge Centre for Oncology NHS Trust, Merseyside, UK, [2]Liverpool John Moores University, Liverpool, UK

PURPOSE: Accurate delivery of high radiation dose to a defined tissue volume is required for successful radical prostate cancer radiotherapy. Modern techniques such as conformal and intensity-modulated radiotherapy can deliver increased radiation dose to the tumour without increased toxicity, but at the expense of requiring smaller delineated treatment margins, which is often difficult to control due to complex organ interactions. The exact position of the prostate is influenced by many factors, in particular bladder and rectal filling. It is beneficial to

study the mechanics of these processes and the interaction between adjacent structures, to improve understanding of their influence on the position of the intended irradiated area. MATERIALS/METHODS: *In vivo* human MR images (T_2-weighted) were obtained, showing variations of bladder filling in each subject. From this imaging, a 3D finite element mesh model was developed, using solid elements for prostate and shell elements for bladder and rectum. Varying bladder filling was simulated by modelling the physical process to predict deformation fields at different volumes. The effects of material properties and boundary conditions on the modelling accuracy were also investigated. RESULTS: Model-predicted prostate movements during bladder filling were multi-millimetre in anterior–posterior and superior–inferior, and sub-millimetre in right–left, directions, respectively, with rotational movement predominantly about a single axis. The numerical results show good agreement with published clinical data. CONCLUSION: This approach can potentially be used to establish more quantitative data concerning the influence of bladder and rectal filling on the positions of the prostate or other structures of interest.

1055 What is the optimal timing of post-biopsy MRI of the prostate?

Sinha, A.[1], Gurajala, R.[2], Kumar, A.[1], Kibriya, N.[1], Ramachandaran, I.[3]
[1]Aintree University Hospital, Liverpool, UK, [2]Whiston Hospital, Liverpool, UK, [3]Royal Liverpool University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: To assess the frequency of haemorrhage after prostatic biopsy and determine optimal timing of post-biopsy prostatic MRI. DESCRIPTION: MRI is the most promising method in local staging of prostate cancer. The majority of cancer foci appear as low signal intensity lesions on T_2-weighted images. Multiple factors may cause decrease in signal intensity: among these the only interfering reducible factor is post-biopsy haemorrhage. Some authors have recommended deferring MRI for up to 8 weeks whereas others recommend 3 weeks. A retrospective audit was conducted at the Royal Liverpool University Hospital between May 2006 and April 2008. 68 male patients (mean age 66 years; range 44–76 years) underwent prostatic MRI after biopsy. Mean time between biopsy and MRI was 6.2 weeks (range 1.3–28.6 weeks). A consultant radiologist with experience in prostate MRI conducted review of MR images. Maximum haemorrhage was noted between 4.1 weeks and 5 weeks. Frequency of haemorrhage did not correlate with time between biopsy and MRI. However, there was a positive correlation with severity of haemorrhage. CONCLUSION: Deferring MRI for at least 8 weeks after prostatic biopsy is recommended.

1105 Is the uncontrasted phase always necessary in multiphase computed tomography urograms?

Goyal, N.[1], King, A.[2], Shukla, R.[2], Reed, H.[2]
[1]University Hospital of Wales, Cardiff, UK, [2]Nevill Hall Hospital, Abergavenny, UK

PURPOSE: To evaluate the usefulness of the uncontrasted phase in a multiphase CT urogram study. MATERIALS/METHODS: CT urograms are routinely done in our department for patients with painless haematuria. Standard technique involves a non-contrast scan of the abdomen and pelvis followed by a split-bolus post contrast scan of the abdomen and pelvis. A retrospective analysis of 50 such cases was done and any additional information obtained from the non-contrast scans was recorded. RESULTS: 25 patients had a normal study and in the remaining 25, findings included simple cysts, renal tract calculi and bladder tumour. Extrarenal pathology was seen as the cause of symptoms in some of the cases including a psoas abscess and colonic tumour tethered to bladder. The uncontrasted phase added additional information in 8 cases (19%). In 7 cases calculi were demonstrated in the kidneys which were not visible on the post contrast phase and in one case, the study helped in characterization of a hyperdense cyst. No additional pathology was demonstrated in the ureters or the bladder. CONCLUSION: The non-contrasted phase provides additional information by demonstrating renal calculi and in the assessment of cysts. However, no additional information was added in either the ureters or the bladder region, in our cohort of patients. Our study suggests that patient dose may be reduced by restricting the uncontrasted phase to the renal region in the investigation of painless haematuria.

1115 Incidence of contrast-induced nephropathy following intravenous injection in a large population of patients with chronic kidney disease undergoing CT imaging

Kuhn, M.J.[1], Chen, K.[2], Chen, N[2], Heiken, J.P.[3], Soulez, I.[4], Sahani, D.V.[5]
[1]Southern Illinois University School of Medicine, Springfield, IL, USA, [2]Rui Jin Hospital, Shanghai, China, [3]Washington University, St. Louis, MO, USA, [4]CHUM – Notre Dame Hospital, Montreal, QC, Canada, [5]Massachusetts General Hospital, Boston, MA, USA

PURPOSE: To evaluate the rate of contrast-induced nephropathy (CIN) in patients with chronic kidney disease (CKD) undergoing MDCT after a low- or an iso-osmolar contrast medium (CM). MATERIALS/METHODS: 401 patients with SCr ≥1.5 mg dl^{-1} and/or CrCl ≤60 ml min^{-1} were randomized to either iopamidol-370 (IOP=202 patients) or iodixanol-320 (IODIX=199 patients). CM were injected IV at 4 ml s^{-1} followed by a 20 ml saline flush. 153 patients received 40 g iodine (gI); the remaining patients received at least 65 ml. CIN was defined as a SCr rise ≥25% from baseline at 48–72 h. RESULTS: Total gI was higher patients receiving IOP; no other significant differences were seen in demographics or risk factors. Baseline SCr level were similar (IOP 1.52±0.36 mg dl^{-1} vs. IODIX 1.49±0.38; p=0.48). No case of acute renal was observed, and CIN rates were similar in the two groups (IOP=10 patients; IODIX=9 patients; p=1.0). Mean postdose SCr changes were comparable (IOP 0.03±0.22 mg dl^{-1} vs. IODIX 0.04±0.25 mg dl^{-1}, p=0.619). Similar findings were seen in patients (IOP=140, IODIX=144) with both CKD and diabetes (CIN in 7 patients each group, p=1.0) or patients with baseline SCr ≥2.0 mg dl^{-1} and/or baseline CrCl ≤40 ml min^{-1} (IOP=53, IODIX=40); CIN in 2 patients in each group, p=1.0). In a multivariate logistic regression analysis no risk factor predicted CIN, however hydration proved marginally beneficial (p=0.042). CONCLUSION: The rate of CIN in large group of patients with CKD undergoing MDCT was 5%. Both iopamidol-370 and iodixanol-320 may be used safety in patients with CKD and other risk factors undergoing CT.

1125 Retrospective evaluation of Randall's plaque theory of nephrolithiasis with CT attenuation values

Yap, W.W.[1], Bhuskute, N.M.[1], Wah, T.M.[2]
[1]Leeds Teaching Hospital NHS Trust, Leeds, UK, [2]St James' University Hospital, Leeds, UK

PURPOSE: We examined the computed tomography attenuation values (HU) of renal papillae in stone formers (SF) to determine whether nephrolithiasis is associated with radiographic changes in renal papillae to investigate the Randall's plaque theory. MATERIALS AND METHODS: Two observers independently and retrospectively recorded the HU of the renal medullae and cortex in 90 patients with a unilateral single calculus within kidney or ureter, and in 104 cases in control group (CG) matched for age and renal functions. RESULTS: The patient ages were similar in the stone former and control groups. However, the male-female ratio was significantly greater in the SF group (68:22) than in the CG (42:62, p<0.0001). Left–right ratio in SF group was 50:40. The inter-rater agreement was kappa=0.53 (95% CI: 0.42, 0.64). Mean HU of all papillae of affected side in stone-formers (ASSF) was significantly greater than that in CG (39.6 versus 29.6, p<0.0001). When comparing affected and non-affected sides within the SF group, there was no significant difference (39.6 versus 38.4, p=0.16). The receiver operating characteristic (ROC) analysis showed area under curve=0.94 with optimal cut-off at 34 HU. At this point the specificity, sensitivity, PPV and NPV were 90%, 90%, 33% and 99%,

respectively. CONCLUSION: HU of the renal papilla is significantly increased in SF in the affected and the non-affected kidneys when compared to the CG. This finding may form one of the risk indicators to determine the future follow up and clinical management for the potential SF.

1135 Open access CT KUB in primary care: Our preliminary experience

McCann, C.A., Jamieson, P., Robinson, L., Gopal, K.
North Cheshire Hospitals NHS Trust, Warrington, Cheshire, UK

PURPOSE: Acute renal colic is common and recurring with a lifetime incidence of 12%. In the past decade, thin-section unenhanced CT has evolved as a rapid examination of patients suspected of having urolithiasis. Many institutions use CT as the primary imaging modality. GPs commonly see acute flank pain but there is uncertainty about the appropriate use of CT in primary care and when it should enter the diagnostic pathway. Our objectives were to share our experience of GP direct access to CT KUB and assess its effectiveness. METHOD: A retrospective review of GP patients directly referred for CT to investigate acute flank pain was carried out over 6 months. Non-contrast, low dose CT was performed at times convenient for the patient. Reports were faxed within 48 hours. RESULTS: 55 scans (34 male, 21 female) were performed within 2 weeks of request. Average age was 46 years. 21 of 55 (38%) scans were positive for calculi with 6 of 21 having a complication from the stone. Non-calculus findings were demonstrated in 12 of 55 scans. CONCLUSION: Over a third of patients were correctly diagnosed with nephro/urolithiasis by their GP and a significant number had a secondary complication. This technique not only enables rapid diagnosis of urolithiasis but also guides appropriate patients to urological referral and standardizes imaging of renal colic across all patient groups. It potentially increases diagnostic accuracy by providing earlier imaging and thereby reducing workload in primary care and the number of hospital admissions.

1000–1130
Back to basics MSK

1000 Plain films – Role in diagnosis and management of inflammatory arthropathies

Aniq, H.
Royal Liverpool University Hospital, Liverpool, UK

PURPOSE: To understand the role of plain films in the diagnosis and management of different arthropathies. MATERIALS/METHODS: The role of imaging in the assessment of musculoskeletal diseases is expanding and it plays an important role in the early diagnosis and management of different rheumatologic conditions. Despite the advent of newer imaging modalities conventional radiographs continue to have a central role in the diagnosis of arthritidis, monitoring of disease progression and response to therapy. When evaluating a conventional radiograph for joint related disease it is vital to consider the various aspects of the joint where changes may be seen. Joints respond to insults in different ways. Radiologically, theses may be seen as soft tissue swelling or calcification, osteopaenia, cartilage loss, alignment deformities, erosions or bone proliferation. Careful identification of these changes along with their distribution in the various joints of the body helps us to divide the disease process in main categories of arthropathies which are inflammatory, depositional and degenerative. CONCLUSION: Plain films findings of arthritidis can be quite subtle but these are usually very distinct. We present a structured approach to plain film analysis and interpretation.

1030 Ultrasound – Role in diagnosis and management of inflammatory arthropathies

Suresh, P.
Plymouth University Hospital NHS Trust, Plymouth, UK

AIM: In this session, we will discuss the constantly increasing indications for Ultrasound in rheumatology in the imaging of different joints and various arthropathies. Ultrasound is routinely used in many institutions in the diagnosis and monitoring of synovitis in rheumatology. There are studies indicating that it is seven times more sensitive than plain radiography in diagnosis of rheumatoid erosions. We will illustrate the typical ultrasound findings in different rheumatologic conditions, with emphasis on early diagnostic features in rheumatoid arthritis. Role of power Doppler and contrast will also be discussed. There is growing evidence in the literature that ultrasound guided aspirations and injections have improved the accuracy and the therapeutic outcome. This will be well illustrated with examples of different ultrasound guided procedures performed routinely. Last but not least, the current state of play, about ultrasound by rheumatologists and radiologists will be highlighted. By the end of the session one will be able to: summarise the indications for ultrasound in rheumatology; identify the typical ultrasound findings in different rheumatological conditions and the role of Doppler; obtain an insight into the role of ultrasound guided procedures in rheumatology.

1100 MRI appearances of inflammatory arthritis and its mimics

Grainger, A.
Leeds Teaching Hospitals, Leeds, UK

Radiologists encounter inflammatory arthritis in two ways on MRI. First, inflammatory arthritides may be seen as an incidental finding when an examination is being undertaken for other conditions. Second, MRI is finding an increasing role in day to day clinical practice for the diagnosis and monitoring of inflammatory arthritis. This is expected to continue further. Modern rheumatology practice means that rheumatologists see patients with inflammatory arthritis at an earlier stage in the disease so that therapy can be initiated before irreversible joint damage has occurred. The result is that the radiological picture seen with conventional imaging has also changed over the last 10 years and the "classical" radiograph showing severe erosive and destructive change is becoming an increasing rarity. MRI allows the earlier detection of changes of the inflammatory arthritides, certainly before they become apparent on MRI and, studies have shown, before they are apparent clinically. Modern drug therapy for the inflammatory arthritides uses powerful (and expensive) biological drugs. MRI is increasingly able to predict whether the disease will respond to the drug before a clinical improvement is seen. This allows therapy to be modified at an early stage if necessary. The role that imaging plays in the detection of cancer and the monitoring of oncology therapy has radically changed over the last 15 years. It is likely that similar changes will be seen in the way we utilise MRI in the diagnosis and treatment of inflammatory arthritis.

1000–1130
Cardiac CT: How to do it

1000 Appropriate patient selection based on the scientific evidence

Morgan-Hughes, G.
Plymouth NHS Trust, Plymouth, UK

The requirements for non-invasive cardiac diagnostic testing are that it should be accurate, effective at both risk stratification and reclassification, applicable, cost effective and finally safe. Coronary CTA has been deemed appropriate for the evaluation of intermediate risk chest pain patients with an uninterpretable ECG/exercise ECG or an inability to exercise or indeed equivocal stress testing of any form by the AHA/ACC. It now has widespread availability in the UK. Guidance from the scientific evidence will be used to outline the appropriate selection of patients for coronary CTA in the context of the pre-stated requirements for high quality non-invasive cardiac diagnostic testing.

1020 Basic technique

Mittal, T.
Royal Brompton Hospital, London, UK

Cardiac CT is one the most challenging CT procedures made possible with recent technological advances. Performing a cardiac CT requires understanding of the underlying principles of ECG gating, drug administration to reduce patient's heart rate, contrast administration, technical aspects such as pitch, tube rotation time and multi-segment reconstruction, contrast administration and timing, and ensuring good breath holding. The radiographer and supervising radiologist should be able to identify artefacts on the scan obtained and correct them where possible (e.g. ECG). Understand of the various reconstructions required to be transferred to the workstations and PACS is important. Image interpretation requires understanding of the image quality, reconstruction techniques, and coronary/cardiac pathology. A good report requires the radiologist to interpret the findings in the light of clinical information and suggest further management where appropriate.

1040 Advanced technique: Keeping radiation dosage to a minimum

Roobottom, C.
Derriford Hospital NHS Trust, Plymouth, UK

PURPOSE: To give a clear understanding to the audience of how to keep radiation dosage to a minimum in cardiac CT angiography. CONCLUSION: Cardiac CT has traditionally been viewed as a high dose examination. However, technological advances are rapid and with state-of-the-art equipment and technique it is possible to perform CT angiography at less than 1 mSv in selected patients. The talk will outline what parameters and protocols are available and how to modify them appropriately to keep dose as low as possible. Topics covered will include the appropriate use of prospective and retrospective gating, modification of mA and kV according to patient criteria, and the use of different dose modulation protocols according to heart rate and heart rate variability.

1100 Image interpretation and accreditation

Gopalan, D.
Papworth Hospital, Cambridge, UK

No abstract supplied.

1000–1130
Carotid artery ultrasound workshop

1000 A comprehensive overview of carotid Doppler ultrasound: From stenosis to dissection

Sidhu, P.
King's College Hospital, London, UK

This lecture will give an up-to-date review of the usefulness of carotid Doppler ultrasound in the assessment of carotid arterial disease. The criteria used for the assessment of stenosis will be discussed. The extended role of carotid artery ultrasound will also be discussed to review plaque composition, IMT measurements, dissections and other rare vascular disease seen in the carotid arteries. Finally, disease outside the artery will be detailed.

1030 MRA, CTA and DSA in carotid disease: Practicalities, pitfalls and limitations

Adams, M.
National Hospital for Neurology and Neurosurgery, London, UK

CT angiography (CTA), MR angiography (MRA) and catheter digital subtraction angiography (DSA) are used commonly in clinical practice to evaluate the carotid arteries, providing information about anatomy and pathology that may be complementary to that gleaned from ultrasound interrogation. The objective of this talk is to present the advantages and limitations of each of these techniques and to illustrate common artefacts and potential pitfalls in image interpretation.

1115 Practical demonstration: how to carry out a carotid Doppler ultrasound examination

Sidhu, P.
King's College Hospital, London, UK

This 15 minute demonstration by an expert will show the technique for a comprehensive examination of the carotid arteries by ultrasound, with tips to get the most out of the examination.

1000–1115
COR Stanley Melville memorial lecture and commissioning effective imaging

1000 Patient safety, risks in healthcare and promoting a safe culture

Leitch, J.
The Scottish Government, Edinburgh, UK

All improvement requires change but not all change is an improvement. Changing long established culture and clinical processes is tougher still and many "projects" within the NHS fail as a direct result of a poor understanding of how people and systems change. There are many models of change that have been established over time, usually in industry, and attempts have been made to transfer them to social and healthcare environments. One such model is the Model for Improvement championed by the Institute for Healthcare Improvement in Cambridge, Massachusetts and adopted by the Improvement and Support team of the Scottish Government Health Directorate. This methodology has been used throughout the world to transform healthcare systems, improve healthcare related outcomes and make care safer for patients. The model has three deceptively simple questions: 1. What are we trying to achieve?; 2. How will we know change is an improvement?; and 3. What change can we make that will result in an improvement?. These questions then rely on a model of small-cycle change called the PDSA (Plan, Do, Study, ACT) cycle which empowers front-line workers to actually redesign the way they work. This model is the key building block for the Scottish Patient Safety Programme presently being rolled out across the NHS in Scotland and for the work of the Improvement and Support Team. This presentation will outline some of the challenges facing our healthcare system and then introduce the change model described above.

0945 Commissioning effective imaging services

Bacon, A.
Commercial Reform & Reconfigurations, North West SHA, Manchester, UK

There have been significant changes in commissioning brought about by process for assuring World Class Commissioning. All PCTs have been now been assessed and are seeking to improve their scores and performance. PCTs and providers also now operate in a market which is governed by a set of "system management" behaviours and rules (including the Principles and Rules of Cooperation and Competition and the Procurement guide) and with an independent panel to investigate, report and recommend on the application of these. Radiology departments will need to understand these changes in order to agree new activity with PCTs and to be able to respond to the increasing number of tenders (through which most new out of hospital services will need to be provided). If they do not understand and act on these changes, they may find themselves missing out on opportunities to develop their services, or in danger of loosing income; or both.

1000–1140
Maximizing the benefits of PACS – Current issues

1000 What PACS managers should know about PACS and IT

Tatlow, M.
Maidstone and Tunbridge Wells NHS Trust, Maidstone, UK

DESCRIPTION: The advent of the National Programme for IT; PACS and RIS project, in 2004, saw for the first time, a single approach to the procurement and deployment of PACS across 5 regional clusters. Each of these areas having a local service provider, a CR provider, a PACS provider and a RIS provider. The National Programme moved the previously relaxed, traditional interaction between purchasers and vendors to a multi tiered, convoluted relationship. This caused imaging departments to re-assess what was required of a PACS manager, almost moving them to become a politician and relationship manager, rather than a "re-skilled radiographer". This change in the partner relationship has been accompanied by an increase in the technical knowledge needed by the PACS team to allow successful triaging of incidents, and consequently prevent un-necessary "calls" being placed with the Local Service Provider, and reduce the risk of possible call re-charges. Responsibilities have increased; previously, the "traditional" PACS manager would have more than likely supported a single location, whilst the new breed is required to maintain the service for multiple sites, sometimes crossing Acute and Primary Care boundaries. Critically, along with these new skills, the PACS manager should also maintain a functioning clinical knowledge these, combined together, move the roll into the discipline of Health Informatics. CONCLUSION: The issues listed above, require the PACS manager to develop a technical understanding of the service, have good communication skills, whilst also being able to maintain a focus that PACS is a real clinical IT system.

1020 The appropriate test? A review of decision support applications: Can they make a difference?

Newman-Sanders, T.
Mayday Hospital, Croydon, UK

One of the central issues facing the NHS and other healthcare systems is that of how best to deploy the powerful weapon of diagnostic imaging to ensure a high quality, timely and cost effective service to patients. There have been a succession of recent initiatives to use diagnostic imaging more often, earlier and by a wider range of healthcare professionals than has traditionally been the case. The main drivers for this expansion and democratisation of diagnostic imaging have included the 18 week referral to treatment pathway, "Better care closer to home", and the "Next Stage" review. The NHS and other healthcare systems across the world are now entering a climate of reduced resources aggravated by the global economic downturn. The role of decision support systems in improving the appropriateness of imaging requests, reducing unnecessary imaging and increasing the expertise of healthcare professionals in the optimal use of diagnostic imaging is being increasingly appreciated. The Department of Health are supporting a pilot project to see how such systems could be deployed into a live NHS environment including primary and secondary care settings. Along the way valuable lessons are being learnt about the challenges involved in getting such systems to work, how their effectiveness can be measured and how they are likely to benefit the wider NHS. This presentation will give an overview of decision support tools, outline the experience and benefits of such systems in other healthcare systems and describe how they could be used in the NHS.

1040 It's good to talk – The importance of the IHE framework in day-to-day radiological practice

Harries, R.
Diana, Princess of Wales Hospital, Grimsby, UK

IHE (Integrating the Healthcare Enterprise) is an international non-profit organization that enables healthcare IT system users and healthcare IT system suppliers to obtain interoperability of systems. It does this through the careful definition of healthcare tasks, by defining how information is to be communicated between systems to support those tasks, and by testing supplier applications at annual week long test sessions called Connectathons. The work is managed by IHE committees at international and national level and is sponsored by various international and national bodies. The fundamental aim of IHE work is to produce Integration Profiles. Each profile describes a clinical requirement for integration and the solution to address it. The functional (i.e. software) components of a profile are IHE Actors, and the communication is defined through IHE Transactions. IHE profiles cover not only radiology but pathology, cardiology, ophthalmology, patient care coordination, IT infrastructure and other areas which are developing. The aim of this presentation is to describe the most useful profiles related to radiology, the benefits they can provide, and the process by which these profiles can be introduced into departments and Trusts.

1110 Joined up thinking – A regional PACS come true?

Ward, A.
Welsh Health Estates, Cardiff, UK

To explain how Wales came to have a number of PACS suppliers operational in Welsh Trusts, and the subsequent steps taken to move towards full integration of these multiple PACS solutions, to show how using a standards based approach each "module" of the integration can be replaced/upgraded with little or no effect on the others, having regard for common coding and common terminology. To explain the approach taken in understanding the issue and the potential pitfalls, or benefits of using a non-standards approach. In addition, how the role out of the new radiology information system has been a driver for, as well as an obstacle to, change.

1000–1130
Into the blue skies: The future of breast imaging

1000 Optical tomography of the breast

Gibson, A.
University College London, London, UK

Optical tomography is a medical imaging method which is sensitive to the concentration of oxyhaemoglobin and deoxyhaemoglobin. Over 2000 women have now been imaged in a number of centres worldwide using a range of approaches. We will explain how optical imaging works and review the current status of optical mammography. In particular, we will concentrate on our work at University College London, where we have imaged over 50 women with cancer with a sensitivity of 86% and specificity 66.8%. We will discuss the future role of optical imaging for breast cancer.

1030 Phase contrast X-ray imaging of breast tumours

Speller, R.D., Olivo, A.
Medical Physics & Bioengineering, University College London, London, UK

Conventional absorption based X-ray imaging is very successful in many areas of radiology where the attenuation coefficients of different structures differ by at least 5%. However, there are a range of examinations, notably in mammography where the linear attenuation coefficients are very similar leading to poor differentiation between structures. An alternative to absorption based imaging is to exploit the wave behaviour of X-rays and to record the effects of diffraction or refraction as X-rays pass through breast tissue. Using refraction allows phase contrast effects to be used to enhance the visibility of tumours. This talk will introduce the background to creating phase contrast images using synchrotron radiation and X-ray tube sources. In particular, it will describe recent work undertaken to enable uptake of the technique in clinical facilities.

1100 Digital breast tomosynthesis

Hawkes, D.
University College London, London, UK

No abstract supplied.

1030–1130
Service delivery scientific session II

1030 "Same-day" ultrasound service: how long do patients have to wait?

Hawtin, K., Ramachandran, R., Hameed, S., Roddie, M.E.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: To assess the effect of introducing a "same-day" ultrasound service on patient waiting time in the department. MATERIALS/METHODS: We have offered all patients a "same-day" ultrasound service since September 2006. In order to examine the effect on patient waiting time in the department we recorded the patient arrival time (from RIS) and scan commencement time (from PACS) for all GP and hospital outpatients scanned during the last week in June 2006 and the same week in June 2008, 22 months after implementation of the "same-day" service. RESULTS: In 2006 105 GP patients, all with appointments, had a median wait of 15 minutes (range 0–99 minutes). In 2008 379 GP patients were seen. The 20% with appointments had a median wait of 15 minutes (range 0–83 minutes) while those using the same-day service had a median wait of 30 minutes (range 0–155 minutes). 201 outpatients (78% with appointments) were seen in 2006 compared with 213 (75% with appointments) in 2008. Median waiting time rose significantly from 17 (range 0–159) to 23 (range 0–266) minutes for outpatients with appointments (Mann Whitney U p=0.01) and from 7 (range 0–71) to 22 (range 0–88) minutes (Mann Whitney U p=0.001) for outpatients using the "same-day" service. CONCLUSION: Introduction of a "same-day" ultrasound service increases patient waiting time in the imaging department and, if considering implementation of such a service, departments should assess waiting room capacity, patient preparation instructions and consider investing in an electronic patient queue management system.

1040 "Same-day" ultrasound: Effect on patient satisfaction

Ramachandran, R., Hawtin, K., Hameed, S., Roddie, M.E.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: To assess the effect of a "same-day" ultrasound service on patient satisfaction. MATERIALS/METHODS: We have offered all GP patients and outpatients a "same-day" service since September 2006. We conducted a patient survey of all GP and outpatients attending the department (578) in the first week of October 2008, 25 months after implementation of the "same-day" service. RESULTS: 141 (24%) of patients completed a questionnaire. 54 had appointments and 87 used the "same-day" service. Of the latter, 50% attended the ultrasound on the same day or the day after seeing their doctor and 30% in the same week. 46 of 87 (53%) using the "same-day" service were given their result at the time compared with 21 of 54 (39%) of patients with appointments. The overall service was rated as "excellent" or "good" in 87% of the appointment patients and 82% of the "same-day" patients. The overall service was rated as "fair" or "poor" in 4% of the appointment patients but 8% of the "same-day" patients. 80% of appointment patients were seen within 30 minutes compared with only 40% of "same-day" patients and 28% of these waited more than 1 hour. Attitude to waiting time was "happy" in 78% of appointment patients compared with 66% of "same-day" patients. It was rated as "unhappy" in 9% of appointment patients compared with 28% of "same-day" patients. CONCLUSION: A "same-day" ultrasound service decreases patient satisfaction predominantly due to patient dissatisfaction with waiting. Improvement in waiting facilities and use of electronic queue management might improve the patient experience.

1050 Results of radiological investigations in a new one stop urology diagnostic centre

Rottenberg, G.T., Koh, K., Viney, Z., Griffin, N., O'Brien, T.
Guy's and St Thomas Hospital NHS Foundation Trust, London, UK

A new urological diagnostic centre opened at Guys Hospital in January 2008. The results of ultrasound examinations performed over the first 3 month period were analysed. Comparison was made to previous data from 2 week wait scheme to determine the relative merits of the 2 approaches to cancer detection and speed of diagnosis. 478 patients were scanned in the 3 month period in the thrice weekly new patient clinics. The majority of the scans were of the kidney and bladder (n= 390), testes (n= 95), or prostate (transrectal; n=11). The most common indications were haematuria (n=199), testicular pain (n=84), UTI (n= 65), or LUTS (n=65). There were 45 significantly abnormal scans, of whom 17 were eventually confirmed as being due to malignancy; bladder (n=4), renal (n=5), prostate (n=7), testicular (n=1). The number of cancers detected in the 478 patients scanned was identical to the number detected from the 2 week wait study performed previously at Guys, although the cancers detected in this group were from a cohort of 124 patients referred for the 2 week wait scheme. The speed of diagnosis and time to work up the patients was significantly higher in the urology diagnostic centre as almost all investigations were performed on the day of attendance. The advantages of the one stop approach to urological diagnosis will be discussed and the problems associated with establishing and supporting such a unit will be outlined.

1100 Radiography of the elderly. How has the National Service Framework for Older People informed practice?

Taylor, R.
University of Bradford, Bradford, UK

The population of the UK is acknowledged to be increasingly ageing with the proportion of people over 65 years old set to rise from 16% in 2006 to 22% by 2031. This increase is due to a number of factors including falling birth rates and increased life expectancy, due in part to improvements in healthcare and lifestyle. As a result, this predicted continued growth in the elderly population presents significant implications for the healthcare sector, including radiology departments, as the demographic of service users' changes and the number of people with chronic age-related disease/disabilities increases. In 2001, the Department of Health published the National Service Framework for Older People (NSfOP) outlining a 10 year plan to set treatment standards in health and social care of older people. Since its publication, a wide range of professional literature has been published relating the NSfOP to practice, particularly within the nursing and rehabilitation services. However, the impact of the NSfOP on diagnostic radiography practice is unclear. This presentation will summarise the findings of a third year student project to assess the impact of the NSfOP on the diagnostic radiography practice and suggest further practice improvements possible.

1110 UK PET-CT audit southern sector. Early service review

Hill, J.
MIAA, In Health, IST, London, UK

INTRODUCTION: A challenging programme for the introduction of a new technology (PET-CT) was introduced to the UK in April 2008. The Department of Health commissioned independent additional provision of PET-CT services for the northern and southern sectors of the UK. This was complimentary to existing arrangements. The Clinical Guardian in conjunction with the RCR and Department of Health required a 100% early service review. METHOD: The first PET-CT report was provided by local clinicians. The second audit review was carried out by independent clinicians, not part of the PET-CT south reporting group. Primary and audit reporters were independent and blind to each others report. An agreed scoring methodology was used, under categories 1–5. All written reports, both first and audited, were reviewed by the Chair of the South Audit Group for concordance. All non-concordant reports which could potentially affect patient management were subject to a third image review by the Chair. All reporters had achieved a minimum of 300 independent reports. All data was anonymised. RESULTS: 2156 primary and audit reports were reviewed (1078 patients). A total of 2.7% were recorded in Category 3. 0.6% of patients were Category 1. A follow-up 10% audit where all images are reviewed by the Chief Auditor is now underway. CONCLUSION: There was a low incidence of significant errors in the primary report. The review was well received and supported by the local clinicians and secondary audit reporters. Assessment methodology and scoring across both UK sectors is under current review.

1120 A quality standard or the numbers game

Beckmann, E.C.[1], Oldknow, M.P.[2]
[1]Medical Imaging Group, Oxted, UK, [2]E-Locum Services Ltd, Oxted, UK

INTRODUCTION: PET-CT is one of the few modalities where a competency standard has been recommended based upon a minimum number of reports per annum. ARSAC has recommended a minimum of 300 examinations a year to report diagnostically. In 2007/08 29 168 scans were made, an additional 3822 compared with 2006/07. There is no national quality assurance test outside the 10% audit in the DoH Southern and Northern Schemes. METHOD: The reporting quality of over 50 UK clinicians (radiologists or nuclear medicine physicians) was monitored through an audit process and, in some cases, training programmes. Quality monitoring over a number of training scans, mentoring of less confident reporters (irrespective of numbers) and variable levels of audit have been adopted for individual reporters. RESULTS: Results over the last year have shown that while all reporters will make errors at some time, a pattern can be identified. Some reporters during their training achieve consistently high quality of reports, even after low volume (less than 100) reports. These clinicians have gone on to make high quality reporters, while other clinicians who have high volumes have needed support to achieve a high quality of reporting. DISCUSSION: Ensuring the highest standard of diagnosis to optimize patient management must be the paramount focus. The optimum quality approach to reporting competence is best achieved by an integrated approach of training, mentoring, and auditing not purely on minimum numbers. Support and training needs vary, dependent upon experience and must be optimised for different clinicians.

1200–1245
IPEM John Mallard lecture
1200 Terahertz imaging and spectroscopy – Current and future modalities

Cunningham, J.
School of Electronic and Electrical Engineering, The University of Leeds, Leeds, UK

The terahertz (THz) region (100 GHz to 10 THz) of the electromagnetic spectrum spans the wide frequency range between the infrared and millimetre/microwaves, but has historically not been fully exploited owing to the very limited number of suitable (in particular, coherent) radiation sources and detectors that have been available. Outstanding progress has been made over the last decade in developing THz components and systems however. Highlights included fabrication of the first THz quantum cascade laser, together with the commercialization of THz spectroscopy and imaging systems based on femtosecond-laser technology, notably for non-destructive testing in the pharmaceutical industry (for example, investigating polymorphic transformations, and drug distributions in tablets). This talk will give an overview of the state-of-art in terahertz technology, explain the operation of modern terahertz systems, and discuss some of their many present as well as possible future applications, including biomedical imaging, security screening, and analysis of pharmaceutical materials.

1300–1345
BIR AGFA Mayneord lecture
1300 Imaging informatics: the key to success for the future of radiology

Siegel, E.
School of Medicine, University of Maryland, Baltimore, MD, USA

The practice expectations for a hypothetical radiologist who joins the radiology workforce in the year 2015 will be substantially higher than what is required today. The key to success for her practice given those expectations for greater productivity, effectiveness of communication, documentation of quality, and integration will be provided by the emerging field of medical imaging informatics. The presentation will include a discussion of the diversity of topics that fall under this field as well as specific ways in which imaging informatics is currently and will continue to respond to these challenges. This will include the role that imaging will play in the development and support of personalized or stratified medicine in the emerging genomic and proteomic era of healthcare. The presentation will conclude with a discussion of how imaging informatics will increasingly define what is unique and critically important about our specialty and how we can use our expertise in this area to provide added value to help secure the future of diagnostic imaging. AIM & OUTCOMES: 1. Be able to discuss the diversity of topics that fall under the sub-specialty, imaging informatics. 2. Speculate about what the requirements will be for a radiologist in 2015 and how imaging informatics will be an essential tool and skill set to address those expectations. 3. Define how imaging informatics will increasingly define what is unique and critically important about our specialty and how to use it to provide added value to help secure the future of radiology.

1415–1730
Musculoskeletal ultrasound workshop
1415 Shoulder

Allen, G.[1], Wilson, D.[2]
University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK, [2]Nuffield Orthopaedic Centre, Oxford, UK

A workshop on the methods of examining the shoulder using high resolution ultrasound. We will demonstrate a standard method of examination and cover the basic disease groups that might be encountered. We will show potential pitfalls and discuss examination technique and normal variation. The anatomy of the shoulder as seen by ultrasound examination will be demonstrated on volunteers. The ESSR web site contains a protocol that will be used as the basis for examinations: http://www.essr.org/cms/website.php?id=/en/index/educational_material.htm

1500 Wrist and hand

Harris, J.[1], Jackson, S.[2]
[1]Salford Hospital, Manchester, UK, [2]Salford Royal Hospitals NHS Foundation Trust, UK

No abstract supplied.

1545 Lower limb (knee)

Watura, R.[1], Cooper, R.[2]
[1]Frenchay Park Road, North Bristol NHS Trust, UK, [2]Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK

No abstract supplied.

1630 Lower limb (ankle and foot)

Marshall, T.[1], Lee, J.C.[2]
[1]Norfolk and Norwich University Hospital, Norwich, UK, [2]Royal National Orthopaedic Hospital, Stanmore, London, UK

Disorders of the foot and ankle constitute a significant proportion of referrals to musculoskeletal radiologists from primary and secondary clinical care. The radiologist's role is to provide an accurate diagnosis upon which all future treatment is based. We can arbitrarily divide the various pathologies that affect the foot and ankle into bone and joint, ligament, tendon and neurovascular causes although several pathologies often co-exist in most patients. Although the central articular surfaces of the joints of the foot and ankle cannot be assessed, ultrasound provides useful information regarding the bony margins of joints as well as reliably detecting the presence of erosive disease. Moreover, diagnostic ultrasound is arguably the optimal imaging tool for assessing the superficial soft-tissues of the foot and ankle due to its excellent spatial resolution and its dynamic capabilities. This

demonstration session will illustrate the relevant anatomy in real time whilst the lecture component will show several pathological conditions that are encountered in clinical-radiological practice.

1415–1645
Lean methodology in radiology: How to put Lean principles into practice

1415 Patient safety: the real reason for lean!

Speaker tbc.

No abstract supplied.

1615 Lean methodology in radiology: How to put Lean principles into practice

Wright, L.[1], Smith, L.[2]
[1]NHS CSCiP Radiology Service Improvement Team, Leicester, UK, [2]Modernisation Agency, Leicester, UK

PURPOSE: To demonstrate the fundamentals principles of Lean Methodology, and "How to" put Lean principles into practice in Radiology. METHOD: This session will cover the Philosophy of Lean Methodology (Toyota Productions System). It will demonstrate the different forms of Waste and how to remove them, how to identify value from the customers' perspective and show how a value stream map is produced. The session will also focus on the various tools that can be applied including, Standard work, visual management and 5S. It will demonstrate the critical role data has in understanding what the source of our problems are and how batching can have a detrimental impact on turnaround times. Finally, there will be some practice examples of how Lean has been applied in imaging.

1415–1515
PACS horizons – UK PACS and teleradiology group session

1415 A brief review of the year and introduction of keynote speaker

Dugar, N.
Doncaster Royal Infirmary, Doncaster, UK

The UK PACS and Teleradiology Group is a Special Interest Group of the Royal College of Radiologists. It holds 2 independent meetings every year (the last 2 meetings have been held in British Institute of Radiology) and also participates in a session at the UK Radiology Congress usually held in June every year. It has a very lively electronic form www.pacsgroup.org.uk. It is an open public forum, with participation between users within NHS, and suppliers. Suppliers have found this invaluable forum for understanding user requirements. Users of the forum have used it to help and support each other on burning PACS and radiology IT issues. It forms a platform for building a user-supplier relationship, and we have encouraged supplier participation in our meetings as well. I was elected Chair of the Group in December 2007. Over the last year we have discussed and debated many issues both in the electronic forum, and within the National Meetings. The Spring 2008 Meeting and Autumn 2008 meetings have had a full attendance at London. As I write the abstract, we have closed applications to the Spring 2009 meeting dedicated to Electronic Requesting, due to excessive numbers (3 weeks prior to the meeting!). The Autumn 2008 meeting was largely dedicated to PACS Image and Report Sharing as a national strategy. The clear outcome of the meeting was that a vendor neutral standards based approach to allow for multi-vendor inter-operability is required in the NHS, in order to deliver a vision of seamless patient centric information flow. The message from the meeting was that adoption of XDS-I (Cross-Enterprise Document Sharing-Imaging) standard from IHE (Integrating the Healthcare Enterprise) is required in the NHS, and adopted by the PACS and RIS suppliers, in order to achieve this goal. Interim solutions to allow for point to point information sharing via DICOM Push were already in place between neighbouring NHS Trusts and were needed until the national vision is achieved. There was also a realisation that there is need to move away from expensive Central Data Store Architectures. Whilst there needs to be data sharing within NHS to improve patient care, we also need to be mindful of the need to maintain data privacy, which also has been much debated on the forum. Electronic transfer of radiology reports to GP surgeries has been a source of much frustration. Whereas there is acceptance in NHS that this should be the available nationally, and there are pockets in the NHS where such best practices are achieved. However, although the technology exists and easy to implement, there are no national targets/drivers, or a national body who takes responsibility for adoption of this. GP web-access to images also is patchy in the NHS with lack of any national drivers. Discussions on other issues have kept the meetings and the electronic forum lively: NHS number use in NHS, PET-CT images inclusion in Local PACS, Direct transfer of images and reports from Independent Sector (AML MRI/PET-CT etc.), Radiology Images and Reports as part of the electronic Health Record, Implementation of PACS CD Encryption Directive from DOH. Teleradiology (for on-call and outsourced Teleradiology). Comparison between digital Dictation and Voice Recognition/ Incorporation of Breast Screening and Cardiology Images into radiology PACS. Electronic Requesting of radiology exams. Smartcard use in NHS. Hardware independent PACS (using standard PC hardware). PACS Migration in 2013 at end of LSP contracts.

1435 Sharing our healthcare records (images) in the wider world – Threat or opportunity: A vision of the future

Achenbach, S.
Microsoft Corporation

No abstract supplied.

1415–1545
Novel applications of diffusion MRI

1415 Diffusional kurtosis imaging of the brain

Helpern, J.
New York University School of Medicine, New York, NY, USA

Diffusion-weighted imaging (DWI) provides a powerful tool for probing tissue structure. Well-established diffusion metrics, such as mean diffusivity (MD) and fractional anisotropy (FA), have proven useful in assessing a number of diseases. It has long been appreciated, however, that DWI is in principle capable of yielding considerably more information than that contained in the conventional diffusion metrics used in clinical studies. In conventional DWI, the diffusion displacement probability distribution is assumed to be Gaussian in form with its width (i.e. standard deviation) proportional to the diffusion coefficient. The complex structure of biological tissues, however, can cause the diffusion displacement probability distribution to deviate substantially from a Gaussian form. This deviation from Gaussian behaviour can be estimated using a convenient dimensionless metric called the kurtosis. Recently, our laboratory has developed a new approach to DWI called diffusional kurtosis imaging (DKI), a quantitiative measure of the nongaussianity of the diffusion process. Since deviation from Gaussian behaviour is governed by the microstructural complexity of the tissue within which the water is diffusing, the diffusional kurtosis can be regarded as a quantitative measure of the complexity of the tissue's microstructure, and is potentially a more specific indicator of tissue microstructure than either the MD or FA. An additional advantage of DKI is that it allows for the investigation of grey matter as well as white matter microstructure. Preliminary data from normal brain development and ageing, attention deficit hyperactivity disorder (ADHD), schizophrenia, stroke and Alzheimer disease (AD) will be presented.

1445 Whole body diffusion weighted MRI: The new paradigm in metastases screening (Sponsored by Philips)

deSouza, N.
Institute of Cancer Research, Sutton, UK

Diffusion-weighted magnetic resonance imaging (DW-MRI) provides image contrast through measurement of the diffusion properties of water within tissues. Application of diffusion sensitising gradients to the MR pulse sequence allows water molecular displacement over distances of 1–20 μ to be recognized. Diffusion can be predominantly uni-directional (anisotropic) or not (isotropic). Combining images obtained with different amounts of diffusion weighting provides an apparent diffusion coefficient (ADC) map. In cancer imaging DW-MRI is increasingly exploited to detect tumour at primary and metastatic sites. It is proving valuable in monitoring treatment where changes in ADC values are measurable at an earlier stage than subsequent conventional radiological response indicators. In metastasis imaging, particularly with reference to bone, lymph node and peritoneum whole body studies are being explored to provide adequate coverage. Until recently, DW-MRI for whole body malignancy screening has been significantly limited because of relatively thick slices required (to achieve coverage during a breath-hold) and unreliable fat suppression. The development of a multiple thin slice whole body DW-MRI using: 1. a free breathing approach that affords multiple slice excitations and signal averaging over an extended period of time, and 2. a short TI inversion recovery (STIR)-EPI sequence that allows potent fat suppression improves the quality of the 3D reconstructed images in whole body imaging. The sequence provides good background body signal suppression including vessel, muscle, and fat signal by the heavy diffusion weighting and/or the STIR pulse. The longer scan time affords more slices with multiple signal averaging, higher SNR, and potent fat suppression, enabling quality MIP reconstruction. Also, the free breathing averages out unwanted signal. The STIR pulse is useful for the detection of lesions because most of the pathologic lesions have increased free water, and thus prolonged T_1 and T_2 values, resulting in a bright signal on STIR. STIR also may be useful in suppressing the intestinal signal that has a short T_1 value. However, SNR is lower in STIR than in spin-echo, which makes it time-consuming, with an average acquisition time of 10 mins for a 60-slice coverage. Images are displayed with an inverted grey-white scale familiar to clinicians, as they resemble those seen in scintigraphy or in PET. However, caution is required in image interpretation, mainly from long T_2 components within tissues, a phenomemnon referred to as "T_2-shine through". Potential advantages and limitations of the techniques in the clinic will be illustrated.

1515 Diffusion tractography of skeletal and cardiac muscle

Damon, B.
Vanderbilt University, Nashville, TN, USA

Striated muscles are highly structured and organized tissues. Because the overall cell geometry is highly elongated and most of the intracellular structures exhibit a predominantly longitudinal orientation, water diffuses preferentially along the long axis of the cell. The sensitivity of diffusion tensor MRI (DTMRI) to cellular geometry allows this technique to be used to examine muscle structure in healthy and disease on both the microscopic and macroscopic scales. On the microscopic scale, DT-MRI appears to reflect certain pathological aspects of muscle damage, such as oedema, membrane damage, and fibre disarray. This pathology results in elevated transverse diffusivities and reduced diffusion anisotropy; these changes have been observed in both animal models and human patients and appear to reflect muscle damage in a manner distinct from elevations in T_2. On the macroscopic scale, DT-MRI fibre tracking techniques have been used to characterize muscle architecture in 3D. In combination with techniques such as perfusion imaging or spatial tagging or phase contrast MRI to assess tissue displacement during contraction, DT-MRI fibre tracking of striated muscle offers the potential to characterize muscle structure-function relationships with very high spatial resolution. While the challenges of DTMRI in striated muscle are great (due to tissue motion, low inherent SNR, partial volume, and low diffusion anisotropy), these can be and are being overcome. This presentation will discuss the potential for DT-MRI to provide new insight into muscle structure and function at the microscopic and macroscopic scales.

1415–1615
Future of PET

1415 PET detector technology: Challenges and opportunities

Del Guerra, A.
University of Pisa, Italy

PET is a nuclear medicine imaging technique which produces a three-dimensional image of the distribution of a positron-emitting radioisotope (radiotracer). This gives information about the functional processes in a living subject. The key part of a PET system is the 511 keV gamma ray multi-detector system that surrounds the patient. Each of the two detectors involved in a coincidence event should provide the position of the interaction of the gamma within the detector itself and the amount of energy released. This is usually accomplished by the use of inorganic scintillators coupled to some kind of position sensitive photodetectors (PSPD). The most popular solution for clinical PET is the so-called "block detector". After more than 20 years from its introduction now it is time for a change. A new technology is becoming mature for the next generation of PET cameras. This presentation is a brief review on the use of position sensitive detectors in PET together with an overview of the near-future perspectives. A special attention is given to the recent development of the magnetic field compatible solid state photodetectors: the so-called Silicon Photomultipliers (SiPM). These photodetectors could soon replace the traditional photomultipliers and bring to the development of a new class of advanced tomographs both for stand-alone clinical PET and combined PET-MR modality.

1445 The role of PET in radiotherapy

Gregoire, V.
Universite Catholique de Louvain, Brussels, Belgium

The ultimate objective of radiotherapy is to achieve a high percentage of loco-regional control with a low incidence of morbidity, hence directly impacting on the overall survival and the quality of life. In this framework, one of the first steps in the radiotherapy planning process is to precisely select and delineate the target volumes (i.e. the tumour) and the surrounding normal tissues potentially responsible for treatment morbidity if irradiated at a too high dose. For a long time, CT is used as the reference imaging modality as it can also be used for dose calculation (taking into account the Hounsfield units, which are surrogates of tissue density). This requires that the image acquisition is performed in treatment position, thus with the patients immobilized on a flat tabletop. In pharyngo-laryngeal tumours, our group has shown that MRI did not brink any advantage over CT neither for the delineation accuracy, nor for the inter-observer variability. On the contrary, more recently, several groups including our, have shown that providing the images are acquired, reconstructed and segmented in a proper way, FDG-PET improved the delineation of pharyngo-laryngeal tumour volumes. This improvement translated into an improvement in dose distribution, i.e. a lower dose was delivered to the surrounding normal tissues. This finding opens the way for a possible increase in the dose prescription – thus potentially increasing the probability of loco-regional control – without increasing the dose to the surrounding normal tissues. Furthermore, the use of PET with other tracers imaging biological pathways involved in radiation response (e.g. cell proliferation, tumour hypoxia) open a new avenue to specifically deliver an extra dose to the PET-positive area, i.e. the so-called "dose painting" approach. After a short description of the radiotherapy processes, the lecture will focus on the usefulness of the various anatomic and functional imaging modalities for radiotherapy treatment of head and neck cancer patients. Methodological aspects and pitfalls with the use of multimodality images will be highlighted.

1515 The future of PET in drug discovery and development

Gee, A.
Imperial College London, UK

No abstract supplied.

1545 Novel PET imaging biomarkers for translational research

Welch, A.
University of Aberdeen, The John Mallard Scottish PET Unit, Aberdeen, UK

There is an increasing realisation of the potential of imaging in translational research, both in drug development and in developing new diagnostic tests. This interest is particularly strong for the modality of PET as it is one of the few imaging techniques that can be said to be truly translational (in the sense that the same investigation with the same tracer and protocol can be carried out in both animal models and in humans). Pharmaceutical companies are increasingly interested in using molecular imaging at all stages of the drug development cycle. There is also significant growth in the diagnostic imaging market and, in particular in clinical PET. However, this growth is currently constrained worldwide by the limited availability of validated imaging biomarkers. These biomarkers include both tracers and imaging methods. In this talk we will review the strengths of PET as a translational tool and outline some of the approaches that can be taken to develop new imaging biomarkers.

1430–1550
Musculoskeletal scientific session I

1430 Does delayed imaging adversely effect outcome in spinal cord compression?

Shaikh, U., Earnshaw, D.
Wirral University Teaching Hospital, Liverpool, UK

PURPOSE: The purpose of this study was to assess the time taken, from request to report, to image a patient with suspected cord compression, and whether delaying the imaging lead to any adverse outcomes. This study was in part initiated to assess the necessity of providing an out-of-hours MRI service for cord compression, in a DGH setting. METHODS: A retrospective review of inpatient spinal MRI reports over a 6 month period was undertaken. All requests for imaging for possible spinal cord compression were highlighted together with positive reports, including cases of unsuspected cord compression. The time of request and time taken for a report to be issued were logged. Particular focus was made in those cases of cord compression in which the patient had an out of hour wait for imaging of more than 8 hours. RESULTS: Over a 6 month period, 139 inpatient "whole" spines were imaged of which 48 cases were referred as possible cord compression which was demonstrated positively in 15 patients. Of the remaining 91 cases, incidental cord compression was found in 11 patients. The total mean wait for scan was 12.6 hours (4.4 working hours). Six patients with cord compression waited more than 8 hours for imaging, none of whom demonstrated negative sequelae attributable to delayed imaging. CONCLUSION: Patients with suspected cord compression did not suffer adversely by an out-of-hours wait for imaging suggesting that, in a medium sized DGH an on call MRI service is not tenable at this stage.

1440 Evaluation of ultrasound as first line investigation in clinically diagnosed soft tissue mass

Lakkaraju, A., Robinson, R., Robinson, P.
Chapel Allerton Hospital, Leeds, UK

PURPOSE: To evaluate the efficacy of ultrasound as a first line investigation in patients with a clinical soft tissue mass MATERIALS/METHODS: 358 consecutive patients (155 male, 203 female, mean age 48 years) referred from primary and secondary care with soft tissue masses underwent ultrasound evaluation. Five radiologists performed ultrasound using a 10–15 MHz linear transducer and recorded referrer diagnosis, history, lesion size, anatomical location and depth, internal echogenicity, external margins (well defined rim or infiltrative) and vascularity on power Doppler (absent or present, if present pattern either linear or disorganized). A provisional ultrasound diagnosis was made using one of 8 categories. Benign categories (1–5) were referred back to a non sarcoma specialist or original referrer for observation. Indeterminate or possible sarcomas (categories 6–8) were referred for MRI within 14 days. Additionally category 8 lesions were referred to the regional sarcoma service. Institutional and regional database follow-up was performed. RESULTS: 284 of 358 (79%) lesions were classified as benign (categories 1–5). On follow-up 15 of 284 patients were re-referred but none (284 of 284) had a malignant pathology on follow-up (24–30 months). 95 of 358 patients had masses larger than 5 cm and/or deep to deep fascia with 6 of 95 tumours (4 of 6 sarcomas and 2 of 6 non sarcomas) and 89 of 95 benign masses. 73 of 358 patients underwent MRI; 60 benign or non tumours, 10 possible sarcomas and 3 indeterminate lesions. Overall 6 of 12 lesions (6 of 358, 1.68%) deemed possible sarcomas on imaging were malignant sarcomas. CONCLUSION: Ultrasound is an effective diagnostic triage tool for evaluation of soft tissue mass referred from primary care.

1450 Ultrasound appearances of the knee following prosthetic placement

Oommen, J.
Wrightington Wigan & Leigh NHS Foundation Trust, Wigan, UK

KEY LEARNING OBJECTIVES: To illustrate base line normal ultrasound and long term appearances of knee replacement arthroplasty. DESCRIPTION: Illustration of the ultrasound appearances of components of a unicompartmental and total knee replacement prosthesis and the normal post surgical changes. Illustration of the site of surgery and components of the extensor apparatus to identify causes for failure of full extension, the presence of patella mal-tracking. Illustration of ultrasound appearances of complications and of early implant failure from post surgical changes. Illustration of other common findings following a prosthetic implant. CONCLUSION: Evaluation of the prosthetic implants of the knee is grossly limited to plain film follow up as CT images are distorted by streak artefacts and MR images are distorted by loss of signal and image distortion due to loss of magnetic field homogeneity arising from the metallic components of the prosthesis. Identification of ultrasound appearances of the normal post surgical changes and the components of the prosthesis with an understanding of the surgical technique used is invaluable in the ultrasound follow up of post-operative cases. Assessment of the extensor mechanism including evaluation of the retinacular fibres for dehiscence and demonstration of subluxation of the patella helps to identify functional and soft tissue causes for limitation of mobility and range of movement in patients. Identification of the immediate post surgical changes and common complications. Identification of post surgical changes from evidences of implant failure would limit the need for revision surgery.

1500 Three dimensional ultrasound imaging for the detection and monitoring of joint damage in rheumatoid arthritis

Shipley, J.A.[1], Thompson, J.M.[1], Harris, N.D.[1], Bhalla, A K.[1], Robinson, G.[2], Glew, D.[2], Hillman, M.R.[3], Duck, F.A.[2]
[1]Royal National Hospital for Rheumatic Diseases, Bath, UK, [2]Royal United Hospital, Bath, UK, [3]Bath Institute of Medical Engineering, Bath, UK

PURPOSE: Current treatments for rheumatoid arthritis (RA) must be selectively applied at an early stage. Both MRI and 2D ultrasound have been shown to achieve greater sensitivity to erosions and soft tissue inflammation than standard X-ray radiography. We have developed a 3D ultrasound system for the diagnosis and monitoring of RA in the small joints of the hand, and assessed the possible clinical advantages this may offer. MATERIALS/METHODS: The system uses an optically tracked, mechanically guided freehand transducer. It is based on the Stradwin 3D ultrasound software package (University of Cambridge, UK) and uses a Polaris Vicra optical tracking device. A cohort of 9 seropositive RA patients and 4 healthy volunteers were scanned using 3D ultrasound, 2D ultrasound and MRI. All scans were reported (blind) by two independent radiologists, who scored RA disease severity and identified erosion locations. RESULTS: 2D and 3D ultrasound were found to be similar in their overall performance; however, the 3D system provides a complete record of the scanned joint morphology for off-line analysis and comparison with subsequent scans. There is good spatial correlation between those erosions detected

using 3D ultrasound and MRI, but MRI often reveals more erosions due to the limited surface area that is accessible using ultrasound. CONCLUSION: We have developed a clinically useable ultrasound system which can produce high resolution (<0.25 mm) three-dimensional images. The novel mechanical guide mechanism allows the acquisition of smooth and reproducible scans without sacrificing operator input towards optimal imaging of the bone surface.

1510 Ultrasound guided haematoma block for closed reduction of distal radial fractures – A novel training method

Kennish, S.J.[1], Currie, S.[2], Kessel, D.[1]
[1]St James's University Hospital Leeds, Leeds, UK, [2]Leeds General Infirmary, Leeds, UK

KEY LEARNING OBJECTIVES: A simulation programme for training emergency physicians in the ultrasound-guided administration of a haematoma block is outlined. DESCRIPTION: haematoma blocks can provide safe and effective loco-regional anaesthesia for the closed reduction of distal radial fractures. Overlying traumatic soft tissue swelling and patient obesity can prevent accurate localisation of the fracture during "blind" insertion of the local anaesthetic. Repeated palpation and failed needle placement increases patient distress. A simple ultrasound guidance technique can be used for accurate initial placement of the needle and a novel training method is outlined. The dorsal surface of the distal radius is scanned with a high frequency linear transducer. The fracture is readily identified as a focal hyporeflective area with highly reflective intact cortex on either side. Ultrasound can be used to visualize a needle as it passes into the associated haematoma. Scanning during injection of 10 ml of local anaesthetic confirms correct position. A single closed fracture can be created in a raw turkey leg bone with a single hammer blow. Ultrasound images of this fracture are very similar to those of a distal radial fracture. Red liquid food colorant can be injected into the fracture site to act as haematoma substitute. Preliminary assessment shows that emergency physicians can be taught how to use ultrasound to recognize the fracture, place the needle, aspirate the "haematoma" and inject anaesthetic. CONCLUSION: This novel simulation training method is inexpensive and provides comparable imaging to a distal radial fracture. Trainees report improved confidence prior to clinical application.

1520 Diagnosing plantar fasciitis – The role of imaging

Ramsden, P.
University of Bradford, Bradford, UK

Plantar fasciitis is a common cause of heel pain in adults. Commonly plantar fasciitis has been associated with running and athletic sports. However, rapid weight gain and obesity are also recognized as factors in its presentation. Plantar fasciitis is often diagnosed on clinical assessment. However, the accuracy of diagnosis varies with the expertise of the clinician and with a number of pathologies presenting with similar symptoms, diagnostic imaging to verify inflammation of the connective tissue and confirm clinical diagnosis may be beneficial. Evidence suggests that ultrasound, MRI and scintigraphy may all have a role to play in detecting and diagnosing plantar fasciitis. However, no recommendations on the use of imaging currently exist. This presentation summarises a third year student project and summarises the evidence on the role of imaging in plantar fasciitis to determine the preferred imaging approach for accurate diagnosis.

1530 Obesity increases precision errors in DXA measurements at the spine and hip

Holl, S.A., Bartlett, A.G., Hopkins, S.J., May, S., Welsman, J.R., Knapp, K.M.
University of Exeter, Exeter, UK

PURPOSE-MATERIALS: The precision of dual X-ray absorptiometry (DXA) measurements is of utmost importance and the current least significant change of 2.8% is based on precision measurements of 1%. Although obesity has typically been thought to be protective against osteoporosis, the rapidly increasing proportion of overweight and obese individuals within the population will lead to an increasing number of these patients requiring DXA scans in the future. This study investigated the effect of being overweight or obese on precision measurements at the clinically important sites of the lumbar spine, femoral neck and total hip using the GE lunar Prodigy. METHODS: 78 women were recruited from a volunteer population with BMIs ranging from 18.5 kg m^{-2} to 45.9 kg m^{-2}. All women had duplicate DXA scans of their lumbar spine and left hip, with repositioning between scans. The group was divided into three groups based on their BMI and the root mean square coefficient of variation calculated for each group. RESULTS: The RMSCV% were as follows for the lumbar spine, femoral neck and total hip, respectively: <25 kg m^{-2} group (n=40) 1.02%, 1.30%, 0.78%; 25–30 kg m^{-2} group (n=19) 1.44%, 1.18%, 0.83%; >30 kg m^{-2} group (n=19) 2.93%, 2.05%, 1.16%. CONCLUSION: The results demonstrate an increase in precision error at all three sites in obese subjects, with the greatest increase being seen at the spine. These results suggest that serial measurements in obese subjects should be treated with caution since the least significant change will be increased, especially at the spine. Further research is required to further investigate these findings.

1540 Imaging features of foot and ankle osteoid osteoma

Shukla, S., Clarke, A., Saifuddin, A.
The Royal National Orthopaedic Hospital, Stanmore, UK

PURPOSE: To review the imaging features of osteoid osteoma of ankle and foot, with emphasis on MRI findings. MATERIALS/METHODS: A retrospective evaluation of imaging findings of 9 patients with osteoid osteoma was performed. Plain radiographs, CT and MRI had been performed in all cases. Radiological features evaluated were presence of a nidus and cortical thickening. CT features were nidus location and nidus calcification. MRI features were presence of identifiable nidus, presence and grade of bone oedema and whether a joint effusion was present. RESULTS: Out of 9 patients, there were 3 female and 6 male. The mean age was 21 year (range 11–39 years). Plain films were normal in all cases with hindfoot (4 calcaneum, 1 talus) osteoid osteoma. A CT scan identified a nidus in all these cases and in all total cases but one (89%). MRI identified a nidus in 6 of 9 cases (67%). High grade bone marrow oedema localized to affected bone and adjacent soft tissue oedema was identified in all cases with no oedema in adjacent bones. The nidus was of intermediate signal on T_1 and intermediate to high signal on T_2-weighted sequences. CONCLUSIONS: MRI should be considered in younger patients with chronic hind or mid foot pain and a normal radiograph. The utility of CT in identifying a nidus in the setting of abnormal radiograph suggestive of osteoid osteoma or after MRI with oedema isolated to a solitary foot or ankle bone and soft tissue is also shown.

1430–1600
Cardiac keynote and scientific session I

1430 Pushing the boundaries of perfusion CMR

Plein, S.
Leeds General Infirmary, Leeds, UK

No abstract supplied.

1455 Multi-slice CT segmental calcium score to predict stenosis severity in calcified coronary lesions

Pugliese, F.[1,2], Hunink, M.M.G.[3], Gruszczynska, K.[3], Meijboom, W.B.[3], Rengo, M.[3], Krestin, G.P.[3], de Feyter, P.J.[3]
[1]MRC-CSC, PET Cardiology, London, UK, [2]Royal Brompton Hospital, London, UK, [3]Erasmus MC University Medical Centre Rotterdam, Rotterdam, Netherlands

PURPOSE: To predict ≥50% coronary stenoses associated to calcified lesions detected at multi-slice computed tomography coronary angiography (MSCT-CA) based on MSCT calcium score (CS) measured per segment and calcification morphology. MATERIALS/METHODS: Patients (n=402) with stable or acute chest pain underwent MSCT CS, MSCT-CA and conventional angiography (CAG). One

observer measured CS in individual coronary segments and classified calcification morphology into spotty, wide and diffuse. A derivation dataset and a validation dataset were obtained. In the derivation dataset, we determined frequency of angiographically proven ≥50% stenoses and explored the predictive value of other variables (location within the coronary tree and clinical factors) to derive a multivariable prediction rule. The prediction rule was validated in the validation dataset. RESULTS: In a multivariable model, the OR for stenosis was 1.8-fold greater (p=0.006) in patients with typical chest pain, 2-fold (p=0.014) greater in patients with acute coronary syndrome, 2-fold greater (p<0.001) in patients with prior myocardial infarction. With distal segments as comparator, each unit of natural log of CS in middle segments corresponded to an OR 1.2-fold (p<0.001) greater; in proximal segments this corresponded to an OR 1.1-fold greater (p=0.021). Spotty calcifications had an OR for stenosis 2.3-fold (p<0.001) greater than the absence of calcification, wide calcifications 2.7-fold (p<0.001) greater, and diffuse calcifications 4.6-fold (p<0.001) greater. CONCLUSION: Combining segmental CS, morphology, lesion location and patient's symptoms we can predict the probability of ≥50% stenosis associated to calcified lesions detected at MSCT-CA.

1505 Adenosine stress perfusion cardiac magnetic resonance imaging: Does it really shape interventional strategy?

McParland, P.[1], Bull, R.[2], Patel, R.[2], Mckenzie, D.[2], Radvan, J.[2]
[1]Southampton University Hospital Trust, Southampton, UK, [2]Royal Bournemouth Hospital, Bournemouth, UK

PURPOSE: Cardiac magnetic resonance imaging (CMRI) allows accurate identification of ischaemic and dead myocardium. We assessed whether application of this technology would influence PCI. MATERIALS/METHODS: 60 patients undergoing diagnostic angiography followed by CMRI were evaluated in 2007. Data for the first 26 patients are included here. All angiograms were examined by a cardiologist for percutaneous intervention (PCI) and number of target lesions and vessels counted. This was done on conventional criteria blinded to the CMRI results. CMRI data included ejection fraction, inducible ischaemia and infarcted territory. The number of PCI targets were then re-assessed following the CMRI data. RESULTS: 10 (the first 26) patients had 3 diseased vessels, 10 had 2 vessel, and 6 single vessel coronary disease (56 diseased vessels). 48 of the 56 vessels were potential PCI targets on conventional criteria. Using CMRI this was reduced to 24 vessel targets – a reduction of 50% (p<0.05). One patient, who was not thought to need a stent, was converted to PCI. 20% (10) of the potential target vessels supplied dead myocardium, and 13 (27%) showed no evidence of ischaemia. Total occlusion was not more likely to be infarct-related than vessels with severe stenoses. CONCLUSION: 1. CMRI allows an ischaemia-guided approach where PCI target vessels are reduced by 50%. 2. CMRI is a fundamental tool in shaping PCI strategy in coronary artery disease. 3. Routine CMRI may be a cost-effective tool.

1515 Dose optimization and image quality in computer tomography

Irwan, R.
Toshiba Medical Systems Europe, Zoetermeer, The Netherlands

KEY LEARNING OBJECTIVES: Dosimetry for both multidetector CT (MDCT) and the new generation volume CT will be presented. DESCRIPTION: This educational session covers from basic understanding on CT dose index (CTDI) and dose–length product (DLP) to more advanced topics such as over-ranging and dose management (automatic exposure control) in relation with the image quality. The influence of CT-pitch, tube potential, tube current and rotation time on both image quality (in terms of temporal resolution) and patient dose will be discussed. The main differences between dosimetry for MDCT, which involves table movement and for volume CT which does not, will be thoroughly discussed and analysed. The CT-pitch will be no longer applicable to the latter. Furthermore, the corresponding phantom measurements will also be covered. This includes the new method to measure CTDI for beam-widths larger than 100 mm. In addition, the impact of scan length on the exposure levels at 16-MDCT and 64-MDCT will be discussed, including the crossing of DLP curves obtained in both systems. Differences in object size may thus explain apparent discrepancies between previous studies reporting either higher or lower effective exposure levels. CONCLUSION: One should pay careful intention to what they are measuring in CT dosimetry. The DLP, and therefore, patient dose should include the over-ranging and not only the scan length.

1525 MDCT coronary angiography vs. myocardial perfusion scintigraphy a comparison of clinical management and cost

Nicol, E.D.[1,2], Stirrup, J.[2], Leatham, E.W.[2], Underwood, S.R.[2], Rubens, M.B.[2], Padley, S.P.G.[2]
[1]John Radcliffe Hospital, Oxford, UK, [2]Royal Brompton Hospital, London, UK

PURPOSE: To assess the short term investigation and treatment costs of CT coronary angiography (CTA) against myocardial perfusion scintigraphy (MPS) using real clinical scenarios. MATERIALS/METHODS: 52 patients with low to intermediate likelihood of coronary artery disease referred for MPS underwent CTA. Clinical information for either CTA or MPS was presented randomly to 20 cardiologists, who decided the further investigations and treatment required. Short term cost was calculated for each imaging strategy. RESULTS: The number of further investigations requested did not differ between groups. Patients undergoing CTA were more likely to be referred for invasive coronary angiography (odds ratio (OR) 2.17), receive aspirin (OR 1.72), statins (OR 3.13), ACEi/ARB (OR 2.1) (all p<0.001), β-blockers (OR 1.45, p=0.004) or clopidogrel (OR 2.43, p=0.012). Mean total cost and investigation costs were similar between CTA and MPS (£48.80 vs. £48.80, p=0.534 and £754 vs. £649, p=0.927, respectively). Treatment costs with CTA were higher (£21.40 vs. £18.30 p<0.001). CONCLUSION: There are significant differences in further investigation and treatment of patients when using CTA compared with MPS in this cohort, in particular with greater use of secondary preventative medication.

1515–1715
Update in urologic imaging

1515 CT urography: Which technique and when?

Silverman, S.
Harvard Medical School, Boston, MA, USA

CT urography has emerged as the heir apparent to the conventional intravenous urogram for the initial imaging evaluation of many urinary tract complaints. There has been considerable debate as to how best to perform a CT urogram. Although it is accepted that the kidneys are best evaluated during the nephrographic phase, most of the controversy stems from the fact that it is difficult to obtain a single image of the urinary tract in which all collecting system components are opacified and distended due to peristalsis. Many techniques have emerged, but in our experience, a three-phase examination that is supplemented with intravenous furosemide is the most reliable way to opacify and distend the collecting system, ureters, and bladder. This three-phase technique has also been shown to be excellent for the detection of bladder cancer, once thought to be solely in the purview of cystoscopy. However, the technique does utilize more radiation than the intravenous urogram. Newer techniques, including the split bolus method, coupled with dose modulation have reduced radiation. Since CT urography is more costly than intravenous urography, it has not been fully determined as to who should be examined with CT urography. Haematuria is found commonly and does not often herald the onset of significant pathology but at the same token, may be the only sign of a cancer or other serious disease. Although evidence-based data are lacking, risk-based protocols are emerging that will maximize the yield of evaluating patients with haematuria with CT urography.

1545 MR imaging for genitourinary emergencies

Spencer, J.
St James's University Hospital Trust, Leeds, UK

In this interactive series of case presentations I will illustrate how MRI can help in the management of genitourinary emergencies.

1615 Bladder cancer: MRI in staging and follow-up

Carrington, B.
Christie Hospital NHS Trust, Manchester, UK

This lecture will discuss the role of MRI in the staging and follow-up of bladder cancer. Diagnostic difficulties in staging will be addressed and atypical sites of tumour spread illustrated. The expected post treatment effects of surgery, radiotherapy and chemoradiotherapy will be identified and patterns of tumour relapse illustrated. Dynamic contrast-enhanced MRI and diffusion-weighted imaging will be considered, particularly as problem-solving tools in the treated patient. The presentation will include a relevant literature review and discuss potential UK multicentre MRI trials in bladder cancer.

1645 Sorting out retroperitoneal masses

Rockall, A.
St Bartholomew's Hospital, London, UK

Retroperitoneal masses are often identified as an incidental finding whilst investigating a patient for relatively non-specific symptoms. The range of diagnoses is varied and includes primary tumours arising in the tissues of the retroperitoneum, such as the connective tissues and neural tissues; secondary masses, such as in testicular germ cell tumours; or inflammatory or infective processes. Primary retroperitoneal tumours are extremely rare and are predominantly sarcomas. In some cases, these are readily diagnosed based on the imaging features, such as well-differentiated liposarcomas. However, in many cases image guided biopsy may be required to establish the diagnosis. As surgery is the predominant treatment modality, imaging is useful in delineating the extent of the tumour and vascular involvement. Masses that originate from neural crest tissue include paragangliomas (extra-adrenal phaeochromocytomas), which are usually benign and are "functional" (secreting catecholamines) in up to 60% of patients. Ganglioneuromas also arise from neural crest tissue along the sympathetic ganglia and may be very large masses at presentation. Other rare primary tumours include angiomyxoma. Cystic lesions in the retroperitoneum may be congenital, such as duplication cysts, or may be acquired, for example following pancreatitis. Primary or secondary germ cell tumours may have a relatively cystic, low density appearance. During the course of this lecture, the imaging characteristics of retroperitoneal masses will be reviewed. Several cases will be used to illustrate different pathologies, using an interactive approach, and a discussion of the differential diagnosis will be undertaken.

1545–1730
PACS Horizons – RCR PACS and teleradiology group session

1545 Cardiology PACS – What are the challenges?

Wilde, P.
Bristol Royal Infirmary, Bristol, UK

A £57m purpose built regional cardiac centre funded by the Department of Health, the Bristol Heart Institute (BHI), has just opened (May 2009) on a site immediately adjacent to the Bristol Royal Infirmary (BRI). It offers a totally integrated cardiac service with cardiac surgery, interventional cardiology (including 24/7 primary angioplasty), electrophysiology and adult congenital heart disease treatments all being delivered on a unified site. Diagnostic imaging facilities include new cardiac catheter laboratories, a "hybrid" catheter laboratory/cardiac theatre, a full echocardiography service and a dedicated 1.5 T cardiac MR scanner as well as plain radiography. The BRI is a major city centre acute hospital and specialist tertiary centre which houses the main radiology department. There are numerous patient pathways through the two buildings. Some cardiac patients will be admitted directly to the BHI whilst others will be transferred from the BRI. Many patients will require investigation for both cardiac and non-cardiac conditions. The challenge has been to integrate an existing radiology PACS system with a new cardiology orientated imaging network. The specification required full compatibility between both systems, allowing clinicians in both sites to review both cardiology and non-cardiology imaging. Viewing of external imaging is also required. Technical differences in requirement between conventional radiology and cardiac imaging will be reviewed and the clinical working practices and needs of the two clinical services will be compared. Our solutions to this challenging specification will be presented and our early experience will be reviewed.

1605 Digital pathology

Treanor, D.
St James's University Hospital, Leeds, UK

Pathology is going digital, from glass to virtual slides. These are gigapixel images produced by scanning tissue sections at high resolution (up to 200 000 dots per inch), enabling the study of tissue at a cellular level. They could replace the conventional light microscope in histopathology clinical practice and research. This talk will introduce virtual slides at a technical and clinical level. The uses of virtual slides and the potential benefits they bring to research, education, and diagnosis will be discussed. The technical, clinical and organisational challenges they present will be described. Examples of virtual slides can be seen on our webpage at www.virtualpathology.leeds.ac.uk.

1625 Mammography – From analogue to digital and PACS

Wallis, M.G.
Addenbrooke's Hospital, Cambridge, UK

Mammography (breast imaging) has two main "components". Lower volume symptomatic/referral services fully intergraded into a Hospital CRIS and PACS and high volume "community based" screening services working from NHS number and a unique screening identifier on a stand alone national computer system (NBSS). Digital mammography equipment is now well tested and available in many hospitals. Thanks to IHE the problem with integration with CRIS and PACS and between different manufactures is essentially resolved. Screening is further behind. Conversion of NBSS is on going. Data transfer to and from remote acquisition stations and desk top integration has been tested and is working in a small number of pilot sites. Spine compliance is outstanding. By 2012 screening will generate over 357 TB of data pa. Working on 3 year cycle 80% of attendees have prior images that will need to be retrieved. The majority of these prior images will have originated from their current screening trust. A substantial minority (as yet to be determined) will be from elsewhere in the country and from the symptomatic service where they are stored under a different primary identifier. Clearly the current PACS architecture (12 months of local storage) and the network will need to be redesigned to ensure that the current systems don't grind to a halt. I plan to explore these issues and potential solutions in more detail, provide an up to date overview of the current state of play and discuss the implications for the complete health care record.

1645 Visible light imaging – Endoscopy and medical photography

Bramley, R.
Radiology, Christie Hospital NHS Trust, Manchester, UK

No abstract supplied.

1705 What radiotherapists want from PACS

Shakeshaft, J.
Clatterbridge Centre for Oncology, Wirral, UK

PURPOSE: The NHS has invested significant amounts in procuring a cluster-based nationwide PACS system. Most of these systems now

include the ability to store a wide range of DICOM objects in addition to the standard images generated in diagnostic imaging departments. This includes the range of objects generated by most commercial radiotherapy systems. This paper discusses the potential for using the nationally procured PACS systems both as an archive of radiotherapy treatments for the host institution and as a means of sharing this data with other institutions, where the patient may be treated at a later date. METHODS: Although radiotherapy systems have been able to generate DICOM objects for a number of years now, there still remain more compatibility problems than with most images generated by diagnostic imaging departments. The limitations imposed by these compatibility issues together with possible solutions and risks will be discussed. RESULTS: Results of some initial pilot work on storing radiotherapy data in the GE PACS at Clatterbridge Centre for Oncology will be presented. This work has seen the extension of the RIS into the radiotherapy imaging department and various solutions for integrating non-modality-worklist compliant equipment. Possible means of oncologists being able to review previous treatment data at clinics based at other hospitals will also be discussed. CONCLUSION: The national PACS does have the potential to be valuable archive for radiotherapy treatment data. The potential for sharing treatment data can also be realised if a national protocol can be agreed. Work is underway to establish this.

1600–1700

Consultant practice in radiography

1600 So you think you do research?

Jones, H.[1], Snaith, B.[2]
[1]Royal Liverpool Hospital, Liverpool, UK, [2]Pinderfields General Hospital, Wakefield, UK

PURPOSE: Research is a requirement of the Consultant radiographer's role and as such, they play a pivotal role in the integration of clinical practice, education and research findings. LEARNING OBJECTIVES: Review the expectations for the research and evaluation domain of consultant practice. Demonstrate the expectation for Consultant practitioners to engage in the research process, at local level and within wider healthcare team. Explore case studies of current and recent research undertaken by consultants. DESCRIPTION: Radiography research has been acknowledged as limited, with much perceived to be undertaken within academia or by the medical profession in isolation. The consultant role was designed to integrate leadership, education and research within expert clinical practice and increase the capacity and quality of clinically based research. In relation to the four domains of consultant practice, the research and evaluation element will be reviewed and case studies of research practice at the consultant level will be discussed. Opportunities for personal and professional development, collaboration and funding will be explored. CONCLUSION: Consultant radiographer appointments across the UK have contributed to the radiography evidence base and future appointments will be expected to both engage in the research process and disseminate the results to further enhance practice.

1615 So you want to do service improvement?

Punt. L.
Addenbrooke's Hospital, Cambridge, UK

KEY LEARNING OBJECTIVES: To investigate service redesign and the role of the Consultant Radiographer. To obtain an understanding of competency program development. To be aware of the benefits of skill mixing and role development facilitating innovative service improvement and improving patient outcomes. DESCRIPTION: Since 2000 [1] government initiatives to ensure a world class health service and improve patient care have highlighted the need to challenge the boundaries that have traditionally existed between professions. New ways of working have been identified including the up-skilling, encouragement and reward for non-medical influences on service redesign and improvement. This presentation examines the impact of the Consultant Radiographer in implementing service improvement within the Anglia cancer network. It also aims to highlight the benefits these changes have made to all service users. The author will illustrate how the Consultant Radiographer can identify, design, implement and evaluate a robust service redesign programme using examples of practice from the introduction of the UK's first radiographer led adjuvant endometrial clinic for new patients and implementation of a radiographer led brachytherapy service. CONCLUSION: Appointment of a Consultant Therapy Radiographer to the Anglia cancer network has influenced service re design that has increased resources, reduced waiting times and provided increased flexibility, continuity and improved integration of care for the patient. Reference: 1. The NHS plan, A plan for investment. A plan for reform Department of Health, July 2000.

1645 So you want to be a consultant radiographer?

Kelly, J.F.
Countess of Chester NHS Foundation Trust, Chester, UK

KEY LEARNING OBJECTIVES: Outline of the UK government rationale behind the development of consultant allied health professional (AHP) posts. Discuss the main factors required to facilitate the establishment of such posts. Exploration of the key differences between consultant and advanced practice. DESCRIPTION: In 2000 the UK (UK) government announced an intention to develop AHP consultant posts for expert staff [1]. The purpose was to create new career opportunities and assist in recruitment and retention of skilled professionals whilst improving patient care and reducing waiting times. Compared with some other AHP groups the number of radiographer consultant posts established since then has been relatively small. There are currently approximately 40 consultant radiographers (therapy and diagnostic) within the UK The establishment of such posts appears to be dependent on a number of factors and varies between organisations. This presentation will outline factors that facilitate the creation of such posts and the educational, training and experience required for appointees to be competent to perform the role. Perceived barriers and threats to further appointments and a strategy for succession planning in order to sustain the current momentum will be considered. CONCLUSION: Consultant radiographer appointees' scope of practice is very broad and, despite the relatively small numbers of appointments, has undoubtedly had a beneficial impact on patient care. A sustainable strategy to raise the profile of this impact is vital if the consultant role is to remain embedded within National Health Service staffing structures. Reference: 1. Meeting the Challenge: a strategy for the allied health professions. Department of Health. London: 2000.

1615–1715

Musculoskeletal scientific session II

1615 Radiography of the shoulder following anterior dislocation of the humeral head-detecting glenoid rim fractures

McCabe, L.
University of Bradford, Bradford, UK

Approximately 23% of anterior dislocations of the humerus have associated fractures. A significant proportion of these occur at the anterior glenoid border. The early identification of glenoid rim fractures is essential as misdiagnosis may result in instability at the gleno-humeral joint, premature arthritis and disruption to shoulder movement and function. Radiography of the shoulder following trauma usually involves the production of 2 images. In the UK, the antero-posterior shoulder projection is undertaken as standard and provides an anatomical overview of shoulder anatomy. However, this projection is not optimal for evaluating the anterior glenoid border due to anatomical orientation and super-imposition of other structures. The second radiographic projection of the shoulder undertaken in the UK is noted to vary between hospitals, although anecdotal evidence suggests it rarely varies between patients imaged within each hospital unless physical disability prevents routine projections being obtained. Consequently, it appears that the choice of projection is related to local practice rather than the diagnostic value of the different shoulder techniques available and their value in diagnosing specific anatomical injuries. This presentation summarises the findings of a third year

student project to evaluate supplementary radiographic projections of the shoulder in terms of anatomy displayed and identifies the most appropriate second projection of the shoulder to be undertaken following an anterior humeral to determine the presence of associated glenoid rim fractures.

1625 Carpal angles defined by the international wrist investigators workshop: Are they reliable

Botchu, R., Rahaman, R., Disini, L., Chojnowski, A., Toms, A.
Norfolk and Norwich University Hospital NHS Trust, Norwich, UK

PURPOSE: Carpal angles, as measured on plain radiographs and used to determine surgical intervention, have been defined by the International Wrist Investigators Workshop (IWIW) but are not known to be reliable. The aim of this study is to measure the reliability of the most commonly used carpal angles in standard wrist radiography. MATERIALS/METHODS: 101 radiographs (orthogonal AP and lateral) of wrists were selected sequentially from PACS. Wrists with an arthropathy, surgical implants or acute fractures were excluded from the study. Scapholunate and capitolunate angles, carpal angle, and radial inclination were independently measured by two observers using PACS tools and following IWIW definitions. RESULTS: The mean age of patients was 45 years (range 8–87 years). 43 males and 58 females were included with 59 radiographs of the right wrist and 42 of the left. The mean angle and differences in observer measurements were: scaphulonate mean 50° (SD 10°), observer difference 6° (SD 6°), lunocapitate mean 4° (11°), observer difference 9° (SD 10°), carpal angle mean 128° (SD 8°), observer difference 4° (SD 4°), and radial inclination mean 26° (SD 4°), observer difference 3° (SD 5°). The intraclass correlation coefficients (ICC) for the two observers were: scapholunate 0.82 (95% CI 0.7–0.9), lunocapitate 0.64 (95% CI 0.5–0.8), carpal angle 0.87 (95% CI 0.8–0.9) and radial inclination 0.52 (95% CI 0.3–0.7). CONCLUSION: ICC, and therefore inter-observer reliability using IWIW definitions of carpal angle measurement, is good for scapholunate, lunocapitate and carpal angles and moderate for radial inclination.

1635 Identification of distal radial fractures by radiographers and consultant radiologists: A comparative study

Mc Entee, M.F.[1], Dunnion, S.[2]
[1]University College Dublin, Dublin, Ireland, [2]Beaumont Hospital, Dublin, Ireland

PURPOSE: The aims of the study is to measure the performance of radiographers in detecting the presence of a distal wrist fracture; to determine whether the number of years clinical service impacts on radiographers performance and to compare the performance of radiographer, untrained in reporting to that of consultant radiologists. MATERIALS/METHODS: To achieve these aims we carried out a receiver operating characteristic (ROC) study on radiographers and radiologists to assess their performance. 19 experienced but untrained radiographers were compared with 15 certified consultant radiologists. 30 wrist radiographs were shown, 15 of which had distal radial fractures 15 did not. The results of the ROC, false positives and false negative were compared using one way analysis of variance (ANOVA). RESULTS: The study showed that for Az values Consultant Radiologist performed better ($p \leq 0.01$) with radiographers scoring 0.877 (0.087) and Radiologist scoring 0.94 (0.05). Radiologists also had fewer false positives than radiographers ($p \leq 0.007$), no difference was found in the false negatives ($p \leq 0.11$). A trend of increased performance with increased experience was seen among the radiographers. CONCLUSION: Radiologists outscored radiographers and a difference in performance exists between the groups. However, radiographers Az scores of 0.87 demonstrates that there is potential for radiographers to recognize fractures with some accuracy. Further training of radiographers should now be carried out and this experiment should be repeated on the group with training.

1645 Is FAST a natural role extension for trauma radiographers?

Adrian-Harris, D.
University of Portsmouth, Portsmouth, UK

The role of FAST in the early diagnosis of intra abdominal bleeding is well understood and the technique is now widely used. Literary evidence suggests that radiology and non radiology clinicians are equally able to conduct and interpret such examinations. Changes in the medical education afforded to recently qualified doctors might be adversely impacting on their opportunities to acquire such skills. The purpose of this paper is two fold, firstly to explore the potential gains should FAST become a role extension activity for A&E radiographers. The second limb is to recount the experience of teaching FAST to a cohort of final year students shortly before they graduated from the diagnostic radiography programme at the University of Portsmouth. It is concluded that the undergraduate radiography programme already encompasses sufficient knowledge of ultrasound physics, cross sectional anatomy and experience in manipulating grey scale images that the development of FAST skills is readily achievable, and further, that FAST undertaken by radiographers is a real possibility as they have the appropriate skill set, are already present during trauma imaging and have the infra structure to maintain competency and clinical governance.

Notes

Scientific programme abstracts Tuesday 9 June

0830–0930
MRI school II – Ankle
0830 Ankle pain and instability

Gafoor, A.
Derriford Hospital, Plymouth, UK

Multi-planar imaging and superior resolution of MRI makes it an ideal tool for investigating and identifying the causes of ankle pain and instability. Although radiographs have a role in identifying bony pathology, especially fractures and bone tumours, MRI is superior in identifying subtle bone and soft tissue abnormalities. We will discuss the bone and ligamentous anatomy and discuss common abnormalities that cause pain and instability including bone bruising, osteochondral fractures and ligament disruptions. We will also discuss the role of MRA (MR arthrography) in evaluating the ankle ligaments. We will also discuss some congenital pathology (e.g. tarsal coalition) that predispose to pain. By the end of the session one will be able to: 1. identify bones and ligaments that constitute the ankle joint; 2. understand the role of MRI and MRA in evaluating the ankle; 3. identify the causes of ankle pain and instability.

0900 MRI ankle – Tendons and other soft tissues

Khan, S.H.
East Lancashire NHS Trust, Blackburn, UK

Ankle soft tissue disorders are common in radiology practice. Ligamentous injuries of the ankle are the most common sports injury. Although ultrasound is useful in the hands of skilled operator but MRI has the advantage of three dimensional assessment of the soft tissue as well as bony structures. MRI is the preferred modality of choice in the assessment of the structures such as sinus tarsi. The presentation will include imaging strategies and MR sequence protocols. Recognition of normal variants which are frequently found in the ankle and avoid the pitfalls. The presentation will focus on the practical aspects of MRI of ankle and the kind of information that the surgeons' expect from such examinations.

0830–0930
Cardiac imaging for the non-cardiac radiologist
0830 Important cardiac pathology that may be seen on MRI

Harden, S.
Southampton General Hospital, Southampton, UK

MR is a very useful clinical tool for assessing the presence of cardiac pathology. This presentation will demonstrate some of the pathology that can be identified incidentally, such as when performing MRI of the thoracic aorta, and then show how these abnormalities can be further characterized with dedicated cardiac MR sequences. The important aspects of imaging technique will be explained.

0900 Important cardiac pathology that may be seen on chest CT

Sparrow, P.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: To encourage general radiologists to examine the heart as part of any cross sectional examination of the thorax; Describe the important pathologies potentially visible on non-gated thoracic CT. DESCRIPTION: A brief overview of relevant cardiac anatomy. Brief descriptions of relevant pathophysiology and relationship to imaging findings. Presentation of appropriate representative images. CONCLUSION: The heart is literally central to cross sectional thoracic images. As with any branch of diagnostic imaging an understanding of anatomy and the pathophysiological processes likely to affect an individual organ is crucial to identification of same. However, the first and most vital step to this process is to actively seek abnormalities.

0830–0920
Optimizing the digital image: From exposure to presentation – DR
0830 The basics of the digital image and DR

Kotre, J.
Newcastle General Hospital, Newcastle-upon-Tyne, UK

PURPOSE: To discuss the physics of direct digital radiography with particular emphasis on optimization. MATERIALS/METHODS: There is a rapid market move towards direct digital radiography (DR) as the receptor of choice. The practical advantages of high throughput coupled with the technical advantages of wide dynamic range, good spatial resolution and excellent detective quantum efficiency combine to offset the high capital cost of these devices. The response of these receptors is, in general, different from the screen–film systems they replace, and markedly different from their main digital competitor; computed radiography. This may mean that experience with optimizing screen–film will not transfer directly to DR, and that the optimization for CR and DR may well involve different approaches. RESULTS: The results from optimization studies and feedback from radiographer experience will be presented. CONCLUSION: The physics of DR leads to a route to optimization that will be different from that for screen-film and for CR.

0855 Radiography practice with DR

Cosson, P.
University of Teesside, Middlesbrough, UK

No abstract supplied.

0900–1000
Service delivery scientific session I
0900 Practical implementation of changes using lean in radiology

Martin, A.J.
Royal Bolton Hospital NHS Foundation Trust, Bolton, UK

PURPOSE-MATERIALS: Lean has a long and interesting history. The reference model for lean and quality is the Toyota Production System, developed in the motor industry. The fundamental principles of lean production can be used in any industry and healthcare is no exception. As Fillingham highlights, there are often long delays in diagnostics suggesting that the use of lean could be extremely beneficial in this service. METHODS: Lean methodologies were used to streamline processes within the radiology department. This presentation reviews the journey so far within CT, ultrasound, plain imaging and the appointments cell at the Royal Bolton Hospital, exploring the challenges faced and the successes achieved through using lean methods to help us provide a better service. RESULTS: Using lean we have: reduced GP reporting from 7 weeks to 2 days maximum; changed templates in ultrasound and CT to create better flow with more capacity and ability to image one stop patients from ENT; third HCA in ultrasound has improved flow; speedier diagnosis, reduced admissions and bed nights by developing ultrasound service in the Emergency Department; stroke patients scanned within 30 mins during daytime; reduced waits for orthopaedic patients; developed dedicated orthopaedic radiology department; reduced the appointing process from max. 9 days to min. 3 days; projected savings of £35 000 in clerical staff; created a better working environment; increased staff morale; improved patient satisfaction; reduced waiting time for ultrasound by 1 week. CONCLUSION: Lean has successfully improved radiology services.

0910 Beating the odds – Hinchingbrooke's challenge

Vosper, R.C.
Hinchingbrooke Healthcare NHS Trust, Cambridgeshire, UK

OBJECTIVE: Despite being faced with significant challenges including the possible franchising out of the trust to the private sector and the large historic debt we also had a rapid reduction in our radiologist staffing which raised operational issues in out of hours work and multidisciplinary staffing issues during the working day. DESCRIPTION: Dwindling radiologist numbers caused a sudden increase in the on-call to 1:2 rota, creating issues with cover during the normal working day impacting into radiologist skill mix. Approximately 50% of radiographic reports are issued by reporting radiographers – these skills had to be fully deployed and included the appointment of a consultant radiographer. The daytime radiologist rota was disassociated from the appointment schedules, allowing radiologists to have fewer interruptions and increased throughput. The out-of-hours on-call CT service was outsourced to allow the radiologists to have at least a 1:4 on-call rota. Several policies had to be rewritten, e.g.: IV out-of-hours contrast policy to accommodate such change. Plans had to be made for the long term sustainability of the imaging service with reduced radiologist numbers. Included in these plans are 7 day working, radiographer CT head reporting, further development of the radiographer MRI reporting service and an ultrasonographer led vascular service. CONCLUSION: Although we encountered significant staff challenges we have been able to remain well within the waiting list targets of 6 weeks and imaging services are being developed as we meet our ongoing yearly increase in referrals to medical imaging.

0920 Out-of-hours spinal magnetic resonance imaging: Does it alter patient management?

Awad, D.M., Amonkar, S., Hughes, D.G.
Salford Royal Foundation Trust, Manchester, UK

PURPOSE: Few trusts in the UK routinely offer an out-of-hours MRI service for the investigation of acute spinal pathologies such as cauda equina syndrome (CES) and spinal cord compression (SCC), often necessitating interhospital patient transfer. The benefit of immediate surgery in these patients is disputed, raising questions about the necessity of out of hours scanning. Our aims were to review the use of the out of hours MRI service in our institution (regional neurosurgical centre) and assess its influence on subsequent patient management. METHODS: This was a retrospective review of all patients undergoing out-of-hours spinal MRI scanning during 2007. Outcome measures were type and times of scan requested, accuracy of clinical diagnosis, subsequent patient management, and where appropriate, time interval between scan and surgery. RESULTS: 73 patients underwent out-of-hours spinal MRI, the most common indication for which was suspected CES (66%), followed by suspected SCC. 57 (78%) scans did not correlate with clinical suspicion, with 38 (52%) scans negative for any form of neurological compromise. MRI scan led to out-of-hours surgery in 3 patients (5%), 2 of which were for post operative haematoma causing neurological compromise, 1 for CES. All other patients requiring surgical intervention were managed electively. CONCLUSION: With the exception of early post operative complications, our results suggest that delaying out-of-hours spinal MRI scans until the following morning may not change patient management or outcome.

0930 The implementation of forthcoming NICE stroke guidelines for MRI "how to do it" first impressions

Bailey, W.M.
Manchester Royal Infirmary, Manchester, UK

PURPOSE: National clinical guidelines for the initial management of acute stroke and transient ischaemic attack (TIA) were published in July 2008. These guidelines will dramatically increase the use of MR and establish this modality at the forefront of diagnostic imaging for the early detection of stroke and TIA. These requirements will increase pressure on already busy MR departments adding to the governments existing waiting list targets. This paper shows how an acute city centre hospital trust has implemented the guidelines. METHOD/MATERIALS: A retrospective analysis of referral data was used to assess the number of patients who required "rapid access" MR scans. A protocol was established to manage these referrals within the normal working day (8–8 Mon–Fri). These data were analysed retrospectively and impact on the daily work load assessed. RESULTS: Patients were referred to the MR department per week over a 6 month period for rapid access MR stroke/TIA protocol imaging. The impact on the working day was minimal, in that all patients were imaged within the recommended time scales and disruptions minimal. CONCLUSION: MR imaging including DWI are more accurate in the assessment of acute stroke and are "well tolerated" by the patient. Rapid access MR scanning can complement initial CT scanning thus streamlining patient care pathways. This technique being both practical and achievable whilst causing minimum disruption to MR scanning lists.

0940 Embedded radiology within a large acute admissions unit, preliminary experience

Boxer, D.I.
Watford General Hospital, Watford, UK

KEY LEARNING OBJECTIVES: A new model of the provision of diagnostic imaging for acute medical and surgical patients is described. The methods by which this has been achieved are discussed and the lessons learnt highlighted. The benefits realised both to the patients and the organization are described. DESCRIPTION: As part of a major reconfiguration of acute hospital services, within West Hertfordshire, a 120 bedded Acute Admissions Unit (AAU) opened at Watford General Hospital in March 2009. Early in the strategic review culminating in this it was appreciated that integrated diagnostic services would be advantageous. The AAU is the largest such facility in the UK and is believed to be the first to be designed from the beginning to incorporate complex diagnostic imaging facilities. It is provisioned with dedicated plain film, CT and ultrasound equipment as well as 2 cardiac catheter rooms together with appropriate recovery areas, reporting rooms, conference rooms, offices etc. Radiologists provide imaging services during an extended working day and at weekends. This presentation describes the process by which radiology was able to influence the design of the building, the nature of the services to be provided and how it would be staffed. The early impact of this on patient care and the function of the radiology department as a whole are discussed. CONCLUSION: The AAU at Watford General Hospital demonstrates the advantages to healthcare of integrating diagnostic imaging within acute hospital care.

0950 Introduction of a "same-day" ultrasound service: Effect on patient referral by general practitioners

Hameed, S., Hawtin, K., Ramachandran, R., Roddie, M.E.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: To assess the effect on workload of changing from an "appointment" to a "same-day" ultrasound service. MATERIALS/METHODS: In order to reduce our ultrasound waiting time of 3 weeks for routine scans, we have offered all GP patients a "same-day" service since September 2006. To examine the effect of this change in practice we performed a detailed assessment of patients scanned in the last week in June 2006 (appointments only) and the same week in June 2008, 22 months after implementation of the "same-day" service. As well as measuring the numbers of GP patients scanned each week, we recorded the patients' home post codes and calculated the distance they travelled. RESULTS: In 2006 105 GP patients were scanned, all with appointments. In 2008 379 GP patients were scanned, only 20% of whom had appointments (a 260% increase). In 2006 the mean distance travelled was 3.6 km (range 0.1–13.4 km) and 79% of patients came from 5 local post codes. In 2008 the mean distance travelled was 6.3 km (range 0.2–44.3 km) with only 50% of patients from local post codes. The increase in workload from local GPs was 112% and from non-local GPs was 814%. Most of this workload had previously been

performed at adjacent hospitals that run an appointment only service. CONCLUSION: There is demand from GPs for "same-day" ultrasound and we have demonstrated that this is feasible. Unless adjacent local hospitals offer a similar service, however, continuing rise in demand may overwhelm the service.

0945–1145
Genitourinary keynote and scientific session

0945 Imaging prostate cancer: State of the art

Padhani, A.
Mount Vernon Hospital, Middlesex, UK

It is widely recognized that there is currently a crisis in prostate cancer diagnosis and management calling for new innovative methods to address clinical issues. Conventional MRI has many limitations and its role is controversial. Advanced imaging techniques including diffusion weighted MRI (DW-MRI), MR spectroscopic imaging (^{1}H-MRSI), dynamic contrast enhanced MRI (DCE-MRI) and MR lymphography have the potential to address many of the clinical bottlenecks. This talk will discuss the biological basis for observations and practical analysis of these techniques. I will show that using more than one tool improves imaging performance but the relative importance/reliability of techniques remains unresolved for any given clinical setting. A simple scheme for reporting findings back to surgeons/oncologists will be presented and illustrated. Advanced functional tools will enable us to tackle new indications including suspected cancer due to raised serum PSA levels with negative TRUS biopsies and for patients undergoing active surveillance.

1015 Diffusion-weighted imaging in the assessment of tumour grade in endometrial cancer

Bharwani, N.[1], Malietzis, G.[2], Narayanan, P.[3], Sahdev, A.[1], Reznek, R.[1], Rockall, A.[1]
[1]Barts and The London NHS Trust, London, UK, [2]East Midlands Healthcare Workforce Deanery, Mansfield, UK, [3]Chelsea & Westminster NHS Trust, London, UK

PURPOSE: To determine if there is a correlation between tumour grade and apparent diffusion coefficient (ADC) in endometrial cancer. MATERIALS/METHODS: 15 patients with endometrial cancer underwent DWI-MR imaging (Philips Achieva 1.5 T system, torso phased array coil) using 6 b-values (50, 100, 150, 250, 500, 750). ADC maps were produced and the tumour ADC values were correlated with histological tumour grade obtained at hysterectomy (14 patients) or endometrial biopsy (1 patient). MRI images were independently reviewed by 2 experienced readers and intra- and inter-observer variability documented. RESULTS: The mean ADC value (10–3 $mm^2 s^{-1}$) of grade 1 (n=6), 2 (n=2) and 3 (n=3) tumours was 0.85 (SD 0.06), 0.94 (SD 0.002) and 0.79 (SD 0.08), respectively. Using linear regression analysis, a good correlation (R=0.60) was obtained between tumour grade and ADC value. There was a significant difference (p<0.05) between ADC values of grade 1 and grade 3 tumours. No significant difference was seen between ADC measurements for grade 1 versus 2 and grade 2 versus 3 tumours. One patient had benign endometrial hyperplasia, the endometrial ADC value was 1.45. CONCLUSION: High tumour grade is an adverse prognostic factor in endometrial cancer. This study is on-going but preliminary data suggests a good correlation between ADC values and histological grade. Potentially this information, taken in conjunction with a biopsy, may improve pre-operative prognostication and thereby optimize patient management.

1025 Uterine artery embolisation: Can MRI characteristics predict outcome?

Albazaz, R.[1], Simpson, J.O.[2], Montgomery, H.[2], Sonwalker, H.A.[2]
[1]Leeds Radiology Academy, Leeds General Infirmary, Leeds, UK, [2]Huddersfield Royal Infirmary, Huddersfield, UK

PURPOSE: To investigate MRI characteristics on T_2-weighted sequences of symptomatic fibroids prior to uterine artery embolisation (UAE) and any relation to outcome. MATERIALS/METHODS: 45 consecutive patients who underwent UAE were included in the study. MRI was performed prior to UAE in all cases and patients were followed up by serial ultrasound at 1, 6 and 12 months post UAE. MR characteristics in comparison to normal surrounding myometrium were noted for dominant fibroids and compared with changes in fibroid volume on follow up ultrasound post-UAE. RESULTS: A total of 55 dominant fibroids were identified. On T_2-weighted sequences, the signal intensity was low in 38 of 55 (69.1%) and high/isointense in 17 of 55 (30.9%) fibroids. Following UAE, in the low signal intensity group there was a reduction in fibroid volume in 26 of 38 cases (68.4%), whilst a higher response of 15 of 17 (88.2%) was seen in the high/isointense group. Reduction in fibroid volume as measured at 1 year post-UAE was greater for the high/isointense group than the low signal intensity group (mean = 76.6% vs 66.5%). CONCLUSION: MRI characteristics of symptomatic fibroids pre-UAE can help predict response to treatment. Fibroids that are high/isointense in signal intensity on T_2-weighted sequences show the best response to UAE.

1035 Diffusion weighted MRI in bladder cancer – Initial experience

Ganeshalingam, S., Koh, D., Lalondrelle, S., Huddart, R., Sohaib, A.
Royal Marsden NHS Foundation Trust, London, UK

PURPOSE: To assess the feasibility of performing DW-MRI and to define the apparent diffusion coefficient (ADCs) values in pathological proven bladder cancer. MATERIALS/METHODS: 14 patients (mean 67 years, range 55–82 years, M:F 12:2) with transitional cell cancer (confirmed at biopsy) were investigated. DW-MRI of the bladder was performed using 6 b-values (0, 50, 100, 250, 500 and 750 s mm^{-2}). T_1- and T_2-weighted axial/coronal images were also acquired. DW-MRI images were analysed offline using IDL-based software. ROIs were drawn on the b = 500 s mm^{-2} images and transferred onto the corresponding ADC maps to record their median values. The median ADC of tumours was correlated with histopathological tumour grade; and compared before and after treatment using the Wilcoxon signed-rank test. RESULTS: The lesions were 1.7–3.9 cm in maximum size. The mean bladder tumour wall thickness was 1.37 cm. The median ADC value was 133.2 $mm^2 s^{-1}$ (54–201 $mm^2 s^{-1}$). There was no relationship between the median ADC value and tumour grade. All patients underwent treatment with neo-adjuvant chemotherapy and repeat imaging showed residual lesions in 7 patients. 5 of those 7 patients showed partial response by RECIST criteria. The median ADC value had increased consistent with decreased cellularity (although not statistically significant). In 2 of the 7 patients who had stable disease there was no increase in the median ADC value. CONCLUSION: This initial study suggests that it is feasible to assess bladder cancer using DW-MRI. Further studies need to validate our finding and to assess the role of diffusion MRI in bladder cancer.

1045 MRI-derived computational modelling of bladder filling mechanics to investigate prostate displacement effects relevant to radiotherapy

Brunt, J.N.[1], Krywonos, J.[2], Elkut, F.[2], Malik, Z.[1], Eswar, C.[1], Fenwick, J.[1], Ren, X.J.[2]
[1]Clatterbridge Centre for Oncology NHS Trust, Merseyside, UK, [2]Liverpool John Moores University, Liverpool, UK

PURPOSE: Accurate delivery of high radiation dose to a defined tissue volume is required for successful radical prostate cancer radiotherapy. Modern techniques such as conformal and intensity-modulated radiotherapy can deliver increased radiation dose to the tumour without increased toxicity, but at the expense of requiring smaller delineated treatment margins, which is often difficult to control due to complex organ interactions. The exact position of the prostate is influenced by many factors, in particular bladder and rectal filling. It is beneficial to

study the mechanics of these processes and the interaction between adjacent structures, to improve understanding of their influence on the position of the intended irradiated area. MATERIALS/METHODS: *In vivo* human MR images (T_2-weighted) were obtained, showing variations of bladder filling in each subject. From this imaging, a 3D finite element mesh model was developed, using solid elements for prostate and shell elements for bladder and rectum. Varying bladder filling was simulated by modelling the physical process to predict deformation fields at different volumes. The effects of material properties and boundary conditions on the modelling accuracy were also investigated. RESULTS: Model-predicted prostate movements during bladder filling were multi-millimetre in anterior–posterior and superior–inferior, and sub-millimetre in right–left, directions, respectively, with rotational movement predominantly about a single axis. The numerical results show good agreement with published clinical data. CONCLUSION: This approach can potentially be used to establish more quantitative data concerning the influence of bladder and rectal filling on the positions of the prostate or other structures of interest.

1055 What is the optimal timing of post-biopsy MRI of the prostate?

Sinha, A.[1], Gurajala, R.[2], Kumar, A.[1], Kibriya, N.[1], Ramachandaran, I.[3]
[1]Aintree University Hospital, Liverpool, UK, [2]Whiston Hospital, Liverpool, UK, [3]Royal Liverpool University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: To assess the frequency of haemorrhage after prostatic biopsy and determine optimal timing of post-biopsy prostatic MRI. DESCRIPTION: MRI is the most promising method in local staging of prostate cancer. The majority of cancer foci appear as low signal intensity lesions on T_2-weighted images. Multiple factors may cause decrease in signal intensity: among these the only interfering reducible factor is post-biopsy haemorrhage. Some authors have recommended deferring MRI for up to 8 weeks whereas others recommend 3 weeks. A retrospective audit was conducted at the Royal Liverpool University Hospital between May 2006 and April 2008. 68 male patients (mean age 66 years; range 44–76 years) underwent prostatic MRI after biopsy. Mean time between biopsy and MRI was 6.2 weeks (range 1.3–28.6 weeks). A consultant radiologist with experience in prostate MRI conducted review of MR images. Maximum haemorrhage was noted between 4.1 weeks and 5 weeks. Frequency of haemorrhage did not correlate with time between biopsy and MRI. However, there was a positive correlation with severity of haemorrhage. CONCLUSION: Deferring MRI for at least 8 weeks after prostatic biopsy is recommended.

1105 Is the uncontrasted phase always necessary in multiphase computed tomography urograms?

Goyal, N.[1], King, A.[2], Shukla, R.[2], Reed, H.[2]
[1]University Hospital of Wales, Cardiff, UK, [2]Nevill Hall Hospital, Abergavenny, UK

PURPOSE: To evaluate the usefulness of the uncontrasted phase in a multiphase CT urogram study. MATERIALS/METHODS: CT urograms are routinely done in our department for patients with painless haematuria. Standard technique involves a non-contrast scan of the abdomen and pelvis followed by a split-bolus post contrast scan of the abdomen and pelvis. A retrospective analysis of 50 such cases was done and any additional information obtained from the non-contrast scans was recorded. RESULTS: 25 patients had a normal study and in the remaining 25, findings included simple cysts, renal tract calculi and bladder tumour. Extrarenal pathology was seen as the cause of symptoms in some of the cases including a psoas abscess and colonic tumour tethered to bladder. The uncontrasted phase added additional information in 8 cases (19%). In 7 cases calculi were demonstrated in the kidneys which were not visible on the post contrast phase and in one case, the study helped in characterization of a hyperdense cyst. No additional pathology was demonstrated in the ureters or the bladder. CONCLUSION: The non-contrasted phase provides additional information by demonstrating renal calculi and in the assessment of cysts. However, no additional information was added in either the ureters or the bladder region, in our cohort of patients. Our study suggests that patient dose may be reduced by restricting the uncontrasted phase to the renal region in the investigation of painless haematuria.

1115 Incidence of contrast-induced nephropathy following intravenous injection in a large population of patients with chronic kidney disease undergoing CT imaging

Kuhn, M.J.[1], Chen, K.[2], Chen, N[2], Heiken, J.P.[3], Soulez, I.[4], Sahani, D.V.[5]
[1]Southern Illinois University School of Medicine, Springfield, IL, USA, [2]Rui Jin Hospital, Shanghai, China, [3]Washington University, St. Louis, MO, USA, [4]CHUM – Notre Dame Hospital, Montreal, QC, Canada, [5]Massachusetts General Hospital, Boston, MA, USA

PURPOSE: To evaluate the rate of contrast-induced nephropathy (CIN) in patients with chronic kidney disease (CKD) undergoing MDCT after a low- or an iso-osmolar contrast medium (CM). MATERIALS/METHODS: 401 patients with SCr ≥1.5 mg dl^{-1} and/or CrCl ≤60 ml min^{-1} were randomized to either iopamidol-370 (IOP=202 patients) or iodixanol-320 (IODIX=199 patients). CM were injected IV at 4 ml s^{-1} followed by a 20 ml saline flush. 153 patients received 40 g iodine (gI); the remaining patients received at least 65 ml. CIN was defined as a SCr rise ≥25% from baseline at 48–72 h. RESULTS: Total gI was higher patients receiving IOP; no other significant differences were seen in demographics or risk factors. Baseline SCr level were similar (IOP 1.52±0.36 mg dl^{-1} vs. IODIX 1.49±0.38; p=0.48). No case of acute renal was observed, and CIN rates were similar in the two groups (IOP=10 patients; IODIX=9 patients; p=1.0). Mean postdose SCr changes were comparable (IOP 0.03±0.22 mg dl^{-1} vs. IODIX 0.04±0.25 mg dl^{-1}, p=0.619). Similar findings were seen in patients (IOP=140, IODIX=144) with both CKD and diabetes (CIN in 7 patients each group, p=1.0) or patients with baseline SCr ≥2.0 mg dl^{-1} and/or baseline CrCl ≤40 ml min^{-1} (IOP=53, IODIX=40); CIN in 2 patients in each group, p=1.0). In a multivariate logistic regression analysis no risk factor predicted CIN, however hydration proved marginally beneficial (p=0.042). CONCLUSION: The rate of CIN in large group of patients with CKD undergoing MDCT was 5%. Both iopamidol-370 and iodixanol-320 may be used safety in patients with CKD and other risk factors undergoing CT.

1125 Retrospective evaluation of Randall's plaque theory of nephrolithiasis with CT attenuation values

Yap, W.W.[1], Bhuskute, N.M.[1], Wah, T.M.[2]
[1]Leeds Teaching Hospital NHS Trust, Leeds, UK, [2]St James' University Hospital, Leeds, UK

PURPOSE: We examined the computed tomography attenuation values (HU) of renal papillae in stone formers (SF) to determine whether nephrolithiasis is associated with radiographic changes in renal papillae to investigate the Randall's plaque theory. MATERIALS AND METHODS: Two observers independently and retrospectively recorded the HU of the renal medullae and cortex in 90 patients with a unilateral single calculus within kidney or ureter, and in 104 cases in control group (CG) matched for age and renal functions. RESULTS: The patient ages were similar in the stone former and control groups. However, the male-female ratio was significantly greater in the SF group (68:22) than in the CG (42:62, p<0.0001). Left–right ratio in SF group was 50:40. The inter-rater agreement was kappa=0.53 (95% CI: 0.42, 0.64). Mean HU of all papillae of affected side in stone-formers (ASSF) was significantly greater than that in CG (39.6 versus 29.6, p<0.0001). When comparing affected and non-affected sides within the SF group, there was no significant difference (39.6 versus 38.4, p=0.16). The receiver operating characteristic (ROC) analysis showed area under curve=0.94 with optimal cut-off at 34 HU. At this point the specificity, sensitivity, PPV and NPV were 90%, 90%, 33% and 99%,

respectively. CONCLUSION: HU of the renal papilla is significantly increased in SF in the affected and the non-affected kidneys when compared to the CG. This finding may form one of the risk indicators to determine the future follow up and clinical management for the potential SF.

1135 Open access CT KUB in primary care: Our preliminary experience

McCann, C.A., Jamieson, P., Robinson, L., Gopal, K.
North Cheshire Hospitals NHS Trust, Warrington, Cheshire, UK

PURPOSE: Acute renal colic is common and recurring with a lifetime incidence of 12%. In the past decade, thin-section unenhanced CT has evolved as a rapid examination of patients suspected of having urolithiasis. Many institutions use CT as the primary imaging modality. GPs commonly see acute flank pain but there is uncertainty about the appropriate use of CT in primary care and when it should enter the diagnostic pathway. Our objectives were to share our experience of GP direct access to CT KUB and assess its effectiveness. METHOD: A retrospective review of GP patients directly referred for CT to investigate acute flank pain was carried out over 6 months. Non-contrast, low dose CT was performed at times convenient for the patient. Reports were faxed within 48 hours. RESULTS: 55 scans (34 male, 21 female) were performed within 2 weeks of request. Average age was 46 years. 21 of 55 (38%) scans were positive for calculi with 6 of 21 having a complication from the stone. Non-calculus findings were demonstrated in 12 of 55 scans. CONCLUSION: Over a third of patients were correctly diagnosed with nephro/urolithiasis by their GP and a significant number had a secondary complication. This technique not only enables rapid diagnosis of urolithiasis but also guides appropriate patients to urological referral and standardizes imaging of renal colic across all patient groups. It potentially increases diagnostic accuracy by providing earlier imaging and thereby reducing workload in primary care and the number of hospital admissions.

1000–1130
Back to basics MSK

1000 Plain films – Role in diagnosis and management of inflammatory arthropathies

Aniq, H.
Royal Liverpool University Hospital, Liverpool, UK

PURPOSE: To understand the role of plain films in the diagnosis and management of different arthropathies. MATERIALS/METHODS: The role of imaging in the assessment of musculoskeletal diseases is expanding and it plays an important role in the early diagnosis and management of different rheumatologic conditions. Despite the advent of newer imaging modalities conventional radiographs continue to have a central role in the diagnosis of arthritidis, monitoring of disease progression and response to therapy. When evaluating a conventional radiograph for joint related disease it is vital to consider the various aspects of the joint where changes may be seen. Joints respond to insults in different ways. Radiologically, theses may be seen as soft tissue swelling or calcification, osteopaenia, cartilage loss, alignment deformities, erosions or bone proliferation. Careful identification of these changes along with their distribution in the various joints of the body helps us to divide the disease process in main categories of arthropathies which are inflammatory, depositional and degenerative. CONCLUSION: Plain films findings of arthritidis can be quite subtle but these are usually very distinct. We present a structured approach to plain film analysis and interpretation.

1030 Ultrasound – Role in diagnosis and management of inflammatory arthropathies

Suresh, P.
Plymouth University Hospital NHS Trust, Plymouth, UK

AIM: In this session, we will discuss the constantly increasing indications for Ultrasound in rheumatology in the imaging of different joints and various arthropathies. Ultrasound is routinely used in many institutions in the diagnosis and monitoring of synovitis in rheumatology. There are studies indicating that it is seven times more sensitive than plain radiography in diagnosis of rheumatoid erosions. We will illustrate the typical ultrasound findings in different rheumatologic conditions, with emphasis on early diagnostic features in rheumatoid arthritis. Role of power Doppler and contrast will also be discussed. There is growing evidence in the literature that ultrasound guided aspirations and injections have improved the accuracy and the therapeutic outcome. This will be well illustrated with examples of different ultrasound guided procedures performed routinely. Last but not least, the current state of play, about ultrasound by rheumatologists and radiologists will be highlighted. By the end of the session one will be able to: summarise the indications for ultrasound in rheumatology; identify the typical ultrasound findings in different rheumatological conditions and the role of Doppler; obtain an insight into the role of ultrasound guided procedures in rheumatology.

1100 MRI appearances of inflammatory arthritis and its mimics

Grainger, A.
Leeds Teaching Hospitals, Leeds, UK

Radiologists encounter inflammatory arthritis in two ways on MRI. First, inflammatory arthritides may be seen as an incidental finding when an examination is being undertaken for other conditions. Second, MRI is finding an increasing role in day to day clinical practice for the diagnosis and monitoring of inflammatory arthritis. This is expected to continue further. Modern rheumatology practice means that rheumatologists see patients with inflammatory arthritis at an earlier stage in the disease so that therapy can be initiated before irreversible joint damage has occurred. The result is that the radiological picture seen with conventional imaging has also changed over the last 10 years and the "classical" radiograph showing severe erosive and destructive change is becoming an increasing rarity. MRI allows the earlier detection of changes of the inflammatory arthritides, certainly before they become apparent on MRI and, studies have shown, before they are apparent clinically. Modern drug therapy for the inflammatory arthritides uses powerful (and expensive) biological drugs. MRI is increasingly able to predict whether the disease will respond to the drug before a clinical improvement is seen. This allows therapy to be modified at an early stage if necessary. The role that imaging plays in the detection of cancer and the monitoring of oncology therapy has radically changed over the last 15 years. It is likely that similar changes will be seen in the way we utilise MRI in the diagnosis and treatment of inflammatory arthritis.

1000–1130
Cardiac CT: How to do it

1000 Appropriate patient selection based on the scientific evidence

Morgan-Hughes, G.
Plymouth NHS Trust, Plymouth, UK

The requirements for non-invasive cardiac diagnostic testing are that it should be accurate, effective at both risk stratification and reclassification, applicable, cost effective and finally safe. Coronary CTA has been deemed appropriate for the evaluation of intermediate risk chest pain patients with an uninterpretable ECG/exercise ECG or an inability to exercise or indeed equivocal stress testing of any form by the AHA/ACC. It now has widespread availability in the UK. Guidance from the scientific evidence will be used to outline the appropriate selection of patients for coronary CTA in the context of the pre-stated requirements for high quality non-invasive cardiac diagnostic testing.

1020 Basic technique

Mittal, T.
Royal Brompton Hospital, London, UK

Cardiac CT is one the most challenging CT procedures made possible with recent technological advances. Performing a cardiac CT requires understanding of the underlying principles of ECG gating, drug administration to reduce patient's heart rate, contrast administration, technical aspects such as pitch, tube rotation time and multi-segment reconstruction, contrast administration and timing, and ensuring good breath holding. The radiographer and supervising radiologist should be able to identify artefacts on the scan obtained and correct them where possible (e.g. ECG). Understand of the various reconstructions required to be transferred to the workstations and PACS is important. Image interpretation requires understanding of the image quality, reconstruction techniques, and coronary/cardiac pathology. A good report requires the radiologist to interpret the findings in the light of clinical information and suggest further management where appropriate.

1040 Advanced technique: Keeping radiation dosage to a minimum

Roobottom, C.
Derriford Hospital NHS Trust, Plymouth, UK

PURPOSE: To give a clear understanding to the audience of how to keep radiation dosage to a minimum in cardiac CT angiography. CONCLUSION: Cardiac CT has traditionally been viewed as a high dose examination. However, technological advances are rapid and with state-of-the-art equipment and technique it is possible to perform CT angiography at less than 1 mSv in selected patients. The talk will outline what parameters and protocols are available and how to modify them appropriately to keep dose as low as possible. Topics covered will include the appropriate use of prospective and retrospective gating, modification of mA and kV according to patient criteria, and the use of different dose modulation protocols according to heart rate and heart rate variability.

1100 Image interpretation and accreditation

Gopalan, D.
Papworth Hospital, Cambridge, UK

No abstract supplied.

1000–1130
Carotid artery ultrasound workshop

1000 A comprehensive overview of carotid Doppler ultrasound: From stenosis to dissection

Sidhu, P.
King's College Hospital, London, UK

This lecture will give an up-to-date review of the usefulness of carotid Doppler ultrasound in the assessment of carotid arterial disease. The criteria used for the assessment of stenosis will be discussed. The extended role of carotid artery ultrasound will also be discussed to review plaque composition, IMT measurements, dissections and other rare vascular disease seen in the carotid arteries. Finally, disease outside the artery will be detailed.

1030 MRA, CTA and DSA in carotid disease: Practicalities, pitfalls and limitations

Adams, M.
National Hospital for Neurology and Neurosurgery, London, UK

CT angiography (CTA), MR angiography (MRA) and catheter digital subtraction angiography (DSA) are used commonly in clinical practice to evaluate the carotid arteries, providing information about anatomy and pathology that may be complementary to that gleaned from ultrasound interrogation. The objective of this talk is to present the advantages and limitations of each of these techniques and to illustrate common artefacts and potential pitfalls in image interpretation.

1115 Practical demonstration: how to carry out a carotid Doppler ultrasound examination

Sidhu, P.
King's College Hospital, London, UK

This 15 minute demonstration by an expert will show the technique for a comprehensive examination of the carotid arteries by ultrasound, with tips to get the most out of the examination.

1000–1115
COR Stanley Melville memorial lecture and commissioning effective imaging

1000 Patient safety, risks in healthcare and promoting a safe culture

Leitch, J.
The Scottish Government, Edinburgh, UK

All improvement requires change but not all change is an improvement. Changing long established culture and clinical processes is tougher still and many "projects" within the NHS fail as a direct result of a poor understanding of how people and systems change. There are many models of change that have been established over time, usually in industry, and attempts have been made to transfer them to social and healthcare environments. One such model is the Model for Improvement championed by the Institute for Healthcare Improvement in Cambridge, Massachusetts and adopted by the Improvement and Support team of the Scottish Government Health Directorate. This methodology has been used throughout the world to transform healthcare systems, improve healthcare related outcomes and make care safer for patients. The model has three deceptively simple questions: 1. What are we trying to achieve?; 2. How will we know change is an improvement?; and 3. What change can we make that will result in an improvement?. These questions then rely on a model of small-cycle change called the PDSA (Plan, Do, Study, ACT) cycle which empowers front-line workers to actually redesign the way they work. This model is the key building block for the Scottish Patient Safety Programme presently being rolled out across the NHS in Scotland and for the work of the Improvement and Support Team. This presentation will outline some of the challenges facing our healthcare system and then introduce the change model described above.

0945 Commissioning effective imaging services

Bacon, A.
Commercial Reform & Reconfigurations, North West SHA, Manchester, UK

There have been significant changes in commissioning brought about by process for assuring World Class Commissioning. All PCTs have been now been assessed and are seeking to improve their scores and performance. PCTs and providers also now operate in a market which is governed by a set of "system management" behaviours and rules (including the Principles and Rules of Cooperation and Competition and the Procurement guide) and with an independent panel to investigate, report and recommend on the application of these. Radiology departments will need to understand these changes in order to agree new activity with PCTs and to be able to respond to the increasing number of tenders (through which most new out of hospital services will need to be provided). If they do not understand and act on these changes, they may find themselves missing out on opportunities to develop their services, or in danger of loosing income; or both.

1000–1140
Maximizing the benefits of PACS – Current issues

1000 What PACS managers should know about PACS and IT

Tatlow, M.
Maidstone and Tunbridge Wells NHS Trust, Maidstone, UK

DESCRIPTION: The advent of the National Programme for IT; PACS and RIS project, in 2004, saw for the first time, a single approach to the procurement and deployment of PACS across 5 regional clusters. Each of these areas having a local service provider, a CR provider, a PACS provider and a RIS provider. The National Programme moved the previously relaxed, traditional interaction between purchasers and vendors to a multi tiered, convoluted relationship. This caused imaging departments to re-assess what was required of a PACS manager, almost moving them to become a politician and relationship manager, rather than a "re-skilled radiographer". This change in the partner relationship has been accompanied by an increase in the technical knowledge needed by the PACS team to allow successful triaging of incidents, and consequently prevent un-necessary "calls" being placed with the Local Service Provider, and reduce the risk of possible call re-charges. Responsibilities have increased; previously, the "traditional" PACS manager would have more than likely supported a single location, whilst the new breed is required to maintain the service for multiple sites, sometimes crossing Acute and Primary Care boundaries. Critically, along with these new skills, the PACS manager should also maintain a functioning clinical knowledge these, combined together, move the roll into the discipline of Health Informatics. CONCLUSION: The issues listed above, require the PACS manager to develop a technical understanding of the service, have good communication skills, whilst also being able to maintain a focus that PACS is a real clinical IT system.

1020 The appropriate test? A review of decision support applications: Can they make a difference?

Newman-Sanders, T.
Mayday Hospital, Croydon, UK

One of the central issues facing the NHS and other healthcare systems is that of how best to deploy the powerful weapon of diagnostic imaging to ensure a high quality, timely and cost effective service to patients. There have been a succession of recent initiatives to use diagnostic imaging more often, earlier and by a wider range of healthcare professionals than has traditionally been the case. The main drivers for this expansion and democratisation of diagnostic imaging have included the 18 week referral to treatment pathway, "Better care closer to home", and the "Next Stage" review. The NHS and other healthcare systems across the world are now entering a climate of reduced resources aggravated by the global economic downturn. The role of decision support systems in improving the appropriateness of imaging requests, reducing unnecessary imaging and increasing the expertise of healthcare professionals in the optimal use of diagnostic imaging is being increasingly appreciated. The Department of Health are supporting a pilot project to see how such systems could be deployed into a live NHS environment including primary and secondary care settings. Along the way valuable lessons are being learnt about the challenges involved in getting such systems to work, how their effectiveness can be measured and how they are likely to benefit the wider NHS. This presentation will give an overview of decision support tools, outline the experience and benefits of such systems in other healthcare systems and describe how they could be used in the NHS.

1040 It's good to talk – The importance of the IHE framework in day-to-day radiological practice

Harries, R.
Diana, Princess of Wales Hospital, Grimsby, UK

IHE (Integrating the Healthcare Enterprise) is an international non-profit organization that enables healthcare IT system users and healthcare IT system suppliers to obtain interoperability of systems. It does this through the careful definition of healthcare tasks, by defining how information is to be communicated between systems to support those tasks, and by testing supplier applications at annual week long test sessions called Connectathons. The work is managed by IHE committees at international and national level and is sponsored by various international and national bodies. The fundamental aim of IHE work is to produce Integration Profiles. Each profile describes a clinical requirement for integration and the solution to address it. The functional (i.e. software) components of a profile are IHE Actors, and the communication is defined through IHE Transactions. IHE profiles cover not only radiology but pathology, cardiology, ophthalmology, patient care coordination, IT infrastructure and other areas which are developing. The aim of this presentation is to describe the most useful profiles related to radiology, the benefits they can provide, and the process by which these profiles can be introduced into departments and Trusts.

1110 Joined up thinking – A regional PACS come true?

Ward, A.
Welsh Health Estates, Cardiff, UK

To explain how Wales came to have a number of PACS suppliers operational in Welsh Trusts, and the subsequent steps taken to move towards full integration of these multiple PACS solutions, to show how using a standards based approach each "module" of the integration can be replaced/upgraded with little or no effect on the others, having regard for common coding and common terminology. To explain the approach taken in understanding the issue and the potential pitfalls, or benefits of using a non-standards approach. In addition, how the role out of the new radiology information system has been a driver for, as well as an obstacle to, change.

1000–1130
Into the blue skies: The future of breast imaging

1000 Optical tomography of the breast

Gibson, A.
University College London, London, UK

Optical tomography is a medical imaging method which is sensitive to the concentration of oxyhaemoglobin and deoxyhaemoglobin. Over 2000 women have now been imaged in a number of centres worldwide using a range of approaches. We will explain how optical imaging works and review the current status of optical mammography. In particular, we will concentrate on our work at University College London, where we have imaged over 50 women with cancer with a sensitivity of 86% and specificity 66.8%. We will discuss the future role of optical imaging for breast cancer.

1030 Phase contrast X-ray imaging of breast tumours

Speller, R.D., Olivo, A.
Medical Physics & Bioengineering, University College London, London, UK

Conventional absorption based X-ray imaging is very successful in many areas of radiology where the attenuation coefficients of different structures differ by at least 5%. However, there are a range of examinations, notably in mammography where the linear attenuation coefficients are very similar leading to poor differentiation between structures. An alternative to absorption based imaging is to exploit the wave behaviour of X-rays and to record the effects of diffraction or refraction as X-rays pass through breast tissue. Using refraction allows phase contrast effects to be used to enhance the visibility of tumours. This talk will introduce the background to creating phase contrast images using synchrotron radiation and X-ray tube sources. In particular, it will describe recent work undertaken to enable uptake of the technique in clinical facilities.

1100 Digital breast tomosynthesis

Hawkes, D.
University College London, London, UK

No abstract supplied.

1030–1130
Service delivery scientific session II

1030 "Same-day" ultrasound service: how long do patients have to wait?

Hawtin, K., Ramachandran, R., Hameed, S., Roddie, M.E.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: To assess the effect of introducing a "same-day" ultrasound service on patient waiting time in the department. MATERIALS/METHODS: We have offered all patients a "same-day" ultrasound service since September 2006. In order to examine the effect on patient waiting time in the department we recorded the patient arrival time (from RIS) and scan commencement time (from PACS) for all GP and hospital outpatients scanned during the last week in June 2006 and the same week in June 2008, 22 months after implementation of the "same-day" service. RESULTS: In 2006 105 GP patients, all with appointments, had a median wait of 15 minutes (range 0–99 minutes). In 2008 379 GP patients were seen. The 20% with appointments had a median wait of 15 minutes (range 0–83 minutes) while those using the same-day service had a median wait of 30 minutes (range 0–155 minutes). 201 outpatients (78% with appointments) were seen in 2006 compared with 213 (75% with appointments) in 2008. Median waiting time rose significantly from 17 (range 0–159) to 23 (range 0–266) minutes for outpatients with appointments (Mann Whitney U p=0.01) and from 7 (range 0–71) to 22 (range 0–88) minutes (Mann Whitney U p=0.001) for outpatients using the "same-day" service. CONCLUSION: Introduction of a "same-day" ultrasound service increases patient waiting time in the imaging department and, if considering implementation of such a service, departments should assess waiting room capacity, patient preparation instructions and consider investing in an electronic patient queue management system.

1040 "Same-day" ultrasound: Effect on patient satisfaction

Ramachandran, R., Hawtin, K., Hameed, S., Roddie, M.E.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: To assess the effect of a "same-day" ultrasound service on patient satisfaction. MATERIALS/METHODS: We have offered all GP patients and outpatients a "same-day" service since September 2006. We conducted a patient survey of all GP and outpatients attending the department (578) in the first week of October 2008, 25 months after implementation of the "same-day" service. RESULTS: 141 (24%) of patients completed a questionnaire. 54 had appointments and 87 used the "same-day" service. Of the latter, 50% attended the ultrasound on the same day or the day after seeing their doctor and 30% in the same week. 46 of 87 (53%) using the "same-day" service were given their result at the time compared with 21 of 54 (39%) of patients with appointments. The overall service was rated as "excellent" or "good" in 87% of the appointment patients and 82% of the "same-day" patients. The overall service was rated as "fair" or "poor" in 4% of the appointment patients but 8% of the "same-day" patients. 80% of appointment patients were seen within 30 minutes compared with only 40% of "same-day" patients and 28% of these waited more than 1 hour. Attitude to waiting time was "happy" in 78% of appointment patients compared with 66% of "same-day" patients. It was rated as "unhappy" in 9% of appointment patients compared with 28% of "same-day" patients. CONCLUSION: A "same-day" ultrasound service decreases patient satisfaction predominantly due to patient dissatisfaction with waiting. Improvement in waiting facilities and use of electronic queue management might improve the patient experience.

1050 Results of radiological investigations in a new one stop urology diagnostic centre

Rottenberg, G.T., Koh, K., Viney, Z., Griffin, N., O'Brien, T.
Guy's and St Thomas Hospital NHS Foundation Trust, London, UK

A new urological diagnostic centre opened at Guys Hospital in January 2008. The results of ultrasound examinations performed over the first 3 month period were analysed. Comparison was made to previous data from 2 week wait scheme to determine the relative merits of the 2 approaches to cancer detection and speed of diagnosis. 478 patients were scanned in the 3 month period in the thrice weekly new patient clinics. The majority of the scans were of the kidney and bladder (n= 390), testes (n= 95), or prostate (transrectal; n=11). The most common indications were haematuria (n=199), testicular pain (n=84), UTI (n= 65), or LUTS (n=65). There were 45 significantly abnormal scans, of whom 17 were eventually confirmed as being due to malignancy; bladder (n=4), renal (n=5), prostate (n=7), testicular (n=1). The number of cancers detected in the 478 patients scanned was identical to the number detected from the 2 week wait study performed previously at Guys, although the cancers detected in this group were from a cohort of 124 patients referred for the 2 week wait scheme. The speed of diagnosis and time to work up the patients was significantly higher in the urology diagnostic centre as almost all investigations were performed on the day of attendance. The advantages of the one stop approach to urological diagnosis will be discussed and the problems associated with establishing and supporting such a unit will be outlined.

1100 Radiography of the elderly. How has the National Service Framework for Older People informed practice?

Taylor, R.
University of Bradford, Bradford, UK

The population of the UK is acknowledged to be increasingly ageing with the proportion of people over 65 years old set to rise from 16% in 2006 to 22% by 2031. This increase is due to a number of factors including falling birth rates and increased life expectancy, due in part to improvements in healthcare and lifestyle. As a result, this predicted continued growth in the elderly population presents significant implications for the healthcare sector, including radiology departments, as the demographic of service users' changes and the number of people with chronic age-related disease/disabilities increases. In 2001, the Department of Health published the National Service Framework for Older People (NSfOP) outlining a 10 year plan to set treatment standards in health and social care of older people. Since its publication, a wide range of professional literature has been published relating the NSfOP to practice, particularly within the nursing and rehabilitation services. However, the impact of the NSfOP on diagnostic radiography practice is unclear. This presentation will summarise the findings of a third year student project to assess the impact of the NSfOP on the diagnostic radiography practice and suggest further practice improvements possible.

1110 UK PET-CT audit southern sector. Early service review

Hill, J.
MIAA, In Health, IST, London, UK

INTRODUCTION: A challenging programme for the introduction of a new technology (PET-CT) was introduced to the UK in April 2008. The Department of Health commissioned independent additional provision of PET-CT services for the northern and southern sectors of the UK. This was complimentary to existing arrangements. The Clinical Guardian in conjunction with the RCR and Department of Health required a 100% early service review. METHOD: The first PET-CT report was provided by local clinicians. The second audit review was carried out by independent clinicians, not part of the PET-CT south reporting group. Primary and audit reporters were independent and blind to each others report. An agreed scoring methodology was used, under categories 1–5. All written reports, both first and audited, were reviewed by the Chair of the South Audit Group for concordance. All non-concordant reports which could potentially affect patient management were subject to a third image review by the Chair. All reporters had achieved a minimum of 300 independent reports. All data was anonymised. RESULTS: 2156 primary and audit reports were reviewed (1078 patients). A total of 2.7% were recorded in Category 3. 0.6% of patients were Category 1. A follow-up 10% audit where all images are reviewed by the Chief Auditor is now underway. CONCLUSION: There was a low incidence of significant errors in the primary report. The review was well received and supported by the local clinicians and secondary audit reporters. Assessment methodology and scoring across both UK sectors is under current review.

1120 A quality standard or the numbers game

Beckmann, E.C.[1], Oldknow, M.P.[2]
[1]Medical Imaging Group, Oxted, UK, [2]E-Locum Services Ltd, Oxted, UK

INTRODUCTION: PET-CT is one of the few modalities where a competency standard has been recommended based upon a minimum number of reports per annum. ARSAC has recommended a minimum of 300 examinations a year to report diagnostically. In 2007/08 29 168 scans were made, an additional 3822 compared with 2006/07. There is no national quality assurance test outside the 10% audit in the DoH Southern and Northern Schemes. METHOD: The reporting quality of over 50 UK clinicians (radiologists or nuclear medicine physicians) was monitored through an audit process and, in some cases, training programmes. Quality monitoring over a number of training scans, mentoring of less confident reporters (irrespective of numbers) and variable levels of audit have been adopted for individual reporters. RESULTS: Results over the last year have shown that while all reporters will make errors at some time, a pattern can be identified. Some reporters during their training achieve consistently high quality of reports, even after low volume (less than 100) reports. These clinicians have gone on to make high quality reporters, while other clinicians who have high volumes have needed support to achieve a high quality of reporting. DISCUSSION: Ensuring the highest standard of diagnosis to optimize patient management must be the paramount focus. The optimum quality approach to reporting competence is best achieved by an integrated approach of training, mentoring, and auditing not purely on minimum numbers. Support and training needs vary, dependent upon experience and must be optimised for different clinicians.

1200–1245
IPEM John Mallard lecture
1200 Terahertz imaging and spectroscopy – Current and future modalities

Cunningham, J.
School of Electronic and Electrical Engineering, The University of Leeds, Leeds, UK

The terahertz (THz) region (100 GHz to 10 THz) of the electromagnetic spectrum spans the wide frequency range between the infrared and millimetre/microwaves, but has historically not been fully exploited owing to the very limited number of suitable (in particular, coherent) radiation sources and detectors that have been available. Outstanding progress has been made over the last decade in developing THz components and systems however. Highlights included fabrication of the first THz quantum cascade laser, together with the commercialization of THz spectroscopy and imaging systems based on femtosecond-laser technology, notably for non-destructive testing in the pharmaceutical industry (for example, investigating polymorphic transformations, and drug distributions in tablets). This talk will give an overview of the state-of-art in terahertz technology, explain the operation of modern terahertz systems, and discuss some of their many present as well as possible future applications, including biomedical imaging, security screening, and analysis of pharmaceutical materials.

1300–1345
BIR AGFA Mayneord lecture
1300 Imaging informatics: the key to success for the future of radiology

Siegel, E.
School of Medicine, University of Maryland, Baltimore, MD, USA

The practice expectations for a hypothetical radiologist who joins the radiology workforce in the year 2015 will be substantially higher than what is required today. The key to success for her practice given those expectations for greater productivity, effectiveness of communication, documentation of quality, and integration will be provided by the emerging field of medical imaging informatics. The presentation will include a discussion of the diversity of topics that fall under this field as well as specific ways in which imaging informatics is currently and will continue to respond to these challenges. This will include the role that imaging will play in the development and support of personalized or stratified medicine in the emerging genomic and proteomic era of healthcare. The presentation will conclude with a discussion of how imaging informatics will increasingly define what is unique and critically important about our specialty and how we can use our expertise in this area to provide added value to help secure the future of diagnostic imaging. AIM & OUTCOMES: 1. Be able to discuss the diversity of topics that fall under the sub-specialty, imaging informatics. 2. Speculate about what the requirements will be for a radiologist in 2015 and how imaging informatics will be an essential tool and skill set to address those expectations. 3. Define how imaging informatics will increasingly define what is unique and critically important about our specialty and how to use it to provide added value to help secure the future of radiology.

1415–1730
Musculoskeletal ultrasound workshop
1415 Shoulder

Allen, G.[1], Wilson, D.[2]
University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK, [2]Nuffield Orthopaedic Centre, Oxford, UK

A workshop on the methods of examining the shoulder using high resolution ultrasound. We will demonstrate a standard method of examination and cover the basic disease groups that might be encountered. We will show potential pitfalls and discuss examination technique and normal variation. The anatomy of the shoulder as seen by ultrasound examination will be demonstrated on volunteers. The ESSR web site contains a protocol that will be used as the basis for examinations: http://www.essr.org/cms/website.php?id=/en/index/educational_material.htm

1500 Wrist and hand

Harris, J.[1], Jackson, S.[2]
[1]Salford Hospital, Manchester, UK, [2]Salford Royal Hospitals NHS Foundation Trust, UK

No abstract supplied.

1545 Lower limb (knee)

Watura, R.[1], Cooper, R.[2]
[1]Frenchay Park Road, North Bristol NHS Trust, UK, [2]Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK

No abstract supplied.

1630 Lower limb (ankle and foot)

Marshall, T.[1], Lee, J.C.[2]
[1]Norfolk and Norwich University Hospital, Norwich, UK, [2]Royal National Orthopaedic Hospital, Stanmore, London, UK

Disorders of the foot and ankle constitute a significant proportion of referrals to musculoskeletal radiologists from primary and secondary clinical care. The radiologist's role is to provide an accurate diagnosis upon which all future treatment is based. We can arbitrarily divide the various pathologies that affect the foot and ankle into bone and joint, ligament, tendon and neurovascular causes although several pathologies often co-exist in most patients. Although the central articular surfaces of the joints of the foot and ankle cannot be assessed, ultrasound provides useful information regarding the bony margins of joints as well as reliably detecting the presence of erosive disease. Moreover, diagnostic ultrasound is arguably the optimal imaging tool for assessing the superficial soft-tissues of the foot and ankle due to its excellent spatial resolution and its dynamic capabilities. This

demonstration session will illustrate the relevant anatomy in real time whilst the lecture component will show several pathological conditions that are encountered in clinical-radiological practice.

1415–1645
Lean methodology in radiology: How to put Lean principles into practice

1415 Patient safety: the real reason for lean!

Speaker tbc.

No abstract supplied.

1615 Lean methodology in radiology: How to put Lean principles into practice

Wright, L.[1], Smith, L.[2]
[1]NHS CSCiP Radiology Service Improvement Team, Leicester, UK, [2]Modernisation Agency, Leicester, UK

PURPOSE: To demonstrate the fundamentals principles of Lean Methodology, and "How to" put Lean principles into practice in Radiology. METHOD: This session will cover the Philosophy of Lean Methodology (Toyota Productions System). It will demonstrate the different forms of Waste and how to remove them, how to identify value from the customers' perspective and show how a value stream map is produced. The session will also focus on the various tools that can be applied including, Standard work, visual management and 5S. It will demonstrate the critical role data has in understanding what the source of our problems are and how batching can have a detrimental impact on turnaround times. Finally, there will be some practice examples of how Lean has been applied in imaging.

1415–1515
PACS horizons – UK PACS and teleradiology group session

1415 A brief review of the year and introduction of keynote speaker

Dugar, N.
Doncaster Royal Infirmary, Doncaster, UK

The UK PACS and Teleradiology Group is a Special Interest Group of the Royal College of Radiologists. It holds 2 independent meetings every year (the last 2 meetings have been held in British Institute of Radiology) and also participates in a session at the UK Radiology Congress usually held in June every year. It has a very lively electronic form www.pacsgroup.org.uk. It is an open public forum, with participation between users within NHS, and suppliers. Suppliers have found this invaluable forum for understanding user requirements. Users of the forum have used it to help and support each other on burning PACS and radiology IT issues. It forms a platform for building a user-supplier relationship, and we have encouraged supplier participation in our meetings as well. I was elected Chair of the Group in December 2007. Over the last year we have discussed and debated many issues both in the electronic forum, and within the National Meetings. The Spring 2008 Meeting and Autumn 2008 meetings have had a full attendance at London. As I write the abstract, we have closed applications to the Spring 2009 meeting dedicated to Electronic Requesting, due to excessive numbers (3 weeks prior to the meeting!). The Autumn 2008 meeting was largely dedicated to PACS Image and Report Sharing as a national strategy. The clear outcome of the meeting was that a vendor neutral standards based approach to allow for multi-vendor inter-operability is required in the NHS, in order to deliver a vision of seamless patient centric information flow. The message from the meeting was that adoption of XDS-I (Cross-Enterprise Document Sharing-Imaging) standard from IHE (Integrating the Healthcare Enterprise) is required in the NHS, and adopted by the PACS and RIS suppliers, in order to achieve this goal. Interim solutions to allow for point to point information sharing via DICOM Push were already in place between neighbouring NHS Trusts and were needed until the national vision is achieved. There was also a realisation that there is need to move away from expensive Central Data Store Architectures. Whilst there needs to be data sharing within NHS to improve patient care, we also need to be mindful of the need to maintain data privacy, which also has been much debated on the forum. Electronic transfer of radiology reports to GP surgeries has been a source of much frustration. Whereas there is acceptance in NHS that this should be the available nationally, and there are pockets in the NHS where such best practices are achieved. However, although the technology exists and easy to implement, there are no national targets/drivers, or a national body who takes responsibility for adoption of this. GP web-access to images also is patchy in the NHS with lack of any national drivers. Discussions on other issues have kept the meetings and the electronic forum lively: NHS number use in NHS, PET-CT images inclusion in Local PACS, Direct transfer of images and reports from Independent Sector (AML MRI/PET-CT etc.), Radiology Images and Reports as part of the electronic Health Record, Implementation of PACS CD Encryption Directive from DOH. Teleradiology (for on-call and outsourced Teleradiology). Comparison between digital Dictation and Voice Recognition/ Incorporation of Breast Screening and Cardiology Images into radiology PACS. Electronic Requesting of radiology exams. Smartcard use in NHS. Hardware independent PACS (using standard PC hardware). PACS Migration in 2013 at end of LSP contracts.

1435 Sharing our healthcare records (images) in the wider world – Threat or opportunity: A vision of the future

Achenbach, S.
Microsoft Corporation

No abstract supplied.

1415–1545
Novel applications of diffusion MRI

1415 Diffusional kurtosis imaging of the brain

Helpern, J.
New York University School of Medicine, New York, NY, USA

Diffusion-weighted imaging (DWI) provides a powerful tool for probing tissue structure. Well-established diffusion metrics, such as mean diffusivity (MD) and fractional anisotropy (FA), have proven useful in assessing a number of diseases. It has long been appreciated, however, that DWI is in principle capable of yielding considerably more information than that contained in the conventional diffusion metrics used in clinical studies. In conventional DWI, the diffusion displacement probability distribution is assumed to be Gaussian in form with its width (i.e. standard deviation) proportional to the diffusion coefficient. The complex structure of biological tissues, however, can cause the diffusion displacement probability distribution to deviate substantially from a Gaussian form. This deviation from Gaussian behaviour can be estimated using a convenient dimensionless metric called the kurtosis. Recently, our laboratory has developed a new approach to DWI called diffusional kurtosis imaging (DKI), a quantitiative measure of the nongaussianity of the diffusion process. Since deviation from Gaussian behaviour is governed by the microstructural complexity of the tissue within which the water is diffusing, the diffusional kurtosis can be regarded as a quantitative measure of the complexity of the tissue's microstructure, and is potentially a more specific indicator of tissue microstructure than either the MD or FA. An additional advantage of DKI is that it allows for the investigation of grey matter as well as white matter microstructure. Preliminary data from normal brain development and ageing, attention deficit hyperactivity disorder (ADHD), schizophrenia, stroke and Alzheimer disease (AD) will be presented.

1445 Whole body diffusion weighted MRI: The new paradigm in metastases screening (Sponsored by Philips)

deSouza, N.
Institute of Cancer Research, Sutton, UK

Diffusion-weighted magnetic resonance imaging (DW-MRI) provides image contrast through measurement of the diffusion properties of water within tissues. Application of diffusion sensitising gradients to the MR pulse sequence allows water molecular displacement over distances of 1–20 μ to be recognized. Diffusion can be predominantly uni-directional (anisotropic) or not (isotropic). Combining images obtained with different amounts of diffusion weighting provides an apparent diffusion coefficient (ADC) map. In cancer imaging DW-MRI is increasingly exploited to detect tumour at primary and metastatic sites. It is proving valuable in monitoring treatment where changes in ADC values are measurable at an earlier stage than subsequent conventional radiological response indicators. In metastasis imaging, particularly with reference to bone, lymph node and peritoneum whole body studies are being explored to provide adequate coverage. Until recently, DW-MRI for whole body malignancy screening has been significantly limited because of relatively thick slices required (to achieve coverage during a breath-hold) and unreliable fat suppression. The development of a multiple thin slice whole body DW-MRI using: 1. a free breathing approach that affords multiple slice excitations and signal averaging over an extended period of time, and 2. a short TI inversion recovery (STIR)-EPI sequence that allows potent fat suppression improves the quality of the 3D reconstructed images in whole body imaging. The sequence provides good background body signal suppression including vessel, muscle, and fat signal by the heavy diffusion weighting and/or the STIR pulse. The longer scan time affords more slices with multiple signal averaging, higher SNR, and potent fat suppression, enabling quality MIP reconstruction. Also, the free breathing averages out unwanted signal. The STIR pulse is useful for the detection of lesions because most of the pathologic lesions have increased free water, and thus prolonged T_1 and T_2 values, resulting in a bright signal on STIR. STIR also may be useful in suppressing the intestinal signal that has a short T_1 value. However, SNR is lower in STIR than in spin-echo, which makes it time-consuming, with an average acquisition time of 10 mins for a 60-slice coverage. Images are displayed with an inverted grey-white scale familiar to clinicians, as they resemble those seen in scintigraphy or in PET. However, caution is required in image interpretation, mainly from long T_2 components within tissues, a phenomemnon referred to as "T_2-shine through". Potential advantages and limitations of the techniques in the clinic will be illustrated.

1515 Diffusion tractography of skeletal and cardiac muscle

Damon, B.
Vanderbilt University, Nashville, TN, USA

Striated muscles are highly structured and organized tissues. Because the overall cell geometry is highly elongated and most of the intracellular structures exhibit a predominantly longitudinal orientation, water diffuses preferentially along the long axis of the cell. The sensitivity of diffusion tensor MRI (DTMRI) to cellular geometry allows this technique to be used to examine muscle structure in healthy and disease on both the microscopic and macroscopic scales. On the microscopic scale, DT-MRI appears to reflect certain pathological aspects of muscle damage, such as oedema, membrane damage, and fibre disarray. This pathology results in elevated transverse diffusivities and reduced diffusion anisotropy; these changes have been observed in both animal models and human patients and appear to reflect muscle damage in a manner distinct from elevations in T_2. On the macroscopic scale, DT-MRI fibre tracking techniques have been used to characterize muscle architecture in 3D. In combination with techniques such as perfusion imaging or spatial tagging or phase contrast MRI to assess tissue displacement during contraction, DT-MRI fibre tracking of striated muscle offers the potential to characterize muscle structure-function relationships with very high spatial resolution. While the challenges of DTMRI in striated muscle are great (due to tissue motion, low inherent SNR, partial volume, and low diffusion anisotropy), these can be and are being overcome. This presentation will discuss the potential for DT-MRI to provide new insight into muscle structure and function at the microscopic and macroscopic scales.

1415–1615
Future of PET

1415 PET detector technology: Challenges and opportunities

Del Guerra, A.
University of Pisa, Italy

PET is a nuclear medicine imaging technique which produces a three-dimensional image of the distribution of a positron-emitting radioisotope (radiotracer). This gives information about the functional processes in a living subject. The key part of a PET system is the 511 keV gamma ray multi-detector system that surrounds the patient. Each of the two detectors involved in a coincidence event should provide the position of the interaction of the gamma within the detector itself and the amount of energy released. This is usually accomplished by the use of inorganic scintillators coupled to some kind of position sensitive photodetectors (PSPD). The most popular solution for clinical PET is the so-called "block detector". After more than 20 years from its introduction now it is time for a change. A new technology is becoming mature for the next generation of PET cameras. This presentation is a brief review on the use of position sensitive detectors in PET together with an overview of the near-future perspectives. A special attention is given to the recent development of the magnetic field compatible solid state photodetectors: the so-called Silicon Photomultipliers (SiPM). These photodetectors could soon replace the traditional photomultipliers and bring to the development of a new class of advanced tomographs both for stand-alone clinical PET and combined PET-MR modality.

1445 The role of PET in radiotherapy

Gregoire, V.
Universite Catholique de Louvain, Brussels, Belgium

The ultimate objective of radiotherapy is to achieve a high percentage of loco-regional control with a low incidence of morbidity, hence directly impacting on the overall survival and the quality of life. In this framework, one of the first steps in the radiotherapy planning process is to precisely select and delineate the target volumes (i.e. the tumour) and the surrounding normal tissues potentially responsible for treatment morbidity if irradiated at a too high dose. For a long time, CT is used as the reference imaging modality as it can also be used for dose calculation (taking into account the Hounsfield units, which are surrogates of tissue density). This requires that the image acquisition is performed in treatment position, thus with the patients immobilized on a flat tabletop. In pharyngo-laryngeal tumours, our group has shown that MRI did not brink any advantage over CT neither for the delineation accuracy, nor for the inter-observer variability. On the contrary, more recently, several groups including our, have shown that providing the images are acquired, reconstructed and segmented in a proper way, FDG-PET improved the delineation of pharyngo-laryngeal tumour volumes. This improvement translated into an improvement in dose distribution, i.e. a lower dose was delivered to the surrounding normal tissues. This finding opens the way for a possible increase in the dose prescription – thus potentially increasing the probability of loco-regional control – without increasing the dose to the surrounding normal tissues. Furthermore, the use of PET with other tracers imaging biological pathways involved in radiation response (e.g. cell proliferation, tumour hypoxia) open a new avenue to specifically deliver an extra dose to the PET-positive area, i.e. the so-called "dose painting" approach. After a short description of the radiotherapy processes, the lecture will focus on the usefulness of the various anatomic and functional imaging modalities for radiotherapy treatment of head and neck cancer patients. Methodological aspects and pitfalls with the use of multimodality images will be highlighted.

1515 The future of PET in drug discovery and development

Gee, A.
Imperial College London, UK

No abstract supplied.

1545 Novel PET imaging biomarkers for translational research

Welch, A.
University of Aberdeen, The John Mallard Scottish PET Unit, Aberdeen, UK

There is an increasing realisation of the potential of imaging in translational research, both in drug development and in developing new diagnostic tests. This interest is particularly strong for the modality of PET as it is one of the few imaging techniques that can be said to be truly translational (in the sense that the same investigation with the same tracer and protocol can be carried out in both animal models and in humans). Pharmaceutical companies are increasingly interested in using molecular imaging at all stages of the drug development cycle. There is also significant growth in the diagnostic imaging market and, in particular in clinical PET. However, this growth is currently constrained worldwide by the limited availability of validated imaging biomarkers. These biomarkers include both tracers and imaging methods. In this talk we will review the strengths of PET as a translational tool and outline some of the approaches that can be taken to develop new imaging biomarkers.

1430–1550
Musculoskeletal scientific session I

1430 Does delayed imaging adversely effect outcome in spinal cord compression?

Shaikh, U., Earnshaw, D.
Wirral University Teaching Hospital, Liverpool, UK

PURPOSE: The purpose of this study was to assess the time taken, from request to report, to image a patient with suspected cord compression, and whether delaying the imaging lead to any adverse outcomes. This study was in part initiated to assess the necessity of providing an out-of-hours MRI service for cord compression, in a DGH setting. METHODS: A retrospective review of inpatient spinal MRI reports over a 6 month period was undertaken. All requests for imaging for possible spinal cord compression were highlighted together with positive reports, including cases of unsuspected cord compression. The time of request and time taken for a report to be issued were logged. Particular focus was made in those cases of cord compression in which the patient had an out of hour wait for imaging of more than 8 hours. RESULTS: Over a 6 month period, 139 inpatient "whole" spines were imaged of which 48 cases were referred as possible cord compression which was demonstrated positively in 15 patients. Of the remaining 91 cases, incidental cord compression was found in 11 patients. The total mean wait for scan was 12.6 hours (4.4 working hours). Six patients with cord compression waited more than 8 hours for imaging, none of whom demonstrated negative sequelae attributable to delayed imaging. CONCLUSION: Patients with suspected cord compression did not suffer adversely by an out-of-hours wait for imaging suggesting that, in a medium sized DGH an on call MRI service is not tenable at this stage.

1440 Evaluation of ultrasound as first line investigation in clinically diagnosed soft tissue mass

Lakkaraju, A., Robinson, R., Robinson, P.
Chapel Allerton Hospital, Leeds, UK

PURPOSE: To evaluate the efficacy of ultrasound as a first line investigation in patients with a clinical soft tissue mass MATERIALS/METHODS: 358 consecutive patients (155 male, 203 female, mean age 48 years) referred from primary and secondary care with soft tissue masses underwent ultrasound evaluation. Five radiologists performed ultrasound using a 10–15 MHz linear transducer and recorded referrer diagnosis, history, lesion size, anatomical location and depth, internal echogenicity, external margins (well defined rim or infiltrative) and vascularity on power Doppler (absent or present, if present pattern either linear or disorganized). A provisional ultrasound diagnosis was made using one of 8 categories. Benign categories (1–5) were referred back to a non sarcoma specialist or original referrer for observation. Indeterminate or possible sarcomas (categories 6–8) were referred for MRI within 14 days. Additionally category 8 lesions were referred to the regional sarcoma service. Institutional and regional database follow-up was performed. RESULTS: 284 of 358 (79%) lesions were classified as benign (categories 1–5). On follow-up 15 of 284 patients were re-referred but none (284 of 284) had a malignant pathology on follow-up (24–30 months). 95 of 358 patients had masses larger than 5 cm and/or deep to deep fascia with 6 of 95 tumours (4 of 6 sarcomas and 2 of 6 non sarcomas) and 89 of 95 benign masses. 73 of 358 patients underwent MRI; 60 benign or non tumours, 10 possible sarcomas and 3 indeterminate lesions. Overall 6 of 12 lesions (6 of 358, 1.68%) deemed possible sarcomas on imaging were malignant sarcomas. CONCLUSION: Ultrasound is an effective diagnostic triage tool for evaluation of soft tissue mass referred from primary care.

1450 Ultrasound appearances of the knee following prosthetic placement

Oommen, J.
Wrightington Wigan & Leigh NHS Foundation Trust, Wigan, UK

KEY LEARNING OBJECTIVES: To illustrate base line normal ultrasound and long term appearances of knee replacement arthroplasty. DESCRIPTION: Illustration of the ultrasound appearances of components of a unicompartmental and total knee replacement prosthesis and the normal post surgical changes. Illustration of the site of surgery and components of the extensor apparatus to identify causes for failure of full extension, the presence of patella mal-tracking. Illustration of ultrasound appearances of complications and of early implant failure from post surgical changes. Illustration of other common findings following a prosthetic implant. CONCLUSION: Evaluation of the prosthetic implants of the knee is grossly limited to plain film follow up as CT images are distorted by streak artefacts and MR images are distorted by loss of signal and image distortion due to loss of magnetic field homogeneity arising from the metallic components of the prosthesis. Identification of ultrasound appearances of the normal post surgical changes and the components of the prosthesis with an understanding of the surgical technique used is invaluable in the ultrasound follow up of post-operative cases. Assessment of the extensor mechanism including evaluation of the retinacular fibres for dehiscence and demonstration of subluxation of the patella helps to identify functional and soft tissue causes for limitation of mobility and range of movement in patients. Identification of the immediate post surgical changes and common complications. Identification of post surgical changes from evidences of implant failure would limit the need for revision surgery.

1500 Three dimensional ultrasound imaging for the detection and monitoring of joint damage in rheumatoid arthritis

Shipley, J.A.[1], Thompson, J.M.[1], Harris, N.D.[1], Bhalla, A K.[1], Robinson, G.[2], Glew, D.[2], Hillman, M.R.[3], Duck, F.A.[2]
[1]Royal National Hospital for Rheumatic Diseases, Bath, UK, [2]Royal United Hospital, Bath, UK, [3]Bath Institute of Medical Engineering, Bath, UK

PURPOSE: Current treatments for rheumatoid arthritis (RA) must be selectively applied at an early stage. Both MRI and 2D ultrasound have been shown to achieve greater sensitivity to erosions and soft tissue inflammation than standard X-ray radiography. We have developed a 3D ultrasound system for the diagnosis and monitoring of RA in the small joints of the hand, and assessed the possible clinical advantages this may offer. MATERIALS/METHODS: The system uses an optically tracked, mechanically guided freehand transducer. It is based on the Stradwin 3D ultrasound software package (University of Cambridge, UK) and uses a Polaris Vicra optical tracking device. A cohort of 9 seropositive RA patients and 4 healthy volunteers were scanned using 3D ultrasound, 2D ultrasound and MRI. All scans were reported (blind) by two independent radiologists, who scored RA disease severity and identified erosion locations. RESULTS: 2D and 3D ultrasound were found to be similar in their overall performance; however, the 3D system provides a complete record of the scanned joint morphology for off-line analysis and comparison with subsequent scans. There is good spatial correlation between those erosions detected

using 3D ultrasound and MRI, but MRI often reveals more erosions due to the limited surface area that is accessible using ultrasound. CONCLUSION: We have developed a clinically useable ultrasound system which can produce high resolution (<0.25 mm) three-dimensional images. The novel mechanical guide mechanism allows the acquisition of smooth and reproducible scans without sacrificing operator input towards optimal imaging of the bone surface.

1510 Ultrasound guided haematoma block for closed reduction of distal radial fractures – A novel training method

Kennish, S.J.[1], Currie, S.[2], Kessel, D.[1]
[1]St James's University Hospital Leeds, Leeds, UK, [2]Leeds General Infirmary, Leeds, UK

KEY LEARNING OBJECTIVES: A simulation programme for training emergency physicians in the ultrasound-guided administration of a haematoma block is outlined. DESCRIPTION: haematoma blocks can provide safe and effective loco-regional anaesthesia for the closed reduction of distal radial fractures. Overlying traumatic soft tissue swelling and patient obesity can prevent accurate localisation of the fracture during "blind" insertion of the local anaesthetic. Repeated palpation and failed needle placement increases patient distress. A simple ultrasound guidance technique can be used for accurate initial placement of the needle and a novel training method is outlined. The dorsal surface of the distal radius is scanned with a high frequency linear transducer. The fracture is readily identified as a focal hyporeflective area with highly reflective intact cortex on either side. Ultrasound can be used to visualize a needle as it passes into the associated haematoma. Scanning during injection of 10 ml of local anaesthetic confirms correct position. A single closed fracture can be created in a raw turkey leg bone with a single hammer blow. Ultrasound images of this fracture are very similar to those of a distal radial fracture. Red liquid food colorant can be injected into the fracture site to act as haematoma substitute. Preliminary assessment shows that emergency physicians can be taught how to use ultrasound to recognize the fracture, place the needle, aspirate the "haematoma" and inject anaesthetic. CONCLUSION: This novel simulation training method is inexpensive and provides comparable imaging to a distal radial fracture. Trainees report improved confidence prior to clinical application.

1520 Diagnosing plantar fasciitis – The role of imaging

Ramsden, P.
University of Bradford, Bradford, UK

Plantar fasciitis is a common cause of heel pain in adults. Commonly plantar fasciitis has been associated with running and athletic sports. However, rapid weight gain and obesity are also recognized as factors in its presentation. Plantar fasciitis is often diagnosed on clinical assessment. However, the accuracy of diagnosis varies with the expertise of the clinician and with a number of pathologies presenting with similar symptoms, diagnostic imaging to verify inflammation of the connective tissue and confirm clinical diagnosis may be beneficial. Evidence suggests that ultrasound, MRI and scintigraphy may all have a role to play in detecting and diagnosing plantar fasciitis. However, no recommendations on the use of imaging currently exist. This presentation summarises a third year student project and summarises the evidence on the role of imaging in plantar fasciitis to determine the preferred imaging approach for accurate diagnosis.

1530 Obesity increases precision errors in DXA measurements at the spine and hip

Holl, S.A., Bartlett, A.G., Hopkins, S.J., May, S., Welsman, J.R., Knapp, K.M.
University of Exeter, Exeter, UK

PURPOSE-MATERIALS: The precision of dual X-ray absorptiometry (DXA) measurements is of utmost importance and the current least significant change of 2.8% is based on precision measurements of 1%. Although obesity has typically been thought to be protective against osteoporosis, the rapidly increasing proportion of overweight and obese individuals within the population will lead to an increasing number of these patients requiring DXA scans in the future. This study investigated the effect of being overweight or obese on precision measurements at the clinically important sites of the lumbar spine, femoral neck and total hip using the GE lunar Prodigy. METHODS: 78 women were recruited from a volunteer population with BMIs ranging from 18.5 kg m^{-2} to 45.9 kg m^{-2}. All women had duplicate DXA scans of their lumbar spine and left hip, with repositioning between scans. The group was divided into three groups based on their BMI and the root mean square coefficient of variation calculated for each group. RESULTS: The RMSCV% were as follows for the lumbar spine, femoral neck and total hip, respectively: <25 kg m^{-2} group (n=40) 1.02%, 1.30%, 0.78%; 25–30 kg m^{-2} group (n=19) 1.44%, 1.18%, 0.83%; >30 kg m^{-2} group (n=19) 2.93%, 2.05%, 1.16%. CONCLUSION: The results demonstrate an increase in precision error at all three sites in obese subjects, with the greatest increase being seen at the spine. These results suggest that serial measurements in obese subjects should be treated with caution since the least significant change will be increased, especially at the spine. Further research is required to further investigate these findings.

1540 Imaging features of foot and ankle osteoid osteoma

Shukla, S., Clarke, A., Saifuddin, A.
The Royal National Orthopaedic Hospital, Stanmore, UK

PURPOSE: To review the imaging features of osteoid osteoma of ankle and foot, with emphasis on MRI findings. MATERIALS/METHODS: A retrospective evaluation of imaging findings of 9 patients with osteoid osteoma was performed. Plain radiographs, CT and MRI had been performed in all cases. Radiological features evaluated were presence of a nidus and cortical thickening. CT features were nidus location and nidus calcification. MRI features were presence of identifiable nidus, presence and grade of bone oedema and whether a joint effusion was present. RESULTS: Out of 9 patients, there were 3 female and 6 male. The mean age was 21 year (range 11–39 years). Plain films were normal in all cases with hindfoot (4 calcaneum, 1 talus) osteoid osteoma. A CT scan identified a nidus in all these cases and in all total cases but one (89%). MRI identified a nidus in 6 of 9 cases (67%). High grade bone marrow oedema localized to affected bone and adjacent soft tissue oedema was identified in all cases with no oedema in adjacent bones. The nidus was of intermediate signal on T_1 and intermediate to high signal on T_2-weighted sequences. CONCLUSIONS: MRI should be considered in younger patients with chronic hind or mid foot pain and a normal radiograph. The utility of CT in identifying a nidus in the setting of abnormal radiograph suggestive of osteoid osteoma or after MRI with oedema isolated to a solitary foot or ankle bone and soft tissue is also shown.

1430–1600
Cardiac keynote and scientific session I

1430 Pushing the boundaries of perfusion CMR

Plein, S.
Leeds General Infirmary, Leeds, UK

No abstract supplied.

1455 Multi-slice CT segmental calcium score to predict stenosis severity in calcified coronary lesions

Pugliese, F.[1,2], Hunink, M.M.G.[3], Gruszczynska, K.[3], Meijboom, W.B.[3], Rengo, M.[3], Krestin, G.P.[3], de Feyter, P.J.[3]
[1]MRC-CSC, PET Cardiology, London, UK, [2]Royal Brompton Hospital, London, UK, [3]Erasmus MC University Medical Centre Rotterdam, Rotterdam, Netherlands

PURPOSE: To predict ≥50% coronary stenoses associated to calcified lesions detected at multi-slice computed tomography coronary angiography (MSCT-CA) based on MSCT calcium score (CS) measured per segment and calcification morphology. MATERIALS/METHODS: Patients (n=402) with stable or acute chest pain underwent MSCT CS, MSCT-CA and conventional angiography (CAG). One

observer measured CS in individual coronary segments and classified calcification morphology into spotty, wide and diffuse. A derivation dataset and a validation dataset were obtained. In the derivation dataset, we determined frequency of angiographically proven ≥50% stenoses and explored the predictive value of other variables (location within the coronary tree and clinical factors) to derive a multivariable prediction rule. The prediction rule was validated in the validation dataset. RESULTS: In a multivariable model, the OR for stenosis was 1.8-fold greater (p=0.006) in patients with typical chest pain, 2-fold (p=0.014) greater in patients with acute coronary syndrome, 2-fold greater (p<0.001) in patients with prior myocardial infarction. With distal segments as comparator, each unit of natural log of CS in middle segments corresponded to an OR 1.2-fold (p<0.001) greater; in proximal segments this corresponded to an OR 1.1-fold greater (p=0.021). Spotty calcifications had an OR for stenosis 2.3-fold (p<0.001) greater than the absence of calcification, wide calcifications 2.7-fold (p<0.001) greater, and diffuse calcifications 4.6-fold (p<0.001) greater. CONCLUSION: Combining segmental CS, morphology, lesion location and patient's symptoms we can predict the probability of ≥50% stenosis associated to calcified lesions detected at MSCT-CA.

1505 Adenosine stress perfusion cardiac magnetic resonance imaging: Does it really shape interventional strategy?

McParland, P.[1], Bull, R.[2], Patel, R.[2], Mckenzie, D.[2], Radvan, J.[2]
[1]Southampton University Hospital Trust, Southampton, UK, [2]Royal Bournemouth Hospital, Bournemouth, UK

PURPOSE: Cardiac magnetic resonance imaging (CMRI) allows accurate identification of ischaemic and dead myocardium. We assessed whether application of this technology would influence PCI. MATERIALS/METHODS: 60 patients undergoing diagnostic angiography followed by CMRI were evaluated in 2007. Data for the first 26 patients are included here. All angiograms were examined by a cardiologist for percutaneous intervention (PCI) and number of target lesions and vessels counted. This was done on conventional criteria blinded to the CMRI results. CMRI data included ejection fraction, inducible ischaemia and infarcted territory. The number of PCI targets were then re-assessed following the CMRI data. RESULTS: 10 (the first 26) patients had 3 diseased vessels, 10 had 2 vessel, and 6 single vessel coronary disease (56 diseased vessels). 48 of the 56 vessels were potential PCI targets on conventional criteria. Using CMRI this was reduced to 24 vessel targets – a reduction of 50% (p<0.05). One patient, who was not thought to need a stent, was converted to PCI. 20% (10) of the potential target vessels supplied dead myocardium, and 13 (27%) showed no evidence of ischaemia. Total occlusion was not more likely to be infarct-related than vessels with severe stenoses. CONCLUSION: 1. CMRI allows an ischaemia-guided approach where PCI target vessels are reduced by 50%. 2. CMRI is a fundamental tool in shaping PCI strategy in coronary artery disease. 3. Routine CMRI may be a cost-effective tool.

1515 Dose optimization and image quality in computer tomography

Irwan, R.
Toshiba Medical Systems Europe, Zoetermeer, The Netherlands

KEY LEARNING OBJECTIVES: Dosimetry for both multidetector CT (MDCT) and the new generation volume CT will be presented. DESCRIPTION: This educational session covers from basic understanding on CT dose index (CTDI) and dose–length product (DLP) to more advanced topics such as over-ranging and dose management (automatic exposure control) in relation with the image quality. The influence of CT-pitch, tube potential, tube current and rotation time on both image quality (in terms of temporal resolution) and patient dose will be discussed. The main differences between dosimetry for MDCT, which involves table movement and for volume CT which does not, will be thoroughly discussed and analysed. The CT-pitch will be no longer applicable to the latter. Furthermore, the corresponding phantom measurements will also be covered. This includes the new method to measure CTDI for beam-widths larger than 100 mm. In addition, the impact of scan length on the exposure levels at 16-MDCT and 64-MDCT will be discussed, including the crossing of DLP curves obtained in both systems. Differences in object size may thus explain apparent discrepancies between previous studies reporting either higher or lower effective exposure levels. CONCLUSION: One should pay careful intention to what they are measuring in CT dosimetry. The DLP, and therefore, patient dose should include the over-ranging and not only the scan length.

1525 MDCT coronary angiography vs. myocardial perfusion scintigraphy a comparison of clinical management and cost

Nicol, E.D.[1,2], Stirrup, J.[2], Leatham, E.W.[2], Underwood, S.R.[2], Rubens, M.B.[2], Padley, S.P.G.[2]
[1]John Radcliffe Hospital, Oxford, UK, [2]Royal Brompton Hospital, London, UK

PURPOSE: To assess the short term investigation and treatment costs of CT coronary angiography (CTA) against myocardial perfusion scintigraphy (MPS) using real clinical scenarios. MATERIALS/METHODS: 52 patients with low to intermediate likelihood of coronary artery disease referred for MPS underwent CTA. Clinical information for either CTA or MPS was presented randomly to 20 cardiologists, who decided the further investigations and treatment required. Short term cost was calculated for each imaging strategy. RESULTS: The number of further investigations requested did not differ between groups. Patients undergoing CTA were more likely to be referred for invasive coronary angiography (odds ratio (OR) 2.17), receive aspirin (OR 1.72), statins (OR 3.13), ACEi/ARB (OR 2.1) (all p<0.001), β-blockers (OR 1.45, p=0.004) or clopidogrel (OR 2.43, p=0.012). Mean total cost and investigation costs were similar between CTA and MPS (£48.80 vs. £48.80, p=0.534 and £754 vs. £649, p=0.927, respectively). Treatment costs with CTA were higher (£21.40 vs. £18.30 p<0.001). CONCLUSION: There are significant differences in further investigation and treatment of patients when using CTA compared with MPS in this cohort, in particular with greater use of secondary preventative medication.

1515–1715
Update in urologic imaging

1515 CT urography: Which technique and when?

Silverman, S.
Harvard Medical School, Boston, MA, USA

CT urography has emerged as the heir apparent to the conventional intravenous urogram for the initial imaging evaluation of many urinary tract complaints. There has been considerable debate as to how best to perform a CT urogram. Although it is accepted that the kidneys are best evaluated during the nephrographic phase, most of the controversy stems from the fact that it is difficult to obtain a single image of the urinary tract in which all collecting system components are opacified and distended due to peristalsis. Many techniques have emerged, but in our experience, a three-phase examination that is supplemented with intravenous furosemide is the most reliable way to opacify and distend the collecting system, ureters, and bladder. This three-phase technique has also been shown to be excellent for the detection of bladder cancer, once thought to be solely in the purview of cystoscopy. However, the technique does utilize more radiation than the intravenous urogram. Newer techniques, including the split bolus method, coupled with dose modulation have reduced radiation. Since CT urography is more costly than intravenous urography, it has not been fully determined as to who should be examined with CT urography. Haematuria is found commonly and does not often herald the onset of significant pathology but at the same token, may be the only sign of a cancer or other serious disease. Although evidence-based data are lacking, risk-based protocols are emerging that will maximize the yield of evaluating patients with haematuria with CT urography.

1545 MR imaging for genitourinary emergencies

Spencer, J.
St James's University Hospital Trust, Leeds, UK

In this interactive series of case presentations I will illustrate how MRI can help in the management of genitourinary emergencies.

1615 Bladder cancer: MRI in staging and follow-up

Carrington, B.
Christie Hospital NHS Trust, Manchester, UK

This lecture will discuss the role of MRI in the staging and follow-up of bladder cancer. Diagnostic difficulties in staging will be addressed and atypical sites of tumour spread illustrated. The expected post treatment effects of surgery, radiotherapy and chemoradiotherapy will be identified and patterns of tumour relapse illustrated. Dynamic contrast-enhanced MRI and diffusion-weighted imaging will be considered, particularly as problem-solving tools in the treated patient. The presentation will include a relevant literature review and discuss potential UK multicentre MRI trials in bladder cancer.

1645 Sorting out retroperitoneal masses

Rockall, A.
St Bartholomew's Hospital, London, UK

Retroperitoneal masses are often identified as an incidental finding whilst investigating a patient for relatively non-specific symptoms. The range of diagnoses is varied and includes primary tumours arising in the tissues of the retroperitoneum, such as the connective tissues and neural tissues; secondary masses, such as in testicular germ cell tumours; or inflammatory or infective processes. Primary retroperitoneal tumours are extremely rare and are predominantly sarcomas. In some cases, these are readily diagnosed based on the imaging features, such as well-differentiated liposarcomas. However, in many cases image guided biopsy may be required to establish the diagnosis. As surgery is the predominant treatment modality, imaging is useful in delineating the extent of the tumour and vascular involvement. Masses that originate from neural crest tissue include paragangliomas (extra-adrenal phaeochromocytomas), which are usually benign and are "functional" (secreting catecholamines) in up to 60% of patients. Ganglioneuromas also arise from neural crest tissue along the sympathetic ganglia and may be very large masses at presentation. Other rare primary tumours include angiomyxoma. Cystic lesions in the retroperitoneum may be congenital, such as duplication cysts, or may be acquired, for example following pancreatitis. Primary or secondary germ cell tumours may have a relatively cystic, low density appearance. During the course of this lecture, the imaging characteristics of retroperitoneal masses will be reviewed. Several cases will be used to illustrate different pathologies, using an interactive approach, and a discussion of the differential diagnosis will be undertaken.

1545–1730
PACS Horizons – RCR PACS and teleradiology group session

1545 Cardiology PACS – What are the challenges?

Wilde, P.
Bristol Royal Infirmary, Bristol, UK

A £57m purpose built regional cardiac centre funded by the Department of Health, the Bristol Heart Institute (BHI), has just opened (May 2009) on a site immediately adjacent to the Bristol Royal Infirmary (BRI). It offers a totally integrated cardiac service with cardiac surgery, interventional cardiology (including 24/7 primary angioplasty), electrophysiology and adult congenital heart disease treatments all being delivered on a unified site. Diagnostic imaging facilities include new cardiac catheter laboratories, a "hybrid" catheter laboratory/cardiac theatre, a full echocardiography service and a dedicated 1.5 T cardiac MR scanner as well as plain radiography. The BRI is a major city centre acute hospital and specialist tertiary centre which houses the main radiology department. There are numerous patient pathways through the two buildings. Some cardiac patients will be admitted directly to the BHI whilst others will be transferred from the BRI. Many patients will require investigation for both cardiac and non-cardiac conditions. The challenge has been to integrate an existing radiology PACS system with a new cardiology orientated imaging network. The specification required full compatibility between both systems, allowing clinicians in both sites to review both cardiology and non-cardiology imaging. Viewing of external imaging is also required. Technical differences in requirement between conventional radiology and cardiac imaging will be reviewed and the clinical working practices and needs of the two clinical services will be compared. Our solutions to this challenging specification will be presented and our early experience will be reviewed.

1605 Digital pathology

Treanor, D.
St James's University Hospital, Leeds, UK

Pathology is going digital, from glass to virtual slides. These are gigapixel images produced by scanning tissue sections at high resolution (up to 200 000 dots per inch), enabling the study of tissue at a cellular level. They could replace the conventional light microscope in histopathology clinical practice and research. This talk will introduce virtual slides at a technical and clinical level. The uses of virtual slides and the potential benefits they bring to research, education, and diagnosis will be discussed. The technical, clinical and organisational challenges they present will be described. Examples of virtual slides can be seen on our webpage at www.virtualpathology.leeds.ac.uk.

1625 Mammography – From analogue to digital and PACS

Wallis, M.G.
Addenbrooke's Hospital, Cambridge, UK

Mammography (breast imaging) has two main "components". Lower volume symptomatic/referral services fully intergraded into a Hospital CRIS and PACS and high volume "community based" screening services working from NHS number and a unique screening identifier on a stand alone national computer system (NBSS). Digital mammography equipment is now well tested and available in many hospitals. Thanks to IHE the problem with integration with CRIS and PACS and between different manufactures is essentially resolved. Screening is further behind. Conversion of NBSS is on going. Data transfer to and from remote acquisition stations and desk top integration has been tested and is working in a small number of pilot sites. Spine compliance is outstanding. By 2012 screening will generate over 357 TB of data pa. Working on 3 year cycle 80% of attendees have prior images that will need to be retrieved. The majority of these prior images will have originated from their current screening trust. A substantial minority (as yet to be determined) will be from elsewhere in the country and from the symptomatic service where they are stored under a different primary identifier. Clearly the current PACS architecture (12 months of local storage) and the network will need to be redesigned to ensure that the current systems don't grind to a halt. I plan to explore these issues and potential solutions in more detail, provide an up to date overview of the current state of play and discuss the implications for the complete health care record.

1645 Visible light imaging – Endoscopy and medical photography

Bramley, R.
Radiology, Christie Hospital NHS Trust, Manchester, UK

No abstract supplied.

1705 What radiotherapists want from PACS

Shakeshaft, J.
Clatterbridge Centre for Oncology, Wirral, UK

PURPOSE: The NHS has invested significant amounts in procuring a cluster-based nationwide PACS system. Most of these systems now

include the ability to store a wide range of DICOM objects in addition to the standard images generated in diagnostic imaging departments. This includes the range of objects generated by most commercial radiotherapy systems. This paper discusses the potential for using the nationally procured PACS systems both as an archive of radiotherapy treatments for the host institution and as a means of sharing this data with other institutions, where the patient may be treated at a later date. METHODS: Although radiotherapy systems have been able to generate DICOM objects for a number of years now, there still remain more compatibility problems than with most images generated by diagnostic imaging departments. The limitations imposed by these compatibility issues together with possible solutions and risks will be discussed. RESULTS: Results of some initial pilot work on storing radiotherapy data in the GE PACS at Clatterbridge Centre for Oncology will be presented. This work has seen the extension of the RIS into the radiotherapy imaging department and various solutions for integrating non-modality-worklist compliant equipment. Possible means of oncologists being able to review previous treatment data at clinics based at other hospitals will also be discussed. CONCLUSION: The national PACS does have the potential to be valuable archive for radiotherapy treatment data. The potential for sharing treatment data can also be realised if a national protocol can be agreed. Work is underway to establish this.

1600–1700

Consultant practice in radiography

1600 So you think you do research?

Jones, H.[1], Snaith, B.[2]
[1]Royal Liverpool Hospital, Liverpool, UK, [2]Pinderfields General Hospital, Wakefield, UK

PURPOSE: Research is a requirement of the Consultant radiographer's role and as such, they play a pivotal role in the integration of clinical practice, education and research findings. LEARNING OBJECTIVES: Review the expectations for the research and evaluation domain of consultant practice. Demonstrate the expectation for Consultant practitioners to engage in the research process, at local level and within wider healthcare team. Explore case studies of current and recent research undertaken by consultants. DESCRIPTION: Radiography research has been acknowledged as limited, with much perceived to be undertaken within academia or by the medical profession in isolation. The consultant role was designed to integrate leadership, education and research within expert clinical practice and increase the capacity and quality of clinically based research. In relation to the four domains of consultant practice, the research and evaluation element will be reviewed and case studies of research practice at the consultant level will be discussed. Opportunities for personal and professional development, collaboration and funding will be explored. CONCLUSION: Consultant radiographer appointments across the UK have contributed to the radiography evidence base and future appointments will be expected to both engage in the research process and disseminate the results to further enhance practice.

1615 So you want to do service improvement?

Punt. L.
Addenbrooke's Hospital, Cambridge, UK

KEY LEARNING OBJECTIVES: To investigate service redesign and the role of the Consultant Radiographer. To obtain an understanding of competency program development. To be aware of the benefits of skill mixing and role development facilitating innovative service improvement and improving patient outcomes. DESCRIPTION: Since 2000 [1] government initiatives to ensure a world class health service and improve patient care have highlighted the need to challenge the boundaries that have traditionally existed between professions. New ways of working have been identified including the up-skilling, encouragement and reward for non-medical influences on service redesign and improvement. This presentation examines the impact of the Consultant Radiographer in implementing service improvement within the Anglia cancer network. It also aims to highlight the benefits these changes have made to all service users. The author will illustrate how the Consultant Radiographer can identify, design, implement and evaluate a robust service redesign programme using examples of practice from the introduction of the UK's first radiographer led adjuvant endometrial clinic for new patients and implementation of a radiographer led brachytherapy service. CONCLUSION: Appointment of a Consultant Therapy Radiographer to the Anglia cancer network has influenced service re design that has increased resources, reduced waiting times and provided increased flexibility, continuity and improved integration of care for the patient. Reference: 1. The NHS plan, A plan for investment. A plan for reform Department of Health, July 2000.

1645 So you want to be a consultant radiographer?

Kelly, J.F.
Countess of Chester NHS Foundation Trust, Chester, UK

KEY LEARNING OBJECTIVES: Outline of the UK government rationale behind the development of consultant allied health professional (AHP) posts. Discuss the main factors required to facilitate the establishment of such posts. Exploration of the key differences between consultant and advanced practice. DESCRIPTION: In 2000 the UK (UK) government announced an intention to develop AHP consultant posts for expert staff [1]. The purpose was to create new career opportunities and assist in recruitment and retention of skilled professionals whilst improving patient care and reducing waiting times. Compared with some other AHP groups the number of radiographer consultant posts established since then has been relatively small. There are currently approximately 40 consultant radiographers (therapy and diagnostic) within the UK The establishment of such posts appears to be dependent on a number of factors and varies between organisations. This presentation will outline factors that facilitate the creation of such posts and the educational, training and experience required for appointees to be competent to perform the role. Perceived barriers and threats to further appointments and a strategy for succession planning in order to sustain the current momentum will be considered. CONCLUSION: Consultant radiographer appointees' scope of practice is very broad and, despite the relatively small numbers of appointments, has undoubtedly had a beneficial impact on patient care. A sustainable strategy to raise the profile of this impact is vital if the consultant role is to remain embedded within National Health Service staffing structures. Reference: 1. Meeting the Challenge: a strategy for the allied health professions. Department of Health. London: 2000.

1615–1715

Musculoskeletal scientific session II

1615 Radiography of the shoulder following anterior dislocation of the humeral head-detecting glenoid rim fractures

McCabe, L.
University of Bradford, Bradford, UK

Approximately 23% of anterior dislocations of the humerus have associated fractures. A significant proportion of these occur at the anterior glenoid border. The early identification of glenoid rim fractures is essential as misdiagnosis may result in instability at the gleno-humeral joint, premature arthritis and disruption to shoulder movement and function. Radiography of the shoulder following trauma usually involves the production of 2 images. In the UK, the antero-posterior shoulder projection is undertaken as standard and provides an anatomical overview of shoulder anatomy. However, this projection is not optimal for evaluating the anterior glenoid border due to anatomical orientation and super-imposition of other structures. The second radiographic projection of the shoulder undertaken in the UK is noted to vary between hospitals, although anecdotal evidence suggests it rarely varies between patients imaged within each hospital unless physical disability prevents routine projections being obtained. Consequently, it appears that the choice of projection is related to local practice rather than the diagnostic value of the different shoulder techniques available and their value in diagnosing specific anatomical injuries. This presentation summarises the findings of a third year

student project to evaluate supplementary radiographic projections of the shoulder in terms of anatomy displayed and identifies the most appropriate second projection of the shoulder to be undertaken following an anterior humeral to determine the presence of associated glenoid rim fractures.

1625 Carpal angles defined by the international wrist investigators workshop: Are they reliable

Botchu, R., Rahaman, R., Disini, L., Chojnowski, A., Toms, A.
Norfolk and Norwich University Hospital NHS Trust, Norwich, UK

PURPOSE: Carpal angles, as measured on plain radiographs and used to determine surgical intervention, have been defined by the International Wrist Investigators Workshop (IWIW) but are not known to be reliable. The aim of this study is to measure the reliability of the most commonly used carpal angles in standard wrist radiography. MATERIALS/METHODS: 101 radiographs (orthogonal AP and lateral) of wrists were selected sequentially from PACS. Wrists with an arthropathy, surgical implants or acute fractures were excluded from the study. Scapholunate and capitolunate angles, carpal angle, and radial inclination were independently measured by two observers using PACS tools and following IWIW definitions. RESULTS: The mean age of patients was 45 years (range 8–87 years). 43 males and 58 females were included with 59 radiographs of the right wrist and 42 of the left. The mean angle and differences in observer measurements were: scaphulonate mean 50° (SD 10°), observer difference 6° (SD 6°), lunocapitate mean 4° (11°), observer difference 9° (SD 10°), carpal angle mean 128° (SD 8°), observer difference 4° (SD 4°), and radial inclination mean 26° (SD 4°), observer difference 3° (SD 5°). The intraclass correlation coefficients (ICC) for the two observers were: scapholunate 0.82 (95% CI 0.7–0.9), lunocapitate 0.64 (95% CI 0.5–0.8), carpal angle 0.87 (95% CI 0.8–0.9) and radial inclination 0.52 (95% CI 0.3–0.7). CONCLUSION: ICC, and therefore inter-observer reliability using IWIW definitions of carpal angle measurement, is good for scapholunate, lunocapitate and carpal angles and moderate for radial inclination.

1635 Identification of distal radial fractures by radiographers and consultant radiologists: A comparative study

Mc Entee, M.F.[1], Dunnion, S.[2]
[1]University College Dublin, Dublin, Ireland, [2]Beaumont Hospital, Dublin, Ireland

PURPOSE: The aims of the study is to measure the performance of radiographers in detecting the presence of a distal wrist fracture; to determine whether the number of years clinical service impacts on radiographers performance and to compare the performance of radiographer, untrained in reporting to that of consultant radiologists. MATERIALS/METHODS: To achieve these aims we carried out a receiver operating characteristic (ROC) study on radiographers and radiologists to assess their performance. 19 experienced but untrained radiographers were compared with 15 certified consultant radiologists. 30 wrist radiographs were shown, 15 of which had distal radial fractures 15 did not. The results of the ROC, false positives and false negative were compared using one way analysis of variance (ANOVA). RESULTS: The study showed that for Az values Consultant Radiologist performed better ($p \leq 0.01$) with radiographers scoring 0.877 (0.087) and Radiologist scoring 0.94 (0.05). Radiologists also had fewer false positives than radiographers ($p \leq 0.007$), no difference was found in the false negatives ($p \leq 0.11$). A trend of increased performance with increased experience was seen among the radiographers. CONCLUSION: Radiologists outscored radiographers and a difference in performance exists between the groups. However, radiographers Az scores of 0.87 demonstrates that there is potential for radiographers to recognize fractures with some accuracy. Further training of radiographers should now be carried out and this experiment should be repeated on the group with training.

1645 Is FAST a natural role extension for trauma radiographers?

Adrian-Harris, D.
University of Portsmouth, Portsmouth, UK

The role of FAST in the early diagnosis of intra abdominal bleeding is well understood and the technique is now widely used. Literary evidence suggests that radiology and non radiology clinicians are equally able to conduct and interpret such examinations. Changes in the medical education afforded to recently qualified doctors might be adversely impacting on their opportunities to acquire such skills. The purpose of this paper is two fold, firstly to explore the potential gains should FAST become a role extension activity for A&E radiographers. The second limb is to recount the experience of teaching FAST to a cohort of final year students shortly before they graduated from the diagnostic radiography programme at the University of Portsmouth. It is concluded that the undergraduate radiography programme already encompasses sufficient knowledge of ultrasound physics, cross sectional anatomy and experience in manipulating grey scale images that the development of FAST skills is readily achievable, and further, that FAST undertaken by radiographers is a real possibility as they have the appropriate skill set, are already present during trauma imaging and have the infra structure to maintain competency and clinical governance.

Notes

Scientific programme abstracts Wednesday 10 June

0830–0930
MRI school III – Shoulder
0830 MRI shoulder – Rotator cuff

Bhatti, W.
Wythenshawe Hospital, Manchester, UK

MRI is often performed to evaluate rotator cuff disorders. Recognition of the types of tears is critical for accurate diagnosis and appropriate patient management. The emphasis will be on improving the standard of reporting MRI shoulder, using precise description and classification of tears providing an Orthopaedic friendly report. Commonly used terminology including rim rent tears, PASTA lesions, delamination and musculotendinous cysts will be described. The aetiology of tears secondary to outlet related impingent and instability will be described. The role of MR arthrography and advantages of provocative sequences such as the ABER will be discussed.

0900 MRI shoulder – Instability

Toms, A.P.
Norfolk and Norwich University Hospital, Norwich, UK

No abstract supplied.

0830–0930
A guide to PET/CT in the MDT
0830 Indications for PET/CT and principles for optimal images

Johnston, C.
St James's Hospital, Dublin, UK

PET-CT examinations form an integral part of the staging investigations for many cancer patients. Non-nuclear radiologists involved in oncology MDTs are often reluctant to provide an opinion on PET-CT examinations. This session is aimed at providing an overview of the current indications for PET-CT in oncology, with a brief overview of how images are acquired and interpreted. Patient variables and system variables that can be modified in order to provide optimal image quality will be described. The utility of the technique as a problem solving technique in atypical clinical scenarios will be shown with examples. AIM: To provide an overview of the utility of PET-CT in the modern comprehensive cancer centre, with emphasis upon optimising image quality. OUTCOMES: 1. Understand the fundamentals of PET-CT patient preparation and image optimization. 2. Highlight the current oncology indications for PET-CT, with review of the information gained from the National Oncology PET registry. 3. Understanding the key strengths and weaknesses of the technique.

0900 Principles of interpretation of PET/CT within the MDT: Pitfalls and perils

Cook, G.
Royal Marsden Hospital, Surrey, UK

The number of clinical PET applications and investigations is increasing. There is a rapid growth in the number of combined PET/CT scanners. It is therefore important that normal variants, artefacts and causes of false positive studies are recognized to avoid misinterpretation and to maintain clinicians' confidence in this powerful imaging technique. The majority of clinical PET studies are oncological and use ^{18}FDG but uptake of this radiopharmceutical is not specific to malignant tissue and indeed uptake of ^{18}FDG may depend on factors other than glycolysis alone. The widespread use of attenuation correction in whole body imaging together with iterative reconstruction techniques has improved image quality and reduced artefacts that were often present before these techniques were more commonly utilized. The advent of combined PET/CT has brought some of its own artefacts and pitfalls. With appropriate attention to patient preparation, recognition of some of these artefacts and with new developments to overcome them, pitfalls in clinical PET interpretation can be minimized.

0830–0920
Optimizing the digital image: From exposure to presentation – DM
0830 Physics of digital mammography

Workman, A.
Forster Green Hospital, Belfast, UK

No abstract supplied.

0855 Practical aspects of digital mammography

Currie, J.
Action Cancer House, Belfast, UK

No abstract supplied.

PURPOSE: To consider some of the challenges involved with setting up a Full Field Digital Mammography centre and to look at some practical lessons learned. METHODS: Action Cancer is a leading Northern Ireland Charity, we offer a breast screening service to women aged 40–49 years and 65+ (outside of the NHSBSP invitation range in Northern Ireland). In 2006 we installed full field digital mammography (FFDM) both in our fixed site and on a new purpose built mobile unit. Since July 2006 the Charity has screened 8000 women per year using FFDM. We have experiences many of the practical aspects of installing FFDM, training staff, Client perceptions and staff opinions of this new system of work, both in screening and reporting. We have also looked at our cancer detection rate with FFDM compared with our old analogue system. CONCLUSION: The last few years has shown that FFDM can be used very effectively and efficiently within our screening centre and has led to more diagnoses of cancer when compared with previous analogue system

0900–1030
Different ways to deliver a patient-focused imaging service
0900 The Bolton experience

Walsh, C.
Royal Bolton Hospital, Bolton, UK

PURPOSE: Bolton Hospital Foundation Trust began its Lean Journey in July 2005 as a participating Hospital in the Institute for Health Improvement save 100K lives campaign. Radiology Department was chosen as one of the first areas to experience "Lean in action". Areas of improvement have included, CT scan, in particular stroke patients pathway, ultrasound services to A&E and plain imaging in Orthopaedic outpatients. AIM: To improve patient experience by reducing waiting times and improving flow by service redesign. These improvements are at the heart of patient value and we have worked with patients to provide not just a patient centred service, but a patient driven service. METHODS/MATERIALS: Lean rapid improvement events using tools such as value stream analysis, "2P" planning and Staff/patient involvement. RESULTS: Noted development in experience in staff members such as improved enthusiasm, ownership in process and an incorporation of "Lean Leadership" within the department. Radiology as a source of learning about lean methods in the wider organization, promoting a multidisciplinary approach. A markedly improved admission pathway for stroke patients, reduced waits for A&E ultrasound patients, reduced or even negated length of stay. Improved flow and patient experience in Orthopaedic outpatients. CONCLUSION: Lean methodology has truly touched the hearts and minds of staff and patients leading to improvement of care pathways.

These improvements are only the start of what is rapidly becoming not just a patient centred but a patient driven service.

0930 Teleradiology across European boundaries – The Barcelona experience

McInnes, G.
Telemedicine Clinic, Barcelona, Spain

As a result of the expansion of the market in teleradiology and the fact that relative shortages of radiologists vary across European borders, teleradiology groups and companies have formed which are based within one or more European country producing reports for others. This has a number of benefits: The ability to use the best subspecialists regardless of nationality or location. Spreading radiology workload from countries with a shortage of specialists to those with a surplus. Knowledge sharing across borders. Economy of scale – larger business with efficient infrastructure. Cost savings for healthcare providers using radiologists in countries with lower salary costs. There are also several challenges: Linguistic problems reporting in languages other than the native tongue. Problems of transcription. Voice recognition software issues. IT and infrastructure costs and logistic issues. Ensuring accuracy of radiology reports. Ensuring that reporting radiologists understand local referral practices etc. Conforming to medical registration and data protection rules of each country. AIMS AND OUTCOMES: The presentation will expand on these and other benefits and challenges of providing a pan-European teleradiology service and consider how the service might improve and develop.

1000 The experience in delivering Integrated Ambulatory Imaging Services in 20 client service units in Sao Paulo, Brazil

Oliveira, J.M.
Laboratorio Fleury, San Paulo, Brazil

A state-of-the-art diagnostic centre in Sao Paulo, Brazil, Fleury is an institution that has built a history of excellence and reliability. From a small clinical laboratory in 1926 to the largest diagnostics centre in the country. Fleury offers over 2000 different diagnostic tests including routine and esoteric laboratory tests, imaging tests (X-rays, ultrasound scan, tomography, magnetic resonance, nuclear medicine and PET-CT, mammography and bone densitometry), capillaryoscopy, electroencephalography, eletroneuromiography, gastrointestinal mobility tests, polissonography, and other diagnostic functional exams covering all medical fields, such as cardiology, gastroenterology, gynaecology, foetal medicine, neurology, ophthalmology, otorhinolaryngology, oncology, pneumology, rheumatology, and urology. During the presentation the speaker will share with the audience the experience in providing imaging services integrated with other diagnostic specialties.

0900–1010
Leadership and role extension in service delivery scientific session

0900 Radiologic sciences program directors and leadership skills: An American perspective

Aaron, A.
Northwestern State University, Shreveport, LA, USA

PURPOSE: American radiologic science program directors were surveyed and interviewed to examine their responsibilities and their satisfaction with their leadership skills in relation to their responsibilities. MATERIALS/METHODS: Two surveys, The Multifactor Leadership Questionnaire and the Leadership Matrix were mailed to 590 program directors of Joint Review Committee on Education in Radiologic Technology (JRCERT) accredited programs and a 48% response rate was obtained. Telephone interviews were conducted with 13 program directors. Multiple regression and two-way ANOVA analyses were used to identify relationships between program directors' ratings of the level of importance of the responsibilities and leadership style, institution type, and program type. The relationships between program directors' levels of satisfaction with their leadership skills in relation to the responsibilities and leadership style, years of experience, and highest degree completed were established. RESULTS: Findings indicated two responsibilities of program directors that could be targeted for professional development: budget and resources and faculty affairs. Program type and institutional type were related to the level of importance of the responsibilities of program directors and years of experience and highest degree completed were associated with program directors' level satisfaction. Program directors with doctorate degrees rated their satisfaction with leadership skills related to department governance and faculty higher than program directors with lower degrees. Passive leadership styles led to dissatisfaction with leadership skills. CONCLUSION: Program director responsibilities related to faculty affairs and budgeting were weaknesses that could be improved through professional development. Experience and education positively affect program director satisfaction with their leadership.

0910 Radiographer reporting of CT colonography

Smith, M.J., Isa, Z.M., Britton, I., Richardson, M.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

AIMS: Previous audit has identified a 94% local sensitivity for colorectal cancer detection by barium enema, with a 99% agreement between Radiographer and Radiologist reporting. Radiographers have undergone formal training in CTC, and are primary operators in the CTC service, providing a first read. No formal training in abdominal interpretation has been undertaken. This audit is to establish the accuracy. METHODS: 87 consecutive patients underwent CT colonography. A first-read was performed by the Radiographer undertaking the examination, with both colonic and extra-colonic findings documented. A second read, performed by a GI Radiologist, was compared. RESULTS: 7 cancers and 17 polyps were diagnosed in 16/87 patients. Extra-colonic findings were present in 23 patients, of which 9 were significant (malignant or life threatening) and 14 were incidental. Complete agreement was present in 80/87 colon findings. Disagreement in 7/87 involved polyps < 6mm in all cases, not clinically significant in the examined age group. Complete agreement was present in 68/87 patients for intra and extra-colonic findings. Significant extra-colonic findings were missed by Radiographers in 9/87 patients. CONCLUSION: Complete agreement was present for all significant colonic findings, justifying the role of Radiographers as independent operators for CT colonography. Radiographer first-read is accurate and reliable, and increases capacity locally from 2 to 4 readers, enabling double reads of all investigations. Because of a 10% incidence of significant extra-colonic findings, contrary to barium enema reporting, the second CTC read will be by a Radiologist for the foreseeable future.

0920 Consultancy in radiography – Success and challenges

Ford, P.C.
Royal West Sussex Trust, Chichester, UK

The nature of consultancy in radiography is not widely understood. Examples where success can make a difference to service provision, and the challenges to appointees, will be presented to illustrate the opportunities these posts can provide. LEARNING OBJECTIVES: To illustrate success and the potential for improvement to the patient pathway. To show the barriers to the establishment and success of the role. To allow constructive reflection on where new posts could be developed. DESCRIPTION: Consultant Allied Health Professional posts were announced in 2001 but posts have been slow to be established in radiography. This is due to a variety of reasons and some of these will be explored. Despite this, notable success has been achieved and improvements made in areas of service provision. These will be discussed as examples of how these posts can aid service management teams to reduce waiting times, improve the quality of services provided, and improve patient pathways. CONCLUSION: The consultant allied health professional role was designed to improve services to patients. Some notable success has been achieved but more understanding is needed to allow the full potential of these innovative roles to be achieved.

0930 Competencies for consultancy

Ford, P.C.
Royal West Sussex Trust, Chichester, UK

The consultant radiographer is the highest clinical role achievable within the radiography profession. Candidates for these posts need to consider the competencies looked for to fulfill all the domains of practice. KEY LEARNING OBJECTIVES: To outline all four domains of practice. To highlight the skills and expertise interview panels are looking for. To facilitate potential candidates to plan their learning requirements. DESCRIPTION: Advertisements for consultant radiographer posts attract few enquiries and interview panels complain of the generally poor quality of applicants for these high profile positions. The sole reliance on a high level of clinical skill by some applicants illustrates a lack of understanding of the breadth and depth of experience required. The four domains of practice will be discussed with the clinical practice element placed in perspective. A better understanding of the qualities looked for by interview panels should allow candidates to prepare themselves for these positions, and develop the skills to lead the radiographic profession into new and improving ways of service delivery. CONCLUSION: The nature of consultancy in radiography is not well understood. A broad portfolio of skills is needed to enhance clinical expertise to achieve the improvement in patient services these posts were designed to achieve.

0940 The clinical application of radiographer reporting skills in Wales

Taylor, S.[1], Hardy, M.[2]
[1]Conwy and Denbighshire NHS Trust, Rhyl, UK, [2]University of Bradford, Bradford, UK

The Department of Health has published information recognising the need for radiographers to play a crucial role in implementing protocol based care to promote heath service efficiency and ensure that patients are treated quickly by people with the right skills, rather than a particular professional background. Radiographer reporting is an acknowledged skills mix development that has been the focus of many reviews and surveys. However, there has been little published research considering the clinical application of reporting skills by radiographers in NHS hospitals in Wales, and no published research has focused specifically on developments in Wales. Instead, English and Welsh data have frequently been amalgamated and as a result, a true reflection of radiographer reporting activity within Wales has been obscured. The results of this MSc research project will report the findings of an All Wales survey of reporting radiographers across all imaging disciplines. It will identify information currently absent from published data and provide details on the number of radiographers participating in reporting services in Wales; variation in practice across the Welsh regions; the range of application of reporting skills in practice; and seek radiographer opinion as to the drivers and threats to radiographer reporting development in Wales. This study will provide evidence to fill the gaps in current knowledge in order to support the continued development of radiographers in Wales and to provide evidence for future service and role developments.

0950 Radiation therapist-led treatment review

Grady, S.W.[1,2], Back, M.[1], Warren-Forward, H.[2], Dempsey, S.[2]
[1]Northern Sydney Cancer Centre, Royal North Shore Hospital, NSW, Australia, [2]School of Health Sciences, University of Newcastle, Newcastle, Australia

PURPOSE: This project aimed to optimise quality of care of patients by an innovative workflow model utilising radiation therapist (RT) staff rather than clinicians to lead weekly treatment reviews (TR). METHODS: Stage 1 involved an audit of all interventions occurring in TRs over a twelve week period in order to establish the medical intervention rates of these reviews. A staff survey was also created to collate staff attitudes towards RT led TR as well as any other concerns they may have in regards to its implementation. Following training (stage 2), Stage 3 comprised a pilot of RT led TR involving an additional weekly review for patients, with full implementation of RT led TR to begin early in 2009. RESULTS: Overall both RTs and ROs were receptive of the concept of RT led TR, with ROs having more confidence than the RTs. The TR Audit showed low medical intervention rates in TR of only 31% and dropping below 25% during the first two weeks of a patient's treatment. Stage 3 has also shown patients to be supportive of the concept with 96% attendance rate and a 90% satisfaction rate. Completeness of toxicity scoring has also increased by over 200%. CONCLUSION: While still in the relatively early stages, RT led TR has proved itself to have a very high potential for success in Australia with high satisfaction levels from both patients and radiotherapy staff.

1000 Radiographer performed and interpreted barium swallows and meals

Kolla, S., Judson, E.
Sunderland Royal Hospital, Sunderland, UK

PURPOSE: To determine whether radiographers could perform a barium swallow and meal to an acceptable standard by measuring performance and outcomes. To calculate accuracy of radiographer reports, using radiologist as the gold standard; standard set at 95%. To ascertain whether radiation dose delivered to patient is within acceptable limits. To ascertain the effectiveness of a radiographer – radiographer reporting system. MATERIALS/METHODS: A retrospective audit over a period of 4 years (Nov 2003–Oct 2007) of the practice of radiographers with various levels of experience, performing and interpreting the examinations. Patient demographics, referrers, findings and diagnosis were studied. Outcome was determined by searching electronic records, case note review, searching for missed cancers and comparing for further bariums swallows and meals studied. RESULTS: 962 examinations were performed and interpreted by 3 Radiographers at Sunderland Royal Hospital. Sensitivity 98%, specificity 98.98%, accuracy 98.93%, 4 false positives and 6 false negatives. No cancers were missed. The median dose rate in the latest analysed period for all 3 radiographers was lower than the regional 3rd quartile level. CONCLUSION: This role development has been proved to be very successful in Sunderland and if implemented in other Trusts may help departments to meet the 31 and 62 day cancer targets (National Caner Plan 2000) and 18 week targets (NHS improvement plan, 2004) by improving waiting times, not only for this examination but for other modalities by releasing Radiologists to perform more complex tasks.

0945–1145
Neonatal imaging and scientific session

0945 The neonatal chest

Sweeney, L.
Royal Belfast Hospital for Sick Children, Belfast, UK

Advances in medicine have resulted in improved survival and decreased mortality and morbidity of infants of very low birth gestational age. These innovations while improving the management have also altered the clinical and imaging appearance of the various diseases. The chest X-ray is most valuable imaging modality and in the assessment of respiratory distress. The correct diagnosis can be made in most cases by correlation of the clinical findings and X-ray appearance. Introduction of imaging modalities such as CT and MR have reduced the requirement for conventional angiography. This presentation will provide an update on clinical management of neonatal chest conditions. The radiological appearances of the most important causes of neonatal respiratory distress will be presented including assessment of catheters, lines and tubes. In a small number of infants with congenital malformations of the heart, lungs or airways other imaging modalities may be required. Mention is made of the role of more complex investigations with CT, MR and interventional therapy.

1015 Abdominal imaging

Halliday, K.
Nottingham University Hospital, Nottingham, UK

No abstract supplied.

1045 Imaging the noeonatal brain

Griffiths, P.
University of Sheffield, Sheffield, UK

No abstract supplied.

1115 Imaging services for children in England and Wales: A survey of current practice

Mathers, S.A.[1,2], Anderson, H.A.[2], Macdonald, S.A.[2]
[1]The Robert Gordon University, Aberdeen, UK, [2]NHS Grampian, Aberdeen, UK

PURPOSE: Recent estimates indicate 2.9 million children are treated in A&E departments in England every year, and it is estimated that a significant number will proceed to imaging. With only 16 children's hospitals in England and Wales the majority of children will be imaged in departments designed primarily for adults. The main aims of this study were to investigate the provision of imaging services for children in England and Wales and identify the extent to which their needs are taken into account. METHODS: A questionnaire was developed and distributed to superintendent radiographers in all hospitals in England and Wales with imaging facilities. Quantitative data was entered into SPSS-PC. RESULTS: A 69% (296/428) response rate was achieved, 82% (14/17) of children's hospitals, and 69% (282/411) of adult hospitals. Respondents estimated that 1.3 million children were imaged in adult hospitals. There were no separate amenities such as child friendly toilets or changing facilities reported in 76% (180/237) of adult hospitals. Approximately 68% (11/14) children's hospitals and 84% (199/238) stated they had no protocols for children with special needs. Approximately 61% of adult hospitals reported radiographers attending no training courses in the imaging of children. Children's views on hospital services were seldom sought in adult or children's hospitals. CONCLUSIONS: There is a need for professional bodies to provide guidance for the improvement of imaging services for children. Educational establishments need to address radiographer paediatric training requirements. Survey was funded by College of Radiographers (UK) Research Award.

1125 Magnetic resonance spectroscopy in pregnancy to detect lactate as a biomarker for foetal hypoxia

Oates, A.E.[1], Paley, M.[1], Fraser, R.[1], Farrell, T.[2], Whitby, E.[1]
[1]University of Sheffield, Sheffield, UK, [2]Sheffield Teaching Hospitals Foundation Trust, Sheffield, UK

AIMS: To develop a non-invasive imaging based technique to detect and semi-quantify lactate in the amniotic fluid and the foetal brain as a biomarker of foetal hypoxia and distress during pregnancy. METHODS: 10 diabetic women with planned caesarean section underwent an MR scan (1.5 T HDX scanner, GE, Milwaukee, USA) the day prior to delivery. Single shot fast spin echo sequences were used to obtain T_2 weighted images of the brain. PRESS MR spectroscopy (MRS) was used to detect the lactate levels in amniotic fluid. Amniotic fluid collected at delivery underwent biochemical analysis and MRS *ex vivo*. Reference values for MRS were obtained using standard lactate dilutions. RESULTS: MR spectroscopy was able to detect lactate in the amniotic fluid *ex vivo* but failed to consistently detect lactate *in vivo*, due to lipid contamination. Manipulation of the PRESS sequence, increasing the TE, overcame this problem allowing detection of lactate, as an inverted doublet, *in vivo*. MR spectroscopy was able to quantify the level of lactate present within reference lactate solutions of varying concentrations. CONCLUSION: Refinement of the technique has enabled the non-invasive detection of lactate as a potential biomarker for foetal hypoxia. Further work is required before this can be used to guide patient management in pregnancies at increased risk of perinatal mortality.

1135 The Grannum assessment method of placental calcification: Observer intra- and inter-variations

Moran, M.C.[1], Ryan, J.[1], Brennan, P.C.[1], Higgins, M.[2], McAuliffe, F.M.[2]
[1]University College Dublin, Dublin, Ireland, [2]National Maternity Hospital, Dublin, Ireland

PURPOSE: Abnormal placental calcification is associated with poor pregnancy outcome. Ultrasound assessment of placental calcification currently relies on Grannum grading. The aim of this study was to measure intra- and inter-observer variation in assessing placental calcification. METHODS: 90 placental images were presented on secondary display monitors. Five expert sonographers independently graded the images on two separate occasions, each viewing separated by 1 week. A number of measures were employed to standardise assessment and minimize potential for variation: prior agreement was established between observers on the classifications for Grannum grading of the placenta; a controlled viewing laboratory was used for all viewings; ambient lighting was maintained between 25 lux and 40 lux; monitors were calibrated to the GSDF standard to regulate luminances so just noticeable difference (JND) properties were maximised. Kappa (κ) analysis was used to measure inter- and intra-observer reliability. RESULTS: Substantial variations between individuals' scores were observed. Intra-observer agreement had a moderate mean κ-value of 0.53, with individual comparisons ranging from 0.45 to 0.65. A mean κ-value of 0.35 (range from 0.19 to 0.52) indicated fair inter-observer agreement over the two occasions and only nine of the 90 images were graded the same by all five observers. CONCLUSION: This study demonstrates that, despite standardised viewing conditions, Grannum grading of the placenta is not a reliable technique even amongst expert observers. The need for new methods to assess placental health to improve neonatal outcomes is required and work is ongoing to develop a software based method using 2D and 3D image datasets.

1000–1130
Characterization of focal liver lesions: A practical approach

1000 The role of ultrasound

Leen, E.
Hammersmith Hospital, London, UK

Because of its relative low cost, safety and availability, conventional ultrasound remains the most widely used cross-sectional imaging modality in routine clinical practice worldwide. Whilst it is well recognized to be limited in the detection and characterization of focal liver lesions compared to contrast enhanced CT and MRI, it is still considered the modality of choice in the initial investigation of patients with suspected focal hepatic lesion in the vast majority of hospitals. However, it is probably inappropriate to compare conventional ultrasound with contrast enhanced CT and MRI given the fact that without contrast the performance of the latter modalities might be equal or even inferior to that of ultrasound. The introduction of ultrasound contrast media has gone some way in bridging that gap between these modalities. A practical approach to using contrast enhanced ultrasound will be presented. Specific clinical scenarios, examination techniques and protocol as well as simplified image interpretations and algorythms will be demonstrated

1030 Focal lesions in patients with cirrhosis

Guthrie, J.A.
St James's University Hospital, Leeds, UK

The incidence of hepatocellular carcinoma (HCC) is increasing in the UK, with cirrhosis caused by viral hepatitis, alcohol and haemochromatosis major aetiological factors. HCC within the cirrhotic liver develops as a multi-step process with nodules progressing from regenerative to dysplastic before transforming to HCC. National guidelines advise patients with cirrhosis undergo 6 monthly ultrasound surveillance and alpha-fetoprotein measurements. There is some evidence that this protocol detects HCCs at a treatable stage. Lesions detected on surveillance ultrasound need characterizing with CT, MR or contrast enhanced ultrasound and if HCC diagnosed the full burden

of disease determined. There is much overlap between the different classes of cirrhotic nodules. Optimization of arterial phase imaging is important to detect the arterialisation of nodules that occurs as they undergo transformation. Washout on subsequent vascular phases should also be sought as a diagnostic feature. MR has the advantages of greater soft tissue characterization and the benefits offered from liver specific contrast agents. Biopsy is not generally required to establish the diagnosis, and avoided in potentially resectable disease. In addition to the patients clinical status, radiological features that have a bearing on the management strategy are; size, number and location of HCCs, the presence of vascular invasion, portal hypertension and metastases.

1100 Incidental liver lesions: CT vs MRI vs PET?

Olliff, S.
Queen Elizabeth Hospital, Birmingham, UK

No abstract supplied.

1000–1215
Make "IT" work – The requirements for a successful MDT meeting

1000 The radiologists' IT needs for MDTM teleconferencing: pitfalls to avoid

Strickland, N.H.
Imperial College Healthcare NHS Trust, London, UK

The MDTM has become an important forum in which the radiologist can demonstrate his "added value" compared with other clinicians and teleradiology providers, in advising upon and interpreting imaging studies. This added value must not be hampered by inadequate suboptimal imaging IT. A slick radiological performance in an MDTM demands: advance preparation by the radiologist. This requires access to previous imaging studies on outside patients, with their reports; the ability to store a particular screen layout to redisplay during the MDTM; simultaneous display of current and previous imaging studies. This is facilitated by dual overhead projection; immediate loading and rapid stack mode display of large imaging studies (containing thousands of images) without incurring delays; concurrent display of imaging studies acquired at different referral sites, and display of their reports, on one platform. XDS (cross-enterprise document sharing) as defined by IHE (integrating the healthcare enterprise) is the only efficient, relatively automated means of achieving this; the ability easily to add appropriately authored addenda to the reports, and have these addenda transmitted back to the referring hospital and inserted into its RIS (radiological information system); a comprehensive audit trail. The teleconferencing facility should be easy to use by radiologists, and have immediate on-site or telephone IT help available for malfunctions. Many of these IT needs for MDTMs and teleconferencing are not currently available, but radiologists should be active in trying to shape future IT developments required to optimize their participation in MDTMs.

1040 The histopathologists' IT needs for a successful MDTM teleconference

Goldin, R.
Imperial College Healthcare NHS Trust, London, UK

HARDWARE: Microscope: An ordinary, reporting-quality microscope is adequate. Digital microscopes are likely to have an increasing role in the future. Resolution of display: Needs to be high and therefore plasma screens/LCDs better than projectors (although the latter cheaper and better suited to larger rooms). Latency of display: This needs to be minimized. It depends mainly on the refresh rate of the capture card. Pointer: Needs to be integrated into the system so that it can be seen at other sites. SOFTWARE: Ability to add cases to MDT list. Ability to directly upload the relevant fields of histology reports (*e.g.* minimum data sets) into the MDT. Ability to upload histology images into the MDT and to transfer images between sites. Individual control of access to projection. Ability to log on remotely when needed.

1100 Resolving our MDT needs: We did it our way – Part 1

Bramley, R.
Christie Hospital NHS Trust, Manchester, UK

No abstract supplied.

1120 Resolving our MDT needs: We did it our way – Part 2

Young, T.
Bart's and The London NHS Trust, London, UK

No abstract supplied.

1140 Networking and IT solutions necessary for a successful MDTM teleconference

Bielby, M.
Imperial College Healthcare NHS Trust, London, UK

No abstract supplied.

1015–1215
Victims of modern imaging: A common sense approach to incidental findings from head to toe

1015 Normal variants and incidental findings in the CNS

Quaghebeur, G.
John Radcliffe Hospital, Oxford, UK

The original article by Richard Hayward regarding the concept of VOMIT highlighted CNS incidental findings and the often unfortunate clinical outcomes from the reporting thereof. There is a wide range of normal variants in the CNS which need to be recognized and correctly interpreted by the reporting radiologist and this lecture will demonstrate the most common of these – with suggested reporting texts and advice on further imaging. There is an increased incidence of "incidental" findings in CNS imaging – both clinical and research based – with an overall incidental finding prevalence of 10% in one large retrospective review. The majority of these are asymptomatic infarcts and non specific white matter hyperintensities; but benign and mailgnant tumours also occur. The developing concept of MRI "screening" in some markets will result in increased numbers of asymptomatic patients with abnormalities – and suggested pathways of dealing with these patients will be presented. The importance of clinical correlation cannot be overemphasised – so that the report can be tailored accurately to deal with the clinical question and not the incidental or normal finding.

1035 Not another solitary pulmonary nodule!

Desai, S.
King's College Hospital, London, UK

No abstract supplied.

1055 Incidental adrenal adenomas: Characterization with confidence

Reznek, R.
Barts and the London School of Medicine, London, UK

Adrenal mass lesions will be detected incidentally in 2–9% of all patients undergoing abdominal cross-sectional imaging. The vast majority of these masses will be benign cortical adenomas. Accurate characterization of these masses is critical, particularly in patients with a known malignancy undergoing routine imaging for staging where the likelihood that this mass is metastatic is far greater and where the decision regarding treatment such as surgery are more likely to be determined by demonstration of the true nature of the adrenal mass. Over the past decade, the principles of CT and MRI have been applied to characterization of these masses.

These have been based on demonstrating the presence of sufficient intracellular lipid or in showing contrast medium perfusion washout, characteristic of a benign cortical adenoma. Sufficient data is now available to know the diagnostic performance of CT/MRI in identifying adenomata. It should not be forgotten, however, that from time to time other adrenal pathology such as phaeochromocytomas, myelolipomas, TB, and cysts also occur and careful attention to the morphology of the lesion is essential to correctly diagnose these.

1115 Management of the incidental renal mass

Silverman, S.
Harvard Medical School, Boston, MA, USA

After three decades of experience evaluating renal masses with cross-sectional imaging, it is now possible to diagnose and manage most renal masses with imaging alone. However, some remain indeterminate and require either percutaneous biopsy, additional imaging, or observation. The approach to the renal mass begins with first excluding inflammatory and other non-neoplastic causes before invoking an imaging classification of both cystic and solid masses. Once a mass is diagnosed as neoplastic, masses can be categorized as either cystic or solid. The Bosniak classification allows cystic masses to be classified as to the likelihood of malignancy and managed on the basis of the imaging findings. Solid masses in the adult are often malignant. However, there is increasing evidence based on surgical series that many solid masses, particularly when small, are benign. This has altered the approach to the solid mass in the adult and has prompted the use of additional imaging, and in selected cases, percutaneous biopsy. Concomitant with these developments, percutaneous ablation is emerging as an effective treatment method for the treatment of small renal cancers. However, since many small solid masses are benign, tissue diagnosis by percutaneous biopsy is needed before ablation is performed. The increasing discovery of small solid renal masses has also prompted us to consider a management approach that includes observation in selected patients.

1145 Incidental lesions in the bone: Benign or biopsy?

Campbell, R.
Royal Liverpool University Hospital, Liverpool, UK

MRI is the primary imaging technique for many disorders of the musculoskeletal system. However, unexpected or incidental lesions are frequently encountered. A large proportion of lesions will have diagnostic appearances on MRI. However, bizarre or atypical appearances may present difficulties in interpretation and mimic serious pathological processes such as malignancy or infection. The specificity of the radiological report is dependant on careful analysis of the imaging findings and consideration of any relevant clinical information. In cases of doubt conventional radiographs may provide sufficient diagnostic information, but it may be necessary to obtain supplementary imaging with CT, nuclear medicine, etc. In those situations where there is persisting uncertainty, discussion within an MDT setting is appropriate to determine the management options. In cases with a low suspicion of index for sinister pathology it may be sufficient to undertake interval scanning. However, when malignancy is suspected, biopsy may be required. This presentation will provide a number of case examples for interactive discussion to illustrate the decision making processes, and to guide where biopsy or referral to a specialist cancer network team is indicated.

1045–1205
Breast keynote and scientific session

1045 Breast MRI – The past, the present and the future

Dall, B.
United Leeds Teaching Hospital, Leeds, UK

No abstract supplied.

1125 Scintimamography and ultrasound in suspected breast cancer recurrence in post mastectomy and post lumpectomy patients

Usmani, S.[1], Ahmed, N.[2], Khan, H.A.[1], Garvie, N.[2], Al Nafisi, N.[1]
[1]Hussain Makki Al Jumma Centre for Specialized Surgery, Khaitan, Kuwait, [2]Barts and The London NHS Trust, London, UK

PURPOSE: To compare the effectiveness of 99mTc-MIBI Scintimamography (SMM) and ultrasound for the detection of local recurrence of breast cancer in modified radical mastectomy (MRM) patients and post lumpectomy (PL) patients. MATERIALS/METHODS: 62 consecutive patients (mean age 47 years; median age 47.5 years) with clinical suspicion of loco-regional recurrence of breast cancer were divided into two groups. Group I comprised of 26 PL patients and Group II of 36 MRM patients. All patients received a 740–1000 MBq bolus intravenous injection of 99mTc-MIBI, followed by Planar and SPECT imaging. Ultrasound of breast was performed by experienced radiologists using a 7.5 MHz transducer. All patients had either excision biopsy or FNAC for tissue diagnosis. RESULTS: 43 of 62 (69%) patients were found disease positive on histopathology. In group I, SMM had better sensitivity, specificity and accuracy then ultrasound (93% vs 67%, 81% vs 73% and 88% vs 69%, $p = 0.001$). In group II, no significant statistical difference was observed between the sensitivity, specificity and accuracy of SMM and US (89% vs 86%, 87.5% vs 75% and 89% vs 83%, respectively, $p=0.30$). The overall sensitivity, specificity and accuracy of SMM and ultrasound was 91% vs 79%, 84% vs 73% and 89% vs 77% ($p =0.04$), respectively. CONCLUSION: SMM can be used with confidence to discriminate tumour recurrence, from benign changes resulting from surgery and irradiation. SMM was as accurate as ultrasound in MRM patients but was more accurate in PL patients. SMM can be used as first line test in PL patients.

1135 The added value of elastography in routine breast ultrasound

Putturaya, S., Stewart, V., Satchithananda, K., Zaman, N., Williamson, R., Sbano, H., Gupte, C., Barrett, N., Ralleigh, G., Comitis, S., Gupta, A., Svensson, W.E.
Charing Cross Hospital Breast Unit, Imperial NHS Trust, London, UK

PURPOSE: To demonstrate the added value that elastography imaging can provide in breast ultrasound. MATERIALS/METHODS: This is a prospective study from February 2006 to October 2007. Patients with focal breast abnormalities had strain imaging included in their examination. This was done on a Siemens Antares (SE) ultrasound scanner using a VFX 13-5 linear array transducer. The results of the strain imaging were correlated with the remainder of the examination, histology or follow-up. Audit data included: Size of the strain image footprint compared with B-mode. If the strain image improved diagnostic confidence changed ultrasound diagnosis altered /aided patient management. RESULTS: 573 lesions, consisting of 140 malignant, 13 intermediate, 385 benign lesions, 44 gynaecomastia, 71 palpable masses with a normal tissue B-mode appearance were evaluated. Elasticity imaging alone had sensitivity 96%, specificity of 52%. Elasticity combined with B-mode and colour Doppler gave sensitivity 99%, specificity 47% (72% including cases with no B-mode abnormality). In 45% of cases, strain imaging increased diagnostic confidence. In 2% of cases, strain imaging affected management. Cysts with echogenic contents and isoechoic fibro adenomas were identified more easily, ensuring appropriate management. BENEFITS EXPERIENCED: More accurate use of fine needle aspiration and core biopsy. Potential reduction of biopsies for benign abnormalities. Potential for more accurate tumour delineation with improved excision margins. CONCLUSION: Elasticity imaging as an adjunct to routine ultrasound increases diagnostic accuracy and confidence.

1145 MRI breast screening in high risk family history women: Assessing the potential impact of NICE guidelines

Peters, F.H., Allen, S., Self, J.S., Richardson, C.L., Pope, R.J.E.
Royal Marsden Hospital, London, UK

PURPOSE: To assess the feasibility of undertaking an MRI screening programme in women with a family history of breast cancer in line with the updated 2006 NICE guidelines. METHODS: A study population of 50 of the highest risk women was identified from our family history cohort through genetic screening (BRAC 1, 2 or P53 gene mutation carriers) as per NICE guidelines. Pregnant and lactating women were excluded. All subjects were currently under surveillance with annual clinical examination and mammography. A new standardized MRI protocol comprising bilateral breast imaging and dynamic contrast enhanced sequences was developed and performed in all subjects. All studies were double reported by consultant radiologists. RESULTS: 50 women invited accepted an offer for MRI screening resulting in a 100% uptake. 12 patients recalled (recall rate 24%) 1 technical recall, 11 clinical recalls. 10 targeted ultrasounds performed resulting in 4 of 50 ultrasound guided biopsies and 2 of 50 cancers detected at second look ultrasound (imaging to be discussed in presentation). No MRI guided biopsies performed. MRI was well tolerated in all subjects. CONCLUSION: This pilot study confirms MRI breast screening is a sensitive method for evaluating high risk women and is a popular, well tolerated examination. We anticipate low numbers requiring MRI guided biopsy and a significantly lower recall rate on subsequent rounds. Funding for an ongoing screening programme is awaited in line with NICE guidelines.

1155 Influence of E-cadherin expression on the mammographic appearances of invasive non-lobular carcinoma

Doyle, S.
Nottingham University Hospitals NHS Trust, Nottingham, UK

KEY LEARNING OBJECTIVES: E-cadherin is a cell adhesion molecule typically absent in lobular breast cancers and reduced in many non-lobular breast cancers (NLC). Loss of E-cadherin may be why lobular cancers can be difficult to detect on mammography. The aim of this study was to determine whether E-cadherin loss causes screening-detected invasive NLC to have different mammographic appearances to NLC with normal E-cadherin expression. DESCRIPTION: Membranous expression of E-cadherin was assessed immunohistochemically in a prospective series of screen-detected NLC. The mammographic features of 131 cases with reduced E-cadherin were compared with those of 145 with normal E-cadherin expression. CONCLUSION: Screening-detected invasive NLC with reduced E-cadherin expression are more likely to appear as ill-defined masses and less likely to manifest granular microcalcification than NLC with normal E-cadherin expression. NLC with reduced E-cadherin expression appear to have mammographic features which make them difficult to detect at small sizes.

1045–1215
Advanced imaging in cancer

1045 MRI biomarkers of early treatment response in cancer

Brindle, K.M.[1], Gallagher, F.A.[2]
[1]Department of Biochemistry, University of Cambridge, Cambridge, UK, [2]Department of Radiology, University of Cambridge, Cambridge, UK

Patients with similar tumour types frequently have markedly different responses to the same therapy. The development of new treatments would benefit significantly, therefore, from the introduction of imaging methods that allow an early assessment of treatment response in individual patients, allowing rapid selection of the most effective treatment. We have been developing methods for detecting the early responses of tumours to therapy. This has included a targeted MRI contrast agent for detecting tumour cell death and MRI of tumour metabolism using hyperpolarized ^{13}C-labelled cellular metabolites. Nuclear spin hyperpolarization techniques can increase sensitivity in the MR experiment by >10 000 times. This has allowed us to image the location of labelled cell substrates and, more importantly, their metabolic conversion into other metabolites. We showed that exchange of hyperpolarized ^{13}C label between lactate and pyruvate, in the reaction catalysed by the enzyme lactate dehydrogenase, could be imaged in tumours and that this flux was decreased in treated tumours undergoing drug-induced cell death. We have also shown that tissue pH can be imaged from the ratio of the signal intensities of hyperpolarized $H^{13}CO_3^-$ and $^{13}CO_2$ following intravenous injection of hyperpolarized $H^{13}CO_3^-$. The technique was demonstrated with a study on a mouse tumour model, which showed that the average tumour pH was significantly lower than the surrounding tissue. Since bicarbonate is already used intravenously in humans, we propose that this technique could be used clinically to image disease and response to treatment.

1115 Advanced imaging in radiotherapy treatment planning

Beavis, A.
Princess Royal Hospital, Hull, UK

No abstract supplied.

1135 Optical techniques in cancer diagnosis

Stone, N.
Gloucestershire Hospitals NHS Foundation Trust, UK

The primary requirement for successful treatment of cancer is early detection. Current methods of detecting malignancies rely upon surveillance of at risk populations or upon diagnostic investigations following presentation with suspicious symptoms. By the time symptoms are present tumours are usually of a significant size, and it is often too late to facilitate a full cure. The majority of malignancies originate in epithelial tissue, usually found lining the surfaces of organs. These are especially of interest because they develop over relatively long time scales on the surface or lining of an organ prior to invasion into deeper tissues. Endoscopic access can often be achieved, making the surveillance or screening of at risk populations possible. Furthermore, the process of carcinogenesis in many epithelial tissues, although not fully understood, frequently includes a pre-malignant state. If this microscopic cellular change can be detected then early treatments, likely to be less damaging and more successful, can be performed. For centuries light has been utilized for diagnosis and therapy of disease with varying efficacy. However, with the rapid advancement of laser and detector technologies it has become possible to harness the power of light; to provide molecular and structural information on pre-cancerous tissues from a patient in real-time. This can be achieved in the patient during endoscopy or near the patient during clinics. Optical diagnostic techniques have demonstrated the potential to revolutionise cancer diagnosis by providing non-destructive, objective measures of tissue disease state.

1155 Dynamic contrast-enhanced MRI in cancer (sponsored by Philips)

Gilbert, F.
University of Aberdeen, Aberdeen, UK

Contrast enhancement in MRI has been long established to improve conspicuity of cancers in many organs. The neoangiogenesis associated with many cancers allowing growth beyond 2 mm in size is responsible for many of the observed contrast enhancement characteristics associated with malignancy. In particular the features noted in dynamic contrast enhanced (DCE) MRI when signal change is plotted against time can be quantified. With pharmacokinetic modelling the calculation of transfer rates, surrogates for tissue perfusion/permeability and ve, the fractional amount of extracellular, extravascular water is possible. These and similar measures have been used to predict and to measure response to a variety of treatments. There is considerable variation in how these are calculated and proposals have been made to standardize acquisition and calculation of these parameters. Various factors influence these measured values such as the baseline T_1 relaxation, sequence parameters, contrast agent properties and mathematical algorithms, as well as how the region of interest is chosen in an inhomogeneous tumour This has meant that standardization of these tools across different machines and

research groups is difficult. Different approaches are suggested and the various commercial solutions will be discussed. Evidence of how these parameters are being used in breast, rectal and cervical cancer imaging will presented to see where there is agreement on technique and the potential to further develop these techniques.

1100–1200
Scope of radiographic practice 2009

1100 Scope of radiographic practice – The 2008 research outcomes

Price, R.[1], Heasman, F.[2]
[1]Health and Emergency Professions, University of Hertfordshire, Hatfield, UK, [2]University of Hertfordshire, Hatfield, UK

PURPOSE: This presentation will report on work commissioned by the Society of Radiographers to identify and quantify the scope of practice and to explore possible future roles within the UK radiographic workforce. The scope of the research included primary and secondary sectors, the independent sector and higher education. The session will focus on the development of clinical roles in diagnostic and therapeutic radiography. MATERIALS/METHODS: A number of methods were used to capture the scope of practice across different sectors. Postal questionnaires sent to radiology and cancer centre managers obtained data on the workforce in the secondary and tertiary sectors. An online survey collected data on roles in the primary and independent sectors. Focus groups explored in-depth issues concerning the implementation and scope of roles and likely future developments. RESULTS: In both disciplines there was evidence of extensive role development and extension. In imaging, roles are diverse with a number of radiographers reporting independently of radiologists. The greatest driver for implementation of new roles was service demand, whilst radiologists' resistance, although generally subsiding, was an inhibitor. In therapy, radiographer involvement in pre-treatment simulation is developing to include autonomous planning and treatment prescribing. There are also developments in brachytherapy and radiographers staffing on-treatment reviews and involvement in patient follow up clinics. New roles are emerging in more holistic aspects of patient management including palliative care and counselling. In both disciplines, the implementation of Agenda for Change showed inconsistency; in some cases it is enhancing career prospects but in others proving to be a barrier to career advancement. Data will be presented to quantify the extent of developments. CONCLUSION: The scope of practice for UK radiographers is broad and continues to expand. A number of key findings and recommendations emerge from the project which will be reported. Significantly, the numbers of consultants in post are growing as are numbers in the other tiers of the career progression framework. Given that there were no radiographer consultant posts some 6 years ago developments are highly significant and will be vital to the acceptance and promotion of the career progression framework.

1125 The effect of Agenda for Change on career progression on the therapeutic and imaging workforce in the NHS in England and Wales

Edwards, H.M.
Health & Emergency Professions, University of Hertfordshire, Hatfield, UK

RATIONALE: Agenda for Change (AfC), the greatest overhaul ever undertaken of pay and grading in the NHS, was a government initiative to standardise roles and working conditions. It applied to all NHS employees with the exception of doctors, dentists and some top managers. AfC was designed to improve recruitment, retention and morale among staff and to help achieve a high quality workforce capable of delivering higher standards of patient care. Today, the Department of Health claims it has "dramatically simplified the process of designing new ways of working and the establishment of extended roles". AfC did not have an easy introduction in radiography. There were concerns over increased working hours, inconsistencies with job evaluations, confusion over on-call arrangements and scepticism over whether AfC would facilitate professional development or improve retention. 5 years on from roll-out this study will assess the true impact that AfC has had on career progression among the imaging workforce. AIMS: To explore NHS radiographers', assistant practitioners' and support workers' expectations of career development. To identify what career progression opportunities are currently available to these groups. To highlight the barriers and incentives to career progression. METHOD: Interviews with key stakeholders within the profession were followed by a cross-sectional survey conducted via an online questionnaire open to therapeutic and diagnostic radiographers, assistant practitioners, and support workers in the NHS in England and Wales. A small sample of volunteers from the online survey will be contacted by telephone for further information on career progression issues. RESULTS: At the time of writing, data collection is on-going. However, the number of participants completing the survey has been very pleasing. Early results confirm responses have been received from the entire spectrum of the radiographic workforce. Early trends suggest the majority seem dissatisfied with the effect that AfC has had on their career progression although there are some participants who believe it has facilitated their advancement and introduced fairness. Whilst many feel the old style Whitley terms and conditions needed replacing, most feel AfC has failed to live up to expectations. Factors influencing and facilitating career progression are cited frequently as service demands and good support from peers and colleagues. Poor management and perceived "bottlenecks" at the top of AfC pay bands are claimed by many to hinder their progression. Conclusions and recommendations will be made after full data analysis and presented at UKRC 2009.

1245–1330
COR William Stripp memorial lecture

1245 Osteogenesis imperfecta – past, present and future

Dimond, D.J.
Bristol Royal Hospital for Children, Bristol, UK

AIM: To explore the history, current thinking and new horizons in the imaging and treatment of the condition of osteogenesis imperfecta (OI). OUTCOMES: 1. The audience will be familiarised with the diagnosis, classification and prognosis of OI patients. 2. Different interventions and treatments will be examined and discussed. 3. An appreciation of the role that radiology plays in the lives of such patients. ABSTRACT: Despite the inherited condition OI being a disorder that is believed to have existed for 5000 years, it has long defied medical treatment. Patients were subjected to a life involving a downward spiral of fractures, gradual deformity and an uncertain future. The last 30 years have charted substantial steps forward in the understanding of the condition, its different forms and specific characteristic traits. Such knowledge has enabled new interventions to be undertaken that have brought much relief to the patients and their families. Regardless of the type or severity of OI, radiographers play a pivotal role as part of a multidisciplinary team involved in the diagnosis and treatment of patients.

1400–1600
Paediatric CT and emergencies

1400 Paediatric CT: Friend or foe?

ISEG Speaker

Wilson, B.
University of Alabama, Birmingham, AL, USA

No abstract supplied.

1430 Neurosurgical emergencies

Stoodley, N.
Frenchay Hospital, Bristol, UK

The radiologist is an important member of the multidisciplinary team in the assessment of children presenting with various urgent neurosurgical problems. Although often treated in regional centres many of these patients present initially to the district hospital. What

conditions need urgent imaging? What imaging should be performed and when and where should this be done? Should the child be referred for specialist imaging or opinion? This presentation will try to clarify these and other important points.

1500 Urological emergencies

Barnacle, A.
Great Ormond Street Hospital, London, UK

AIM: To discuss the clinical presentation and imaging features of a range of paediatric urological emergencies, and to consider the role of imaging and intervention in their management. OUTCOMES: To raise awareness of the differences in clinical presentation and interventional radiology management of some urological conditions compared to adult practice. To highlight specific imaging features that are critical in evaluating acute urological conditions in children. To discuss some of the more unusual aetiologies and clinical presentations of some of these conditions. SUMMARY: Acute urological emergencies are relatively rare in children, but radiologists must be vigilant in identifying renal tract pathology in acutely unwell children. Topics discussed will include paediatric renal stone disease, rarer causes of renal tract obstruction such as bladder base tumours, and the value of interventional radiology in some of these conditions.

1530 Abdominal emergencies

Somers, J.
Nottingham University Hospitals, Nottingham, UK

PURPOSE: To review the radiology of commonly encountered abdominal emergencies in children. CONCLUSION: This talk will review the imaging strategies and findings of commonly encountered abdominal emergencies in the paediatric age group from the neonate to the teenager. Included will be the vomiting and obstructed neonate, intussusception, appendicitis, inflammatory bowel diseases and trauma. The emphasis will be upon plain film, contrast radiography and ultrasound. The role of CT will be considered, in particular where it differs from adult practice.

1415–1600
GI keynote and scientific session

1415 State-of-the-art small bowel imaging

Taylor, S.
University College Hospital, London, UK

Whilst barium fluoroscopy remains the mainstay of small bowel imaging in the UK, small bowel MRI enterography is a well-tolerated reliable alternative for the assessment of Crohn's disease, particularly in those with a known diagnosis. Once established, small bowel enterography protocols are relatively simple and robust and may be supervised by MRI radiographers. Scan time is typically less than 30 min. A typical MRI protocol comprises oral ingestion of contrast over 45 min/prone patient position/axial and coronal breath hold TrueFISP through abdomen and pelvis/sequential dynamic coronal TrueFISP though bowel to assess peristalsis (optional)/10–20 mg buscopan/axial and coronal breath hold HASTE through abdomen and pelvis/coronal fat sat HASTE through abdo pelvis/10–20 mg buscopan/pre 2D or 3D fat sat T_1 coronal breath hold though abdo and pelvis/gadolinium injection/coronal breath hold though abdomen and pelvis (30 s and 70 s) and axial 2D or 3D fat sat T_1 though abdo and pelvis (100 s). Exact sequence name will differ between manufactures. Accurate diagnosis during MRI enterography requires cross-reference across all image sequences to differentiate between collapse and pathology. Dynamic "peristalsis" sequences are particularly useful if in doubt. Jejunal distension is often not optimal but ileal distension is good in most patients using simple protocol. MRI may give some idea regarding disease activity (contrast pattern, mural and lymph node oedema etc.) but there is overlap between disease states. The presentation will review state of the art small bowel imaging, with specific focus on the role of MRI.

1445 Magnetic resonance enteroclysis: Fundamentals and imaging findings in Crohn's disease

Yadavali, R.P., Biswas, S., Slaven, K., Healey, P.
Royal Liverpool University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: Fundamentals of MR enteroclysis and imaging appearances of small bowel Crohn's disease. DESCRIPTION: MR enteroclysis is an emerging technique and is performed only in some centres in the UK It is used for the evaluation of small bowel in patients with suspected Crohn's disease and for follow up. The major advantages of MR enteroclysis over conventional enteroclysis are lack of radiation exposure, detailed information regarding extramural spread of disease and multiplanar imaging. A naso jejunal (NJ) catheter is inserted under fluroscopic guidance. The patient lies in prone position on the MR scanner table. The NJ catheter is connected to a pump and 1.5–2 l of isoosmotic water solution (Klean-Prep) is administered continuously at an adjustable rate during the study. In our department a 1.5 Tesla Philips MR scanner is used for this study. Various sequences used are axial T_2, coronal BFFE, axial BFFE, coronal SSTSE, coronal THRIVE pre and post gadolinium, axial THRIVE and coronal fat sat BFFE. These sequences will be explained in detail with a pictorial review. CONCLUSION: The basics of MR enteroclysis procedure and pulse sequences will be outlined and a pictorial review of imaging appearances of small bowel Crohn's disease will be presented.

1455 The utility and diagnostic impact of contrast enhanced ultrasound assessment of bowel perfusion and viability

Osborn, P.A., Higginson, A.
Queen Alexandra Hospital, Portsmouth, UK

LEARNING OBJECTIVES: To demonstrate the ultrasound appearances of bowel perfusion using contrast enhanced ultrasound and its impact when CT interpretation and clinical assessment are discrepant in cases of suspected ischaemic bowel. To discuss the advantages of using ultrasound contrast in patients with poor renal function and its potential additional benefit in cases where CT interpretation is difficult. To illustrate the limitations of the technique. DESCRIPTION: 7 ultrasound examinations were performed with Ultrasound Contrast enhancement (Sonovue; sulphur hexfluoride). Confident diagnoses of critical bowel ischaemia were made in 2 cases with caecal infarction and small bowel infarction. In 2 further cases where CT suggested critical ischaemia in whom operative management was being considered ultrasound demonstrated viable bowel perfusion. In 1 case with patchy small vessel infarction of the distal small bowel although perfusion was demonstrated at ultrasound the bowel wall appearances seen at CT influenced the decision to proceed to surgery. In 1 case ultrasound contrast clarified the appearance on a CT KUB of increased attenuation in the jejunal mesentery by demonstrating SMV thrombosis. In 1 case ultrasound clarified appearances seen at CT and confidently diagnosed adhesional small bowel obstruction with no evidence of small bowel ischaemia. CONCLUSION: Contrast enhanced ultrasound is a useful problem solving tool affecting patient outcome in assessment of bowel perfusion as an adjunct to CT and may be helpful in cases where clinical findings are discrepant.

1505 Biliary intervention in a district general hospital. Is it safe?

Young, R., Beynon, C., Beale, A.
Great Western Hospital, Swindon, UK

PURPOSE: Review of percutaneous biliary intervention at a DGH and comparison with published data. MATERIALS/METHODS: Over a 20 month period 32 patients had 33 stents at our institution. Medical notes and radiology reports were reviewed and compared with published data. 27 of 28 patients were treated for relief of malignant obstruction with metal stents, 1 patient had no contraindication for surgery and had a plastic stent. 4 patients treated for non-malignant disease were treated with plastic stents. Antibiotic prophylaxis was not used. RESULTS: The success rate was 91% (per patient) and 77% (per attempt). 2 patients required multiple attempts (2 or 4). The major

complication rate was 15% (all due to cholangitis) and 4 stents became blocked due to malignant infiltration. There were no deaths due to the procedure although the 30 day mortality was 41%. These figures compare with published data showing 67–100% success rates (not all first attempts), 5–25% major complication rates, 0–8% deaths, and 8–25% 30 day mortality. CONCLUSION: Percutaneous biliary drainage and metallic stent placement is appropriate treatment for malignant biliary obstruction. There is debate about whether this procedure should be performed in a DGH. Our results show that our technical success and complications rates are comparable to published data. However, the cholangitis rate is slightly high and we will be re-auditing after a trial of antibiotic prophylaxis. Our 30 day mortality rate we feel reflects patient selection and indications will be reviewed at the biliary MDT.

1515 Added value of ^{18}F fluorodeoxyglucose positron emission tomography (FDG PET) in colorectal cancer patients with clinically or radiologically suspected tumour recurrence and normal carcinoembryonic antigen levels

Wieshmann, H., White, D., Smethurst, S., Amin, S.
University Hospital Aintree, Liverpool, UK

PURPOSE: The use of carcinoembryonic antigen levels (CEA) monitoring in the follow-up evaluation of patients with treated colorectal cancer is well established. An increase in CEA concentration on serial measurements after curative surgery is indicative of tumour recurrence. This study aims to establish the added value of ^{18}F-fluorodeoxyglucose positron emission tomography (FDG PET) in colorectal carcinoma patients with clinical or radiological findings suspicious for tumour recurrence but normal CEA levels. MATERIALS/METHODS: We reviewed 36 patients with suspected recurrent colorectal cancer who had FDG-PET in addition to conventional diagnostic methods. The FDG PET results were compared with CEA and histopathology findings where available. RESULTS: 22 of 36 patients who underwent whole body ^{18}F FDG PET had raised CEA results and in the remaining 14 patients CEA levels were normal. ^{18}F FDG PET detected recurrent disease in 21 of 22 patients with raising CEA and in 7 of 14 patients with normal CEA levels. Tissue diagnosis was available in 14 of 36 patients and all had histopathological evidence of malignancy. In 4 of 7 with normal CEA but abnormal FDG PET CT malignancy was proven by histology. CONCLUSION: Our study indicates that FDG PET is a valuable imaging method to detect recurrent disease in colorectal cancer patients with normal CEA levels and should be used early in the diagnostic workup if clinically tumour recurrence is suspected.

1525 Recognizing CT findings of *Clostridium difficile* colitis prior to the clinical manifestation of the disease

Budak, M.J., Ley, N.J., Asquith, J.R., Cowling, M., Vessal, S.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

PURPOSE: To Identify and recognize multislice CT findings of *Clostridium difficile* colitis prior to the clinical manifestation of diarrhoea. METHODS: A retrospective review over a 10 month period of CT scans that were performed in patients prior to developing *C. difficile* associated diarrhoea. Patients with diarrhoea and a positive stool assay for *C. difficile* toxin were identified and then cross referenced with the institution's electronic radiological database. Patients selected must have incidentally received an abdominal CT scan 1 day to 10 weeks prior to developing diarrhoea. The images were reviewed by 3 observers independently, identifying; colonic wall thickening greater than 4 mm, ascites, pericolonic oedema, the accordion sign, and ileus. RESULTS: 14 abdominal CT scans were reviewed. Colon wall thickening greater than 4 mm was identified in 9 (64.29%) patients, pericolonic oedema was identified in 6 (42.86%), ascites was identified in 4 (28.57%), the accordion sign identified in 4 (28.57%), and an ileus identified in 3 (21.43%) of the patients. CONCLUSION: *Clostridium difficile* colitis is a common problem causing significant morbidity and mortality in hospitals throughout the UK. The current gold standard for diagnosis *C. difficile* colitis is a positive stool assay. Recognized CT findings of *C. difficile* colitis include colon wall thickening, pericolonic oedema, ascites, and the accordion sign. With the increasing use of multislice CT scans for the investigation of various disease and pathology, evidence suggests that *C. difficile* colitis may be identified incidentally on abdominal CT scans before the onset of clinical disease.

1535 Defaecating proctogram: Resurrection of a dinosaur

Au-Yong, K.J., Coupe, N.J., Nayeemuddin, M., Tebby-Lees, S.J.
University Hospital of North Staffordshire, Newcastle-under-Lyme, UK

PURPOSE: We review our experience in defaecating proctogram. Radiographic imaging of dynamic changes within the pelvic cavity and rectum during evacuation can be a valuable adjunct in the diagnosis for patients who had functional symptoms, but with no organic cause being found in the anorectal region using conventional studies. A new service was set up in September 2007 because of new interest in STARR (Stapled Trans Anal Rectal Resection) procedure for the treatment of mucosal prolapse. MATERIALS/METHODS: 100 patients, who had undergone defaecating proctogram in the University Hospital of North Staffordshire with an age range from 26 to 83 years, were evaluated retrospectively from September 2007 to May 2008. We sought to identify how useful this technique is in helping to diagnose functional disorders of defaecation. RESULTS: We will illustrate our technique in performing the procedure. We will then explore some of the main reasons of referral. High quality images of the common abnormalities of functional disorders in the anorectal region (e.g. rectocele and perineal descent) and the defaecographic results will be presented. CONCLUSION: Defaeating proctogram is easy to perform, and well tolerated by patients. It has a high diagnostic yield and is useful in the diagnosis of functional disorders of defaecation.

1545 Is enhanced MRI for characterizing lesions of the liver always worth it?

Cousins, A.R., Alvey, C., Golding, S.J.
University of Oxford, Oxford, UK

PURPOSE: MRI is established for detecting and characterizing hepatic focal lesions and contrast medium enhancement can contribute to both. However, biopsy remains the gold standard diagnosis and contrast enhancement adds significant cost. This study addresses whether potential benefits of enhancement are achieved in practice and where enhancement might be critical to clinical management. MATERIALS/METHODS: The study group comprises 86 (50M, 36F) patients selected from those found to have focal disease at hepatic MRI. All studies were carried out on a 1.5 T system by a standard examination protocol which included arterial, portal and delayed phases of enhancement using standardised dose administration. Patterns of enhancement were evaluated by multiple ROI and compared with final diagnosis established by biopsy or clinical behaviour. RESULTS: Diagnoses comprised haemangioma (25.6%), metastases (20.2%), cyst (18.0%), hepatocellular carcinoma (16.1%), focal nodular hyperplasia (7.6%), adenoma (5.7%) and a small group of miscellaneous lesions (6.7%). Observed patterns of enhancement correlated well with published characteristics, mostly commonly for hepatocellular carcinoma, haemangioma and cyst with variable patterns being met with other diagnoses. Correlated with pre-test probability and clinical need for biopsy, the results suggest that a significant number of patients may avoid enhancement for characterization as biopsy will be mandatory and that that this should be reserved particularly for cases of presumed benign disease where clinical findings are in agreement. CONCLUSION: Cost constraint may be practised in hepatic MRI by avoiding enhancement where biopsy is indicated but appears justified in specific clinical diagnoses with good pre-test probability.

1430–1700
Oncology imaging: An interactive session with a focus on PET

1430 PET/CT in lymphoma

Johnston, C.

St James's Hospital, Dublin, Ireland

Much of the initial groundbreaking research on the utility of PET was derived from studies in lymphoma patients. In the average clinical practice, lymphoma patients will constitute a substantial portion of referrals and it is important to understand the utility of PET-CT in each of the major lymphoma groups. PET-CT in lymphoma has evolved from a purely staging examination to one that provides response assessment to therapy and beyond this to offer valuable prognostic information, and even treatment stratification data. The advantages and disadvantages of the technique with respect to conventional imaging strategies will be discussed. AIM: To provide an overview of the utility of PET-CT in lymphoma management. OUTCOMES: 1. Understand the fundamentals of the utility of PET-CT for aggressive lymphomas, and describe the new standardised criteria for acquiring and interpreting PET-CT examinations (International Harmonisation Project in Lymphoma). 2. Review the major advantages of PET-CT over conventional imaging strategies, and also the limitations of the technique. 3. Demonstrate the clinical utility of PET-CT as more than just a staging technique, to one that provides information on prognosis and response assessment.

1500 PET/CT in oesophageal cancer

Bradley, K.
Oxford Radcliffe Infirmary, Oxford, UK

This interactive session will discuss and demonstrate the current role of 18FDG PET/CT in the management of oesophageal carcinoma with emphasis on: Initial staging. Re-staging following neo-adjuvant therapy. Disease recurrence.

1600 PET/CT in lung cancer

Collins, C.
St Vincent's Hospital, Dublin, Ireland

This presentation will review the background to the use of PET-CT in lung cancer, its current role and its importance at various points in the cancer journey. A series of cases will illustrate these issues using an interactive format.

1630 PET/CT in colorectal cancer

Cook, G.
Royal Marsden Hospital, Surrey, UK

There is an emerging role for PET in the initial staging of colorectal cancers (N and M but not T) but the area where PET has proved to be most advantageous is in the staging of recurrent disease. A number of studies have shown the inclusion of PET in the management of these patients is cost effective both in detecting recurrence in the pelvis, for accurately staging patients prior to hepatic resection and for detecting otherwise unsuspected distant metastases. In a meta-analysis of early studies of the use of ^{18}FDG in recurrent disease [1], sensitivity and specificity for liver and pelvic imaging was greater than 90%. For whole body imaging the sensitivity and specificity was 97% and 76%, respectively, the lower specificity probably being due to a number of normal variants and artefacts causing false positives that are now more widely recognized and avoided. ^{18}FDG PET identifies the site of recurrent disease, detected by a raised CEA level, in 2 of 3 of patients in whom anatomical imaging has failed and can give a definitive diagnosis in the majority of patients in whom CT or MRI have been equivocal, e.g. possible local recurrence after pelvic radiotherapy. In summary, there is now sufficient evidence that PET/CT should be included in the management of patients with colorectal cancer, particularly those with recurrent disease. Reference 1. Huebner et al. *J Nucl Med* 2000;41:1177–89.

1430–1600
Academic radiology in the UK – Does it have a future?

1430 Support of the motion

Toms, A.P.
Norfolk and Norwich University Hospital, Norwich, UK

Academic radiology in the UK is at best stagnant, at worst in decline. The number of academic radiologists has collapsed and radiology research activity has stalled. The causes of this demise are various. Governance and ethics bureaucracy is a major obstacle to innovation. The new consultant contract has limited the opportunities for research. In the NHS Clinical Excellence Awards favour management and service delivery. In universities the Research Assessment Exercise measures money rather than quality. The future of academic radiology is one that will be ruled by unimaginative portfolio research with no place for innovative own account activity.

1450 In defence

Dixon, A.
Addenbrooke's Hospital, Cambridge, UK

Imaging has become central to modern medical practice and biomedical research. Academic radiologists employed by Universities, research institutions and the NHS should embrace the opportunities that are now offered as imaging becomes more and more crucial in virtually all medical research. Now is the time to strengthen academic endeavours and build with clinical partners the appropriate research infrastructure to bring the imaging research fraternity and infrastructure up to an equal footing with those of our clinical counterparts.

1430–1630
Military radiography

1430 Military radiography in the field

Kinnaird, R.
UK Defence Medical Services

Military radiographers who are deployed on operations have to be able to operate a CT scanner on their own as well as manage complex trauma calls. They may have to operate in a tent, in a department they have built themselves and in testing environmental conditions. They will also require the skills and confidence to not only provide an imaging service, but also those needed to master all of the administrative issues usually dealt with by superintendents, medical physics, clerical staff and radiologists. AIM: To outline the work undertaken by military radiographers when they deploy out into the field. OBJECTIVES: To show the range of work, patients and conditions that are routinely experienced by military radiographers when they deploy on operations.

1500 From NHS hospital to Army tent – The training challenge

Appleton, I.
UK Defence Medical Services

This talk will follow on the preceding presentation and describe how the military radiographers have designed a programme to train staff for their deployed role. It will cover the course design, content and how it is delivered. AIM: To outline the additional training required to allow all radiographers to provide a near NHS-standard service in non NHS-standard conditions. OBJECTIVES: To give a better understanding of the training given to military radiographers in order that they are able to operate in difficult environments.

1530 Enter the dragon

Andrews, S.
UK Defence Medical Services

The introduction of Direct Digital Imaging into a department will require a change in working practices wherever it is used. This was especially true when mobile DDR units were introduced into the field hospital in Afghanistan. Bringing a new item of equipment into service is always a challenge. The particular conditions under which the military DDR units were expected to function required adaptation of training and working practices as well as co-operation between the

supplier and end-user and this talk will describe how this was achieved. AIM: To describe the challenges faced in introducing DDR into the field. OBJECTIVES: To show how modification of ways of working, changing working practices and adaptation were used to improve the access to imaging in the field.

1600 Bullet and blast – A military radiology perspective

Gibb, I.
UK Defence Medical Services

This presentation will briefly outline how the British military radiologists have provided clinical support during current conflicts. The main aim of the presentation is to demonstrate the plain film and computed tomographic appearances of cases of gunshot wound and bomb blast injury. Due to the energy of the high velocity rifle round and the evolution of more effective explosive devices the patterns of injury experienced are unlike any seen in normal civilian practice. The talk will also outline the principles of ballistics behind the injury patterns AIM: To describe how a reporting service has been maintained in support of current operations and discuss some of the typical radiological appearances experienced. OBJECTIVES: To give a better understanding of the requirements of a radiology reporting service operating in support of current conflicts.

1430–1530
Service delivery scientific session

1430 Initial experience with an outsourced reporting service for trauma CT head and neck

Maniyar, J.A., Suter, J., Norris, K., Jones, A., Gray, A.J.,
Choudhri, A.
Stepping Hill Hospital, Manchester, UK

PURPOSE: There is increased demand for out-of-hours CT of head and neck trauma, partly due to NICE guidelines. In order to cope with this and also comply with Health and Safety regulations regarding safe working there was an impact on elective radiology services. This compromised the Trust's ability to meet its targets, and hence the outsourced services were sanctioned to mitigate this effect. MATERIALS/METHODS: A protocol for direct outsourced referral of CT head and/or neck was agreed between the Radiology and Emergency Departments. The start-up costs were £7995.00 plus VAT. Thereafter fees were paid per item of service, including a typed report on our CRIS system within 1 hour. RESULTS: Between March 2008 and August 2008 there were 59 out-of-hours calls, of which 51 were directly outsourced. Total calls in the corresponding period in 2007 were 32; and 31 in 2006. All outsourced cases followed protocol, apart from 2 discussed beforehand with the in-house on-call radiologist. There was no significant discrepancy on auditing the outsourced reports. 7 reports were not on our CRIS within the specified time frame. Reporting costs were £7798.00. Potentially 65 consultant lists could have been lost, costing £17 420.00 to replace assuming available locums. CONCLUSION: The service appears successful and cost effective, enabling minimal disruption to elective radiology services (but this does not take into account any increased cost of radiographer time). The increase in number of untimely scans may have been due to loss of the traditional gatekeeper role of the radiologist

1440 Radiology in a field. The Glastonbury Festival experience

Regi, J.M.
Severn Radiology School, Bristol, UK

LEARNING OBJECTIVES This presentation maps out the whole process from idea to execution of bringing a radiology service to Europe's biggest music festival. Festival Medical Services (FMS) provides over 600 staff to look after all the medical needs of the 185 000 festival goers each year at Glastonbury. Each year FMS treats 5000 patients over the period of the festival. Most of the patients that are seen and treated present with a range of musculoskeletal injuries but some present as life threatening emergencies. Many of these patients require X-rays for evaluation of their injuries and subsequent transfer off site to the local hospital. This transfer is time consuming and expensive. I had the idea to take a portable digital radiography (DR) machine and a portable ultrasound machine to the festival to offer a new service to the clinicians and patients. I had to source the machines, recruit teams of both radiologists and radiographers and abide with all the radiation protection issues of bringing a DR machine to a field in the middle of a festival. This presentation will concentrate on how this was achieved, the lessons learnt and what we found when we X-rayed to festival going public!! CONCLUSION The end result was an excellent resource which has now become an integral part of the service that FMS offers the Glastonbury punters.

1450 Discrepancy meetings. Are we doing them right?

Shetty, S., Das, N., Ridley, N., Beale, A.
Great Western Hospital, Swindon, UK

PURPOSE: Discrepancy meetings are held in various hospitals in different forms. We wanted to ascertain the present practice with regard to discrepancy meetings in our region. MATERIALS/METHODS: The RCR has issued guidelines for Discrepancy meetings. A questionnaire based on the RCR guidelines was sent out to 17 hospitals in the region. 13 responded. RESULTS: 11 of 13 had formal discrepancy meetings. 5 were stand-alone discrepancy meetings. 6 were included as part of consultant, audit or clinical governance meetings. Frequency of meetings: 3 – once in 2 months, 6 – monthly, 1 – once per fortnight, 1 – weekly. Length of each meeting: 4 <1 h, 6 =1 h, 1 >1 h. Convenor: 10 had a convenor, 1 had none. Time allocation: 6 in SPA, 5 not using SPA. Meetings: Structured – 9 and 2 were not. Grading of discrepancies: 8 did, 3 did not. (4 graded according to college guidelines). Outcomes of discrepancy meetings: Contact with patient – rarely 100%, Discussion with Clinicians often 10, rarely 1. Discrepancy audit: Undertaken by just one hospital yearly. CONCLUSION: None surveyed were following all the recommendations of the college. 4 followed RCR guidelines for grading of discrepancies. 1 audited discrepancies yearly. Both DGH's and Teaching hospitals are poorly compliant with college guidelines and this regional occurrence is likely to be reproduced nationally. Is this due to lack of allocated SPA time, lack of awareness, low prioritisation or all three? If Discrepancy meetings are to be pushed up the agenda then these points will need to be addressed.

1500 Embedding service improvement skills in an undergraduate curriculum

Summerlin, M.M., Cuthbert, K., Carter, C.
University of Derby, Derby, UK

PURPOSE: Evidence exists suggesting that extending the capability of frontline practitioners in service improvement plays an important role in the transformation of health and social care services. This paper will examine how far this capability can be developed prior to qualification by first describing and then evaluating the involvement of final year diagnostic radiography students in an interprofessional service improvement module. METHOD: Final year diagnostic radiography students working in interprofessional groups took part in service improvement activities linking campus learning with the practice environment as part of a project supported by the NHS Institute for Innovation and Improvement. Their experience was then evaluated through a questionnaire and focus groups. RESULTS: After the module students felt that they knew a "fair amount" about service improvement. Although the majority were "keen" or "very keen" to be involved in future service improvement work a proportion reported a lack of confidence in this type of activity. CONCLUSION: The module, and its associated study, shows that it is possible to teach improvement skills and prepare students to engage with service improvement work from the beginning of their careers.

1510 Radiographic markers – A reservoir for bacteria?

Tugwell, J.[1], Maddison, A.A.[2]
[1]Ysbyty Gwynedd, Bangor, UK, [2]Bangor University, Wrexham, UK

INTRODUCTION: Amongst the most frequently handled objects in the radiology department are radiographic markers. They are personal accessories used with every patient, and are kept in the radiographers pockets when not utilized. Upon enquiry it was discovered that many radiographers disregarded the potential of these accessories to become a vector for cross-contamination thus never or rarely clean them. The aims of this study were therefore to identify radiographic markers as reservoirs for bacteria and to establish an effective cleaning method for decontaminating them. METHODOLOGY: 25 radiographers/student radiographers were selected for this study. Swabbing of their markers prior and post cleaning took place. The microbiology laboratory subsequently analysed the results by quantifying and identifying the bacteria present. The participants also completed a closed questionnaire regarding their markers (e.g. frequency of cleaning and type of marker) to help specify the results gained from the swabbing procedure. RESULTS: From the sample swabbed, 92% were contaminated with various organisms including staphylococcus and bacillus species, the amount of bacteria present ranged from 0 to >50 CFU. There were no significant differences between disinfectant wipes and alcohol gel in decontaminating the markers. Both successfully reduced their bacterial load, with 80% of the markers post cleaning having 0 CFU. CONCLUSION: The results indicated that radiographic markers can become highly contaminated with various organisms thus serve as a reservoir for bacteria. In addition, the markers need to be cleaned on a regular basis, with either disinfectant wipes or alcohol gel to reduce their bacterial load.

1520 Acoustic noise has no significant effect on radiologists' performance

Mc Entee, M.F.[1], O'Beirne, A.[2], Ryan, J.[1], Toomey, R.[1], Evanoff, M.[3], Chakraborty, D.[4], Manning, D.[5], Brennan, P.C.[1]
[1]University College Dublin, Dublin, Ireland, [2]Beaumont Hospital, Dublin, Ireland, [3]The American Board of Radiology, AZ, USA, [4]University of Pittsburgh, Pittsburgh, PA, USA, [5]University of Cumbria, Lancaster, UK

PURPOSE: The radiology reporting room can have many distractions. The sound of dictation is often accompanied by computer hard drives, air-conditioning units, telecommunications devices and the general noise of the imaging department. This work aimed to assess the effect of noise on the diagnostic performance of radiologists. MATERIALS/METHODS: Noise levels commonly experienced in the imaging department were initially measured and recorded. The level of noise was recorded 10 times in 14 areas within a radiology department. Eleven of which were radiology reporting rooms. Recordings were then edited into one 15 min soundtrack of clinically relevant noise. Consultant radiologists (n=26) assessed 30 posteroanterior chest X-ray images for the presence or absence of nodular lesions in the absence and presence of clinically relevant noise. Jackknife free-response receiver-operating characteristic analysis was performed. RESULTS: The noise measured in the clinical departments, rarely exceeded that encountered within normal conversation. The maximum mean value for a radiology reporting room being 56.1 dBA. Radiologists' performance in the presence of noise did not differ significantly from that without noise. The difference in the figure of merits of +0.03, +0.01, and 0.0 with noise in comparison to without noise for cardiopulmonary radiologists, non-cardiopulmonary radiologists and all radiologists, respectively. No differences were seen for false-positive and false-negative scores or the time assessing the images. CONCLUSION: This work demonstrated that the level of noise normally found within the Diagnostic Imaging Department is not a major distracter during this radiological task.

1430–1600
Junior radiologists' forum

1430 The consultant contract: All the newly-qualified consultant needs to know

Ellis, J.
Milton Keynes General Hospital, Milton Keynes, UK

No abstract supplied.

1500 Preparing for consultant interview

Davies, G.
Royal Glamorgan Hospital, South Wales, UK

The aim of this presentation is to give guidance in preparation for applying for your consultant post and the consultant interview. AIMS: To give an overview of the following: 1. Choosing the right job. 2. Preparation before application. 3. Overview of curriculum vitae. 4. Background reading and preparation prior to the interview. 5. The interview process.

1530 Overseas fellowships

Wardle, P.
Royal Glamorgan Hospital, UK

1600–1700
IT for healthcare: Where next?

1600 What has CFH ever done for me?

Eccles, S.
Connecting for Health, UK

Dr Simon Eccles is the Medical Director of NHS Connecting for Health. He will explain, in characteristically frank manner, the current state of NHS CFH. He will describe what has been delivered and what is yet to come, together with a description of many of the difficulties faced by the programme. Whilst the high-profile delays in the introduction of coordinated Electronic Health Records in secondary care are well publicised; the successes in the necessary underlying infrastructure are far less well known. Yet it is these that offer the greatest opportunities to digital imaging and the beneficial changes in practice which flow from the easy transmission and storage of images. The National Programme for IT is the start of a journey for healthcare in England not an end in itself. PACS is not enough. Dr Eccles will explain what digitising healthcare will mean for our practice and how this differs from just introducing new software. Digitizing the financial sector allows us to bank online and ensures our credit cards work in all shops and in all countries – no-one advocates a return to paper-based banking. The digitization of healthcare will be just as revolutionary though the effects are harder to predict.

1630 The Scottish IT solution

Downie, A.C.
Victoria Infirmary, Glasgow, UK

No abstract supplied.

Notes

Scientific Poster Exhibition

Breast

p101

Audit of compliance with Royal College of Radiologists Breast Group Guidelines

Duncan, K.A.
North East Scotland Breast Screening Service, Aberdeen, UK

PURPOSE: In the early 1990s the RCR Breast Group drew up guidelines for radiologists working in both screening and symptomatic breast imaging. Over the last 20 years there have been considerable changes in work practice and delivery of breast imaging services, in particular the implementation of role extension. This audit was undertaken to determine whether following these changes breast radiologists are still able to comply with the published guidelines. METHOD: A questionnaire was emailed to all RCR Breast Group Members requesting details of their breast imaging activity. RESULTS: 128 anonymous replies were received. Whilst the majority of radiologists do comply with the guidelines a significant number, 32% of screening radiologists, do not comply fully with the guidelines and 62% of symptomatic radiologists are not fully compliant. The main areas of non compliance are reading numbers and stereotactic work. CONCLUSION: These results suggest that it is perhaps time for the RCR Breast Group Guidelines to be reviewed. Tasks traditionally undertaken by radiologists such as stereotactic biopsy are now being undertaken by others, and this and other elements of role extension mean that the nature of the radiologist's workload is changing. What is essential is that the service is safe and the quality of each component maintained. To meet service needs it may be appropriate for some radiologists to sub-specialise within breast imaging, undertaking only some elements, particularly if they are only able to do a limited number of breast imaging sessions.

p102

Seeding of tumour cells down the needle track following breast biopsy

Loughran, C.F., Williams, A., Hudson, T.
Macclesfield District General Hospital, Macclesfield, UK

PURPOSE: Needle breast biopsy is widely practised. Inevitably the needle transgresses the tumour field and when withdrawn cells may migrate into adjacent tissues. The possibility of tumour spread is a recognized but infrequent occurrence. We have undertaken a literature search to determine the potential for this occurrence. This paper describes our search methodology and findings. MATERIALS/METHODS: We searched Medline, Embase and the Cochrane Library, combining keywords and subject headings for needle/percutaneous biopsy with those for neoplasm seeding, metastasis or local recurrence. Relevant articles were identified by inspection of titles and abstracts. RESULTS: Post biopsy cellular displacement occurs in approximately one third of cases. This may be reduced by the adoption of vacuum assisted biopsy techniques. There is an inverse relationship between the time interval between biopsy and the identification of displaced tumour cells at surgery. This suggests tumour cells do not survive displacement. A small number of cases have been described where the biopsy procedure may have been responsible for tumour recurrence. Lobular carcinomas may be less liable to seed than ductal tumours. Cell displacement may complicate histology by altering tumour size and lymphovascular invasion. To limit the potential for tumour recurrence the biopsy track should be excised at surgery and radiotherapy to the track should be considered, if not excised. CONCLUSION: Seeding of tumour cells occurs but in the vast majority of cases has no long term impact. To limit the potential for tumour recurrence it is recommended that the track be excised or included in the radiotherapy field.

p103

Familial breast cancer screening with dynamic magnetic resonance imaging: Our experience in south Manchester

Stokes, M.C.[1], Jain, A.[1], Evans, G.[2]
[1]Department of Radiology and the Nightingale & Genesis Prevention Centre, University Hospital of South Manchester, NHS Trust, Wythenshawe, Manchester, UK, [2]Regional Genetics Department, St Mary's Hospital CMMC Trust, Manchester, UK

KEY LEARNING OBJECTIVES: Review current guidelines on familial breast cancer screening. Present the results of an audit of MRI screening. Present salient examples and illustrate the difficulty in interpreting mammography in dense glandular breasts. DESCRIPTION: NICE guidelines (2006) recommend MRI screening for: TP53 carriers ≥ 20 years. BRCA1/2 carriers (30–49 years). Women with 10-year breast cancer risk > 8% (30–39 years) and > 20% (40–49 years). Family History Clinic (FHC) notes and MRI referrals of women screened at the University Hospital of South Manchester, February 2007 to June 2008 were reviewed. Scans were performed on a Philips 1.5 T scanner with a dedicated breast coil using 2D (University of Bonn Technique) or 3D dynamic MRI. 49 women were screened (range 22–53 years). 31 were mutation carriers and 16 were first-degree relatives of a carrier. Two remaining women, aged 40–49 years had a 10-year risk greater than 20% and 12%, respectively. 45 (92%) referrals complied with the NICE guidelines. Four patients over 50 years were not eligible for MRI screening. 43 of 49 (88%) had mammography. 10 of 43 (23%) were recalled for ultrasound due to MRI abnormalities. Six women who had additional ultrasound due to technical difficulties have been excluded. 3 of 43 (7%) required ultrasound guided biopsy or FNA with benign result. A 2 mm DCIS was found on risk reduction mastectomy in one patient with normal screening. CONCLUSION: Our FHC MRI referrals comply with NICE guidelines with slightly high ultrasound recall rate but low biopsy rate.

p104

Breast screening: What do women want?

Hackney, L., Bydder, M., Bajwa, S.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

PURPOSE: In 2007 the North Staffordshire Breast Screening service undertook a survey of the views of its screening population on various aspects of the breast screening service, in order to inform planning of future service provision. MATERIALS/METHODS: A random selection of 1000 women aged 40 years and over was obtained from the Exeter computer system and cross-checked against the NBSS to ensure eligibility. A questionnaire exploring local issues relevant to attendance at the breast screening service was sent by post to selected women and returned to the regional QA Reference Centre for analysis. RESULTS: A response rate of 56.4% was obtained, with respondents evenly distributed across the age ranges. The majority of women (88.1%) were happy with their current travelling distance to the static site, and most (67.4%) stated that the availability of a mobile unit would not affect their decision to attend for screening. Over half the respondents (53.6%) expressed a preference for an appointment time outside normal working hours, with this option being most popular amongst younger women. Access to public transport was a "very important" factor for 32.4% of women, particularly for older women who were less likely to travel to a screening appointment by car. CONCLUSION: The project has highlighted several aspects of the breast screening service that are particularly important to our current and future local screening populations. This information will be useful when planning flexible service provision, and will be particularly relevant when incorporating

age extension and family history surveillance into the breast screening programme.

p105

Deprivation and ethnicity: Are they major barriers to breast screening uptake in the north west of England?

Edmundson, C.L.[1], Jain, A.K.[1], Astley, S.M.[2]
[1]University Hospital of South Manchester NHS Foundation Trust, Manchester, UK, [2]University of Manchester, Manchester, UK

OBJECTIVES: To assess whether deprivation and ethnicity are major barriers to breast screening uptake in the North West of England, an extremely ethnically and economically diverse region. METHODS: The number of women invited and those who attended each screening unit were obtained from 2000 to 2001 and 2004 to 2005 from the North West QA Office. Index of Multiple Deprivation (IMD) scores were available for each Primary Care Trust; these were weighted by population to obtain an average score for each unit. The screening uptake rates for overall, prevalent and incident screening rounds were correlated with IMD for each region. Ethnic make-up of each area was obtained and data for each ethnic group was again correlated with uptake rates. RESULTS: In most screening areas there was decline in uptake between 2000 and 2001 and 2004 and 2005. The uptake was highest in rural areas while it was lowest major cities. IMD negatively correlates with screening uptake in all rounds, the strongest correlation being with prevalent screening rounds (p=0.004). The impact of ethnicity on screening uptake was more complex. Incident rounds seemed to be most affected by ethnicity. Some ethnic populations were positively correlated with uptake, such as White British (p=0.020) and Indian (p=0.023). Meanwhile, larger Pakistani (p=0.009) and Black African (p=0.012) populations had significantly negative correlations with uptake rates. CONCLUSIONS: Being socioeconomically deprived is a major barrier to breast screening uptake. Ethnicity also plays a role, but it is more complicated. However, the poorest uptake rates are seen when an area is both socioeconomically deprived and ethnically diverse.

p106

Which film reading behaviours are most optimum for best performance? A study of those who perform best and least well on the PERFORMS self-assessment scheme

Scott, H.J., Gale, A.G.
University of Loughborough, Loughborough, UK

PURPOSE: PERFORMS (Personal Performance in Mammographic Screening) is a free and anonymous self-assessment scheme allowing all film readers on the NHSBSP to regularly monitor their radiological skill. Our previous research has shown that those who perform best (top 12%) on this task form a relatively homogeneous group showing greater reported years of reading experience, volume of weekly cases read and reading sessions per week than those whose scores were in the lower percentile range (bottom 12%). In addition, we have shown that "reading style", defined as those actual behaviours (i.e. not reported behaviour) exhibited in the course of completing a film-reading task can effect overall performance. These behaviours include task duration, time of day, breaks during task and number of reading sessions. The current study aims to expand this previous research in order to establish if there is a uniform or optimum "reading style" for those groups identified at either end of the performance spectrum. MATERIALS/METHODS: For a recent PERFORMS task we assigned participants (n=400) into low (bottom 12%) and high (top 12%) performance groups based on individual sensitivity and specificity. RESULTS: Any differences in "reading style" between the two performance groups were isolated. In addition, any individual differences in self-reported factors such as case volume and reading experience (as well as occupation) were also considered as possible between-group determinants. CONCLUSION: We aimed to illuminate any significant differences in "reading style", between high and low performance groups in this sample, with a view to understanding optimal film-reading behaviour.

p107

Magnetic resonance imaging in axillary assessment in breast cancer

Datta, S., Saad, Z., Chatterjee, S., Bashir, M.S..
Salford Royal NHS Foundation Trust, Manchester, UK

PURPOSE: To evaluate the role of MRI in preoperative assessment of axilla in breast cancer in a symptomatic unit. METHOD: A retrospective study was performed on 58 women with suspected diagnosis of breast cancer who underwent MRI since June 06. Preoperative imaging findings (MRI and ultrasound ± FNA) were analysed regarding nodal status. The pathological finding was the gold standard. RESULTS: Of the 58 women, results were available in 46 women. Of 46 women, the final diagnosis of 4 patients was benign. Pathological results were available in 42 patients (43 cancers) of which 19 were found to be node positive. Ultrasound ± FNA diagnosed 6 of 19 while MRI raised suspicion in 10 of 19. Of the node negative ladies; ultrasound could diagnose 20 of 24 while MRI was found to be correct in 23 of 24. This gives us the sensitivity of 75% for ultrasound and 90% for MRI; specificity of 59% for ultrasound and 71% for MRI and True negative probability of 90% for ultrasound and 95% for MRI. MRI also diagnosed one case of enlarged contra lateral axillary node and one case of enlarged ipsi lateral internal mammary node. CONCLUSION: Pre therapeutic MRI is used for loco regional assessment of breast cancer. In a disease where nodal status is the single most important indicator of prognosis, Pre operative accurate assessment is must and MRI adds to ultrasound examination.

e108

A pictorial review of breast implant radiology

Tang, Y.[1], Crooks, R.[1], Teh, W.[2], Chaudhuri, R.[1]
[1]Whittington Hospital, London, UK, [2]Northwick Park Hospital, London, UK

KEY LEARNING OBJECTIVES: To understand the variety of implants used for breast reconstruction or augmentation. To highlight complications that occur with each type of implant (expander or shaped implants) and different placement (sub-glandular or sub-pectoral). Clinical presentations will be reviewed. DESCRIPTION: Breast augmentation for cosmesis or reconstruction, immediate or delayed, are increasingly common, especially with increased incidence of breast cancer and patient cosmetic awareness in the UK. Breast implants with expanders or shaped implants are commonly used, and previously, using an injection of silicone or wax directly into breast tissue were various augmentation techniques. Each type has unique imaging findings. Clinical examination alone is not always conclusive to diagnose problems associated with such techniques. Radiology together with clinical examination plays an important role in the follow up and early detection of complications. Intracapsular ruptures, extracapsular ruptures, capsule formation, and silicone leaks will be included. Correlation with various imaging modalities such as MRI, ultrasound, and mammography will be reviewed. CONCLUSION: Radiological techniques together with clinical assessment are key to early diagnosis of complications accompanying breast augmentation or reconstruction after implant surgery.

e109

The clinical uses and benefits of MRI in patients with breast implants

Martin, M.M., Solomons, P.
Siemens Healthcare, Frimley, UK

KEY LEARNING OBJECTIVES: To describe the clinical utility and application of breast implant imaging with MRI. To illustrate the spectrum of imaging appearances of breast implants using a variety of MRI techniques and sequences. DESCRIPTION: The main indication for MR of breast implants is to evaluate a possible rupture of an implant. MRI is the most sensitive method for evaluating implant integrity and MR can be used to exploit differences in silicone, water, and fat resonance frequencies to deliver high-resolution images.

There are a number of sequence choices available to optimize the visualization of breast implants using MRI. These include STIR (Short TI inversion recovery) along with additional spectral fat suppression techniques to enable clear visualization of the implant. Depending on the clinical question, either fat or silicone can be suppressed, or pure silicone images can be created. Case studies will show examples of clinical applications where the STIR and spectral fat sat techniques can be used. CONCLUSION: MRI of breast implants is a simple, non-invasive, yet highly sensitive imaging technique which can provide a clear diagnosis of the integrity of breast implants.

Chest

p201

Investigation of pulmonary embolism can we do better

Akhtar, S., Rajan, S.S., Rehman, A.K.
Huddersfield Royal Infirmary, Huddersfield, UK

PURPOSE: Assess adherence to a BTS guideline-based protocol investigating suspected PE as implemented by a District General Hospital. MATERIALS/METHODS: All referrals (n=107: medicine 83%; surgery 12%; emergency medicine, 4%; paediatrics, 1%) to investigate PE over three months were retrospectively analysed for: probability assessment, D-dimer assay use and imaging. The potential value of radiologist-reported CXRs prior to CTPA was assessed by comparing X-ray and CT findings. RESULTS: Most scans occurred within 24 h (71%) with 70% same-day reports. 59% of delays resulted from weekend inaction. Overall "PE rate" was 29% (medicine 28%; surgery 23%; emergency medicine 75%). CTPA was the predominant modality (n=100, "PE rate" 30%). Clinical probability was documented in 63% (21% inadequately so). Of all criteria "PE most likely diagnosis" was most frequently documented. In those with PE, "past medical history of DVT/PE" was the modal criteria (63% cf. "no PE", 38%). Overall there were equal numbers of "low" scores in "PE" and "no PE" groups but more high scorers in the "PE" group (71% cf. 29% "no PE"). Most (81%) D-dimer assays were appropriate, i.e. "low" clinical probability. 96% proceeding to CTPA had CXRs, of which 26% were reported before CT requested. In the "no PE" group, 69% had normal CXRs and 31% abnormal. In the 22% with PE, 67% had alternative diagnoses explaining symptoms and 33% incidental findings. CONCLUSION: Effective clinico-radiological dialogue should be maintained by accurate probability scoring dictating D-dimer use. Radiologists should endeavour to report CXRs before further imaging enhancing value of CTPA.

p202

CT pulmonary angiography for diagnosis of pulmonary embolism: Change in scan protocol

Menezes, R.B.
Royal Victoria Infirmary, Newcastle Upon Tyne, UK

PURPOSE: In our institution, prior to October 2007 the CTPA protocol used bolus tracking (ROI placed over the pulmonary trunk) enhanced with 100 ml non-ionic contrast 300 mg ml^{-1} at 3 ml s^{-1}. We introduced a change in protocol in October 2007 to a standard empiric scanning delay of 16 s from start of contrast injection for the majority of patients (this was lengthened to 20 s if there was clinical evidence of cardiac failure). CTPAs were enhanced with 120 ml non-ionic contrast 300 mg ml^{-1} at 4 ml s^{-1}. We compared the diagnostic quality of CTPAs on our 4-slice CT scanner, before and after a change in scanning protocol. MATERIALS/METHOD: A prospective study compared 42 consecutive CTPAs performed with each protocol in patients with suspected pulmonary embolism, using data from September and October 2007. Random, anonymised studies were reviewed on mediastinal window settings by two experienced Consultant Thoracic Radiologists, to assess adequacy of enhancement to segmental arterial level and overall diagnostic quality. Consensus opinion was obtained in cases of discrepancy. Relevant artefacts were noted. Objective assessment of enhancement of the main pulmonary trunk was recorded in Hounsfield Units. RESULTS: 84 cases were included in the study (42 in each group). Overall image quality improved following the change in protocol, with the non-diagnostic rate falling from 14% to 2%. The percentage of studies assessed as excellent diagnostic quality rose from 66% to 81% following introduction of the new protocol. CONCLUSION: The study demonstrates considerable increase in diagnostic quality of CTPAs in our institution using the new CTPA scan protocol.

p203

Diagnostic yield and utilization patterns of radiological investigations for pulmonary embolism

Gatt, A.S., Zealley, I.A., Sudarshan, T.A.
Ninewells Hospital, Dundee, UK

PURPOSE: To determine the utilization patterns and diagnostic yields from CT pulmonary angiograms (CTPA) and ventilation/perfusion scans (V/Q) for investigating suspected pulmonary embolism (PTE). MATERIALS/METHODS: Retrospective analysis over 4 years (September 2004 to August 2008) to identify all patients investigated for PTE in a single large teaching hospital. Total positive scans and diagnostic yields were calculated for each 12 month period. The number of V/Q scans performed on patients with significant ventilation defects due to chronic obstructive pulmonary disease (COPD) was also determined. RESULTS: 1608 patients underwent CTPA and 2663 V/Q scan. Over the 4-year period there was a small increase in the total number of patients investigated (967 vs. 1035) and PTE cases diagnosed (198 vs. 210, respectively). The percentage of CTPAs performed increased from 25% in the first year to 40% in the fourth year ($p \leq 0.0001$). Diagnostic yield for CTPA fell from 24.0% in 2004/2005 to 19.2% in 2007/2008 (p=0.18). Diagnostic yield for V/Q decreased from 19.3% in 2004/2005 to 13.3% in 2006/2007 (p=0.005) but increased to 21.1% in 2007/2008 (p=0.0003). This improvement in V/Q diagnostic yield was linked to a reduction in patients with COPD being scanned from 14.7% in 2004 to 9.5% in 2008 (p=0.006). This reduction is believed secondary to stricter implementation of local guidelines. CONCLUSION: Relative utilization of CTPA and V/Q scanning has changed over this 4-year period. However, relative diagnostic yields appear maintained. This contrasts with recent reports from other centres. Closer adherence to established protocols may help maintain diagnostic yields.

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A pictorial review of imaging in cystic fibrosis

Binukrishnan, S.R.[1], Jacob, C.[2], Irion, K.[1], Holemans, J.[1], Fewins, H.[1], Ledson, M.[1], Walshaw, M.[1]
[1]*Liverpool Heart and Chest Hospital, Liverpool, UK,*
[2]*Leicester Royal Infirmary, Leicester, UK*

KEY LEARNING OBJECTIVES: Cystic fibrosis is the most common lethal inherited autosomal recessive disease of Caucasians. It affects approximately 1 in 2500 newborns and 50 000 individuals in total worldwide. Primarily identified during early childhood, approximately 1000 new cases of CF are diagnosed each year. CF is caused by 1 or more mutations involving the CF transmembrane conductance regulator (CFTR) gene located on chromosome 7. The basic pathology involves impairment of chloride and sodium ion transport within the epithelium. Although CF was once almost universally fatal during infancy, the development of new diagnostic techniques and therapeutic regimens has increased the predicted median age of survival to approximately 37 years. Radiological findings are seen in different systems and the time at first diagnosis ranges from at birth to early adulthood. These patients need lifelong follow-up. DESCRIPTION: This poster discusses and illustrates the typical radiological features, the most common complications and the imaging modalities involved in patient management. CONCLUSION: An understanding of the various radiological findings and different imaging modalities that can be used is important in proper management of cystic fibrosis patients.

p205

The radiological manifestations of Aspergillus lung disease

Johnson, M.B., Shambrook, J., Harden, S.P.
Southampton General Hospital, Southampton, UK

KEY LEARNING OBJECTIVE: To illustrate the spectrum of radiological appearances of Aspergillus lung disease. DESCRIPTION: Aspergillus is an opportunistic fungus. There are approximately 200 species but only a few cause pulmonary disease in humans. The most common of these is *Aspergillus fumigatus*. There are three well-recognized manifestations of Aspergillus-related lung disease. Aspergillomas are fungal balls that develop from secondary colonization of pre-existing lung cavities. These may be identified as a focal intracavitary mass and a typical air-crescent sign seen on both CT and CXR. Allergic bronchopulmonary aspergillosis (ABPA) occurs almost exclusively in patients with asthma or cystic fibrosis. Aspergillus causes a hypersensitvity reaction involving eosinophilic infiltration of the bronchial wall which can result in chronic airway inflammation, central bronchiectasis and mucoid impaction. Invasive Aspergillosis, primarily found in the immunocompromised, typically shows nodules with halos of ground-glass attenuation on CT. This is the result of haemorrhage surrounding the nodule of necrotic, fungally infected tissue. CONCLUSION: We present an imaging review of the typical radiological presentations of aspergillus lung disease with an emphasis on the CT appearances. As this pathogen represents a common, potentially lethal opportunuistic infection, it is important that its appearances are well recognized allowing prompt diagnosis and optimal clinical therapy.

p206
More than just a hole!

Nayeemuddin, M., Au-Yong, K.J., Tony, G., Vessal, S.
University Hospital North Staffordshire NHS Trust, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVES: To review the wide range of diseases that cause cavitating lesion in the lung with special emphasis on their appearance on chest X-ray and CT scans. DESCRIPTION: A cavity is defined as a gas-filled space within a zone of pulmonary consolidation, a mass, or a nodule. Cavitary lung disease can be caused by a wide variety of pathologic conditions. The wall thickness and the morphology are helpful to determine if a cavitary lesion is benign or malignant. The possible aetiologies include aspergilloma, bronchiectasis, infection, pulmonary infarct, primary lung tumours, pulmonary metastatic disease, rheumatoid nodule and Wegener's granulomatosis. Our exhibit uses plain chest X-ray and high quality images from multidetector CT to demonstrate the various pathologic conditions that cause lung cavitation. CONCLUSION: Familiarizing with radiographic and CT scan patterns may help to exclude certain diagnoses and narrow the differential diagnosis.

p207
Computed tomography staging of lung cancer: The patient pathway

Shah, V.[1,2], Mandumula, S.[1]
[1]Barnet and Chase Farm Hospitals NHS Trust, London, UK, [2]Imperial College Healthcare NHS Trust, London, UK

PURPOSE: To evaluate the patient pathway prior to CT staging of lung cancer, in particular, the avenues through which the CT is the endpoint, and the time from the trigger (abnormal chest radiograph or other study) to CT. METHODS: Using a list of all new diagnoses of lung cancer in a 12 month period, the following data was obtained from the RIS/PACS systems: dates of abnormal chest radiographs and their reports, staging CTs and other investigations which prompted the staging CT. RESULTS: 112 patients had a staging CT for lung cancer over the 12 month period; 81 of 112 after an abnormal chest radiograph, 14 of 112 after discovery of "incidental" lung cancer on CT for other reasons, 7 of 112 after discovery of metastatic deposits elsewhere, 7 of 112 had either a normal or missed lesion on chest radiography and body CT was requested to find an occult neoplasm, and for 3 of 112 a malignancy-screening CT was requested without any chest radiography. The mean time to completion of staging was 15.3 days for those with abnormal chest radiographs, 2.8 days for the "incidental" cancers, 15.4 days after discovering metastases, and 59.3 days between chest radiography and CT for those with normal chest radiographs/missed lesions. CONCLUSION: Although abnormal chest radiography is the most prevalent trigger for staging CT, 27% of new cancers are discovered via other routes. For both the predominantly outpatient/GP discoveries of abnormal chest radiographs or metastases, and predominantly inpatient discoveries of "incidental" cancers, patients were promptly staged with CT.

p208
Nontuberculous (atypical) mycobacterial pulmonary infection diagnosed on HRCT in the DGH setting: A radiological diagnosis?

Brant, J.M., Rupani, H., Matti, S.
Basingstoke & North Hampshire Hospital, Basingstoke, UK

KEY LEARNING POINTS: The term nontuberculous (atypical) mycobacteria gathers together a group of varied saprophytic organisms and occasional pathogens that can cause significant morbidity. Cases often present with an insidious clinical course and can be difficult to diagnose. Detection of the bacteria within bronchial washings or sputum does not directly correlate with clinical infection and therefore the radiological findings are important to recognise. They can often raise initial suspicion of the diagnosis and can guide difficult therapeutic decision making involving the use of some potentially toxic drugs. DESCRIPTION: Prevalent pathogens from this group include Mycobacterium avium-intracellulare complex (MAC), M. Kansasii, and M Xenopi. These often have distinct imaging appearances but some common HRCT findings to be found include a triad of bronchiectasis (particularly in MAC), cavitating nodules, and a tree-in-bud pattern. Typically there is upper zone predominance. The cavitary or "classic" form can look like post-primary tuberculosis and infection can also present as a hypersensitivity pnuemonitis. Nontuberculous infection can also masquerade as a lung mass. These findings commonly occur alongside COPD, in immunosurpressed patients and also can be seen in relatively well individuals. The CT findings from 10 patients with proven differing mycobacterial infections are shown to illustrate the common radiological appearances. CONCLUSION: Nontuberculous mycobacterial infection is not uncommon in the DGH setting. It remains a clinical diagnosis but a DGH radiologist armed with a high index of suspicion and an awareness of readily recognized suggestive CT appearances can be the first to raise the alarm.

e209
Changes in the guidelines for chest drain insertion: Implications for the radiology department

Upadhyay, N., Misra, R., Tavares, R., Garner, J., Bowen, F., Roddie, M.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: The National Patient Safety Agency has recently warned of the risks associated with chest drain insertion and recommended the use of ultrasound guidance. This is likely to change clinical practice. We conducted an audit to determine the workload implications this could have for the radiology department. MATERIALS/METHODS: We audited the number of chest drains inserted over 3 months at Charing Cross Hospital. We established the number that had been inserted in the radiology department or marked for drainage under ultrasound, and compared this with the number of chest drains that had been ordered for use on the wards. RESULTS: During the 3 month period 45 chest drains had been ordered for use on the wards whilst 34 had been inserted in the radiology department. Of the 45 from the ward, 16 had been marked under ultrasound guidance. A further 11 patients were deemed unsuitable for drainage following ultrasound. CONCLUSION: We project that a change in guidelines would result in a 48% increase in requests for ultrasound prior to chest drain insertion. This raises questions about how such an increase in workload should be met. A potentially controversial solution is to train respiratory physicians in chest ultrasound to manage the increase in demand.

However, there are concerns that by separating ultrasound in this way, the value from the radiologist's ability to correlate and synthesise findings with investigations from other imaging modalities may be lost.

e210

The appearances of non-asbestos related rounded atelectasis and evidence for the "post-effusion theory" of pathogenesis

Brant, J.M., Enver, K.
Basingstoke & North Hampshire Hospital, Basingstoke, UK

KEY LEARNING OBJECTIVES: Rounded atelectasis is commonly associated with previous asbestos exposure. Patients with the CT finding of rounded atelectasis often do not have an exposure history and it is often found on CT without other evidence of asbestos exposure such as asbestos pleural plaques. DESCRIPTION: Several other causes of rounded atelectasis are recognised. Determining the likely cause of the atelectasis can then become a process of clinical and radiological exclusion and can have medicolegal implications. We will present typical CT findings of rounded atelectasis from a collected series of cases including post-CABG surgery; post-tuberculosis empyema; following talc pleurodesis and bacterial parapnuemonic effusion and illustrate how these can be distinguished. Two contrasting theories of the pathogenesis of rounded atelectasis include the "post effusion atelectasis theory" and the "fibrosing theory". We will also show several cases of rounded atelectasis developing following the resolution of biopsy proven benign exudative pleural effusions. These provide support for the "post effusion theory" that the primary event in the formation of rounded atelectasis is the formation of an exudate as a result of pleural inflammation. CONCLUSION: Rounded atelectasis is often but not uniquely found in patients who are assumed to have been exposed to asbestos as a result of pleural inflammation and a pleural exudate. Other causes can be distinguished radiologically and awareness of some typical findings will help to make the appropriate diagnosis. The natural history and pathogenesis of rounded atelectasis is demonstrated with several cases.

e211

The diaphragm, a pictorial review

Chin, K., Wee, B., Oliff, J.
Queen Elizabeth Hospital, Birmingham, UK

KEY LEARNING OBJECTIVES: To review the radiological appearances of diaphragmatic pathology. DESCRIPTION: The diaphragm is a large organ which is involved in many disease processes. Knowledge of the normal anatomy and radiological appearances of the diaphragm is vital for subsequent accurate diagnosis of diaphragmatic pathology. The range of pathologies which affect the diaphragm is vast, including neoplasia, inflammation, infection, post surgical change as well as congenital defects. Early recognition of these diaphragmatic entities, which may be subtle, enables timely diagnosis and treatment. The available educational resources on the radiological appearances of the normal and abnormal diaphragm are scanty; this educational poster is aim at providing radiologists with an additional resource. CONCLUSION: The diaphragm can be affected in many ways, and it is important to be familiar with the radiological appearances of diaphragmatic pathology. We review the normal diaphragm, as well some of the common diaphragmatic abnormalities.

e212

Developmental anomalies of the azygous and hemiazygous venous systems that may mimic chest pathology

Bhatnagar, G., Chapman, P., Riordan, R.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: To review the developmental anatomy and anomalies of the azygous and hemiazygous veins in order to differentiate variants from true pathology avoid potential diagnostic pitfalls. DESCRIPTION: The embryology of the azygous and hemiazygous veins is such that it lends itself to a variety of developmental abnormalities. In fact, an incidence as high as 26% in a series of 200 cases have been reported in the literature. These anomalies may lend them self to misinterpretation particularly in light of other supporting features such as lymphadenopathy and intrathoracic malignancy. Hence, familiarity with the developmental anatomy and imaging characteristics of the anomalies of these veins is essential knowledge for a radiologist. CONCLUSION: The anatomy and imaging characteristics of developmental anomalies of the azygous and hemiazygous veins are reviewed on a variety of thoracic imaging modalities and key points are highlighted to allow differentiation from pathology and avoid potential diagnostic pitfalls.

e213

Lines, wires and who-knows-what – Review of cardiothoracic intensive care equipment on chest radiographs

Jones, C.M., Holloway, B., Olliff, J.
Queen Elizabeth Hospital, Birmingham, UK

KEY LEARNING OBJECTIVES: To review the plain radiograph appearances of lines, wires and other equipment seen on cardiothoracic intensive care chest radiographs, including the less commonly encountered devices seen mainly in tertiary centres. DESCRIPTION: Chest radiographs demonstrate devices used in the treatment and monitoring of cardiothoracic disease including patients post complex surgery in the intensive care. These include various pulmonary and systemic venous and arterial lines, oesophageal monitoring devices, pacemakers, implantable cardioverter defibrillators, ventricular assist devices and aortic balloon pumps. Part of the assessment of chest radiographs is the evaluation of the positioning of such iatrogenically placed devices and their potential complications. The more obscure devices may not be identifiable at all by the radiologist reporting the radiograph. It is also common for non specialist radiologists to be unaware of the normal appearances of a well positioned device, so their ability to highlight potential issues is limited and complications can be missed. CONCLUSION: This pictorial poster reviews the more complicated equipment seen on chest radiographs in the cardiothoracic intensive care setting highlighting normal appearances and complications.

e214

Devices seen in grown up congenital cardiac disease – An update on radiographic appearances

Jones, C.M., Holloway, B., Windram, J., Olliff, J.F., Thorne, S.
Queen Elizabeth Hospital, Birmingham, UK

KEY LEARNING OBJECTIVES: To revise the radiological chest appearances of devices used in the treatment of congenital cardiac disease. DESCRIPTION: The variety and number of devices available in the treatment of congenital heart disease continue to increase with advances in technology as well as understanding of the underlying physiology. These include stents, grafts, valves, shunt closure and vessel occlusion devices. Grown up congenital heart (GUCH) disease patients are living longer and are frequently encountered outside the tertiary setting. Radiologists interpreting chest radiographs of GUCH patients with these devices often find them and the anatomy unfamiliar, making interpretation of their appearance difficult and time consuming. CONCLUSION: We present an array of devices which are used in the treatment of congenital cardiac disease, with conceptual diagrams as well as normal chest radiograph appearances. Examples of misplaced or malfunctioning devices are also shown to demonstrate abnormal appearances.

e215

Spontaneous pneumomediastinum – A real pain in the chest

Drake, B.E.[1], Rock, B.G.[1], Jackson, S.[2]
[1]Peninsula Radiology Academy, Plymouth, UK, [2]Plymouth Hospitals NHS Trust, Plymouth, UK

LEARNING OBJECTIVES: To present a pictorial review of spontaneous pneumomediastinum with emphasis on distinguishing the appearances from secondary causes. BACKGROUND: Spontaneous

pneumomediastinum is a rarely encountered condition usually affecting young adults. It has a benign course and rarely requires treatment or follow-up. This is in marked contrast to secondary causes of pneumomediastinum where urgent intervention is sometimes indicated. Recognising the various radiographic appearances is crucial for prompt and appropriate patient management. We present our experience of spontaneous pneumomediastinum. We emphasise the differences between this condition and more serious pathology both on imaging and on text as a learning experience. We review the current literature and suggest an appropriate imaging and management algorithm. CONCLUSION: Distinguishing between spontaneous pneumomediastinum and more serious secondary pneumomediastinum can prove problematic. Awareness of the potential pitfalls and characteristic imaging findings are emphasised to avoid radiological misdiagnosis.

e216

What's that box? An imaging review of subcutaneously implantable electronic devices

Bhatnagar, G., Bull, M., Rock, B., Suresh, P.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: To review the radiographic appearances of the various types of subcutaneously implantable electronic device that may commonly be seen in routine radiological practice. DESCRIPTION: Numerous types of electronic device may be inserted into the subcutaneous tissue of the chest and abdominal wall. Identification of the device is essential for the reporting radiologist, not only in interpreting whether the device itself is correctly positioned and intact but also in providing important clues towards other diagnoses. CONCLUSION: The imaging characteristics of such devices are reviewed and compared with common everyday items that may mimic them if sound radiograph preparation technique is not followed.

e217

Imaging characteristics of the solitary pulmonary nodule

Jones, Y.M.[1], Clark, A.[2]
[1]*Liverpool Heart and Chest Hospital, Liverpool, UK,*
[2]*University Hospital of North Staffordshire, Stoke-on-Trent, UK*

KEY LEARNING OBJECTIVES: To describe and illustrate the salient imaging appearances of a solitary pulmonary nodule which can aid the radiologist in differentiating benign and malignant nodules. DESCRIPTION: The incidental finding of a solitary pulmonary nodule is a frequent clinical occurrence. With the advent of improved CT scanners and the possibility of introducing screening for lung cancer it is becoming increasingly common, and is likely to continue to do so. Until fairly recently it had been widely accepted that non-calcified pulmonary nodules should be considered to be malignant until proven otherwise; however current thinking has evolved from this. Nodule contour, location, cavitation, attenuation, presence of fat or calcification, size, volume doubling time, enhancement properties on CT and MRI and metabolic activity on ^{18}F-FDG PET are all valuable features in evaluating the likelihood of malignancy within a solitary pulmonary nodule. We review these imaging characteristics with illustrative examples. CONCLUSION: The SPN often causes a clinical dilemma. Early detection and correct management of malignant nodules is crucial, with the aim to minimize unnecessary intervention and follow up of benign lesions, while detecting malignant nodules at the earliest opportunity. This review demonstrates, with examples, the key imaging appearances which can assist the radiologist in determining whether a solitary pulmonary nodule is more likely to be benign or malignant.

e218

Pulmonary embolism and lung cancer. A correlative study by using multi-detector-row CT angiography

Saba, L.[1], Potter, F.[2], van der Lugt, A.[2], Mallarini, G.[1]
[1]*A.O.U. Cagliari, Cagliari, Italy,* [2]*Erasmus Center MC Rotterdam, Rotterdam, The Netherlands*

PURPOSE: The incidence of pulmonary embolism (PE) in patients with lung cancer remains still undefined. In this category of patients the risk of PE is high due the combination of prothrombotic effects of the cancer. The aim of this work was to determine the incidence of PE in patients affected by lung cancer. MATERIALS/METHODS: MDCT records of 94 consecutive patients affected by lung cancer (61 epidermoid carcinoma, 24 adenocarcinoma, 5 anaplastic carcinoma, 4 neuroendocrin carcinoma) were retrospectively evaluated by two radiologists in consensus for PE; data were compared with 125 in-patients without cancer that matched for age and sex. MDCT exams were performed by using a four-detector-row CT scanner; 100–140 ml of contrast material were injected. Slice thickness used was 3.2 mm and increment 1.6 mm. MDCT data set were evaluated by using axial scans, multi-planar-reconstruction and maximum intensity projection algorithms. RESULTS: In the group of patients with lung cancer, PE was detected in 9 (9.57%). Three patients had a clinical suspect of PE, and 6 had an unsuspected PE. Ancillary parenchymal finding were present in 7 cases. In the control group, PE was detected in 2 patients (1.6%). One patient had a clinical suspect of PE and 1 was unsuspected for PE. A statistical significant difference was observed between the two groups (p=0.0078). CONCLUSION: Our data suggest that the presence of PE is a frequent pathologic condition in patients of lung cancer that is more frequent that in patients without lung cancer.

e219

Ultrasound imaging in blunt thoracic trauma: What a resident needs to know in the emergency department

Petrocheilou, G., Vlachou, I., Stathopoulou, S., Peteinelli, A., Pantou, S., Theodorakopoulos, G., Charitidis, C., Livieratos, L., Kokkinis, C., Zavras, G.M.
St. Paul Hospital, Athens, Greece

KEY LEARNING OBJECTIVES: The aims for this presentation are: To review the clinical applications of ultrasound as a dynamic imaging tool applied to blunt thoracic trauma (BTT) evaluation. To present its technique, its potential advantages and limitations. To describe ultrasound normal thoracic anatomy and familiarize trainee radiologist with the spectrum of ultrasound imaging manifestations of BTT. DESCRIPTION: While plain radiography remains the mainstay of imaging in the evaluation of BTT in the emergency department, familiarity with ultrasound normal/pathological imaging features can play a significant role in thoracic trauma management. Diagnostic dilemmas not solved by plain radiography can be approached by thoracic ultrasound avoiding unnecessary additional investigations. Ultrasound is a safe, rapid, non-invasive technique yielding high resolution, bedside, real time images of the thorax. To achieve good results, though, adequate education in ultrasound is crucial. A pictorial review (with corresponding schematic diagrams) and realtime video clips of ultrasound scanning are used to demonstrate normal thoracic anatomy and various thoracic trauma pathology: pleural effusion, atelectasis, lung contusion, occult pneumothorax, chest wall haematoma, fracture of thoracic cage (rib, sternum). CONCLUSION: Radiologists play a pivotal role in the evaluation of blunt thoracic trauma. Awareness of ultrasound diagnostic features can allow a more accurate diagnosis. Understanding the technique, its strengths and limitations maximizes the method's diagnostic potential as a problem solving tool. We consider this poster to be useful as an educational tool for trainee radiologists in the emergency department.

e220

A pictorial review of non-thromboembolic findings on computerised tomography pulmonary angiography

Ali, K.A., Rasul, S., Roditi, G.
Glasgow Royal Infirmary, Glasgow, UK

KEY LEARNING OBJECTIVES: Provide a pictorial review of a selection of non-thrombotic findings identified on computerised

tomography pulmonary angiography (CTPA). DESCRIPTION: The symptoms of suspected pulmonary thrombo-embolism (PTE) overlap with the presenting symptoms of a wide variety of other conditions such as heart failure, pneumonia and pericarditis. The advantage of CTPA in providing a comprehensive assessment of thoracic structures is that an alternative diagnosis for the patient's symptoms can often be provided. Even without ECG gating cardiac pathology is now often obvious on modern multidetector row CT scans. A comprehensive review of all CTPA studies in a radiology department of a large teaching hospital over a 6 month period was undertaken. 386 CTPA studies were performed with 54 positive for PTE (an incidence of 14.0%). Other diagnoses included 111 (28.8%) cases with pleural effusion, 87 (22.5%) cases of consolidation (not related to PTE), 8 (2.1%) cases of pericardial effusion and importantly in 17 patients (4.4%) nodules/masses that were likely primary lung neoplasms. Other interesting presentations included cases of left ventricular thrombus and left ventricular false aneurysm. CONCLUSION: CTPA can often identify a variety of other clinically important alternative diagnoses explaining symptoms. This pictorial review demonstrates a selection of these non-thrombotic findings.

e221

Anterior mediastinal masses: A pictorial review

Ananthakrishnan, G., White, R.D., Sudarshan, T.
Ninewells Hospital, Dundee, UK

KEY LEARNING OBJECTIVES: Provide an anatomical overview of the anterior mediastinum. Provide a pictorial review of pathologies causing anterior mediastinal masses, both benign and malignant. Highlight the characteristics of benign and malignant pathologies which would enable a diagnosis to be made. Illustrate potential pitfalls in diagnosis. DESCRIPTION: Anterior mediastinal masses are an uncommon yet significant source of confusion in the interpretation of chest radiographs. Here, using actual cases (histologically-proven where possible) involving a variety of imaging modalities – cross-sectional, nuclear medicine, ultrasound and radiography – we strive to demystify this anatomical region and highlight the features of a variety of pathologies. CONCLUSION: Anterior mediastinal masses cannot typically be diagnosed solely on the basis of plain radiographic appearances, hence further imaging is usually required. Review of this exhibit should increase confidence in the diagnosis of such pathologies, as well as providing insight into those masses which require pathological correlation and possible intervention, and those which can be safely left alone.

e222

Pulmonary sarcoidosis: The great pretender

Hawtin, K., Copley, S.
Hammersmith and Charing Cross Hospitals, London, UK

KEY LEARNING OBJECTIVES: To review typical and atypical features of pulmonary sarcoidosis with examples of sarcoid mimicking other lung diseases. DESCRIPTION: Sarcoidosis can be termed "the great pretender" due to its ability to mimic other diseases. It is a systemic disorder of unknown aetiology characterized by the presence of non-caseating granulomas. In the chest, granulomas are typically distributed along the lymphatics in the bronchovascular bundle, interlobular septa, major fissures and subpleural regions. Other recognized HRCT features include the development of fibrosis, ground glass attenuation and air trapping. All sarcoidosis cases presented in this review have been histologically confirmed. This pictorial review will demonstrate typical and atypical HRCT features of sarcoidosis, supplemented with chest radiographs and histopathological correlation. Atypical manifestations including: isolated air trapping (mimicking obliterative bronchiolitis), conglomerate masses (resembling progressive massive fibrosis) and extensive interlobular septal thickening (mimicking lymphangitis) are illustrated. Examples of mimics of other interstitial lung diseases include: subacute and chronic hypersensitivity pneumonitis, non-specific interstitial pneumonia and rarely usual interstitial pneumonia. A case characterized by irregular cystic air spaces and tiny cavitating nodules on HRCT, similar to features seen in Langerhan's cell histiocytosis will also be demonstrated. Other mimics include consolidation (resembling cryptogenic organizing pneumonia) and "vanishing lung disease" (sometimes indistinguishable from severe emphysema). CONCLUSION: This pictorial review illustrates the wide spectrum of appearances in pulmonary sarcoidosis and the ability to mimic other lung diseases. The diagnosis should be considered in the differential in atypical cases.

e223

Pulmonary toxicity secondary to Amiodarone

Kumaraguru, J.J.[1], Kandasamy, N.[2], Symeonidou, C.[2]
[1]Barnet General Hospital, London, UK, [2]Royal Free Hospital, London, UK

KEY LEARNING OBJECTIVES: To illustrate the characteristic findings of Amiodarone induced pulmonary toxicity on HRCT and emphasise the importance of its early recognition. DESCRIPTION: Amiodarone is a class III antiarrhythmic agent indicated for the treatment of refractory tachyarrhythmia particularly in the setting of acute ischaemia. The reported prevalence of pulmonary toxicity in patients on Amiodarone ranges from 1.4% to 18% and mortality secondary to which is as high as 20–30%. The exact mechanism of pulmonary toxicity is less understood. Numerous appearances on CT have been described of which ground glass opacities, interlobular septal thickening, fibrosis and associated traction bronchiectasis are non specific. The presence of high attenuation (usually HU 82–174) pulmonary/pleural based lesions has been described to be fairly specific. There are a few disease processes which cause a high attenuation pulmonary/pleural lesion of which primarily metastatic calcification due to secondary hyperparathyroidism from renal insufficiency need to be considered. High attenuation secondary to pulmonary haemorrhage has also been described although extremely uncommon. CONCLUSION: Early recognition of pulmonary toxicity secondary to Amiodarone therapy is important as prompt cessation of the drug results in resolution of toxicity and concomitant use of corticosteroids may stabilise pulmonary function. Although most of the imaging features are non specific the combination of high attenuation pulmonary/pleural lesion with associated increase density of the liver/spleen is characteristic of Amiodarone exposure.

e224

Sarcoidosis: The master of pulmonary disguise

Verma, H., Nair, A., Grubnic, S.
St George's Hospital, London, UK

KEY LEARNING OBJECTIVES: A brief overview of the typical features of pulmonary sarcoidosis with a more comprehensive description of the atypical features on CXR and HRCT will be discussed along with the common diseases that sarcoid may mimic. DESCRIPTION: Pulmonary sarcoid is a relatively common disease of unknown cause characterised by non-caseating granulomata. It can manifest in multiple guises and the correlating pathophysiology and imaging will be demonstrated. Atypical manifestations including pulmonary nodules, cavitation, alveolar sarcoid, nodal disease, pleural and tracheal involvement and veno-occlusive disease with examples of common differentials will be illustrated. CONCLUSION: Pulmonary sarcoid has numerous manifestations and atypical features are often challenging to diagnose. The viewer will have a clearer understanding of these and the diseases it can imitate.

e225

Sickle cell lung disease: Manifestations on HRCT

Bell, D.J., Preston, R.
Guy's and St Thomas' NHS Foundation Trust, London, UK

KEY LEARNING OBJECTIVES: To describe and illustrate the high resolution computed tomography (HRCT) appearances of sickle cell lung disease. DESCRIPTION: In sickle cell disease the sickle haemoglobin is prone to conformational change when it becomes deoxygenated. The abnormal haemoglobin crystallises within the red

cell which becomes abnormally stiff and prone to haemolysis. The sickle cells occlude blood vessels, including within the lungs. This leads to chronic, extensive and irreversible damage to the pulmonary vasculature. Initially the patient will present with recurrent acute chest crises and infections. However, repeated chest crises and pneumonias eventually manifest as sickle cell lung disease (SCLD) which encompasses a whole spectrum of lung abnormalities including pulmonary fibrosis and cor pulmonale; in some cases, this eventually progresses to end stage respiratory failure. We will demonstrate the full gamut of HRCT changes in SCLD from early changes to full blown restrictive lung disease with extensive fibrosis and pulmonary vascular disease. CONCLUSION: After reviewing this exhibit the reader should be able to recognize and describe the common HRCT abnormalities encountered in sickle cell lung disease.

Cardiac

p301

Faulty lines

Tony, G., Nayeemuddin, M., Chidambaram, V.
University Hospital North Staffordshire, Stoke-on-Trent, UK

KEY OBJECTIVES: To demonstrate the importance of recognizing common radiologically identifiable complications associated with implantable cardiac pacemakers/defibrillators and their leads. DESCRIPTION: As of 2006, there were over 240 000 people in the UK benefiting from an implantable pacemaker or cardioverter defibrillator (ICD). The rate of acute and chronic post-implantation complications with these devices has been reported as 4–5% and 2.7%, respectively. Acute complications are usually operator dependent like pneumothoraces, malpositioning and early lead dislodgement. Late complications include problems like erosion/ infection of pacemaker pocket and lead insulation defects. The aim of this exhibit is to illustrate the radiological appearances of some of these common complications using a series of cases where problems were detected on routine/ emergency chest imaging. CONCLUSION: Most complications associated with implantable cardiac devices are easily and successfully rectifiable and therefore radiologists should be able to reliably identify them so that prompt appropriate management can be initiated and potential harm avoided.

p302

Comparison between multidetector nongated computed tomography pulmonary angiography and echocardiography in assessment of cardiac function

Duerden, R.M., Townsend, M., Hamilton, M.C.K.
University Hospitals Bristol NHS Trust, Bristol, UK

PURPOSE: Non-subspecialist radiologists increasingly analyse cardiac structure and function during CT studies. Cardiac function may be analysed accurately in routine non-gated CTPAs. MATERIALS/METHODS: Studies of 20 patients undergoing both non-gated CTPA and echocardiography in the same admission were retrospectively analysed. Echocardiography was used as the gold standard for assessing cardiac chamber size and function. CTPAs and echocardiograms were assessed blinded using an equivalent grading system, with respect to degree of atrial or ventricular dilatation, long and short axis function and radiological evidence of raised right heart pressures, respectively, by an expert cardiac radiologist and cardiologist. RESULTS: Results were considered to correlate when comparison between the two modalities gave results that agreed either completely or by one grade of functional difference. With regards to left ventricular function, 90% of cases studied correlated, with 88% agreement for right ventricular function. Left atrial and ventricular dimensions showed agreement in 89% and 85% of cases, respectively. Where the right heart was assessable on echocardiography, there was 81% and 80% correlation for right atrial and ventricular sizes, respectively. Tricuspid valve incompetence assessment correlated 94% of cases where formal assessments were made on echocardiography. In no cases were there significant discrepancies in recognizing severe ventricular failure. CONCLUSION: By using simple analysis techniques of cardiac structure and movement in non-gated CTPA images, relevant clinical information regarding cardiac function can be obtained, which closely correlates to echocardiographical data. Contrast enhanced examinations of the thorax should include this assessment to guide further imaging and management.

p303

Cardiac CT and coronary CTA – A review of our experience at UHCW

Kolawole, R.O., Wellings, R.
University Hospitals Coventry and Warwickshire, Coventry, UK

KEY LEARNING OBJECTIVES: To provide a basic outline of the techniques and protocols involved in coronary CTA. The workstation applications and post-processing techniques required in the interpretation of data. The range of coronary artery pathology that can be diagnosed on CTA. Support CTA diagnoses with conventional angiographic correlation. DESCRIPTION: Over the last few years, with the advent of multislice CT scanners, contrast enhanced coronary CTA has rapidly emerged as a sensitive and specific tool for imaging the coronary arteries without the risks that accompany selective angiographic catheterisation of the coronary arteries. The heart and coronary vessels can now be imaged as a motion-free volume of data to which a variety of post-processing techniques such as volume rendering (VR), multiplanar reformation (MPR), maximum intensity projection (MIP) and cine imaging can be applied. This makes possible a thorough, non-invasive assessment of the cardiovascular system. We present a range of patients presenting with chest pain who had low or indeterminate risk of coronary artery disease imaged at our institution (University Hospitals of Coventry and Warwickshire) over the past year, the range of diagnostic pathology of which coronary CTA is capable and conventional angiographic correlation of some of these pathologies. CONCLUSION: CTA is an effective, non-invasive tool in the assessment of coronary vasculature. The factors involved in producing diagnostic quality coronary assessments are described and illustrated.

p304

Cardiac magnetic resonance imaging for the investigation of ischaemic heart disease – An image review

Murday, D.C., Shambrook, J.S., Brown, I.W., Harden, S.P., Peebles, C.R.
Southampton University Hospitals NHS Trust, Southampton, UK

KEY LEARNING OBJECTIVES: Understand the role of cardiac magnetic resonance (CMR) imaging in the investigation of ischaemic heart disease (IHD). Appreciate the techniques for assessment of inducible ischaemia, myocardial viability and myocardial infarction. DESCRIPTION: Historically imaging assessment of IHD has involved catheter angiography, stress echocardiography and perfusion scintigraphy. With the development of improved CMR sequences it is now possible to image the moving heart within a breath-hold. As a consequence advanced techniques are now available to evaluate myocardial perfusion, viability and infarction. We illustrate the current clinical applications of CMR in the assessment of IHD. Myocardial perfusion can be demonstrated at rest and stress by first pass perfusion of gadolinium contrast. Stress is induced by adenosine infusion resulting in vasodilation and simulating the response to exercise. Dobutamine is an alternative stress agent, relying on a positive chronotropic and inotropic response, to assess ischaemia by detecting inducible wall motion abnormalities (IWMA). Low dose dobutamine is used to elicit functional improvement in area of hypokinesia, indicating viability. High dose dobutamine induces new IWMA in ischaemic territories. Scar as a consequence of myocardial

infarction can be demonstrated by the use of delayed gadolinium enhancement images. The degree of transmurality of scar has been shown to predict the success of subsequent coronary revascularisation. CONCLUSION: CMR techniques are evolving rapidly allowing the non-invasive assessment of patients with IHD. It provides structural and functional information to guide treatment and can help predict prognosis. We present an up-to-date image review of its current clinical applications.

e305

Assessing effectiveness of adaptive filters to reduce radiation dose in computerized tomography coronary angiography (CTCA)

Bhonsle, N.
Conquest Hospital, Hastings, UK

The computerised tomography coronary angiography (CTCA) is carried out using multi-slice CT (MSCT) scanners. MSCT is a relatively new modality to assess coronary disease. It is expected that CTCA could emerge as the diagnostic test of choice for patients with intermediate pre-test probability of disease. (1) It is also likely that the MSCT will be used to monitor patient progress with established diagnosis of coronary artery disease. The average effective dose in CTCA is 16 mSv. (2) The possibility of repeat examinations particularly in younger female patients has caused some concern. There are number of strategies suggested to reduce the radiation dose to patients undergoing CTCA examinations. Optimization of exposure time, scan coverage area, ECG and anatomical dependent current modulation etc. have been proposed and used in various combinations to achieve radiation dose reduction. Similarly application of contextual adaptive filters to the reconstructed images processed from raw data which was acquired using lower mAs has been suggested. (3) The poster describes validation of use of contextual adaptive filter for CTCA imaging protocol under test conditions. References: 1. Berman D. Roles of nuclear cardiology, cardiac computed tomography and cardiac magnetic resonance: assessment of suspected patients with suspected coronary artery disease. *J Nucl Med* 2006;47:74. 2. Mettler FA. Effective doses in radiology and diagnostic nuclear medicine. *Radiology* 2008;248:254. 3. Traegde Martinsen AC. Reduction in dose from CT examinations of liver lesions with a new postprocessing filter: a ROC phantom study. *Acta Radiologica* 2008;49:303.

e306

Don't go breaking my heart – Imaging of post-operative complications of adult cardiac surgery

Lee, E.Y.P., Mathias, H., Wood, A.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: To highlight the post-operative complications of cardiac surgery and assessment of these patients on cross-sectional imaging. DESCRIPTION: Imaging of cardiac surgical patients has become a common radiological encounter. A sound knowledge of the potential post-operative complications is essential. These can be categorised into general post-surgical complications and specific complications related to cardiac surgery. We present an illustrated account of a variety of these complications, including apico-aortic conduit dehiscence, LVOT false aneurysm, aortic anastomosis false aneurysm, graft occlusion and mediastinitis/abscess, using CT as the primary modality, with reference also to MR appearances. CONCLUSION: As increasingly complex cardiac surgery is being performed more frequently, a comprehensive knowledge of the potential post-operative complications is essential when imaging such patients, to ensure accurate diagnosis and aid clinical management.

e307

Computed tomography and magnetic resonance imaging appearances of repaired transposition of the great arteries and their role in surveillance

Mathias, H.C., Lee, E.Y.P., Alison, D.B., Wood, A.
University Hospital of Wales, Cardiff, UK

LEARNING OBJECTIVES: To recognize the characteristic appearances of surgically corrected transposition of the great vessels and explain the role of CT/MR in surveillance of these patients. DESCRIPTION: Children with TGA are surviving longer into adulthood. They are now being followed up within adult clinics. Radiologists may encounter these patients in the general setting, where imaging is performed for unrelated reasons. Hence, a good overall understanding of the characteristic appearance is vital in interpretation of the relevant findings. We describe the CT and MR appearances of repaired congenital TGA, following both the Mustard/Senning and the arterial switch approach. Echocardiography as a modality of surveillance is more difficult in the adult patient with repaired TGA as compared with children. Due to the advance CT and MR technologies, these modalities are now becoming standard imaging tools for surveillance. We discuss the emerging role of CT and MR as surveillance tools in regular follow up of these patients. We highlight several common sequelae of the procedures that should be assessed, including right ventricular failure following the Senning procedure and pulmonary valve dysfunction after arterial switch. CONCLUSION: Patients with congenital TGA are surviving longer. It is important to recognize the appearances of repaired TGA on CT or MR and their role as surveillance tools, so that more meaningful interpretation of their imaging can be made.

e308

A pictorial review of corrected Tetralogy of Fallot

Mathias, H.C., Lee, E.Y.P., Alison, D.B., Wood, A.
University Hospital of Wales, Cardiff, UK

LEARNING OBJECTIVES: 1. Review the embryology and anatomy of Tetralogy of Fallot. 2. Describe the surgical procedures to correct Tetralogy of Fallot and their appearances on cross-sectional imaging. 3. To highlight the post-operative complications and the associated imaging findings. DESCRIPTION: Tetralogy of Fallot is the most common cause of cyanotic congenital heart disease. With improved surgical techniques the majority of children with this condition survive into adulthood. This has resulted in increasing numbers of adults requiring follow up imaging. Radiologists are also increasingly likely to encounter these patients in general imaging practice. For these reasons, it is important that all radiologists have an understanding of the anatomy and imaging appearances of this condition following corrective surgery. We review the embryology and anatomy relevant to the condition and present an illustrated summary of the appearances of repaired Tetralogy of Fallot and its complications on CT and MR. CONCLUSION: The learning points: 1. Emphasise the embryology and surgical procedures for correction of Tetralogy of Fallot to aid understanding of imaging findings. 2. Understand the various potential complications from corrective surgery and their appearances on cross sectional imaging to help further clinical management.

e309

Pericardial pathologies on computed tomography and magnetic resonance imaging

Lee, E.Y.P., Mathias, H., Wood, A.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: To highlight the importance of reviewing the pericardium and recognize the appearances of various pericardial pathologies. DESCRIPTION: CT thorax is a common radiological examination. Careful review of the pericardium sometimes reveals important findings, which alter clinical management and sometimes hold the key to patient's primary diagnosis. Though echocardiography is easily accessible, there are limitations with its low signal-to-noise ratio and difficulties in patients with obesity and COAD. We wish to provide a comprehensive illustration of pericardial pathologies including pericardial effusion of different aetiologies, pneumopericardium, congenital abnormalities and tumour, using CT as the primary modality and supplemented with MR images. These pathologies are often not suspected clinically, hence careful review of the area is crucial in aiding clinical diagnosis and management.

CONCLUSION: Careful review and understanding the appearances of various pericardial pathologies on CT and MRI is important to facilitate clinical diagnosis and management.

Vascular/interventional

POSTERS

p401

A pictorial review of the applications of magnetic resonance blood pool contrast agents

Harryman, O.A., Oh, T.C., Bailey, W.M., Farquharson, F.
Manchester Royal Infirmary, Manchester, UK

KEY LEARNING OBJECTIVES: To demonstrate how the applications of magnetic resonance (MR) blood pool contrast agents (BPCA) have revolutionized imaging of previously complex cases. DESCRIPTION: Gadofosveset is the first BPCA approved for clinical use in contrast enhanced magnetic resonance angiography (MRA) in the European Union. It reversibly binds to human serum albumin and remains in the blood for several hours. It can therefore be used for high resolution steady state imaging as well as conventional first pass MRA scans. Its T_1 relaxitivity rate is 5 times higher than standard gadolinium contrast agents. Steady state imaging with blood pool agents are comparable with the gold standard of digital subtraction angiography. We will demonstrate the applications of BPCA in a number of conditions which were previously complex and unpredictable to image, such as a spinal dural arteriovenous (AV) fistula, pelvic congestion syndrome and thoracic aortic dissection. We will illustrate the improvement of steady state over first pass imaging in peripheral MRA. We will include the excellent and accurate anatomical detail of thoracic outlet syndrome, intracavernosal caverjet imaging, an axillary AV malformation and common iliac and below knee deep vein thromboses. CONCLUSION: We are continuously discovering the scope of the applications of BPCA in MRA. We will illustrate the excellent and diagnostically accurate images achievable in a range of notoriously difficult conditions to image.

p402

Pictorial review of the various anatomical variants of the pulmonary veins

Odetoyinbo, T.O.[1], Binukrishnan, S.[2], Irion, K.[2], Holemans, J.[2], Fewins, H.[2], Jones, Y.[2], Hocchegger, B.[3], Verlang, H.[4]
[1]Royal Liverpool University Hospital, Liverpool, UK, [2]Liverpool Heart and Chest Hospital, Liverpool, UK, [3]Santa Casa de Porto Alegre, Brazil, [4]Irion Radiologia, Brazil

KEY LEARNING OBJECTIVES: Anomalous pulmonary venous drainage can be an isolated incidental finding, can be the sole cause of hypoxemia or can be part of a complex cardiovascular malformation. Some variants of the pulmonary venous anatomy have also been associated with atrial fibrillation. Some patients will be treated conservatively, but other patients will need vascular re-implantation or even more complex cardiovascular surgery. Recognition of an anomalous pulmonary venous system is also important in the planning of radiofrequency ablation for the management of supra-ventricular tachycardia. With the widespread use of MDCT, the importance of a better understanding of the most common anomalous anatomy is growing in importance, especially in symptomatic patients or patients who being worked up by cardiologists for ablation therapy. More than 14 different variants have been described in the literature. DESCRIPTION: We present a pictorial review of the various variants of the pulmonary venous anatomy, using multi-detector CT with multi-planar reconstructions and volume rendering where appropriate. We also state which of these have been associated with arrhythmias in the literature. CONCLUSION: An understanding of the various variants of pulmonary venous drainage is important in the assessment of patients with unexplained hypoxia, who are awaiting thoracic surgery or who are being assessed for radiofrequency ablation for cardiac arrhythmias.

p403

The Nutcracker Suite – A tale of two syndromes

Gatt, A.S., White, R.D., Sanjay, S.P.
Ninewells Hospital, Dundee, UK

KEY LEARNING OBJECTIVES: This educational poster aims to: 1. Differentiate two separate and unusual conditions, both of which are referred to as "Nutcracker syndrome" in the literature. 2. Raise awareness of these clinically important conditions, which are likely to be significantly underreported. DESCRIPTION: The first "Nutcracker syndrome" is compression of the left renal vein between the superior mesenteric artery (SMA) and abdominal aorta (AA). The second is also known as Wilkie syndrome and is characterized by compression of the third part of the duodenum between the SMA and AA. We present a pictorial review of the radiological appearances of both syndromes along with an overview of the clinical features through a review of current literature. CONCLUSION: Although both syndromes have similar pathogenesis, they are separate conditions with significant clinical sequelae. We hope that this review helps to differentiate these conditions, improve understanding and encourage the use of descriptive names rather than "Nutcracker syndrome".

p404

Radiographic findings following endovascular abdominal aortic aneurysm repair. What every radiologist needs to know

Thomson, A., Osborn, P., Atchley, J.T.M.
Queen Alexandra Hospital, Portsmouth, UK

Thousands of endovascular abdominal aortic aneurysm repairs (EVARs) have now been performed in the UK. The stents are easily visible and routinely appear on plain film radiography in patients imaged for other clinical indications. It is therefore necessary for any plain film reporting practitioner to be able to evaluate the normal and abnormal findings following EVAR. We demonstrate the normal radiographic findings of the commonly used EVAR stents and the main complications every reporting practitioner should look for when reviewing these images. We will particularly focus on the most easily appreciable plain film EVAR complication of stent migration.

p405

Imaging in fibromuscular dysplasia

Gurjar, N.V., Pherwani, A.D., Asquith, J.R.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVES: Fibromuscular dysplasia (FMD) is a group of non-atherosclerotic, non-inflammatory arterial diseases that most commonly affect the renal and carotid arteries. With the increasing use of CT and MR angiography in these areas, this pictorial review of the imaging of FMD aims to improve the recognition of the disease. In addition, the prevalence, aetiology, diagnostic imaging modalities and the management of FMD are discussed. DESCRIPTION: FMD is defined as an idiopathic, segmental, non-inflammatory and non-atherosclerotic disease of the musculature of arterial walls, leading to stenosis of small and medium sized arteries. The gold standard for diagnosing FMD remains catheter angiography, but non-invasive tests including MR angiography and multislice CT angiography are important and are used increasingly. We present cases of FMD affecting the renal and carotid arteries seen in our institution and review the images on different modalities of investigation. CONCLUSION: FMD is a relatively rare condition, but knowledge of the imaging appearances is essential while treating patients with vascular disease. This pictorial essay aims to improve the recognition of this disease and thus aid its management.

p406

The effect of a robust follow up system on IVC filter retrieval rates

Lee, L., Taylor, J., Belli, A.-M.

St George's Hospital NHS Trust, London, UK

PURPOSE: Successful IVC filter retrieval rates fall with time and serious complications are reported following attempts to remove filters after 3–18 months. Failed retrieval may be associated with clinical sequelae. It is usually left to the referring clinician to arrange retrieval, sometimes resulting in considerable delay. This study explores whether retrieval rates are improved if Interventional Radiologists organize patient follow up. MATERIALS/METHODS: In May 2008 a proactive approach to the follow-up of patients undergoing retrievable filter placement was implemented. At the time of filter placement a report was issued to the referring consultant notifying them of the advised time frame for filter retrieval. Teams were contacted to arrange retrieval within 30 days. We compared this with our previous practice for the preceding year. RESULTS: May 2007 to April 2008: 28 filters inserted, 14 retrievals attempted, 10 successfully, 2 retrievals abandoned, 2 technical failures. Of the 14 patients where retrieval was not attempted 5 patients had continuing contraindications to anticoagulation, 5 patients died and 4 filters remained *in situ* with no clear indication. May to October 2008: 15 filters inserted, 10 retrievals attempted, all successfully. 1 patient moved hospital, 4 had continuing contraindications to anticoagulation. Median time to retrieval attempt fell from 10 days (range 3–292 days) to 8 days (range 2–114 days). p=0.052 for the rate of successful retrievals following the change in practice. There were no complications. CONCLUSION: A proactive approach to patient follow-up has improved filter retrieval rates.

p407

Factors predicting the success of tunnelled central line (TCL) placement by interventional radiologists. A multivariate analysis

Tapping, C.R., Mallinson, P.I., Scott, P., Ettles, D.F., Robinson, G.J.
Hull Royal Infirmary, Hull, UK

PURPOSE: To investigate the factors predicting the success and lifespan of radiologically placed TCL. MATERIALS/METHODS: 64 consecutive patients who had a TCL sited by consultant interventional radiologist between August 2005 and August 2006 (n=64) were retrospectively reviewed. Four patients were excluded; two sets of notes were unavailable and two patients' TCL were still *in situ* at the time of study. Pre-interventional history, procedural records and outcome were investigated. Uni- and multi-variate logistic regression analysis and Chi-squared test were performed. RESULTS: The initial success rate was 59 of 60 (98.5%). The single immediate complication (<24 h) was a kinked catheter, which required repositioning. Early morbidity (>24 h to <30 days) was 6.6% (n=4) comprising of three confirmed infections and a 10% pneumothorax, which spontaneously resolved. Late morbidity (>30 days) was 5% (n=3) comprising of two confirmed infections and one blockage. TCL longevity ranged from 4 days to 280 days (mean 67.5 days). Significant factors (p<0.05) associated with longevity were haemoglobin, white cell count and albumin. Early complications and a reduced length-of-time *in situ* were associated with a raised c-reactive protein (p=0.007). 25 (40%) patients had a previous TCL at the same anatomical location and this was associated with early complications (p<0.001). Subsequent TCL placement in the left internal jugular vein (IJV) was more successful (n=6, range 15–280 days, average 134 days) than the right IJV (n=19, range 5–50 days, average 22 days). CONCLUSION: Rotating the site of subsequent TCL and using the left internal jugular vein if possible are important in reducing early complications.

p408

Development and characterisation of a carotid flow phantom

Mirsadraee, S.[1], Evans, A.[2], Korossis, S.[2], Scott, J.[1], Kessel, D.[1]
[1]Leeds Teaching Hospitals, Leeds, UK, [2]Leeds University, Leeds, UK

PURPOSE: Doppler ultrasound is used to investigate carotid artery disease. Variability between different observers, ultrasound machines and vascular laboratories are well recognized. The aim of this study was to develop a flow phantom suitable for calibration of machines, training and certification and investigation of models of stenoses. Progress and results is discussed. METHODS: Components were developed to mimic tissue, blood vessels, blood and pulsatile flow. Different materials and approaches were evaluated for each element of the phantom. Properties assessed included transmission of sound, viscosity, safety, and availability. Details of the different constructions will be given during the presentation. The existing version is described below: The "vessel" is suspended in semisolid tissue mimicking material (TMM) within a sealed container and connected to a pump. Blood mimicking solution (BMS) comprised nylon scattering particles (Orgasol) suspended in a water based fluid. The pump generates pulsatile flow in the phantom. The characteristics of materials used were assessed using ultrasound/CT. RESULTS: Polyvinyl alcohol (PVA) is a suitable TMM, it is sonolucent and the velocity of ultrasound in PVA is similar to water. Insonation demonstrates pulsatile flow in the phantom with both colour flow and spectral traces obtained from the BMS. Supporting the "artery" in TMM reduces reverberation artefacts. An alternative model using moulded rubber to produce sonolucent tubes, the speed of sound within these was significant higher. CONCLUSION: A pulsatile flow Doppler phantom has been developed and reproducible signals were detected. A test object that reproduces vascular stenoses is in production to study flow dynamics.

p409

Vascular injuries of the thoracic wall

Hawkins, M., Tweed, K., Anthony, S., Uberoi, R.
Oxford Radcliffe Hospitals Trust, Oxford, UK

LEARNING OBJECTIVES: 1. To illustrate the normal vascular anatomy of the thoracic wall. 2. Discuss imaging techniques and findings following traumatic or iatrogenic injury to the thoracic wall vessels using contrast enhanced MDCT and angiography. 3. Have an understanding of the role interventional radiology in the management of injuries to the thoracic wall vessels. DESCRIPTION: Vascular injuries involving the vessels that supply the thoracic wall are usually the result of penetrating or blunt trauma; much less commonly the injury is iatrogenic. The blood supply of the thoracic wall is principally derived from the paired intercostal arteries which supply the flanks, and the internal thoracic and superior epigastric arteries which supply the anterior thoracic wall. Contrast enhanced MDCT is useful in patients with suspected haemorrhage within the chest as it often identifies the bleeding point which can then guide subsequent angiography and endovascular treatment. When a bleeding point is not identified the location of other findings such as haemothorax, contusion, rib fractures and the position of recently inserted drains can sometimes help localise the source of haemorrhage. CONCLUSION: MDCT should be considered in all patients with suspected intrathoracic haemorrhage to attempt to localise the source of blood loss. Although injuries to the vessels supplying the thoracic wall are not common, they are often amenable to endovascular treatment and therefore haemorrhage from the thoracic wall vessels should be considered in all patients following trauma or interventional procedures in the chest.

p410

Imaging of the complications following open repair of abdominal aortic aneurysms

Budak, M.J., Asquith, J.R., Pherwani, A.D., Morgan, R.H., Wong, J.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVES: To illustrate the role of multislice CT and angiography in the evaluation of patients with acute and chronic complications of open repair of abdominal aortic aneurysms (AAA). DESCRIPTION: Open surgery remains the "gold standard" for the successful long term repair of AAA. Through the increasing use of CT scanning particularly with endovascular repair (EVAR), there is now a greater awareness of the complications following

EVAR. However, the literature remains limited regarding the imaging appearances of the early and late complications following open repair. This pictorial review aims to address this and illustrates a range of complications after surgical AAA repair. This includes graft infection, aorto-enteric fistula and anastomotic complications such as endoleak, pseudoaneurysm and intimal flaps. CONCLUSION: Multislice CT and angiography are useful in detecting and characterizing the complications following open AAA repair. Awareness of such potential post operative complications is essential for management of these patients to decrease morbidity and mortality.

p411

The role of embolisation in the management of abdominal trauma: A review

Wallis, A.G.[1], Kelly, M.[2], Jones, L.[2]
[1]United Hospitals Bristol NHS Trust, Bristol, UK, [2]North Bristol NHS Trust, Bristol, UK

PURPOSE: The last 20 years have seen a shift in the management of abdominal trauma from routine operative care to selective non-operative management (NOM). We will present an illustrated review demonstrating how therapeutic embolisation can extend the role of NOM for blunt and penetrating trauma to solid abdominal viscera. MATERIALS/METHODS: English language publications were reviewed. We present cases of trauma and highlight the role of CT reconstructions in guiding catheter selection. RESULTS: Haemodynamic instability is an accepted indication for surgical management. NOM is successful in over 80% of patients with low-grade splenic injury, in whom failure of NOM is most likely due to vascular complications including pseudoaneurysm. Embolisation provides an elegant solution with failure rates as low as 4%, and is indicated where CT demonstrates contrast blush and a bleeding point is identified at angiography. Complications arising due to intra-arterial embolisation are rare, but in higher grade injuries embolisation is more likely to fail and surgical intervention may be required. Over 80% of injuries to the liver and kidneys heal spontaneously. NOM of these is highly successful. Where contrast blush is demonstrated on CT, disruption of the portal triad, arterio-portal fistula, pseudoaneurysms, arteriovenous or arteriocalcyceal fistulae must be suspected and in such cases embolisation can result in excellent preservation of hepatic and renal tissue. CONCLUSION: In selected haemodynamically stable patients with vascular complications arising from abdominal trauma, embolisation allows extension of the role of NOM. CT must be immediately available for trauma patients with adequate interventional and diagnostic radiological expertise.

p412

Temporary balloon catheter arterial occlusion prior to nephrectomy

Nayeemuddin, M., Chidambaram, V., Golash, A., Luscombe, C.J., West, D.J., Asquith, J.R.
University Hospital North Staffordshire NHS Trust, Stoke-on-Trent, UK

KEY OBJECTIVES: A retrospective study to analyse the surgical benefits and the risks in performing temporary renal artery balloon occlusion prior to nephrectomy for renal cancer. MATERIALS AND METHODS: The aim of this technique is to decrease the vascularity and engorgement of a kidney and its tumour in order to facilitate nephrectomy. This procedure involves percutaneous transfemoral artery catheterisation and temporary balloon occlusion of the renal artery with a 5 Fr double lumen occlusion catheter. The procedure is performed while the patient is intubated and ventilated immediately prior to nephrectomy. Patients who underwent this procedure were identified from the Radiology Information System. The available surgical operative notes of these patients were reviewed for success of the technique and its complications. RESULTS: We identified 10 cases of renal carcinoma in which renal artery temporary balloon occlusion was performed. In all of the cases there was no evidence of a high intra-operative blood loss. There were no major complications and no evidence of balloon migration during the surgery. CONCLUSION: Percutaneous transfemoral renal artery balloon occlusion is a safe, reliable and effective means to control the operative risk of haemorrhage. This technique facilitates laparoscopic nephrectomy. Preoperative embolisation is not necessary when this technique is used.

e413

Carotid artery wall thickness and intima media thickness. Comparison between ultrasound and multidetector row CT angiography

Saba, L.[1], Sanfilippo, R.[1], Farina, D.[1], Rubin, M.[2], Montisci, R.[1], Mallarini, G.[1]
[1]A.O.U. Cagliari, Cagliari, Italy, [2]New York University, NY, USA

PURPOSE: Prospective studies have shown that increased the thickness of the carotid wall is a powerful predictor of coronary and cerebrovascular complications. Our purpose was to assess the agreement between multidetector row CT angiography (MDCTA) and colour Doppler ultrasound (CD-US) in the measurement of the carotid artery wall thickness (CAWT) and intima-media-thickness (IMT). MATERIALS/METHODS: 97 patients (64 males, 33 female; mean age 61 years; age range 39–82 years) were prospectively analysed. We measured in each patient CAWT using MDCTA and IMT using CD-US by applying a digital calliper. Continuous data were described as the mean value ± standard deviation (SD) and they were compared with a Mann-Whitney test. A p-value < 0.05 was considered to mean statistical significance. Bland-Altman statistics was used to measure the agreement between MDCTA and CD-US. RESULTS: CAWT ranged from 0.5 mm to 1.53 mm, with a mean value of 0.9072 mm. IMT ranged from 0.46 mm to 1.5 mm, with a mean value of 0.8839 mm. By analysing Bland-Altman plot we observed an excellent agreement between CD-US and MDCT with a bias between methods of 0.023±0.0424 mm and limits of agreement from -0.06 to 0.106. Correlation coefficient r was 0.9855 (95% CI 0.9808–0.989). Mann-Whitney test indicated a p-value of 0.377. CONCLUSION: Our results indicated an optimal agreement between MDCTA and CD-US in the measurement of CAWT and IMT. MDCTA showed itself as an highly reproducible method in measuring CAWT. We can assume that CAWT corresponds to the ultrasound concept of IMT.

e414

Comparison between percentage methods and mm-method in the quantification of carotid artery stenosis

Saba, L., Sanfilippo, R., Montisci, R., Mallarini, G.
A.O.U. Cagliari, Cagliari, Italy

PURPOSE: The purpose of this study was to compare three percentage carotid artery measurement methods (NASCET – ECST – CSI) and one mm-method (mm direct) in order to evaluate the difference and correlation between them. MATERIALS/METHODS: 398 patients (293 males, 105 female; mean age 62 years; age range 35–87 years) studied by using a MDCT scanner, were retrospectively analysed. Each carotid stenosis was measured according to NASCET, ECST, CSI and mm direct methods). Kolmogorov-Smirnov Z test was used to test the normality of continuous variable groups and Wilcoxon test was applied to compare the measurement methods. Correlation coefficients were also calculated by using nonparametric Spearman correlation. RESULTS: We excluded 27 vessels because a near-occlusion condition was detected; in the remaining 769 carotid arteries, a strength correlation according to quadratic regression was observed between NASCET and ECST methods (Spearman's rho coefficient = 0.980; p<0.0001). An inverse correlation according to linear regression was observed between NASCET and mm-measurement (Spearman's rho coefficient = -0.995; p<0.0001). CSI index shows a quadratic regression with NASCET, a linear regression with ECST and an inverse quadratic regression with direct mm-measurement (Spearman's rho coefficient

= 0.976, 0.961 and -0.971, respectively). Wilcoxon test indicated a statistically significant difference between the three percentage methods groups (p<0.001). CONCLUSION: Our study results indicate a quadratic regressive correlation between NASCET and ECST, and a inverse linear regressive correlation between NASCET and mm-measurement: the mm measurement of stenosis can reliably predict NASCET-type, ECST-type and CSI-type percent stenosis.

e415

Angio CT preoperative evaluation for anterolateral thigh flap harvesting

Saba, L., Atzeni, M., Ribuffo, D., Mallarini, G.
A.O.U. Cagliari, Cagliari, Italy

PURPOSE: The anterolateral thigh flap (ALTF) is now considered the first choice among most of the commonly used soft tissue flaps. Among the last generation of angiographic diagnostic techniques, multidetector computed tomography angiography (MDCTA) has emerged as an outstanding non-invasive operator independent option. The aim of this work was to demonstrate the usefulness of (MDCTA for preoperative planning in patients undergoing ALTF procedure. MATERIALS/METHODS: Nine consecutive patients, six males and three females, were considered for oral or lower extremity reconstruction with the ALT flap. After written informed consent was obtained from all patients, a preoperative MDCT angiography was performed for surgical planning. RESULTS: Accurate identification of septocutaneous and muscolocutaneous perforator vessels were achieved in each patients. Location, course and anatomic variations of these perforators vessels were reported. CONCLUSION: Unlike other soft tissue flaps or muscular flaps where surgical anatomy is very constant, the vascular anatomy of the ALT flap has many possible important variations. For this reason, surgeons have looked for an instrumental technique that could offer important preoperative information. MDCTA allows a study of the donor area. Evaluation of the best perforator vessels before surgery allowed us to choose preoperatively between right or left thigh in order to plan the flap using the best vascularised tissue supplied by the dominant perforators with regards to its origin, course and calibre. The high sensitivity, specificity and the easiness to interpret have made MDCTA an invaluable help when planning an ALT flap.

e416

Outcomes of iliac intervention by combined axillo femoral approach

Damodharan, K.[1], Thava, V.R.[2]
[1]Leicester Royal Infirmary, Leicester, UK, [2]Lincoln County Hospital, Lincoln, UK

PURPOSE: To determine the technical and clinical success rates of iliac intervention by combined axillo femoral approach, which has been described by the last author [1] in patients who had failed via the retrograde femoral approach. MATERIALS/METHODS: Retrospective review of case notes of patients who have had iliac intervention by the above mentioned approach for up to 2 years after the procedure was done to assess the technical and clinical outcome rates as well as the complication rates. RESULTS: 16 iliac lesions in 9 patients were treated between 2004 and 2005. The lesions varied between types TASC A-C according to the TASC (II) classification of aorto-iliac lesions [2]. The distributions of lesions treated are as follows: 5 CIA, 4 EIA occlusions and 2 CIA, 6 EIA stenoses. Primary patency was established in all the patients. 5 patients were asymptomatic at 3-monthly and 12-monthly follow up assessments and no evidence of recurrence was documented in the notes up to 3 years following the procedure. 1 patient died of CVA within 3 months of the procedure. 3 patients remained symptomatic at 3 months follow up and 1 patient underwent surgical revascularisation which failed. One patient developed localised external iliac perforation during angioplasty which was successfully stented. CONCLUSION: The success rates and complication rates are within the recommended standards considering the fact that these were difficult patients who had failed traditional retrograde femoral approach [2, 3].

e417

Intraindividual crossover comparison of gadobenate dimeglumine and gadopentetate dimeglumine for MR angiography of the peripheral arteries

Leiner, T.[1], le Maire, T.[2], Miller, S.[3], Thurnher, S.[4], Herborn, C.U.[5], Michaely, H.[6], Kramer, H.[7], Vanzulli, A.[8], Vymazal, J.[9], Wasser, M.10
[1]Maastricht University Hospital, Maastricht, The Netherlands, [2]Catharina Hospital, Eindhoven, The Netherlands, [3]Eberhard-Karls University, Tübingen, Germany, [4]Hospital of St John of God, Vienna, Austria, [5]University Medical Center, Hamburg-Eppendorf, Germany, [6]University Hospital Mannheim, Mannheim, Germany, [7]Ludwig Maximilians University, Munich, Germany, [8]Hospital Niguarda Ca' Granda, Milan, Italy, [9]Homolce Hospital, Prague, Czech Republic, [10]Leiden University Medical Center, Leiden, The Netherlands

PURPOSE: To compare gadobenate dimeglumine and gadopentetate dimeglumine in patients undergoing contrast-enhanced MRA (CE-MRA) for evaluation of PAOD. MATERIALS/METHODS: 96 patients (mean age: 63.7 years) with PAOD (Fontaine's: IIb [90%], III [5%], and IV [5%]) underwent 2 identical CE-MRA examinations at 1.5 T using 3D spoiled GRE sequences with 0.1 mmol kg^{-1} of gadobenate dimeglumine and gadopentetate dimeglumine administered in randomised order. Images were assessed by 3 blinded readers for vessel anatomical delineation, detection/exclusion of pathology and global diagnostic preference at 23 segments (pelvis, thigh and calf). Overall global diagnostic preference was assessed for each examination. Between-group comparisons were made with the Wilcoxon signed-rank test. Contrast-to-noise ratios (CNR) were compared in each territory. RESULTS: 92 patients received both agents. Technical failure rate were lower with gadobenate dimeglumine (4% of segments vs 12%, p<0.0001), and more vascular stations were rated good/excellent with gadobenate dimeglumine (87% vs 74%; p<0.0001). Highly significant (p=0.0001; all evaluations) preferences for gadobenate dimeglumine were expressed by each reader for each qualitative endpoint in each vascular territory. Readers 1, 2 and 3 reported overall global diagnostic preference for gadobenate dimeglumine in 75 (82%), 75 (82%) and 70 (76%) patients, respectively, compared with 4 (4%), 7 (8%) and 8 (9%) patients, respectively, for gadopentetate dimeglumine (p=0.0001; all readers). Significantly (p=0.0001) higher CNR was noted for gadobenate dimeglumine in each vascular territory. Safety findings were comparable between the two agents. CONCLUSION: At 0.1 mmol kg^{-1} gadobenate dimeglumine performed significantly better than gadopentetate dimeglumine for CE-MRA of the peripheral arteries.

e418

IR to the rescue. Endovascular techniques for managing complications relating to central venous catheter placement

Narayanaswamy, S., Adejolu, M., Wilkins, C.J., Huang, D.Y.
King's College Hospital, London, UK

KEY LEARNING OBJECTIVES: To present a pictorial review of various complications associated with the placement of central venous catheter. To illustrate the endovascular approaches which could be employed by interventional radiologists (IR) in the management of these complications. DESCRIPTION: The placement of the central venous line can be undertaken by not only radiologists but also other trained physicians or increasingly, nurse specialists. Despite of the implementation of the NICE guideline in 2002, not infrequently, insertions of central venous catheter are performed without imaging guidance, with potentially increased complication rate. Although uncommon, some of these complications may be life threatening

and may require prompt management either surgically or with endovascular techniques. We aim to present our experience in managing complications associated with central venous catheter placement with endovascular techniques. Variously, these consists of retrieval of a migrated catheter fragment from the pulmonary trunk, utilisation of a covered stent in removing a catheter placed in innominate artery, the use of a variety of snare catheters and wires in catheter repositioning, and line stripping for fibrin sheath formation. Management for complicating central venous obstruction following long term central venous catheter placement with stents and pseudoaneurysm formation following inadvertent arterial puncture during line insertion are also illustrated. CONCLUSION: Endovascular management plays an important role in dealing with complications arise from central venous catheter placement. Re-insertion of a central venous catheter, or a potential surgery, can be avoided if these complications are managed by interventional radiologists successfully.

e419
Is computer simulation the future of endovascular intervention training?

Morse, R.[1], Gafoor, N.F.[1], Cousens, C.[1], Kakani, N.[2]
[1]Peninsula Radiology Academy, Plymouth, UK, [2]Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: Computer simulation in interventional radiology. DESCRIPTION: Interventional computer simulations, is a new concept in the way trainees in interventional radiology are trained. Whilst traditional training largely focused on training hands on during interventional procedures on patients, new emerging training techniques are using computer-guided simulators for training. Traditional training is dependent on caseload, variety and training centres capability. Often it is also dependent on the trainee's level of confidence as to the type and complexity of the procedure they will be able to complete with out assistance. Getting such experience can some times prove to be difficult with ever increasing trainees in radiology as well as from other specialties such as vascular surgery. Spending time on a simulator will, however, improve skills, boost confidences and increase familiarity with the procedure and equipment allowing them to be translated to procedures. This may indeed be able to reduce undesirable complications due to lack of experience during actual procedures. CONCLUSION: Validating such training will be essential, in our current climate. Our aim is to reflect our experience in the largest radiology academy training scheme in Europe and look at methods to validate this training by comparing knowledge and skill levels pre and post simulator training. We also look at possibilities of this type of simulation being used to retain interventional skills even following completion of training, drawing parallels with airline pilot training.

Gastrointestinal & abdominal imaging

p501
Local accuracy of CT of the acute abdomen

Sarno, A.[1], Davies, R.[2], Britton, I.[2]
[1]Keele University Medical School, Stoke-upon-Trent, UK, [2]University Hospital of North Staffordshire, Stoke-upon-Trent, UK

PURPOSE: To establish the local sensitivity and specificity of CT of the acute abdomen. MATERIALS/METHODS: 142 records were obtained from the CRIS radiology database of patients who had presented for a CT of an acute abdomen out-of-hours between January 2007 and September 2007. CT reports were compared with clinical outcome, with a 1 year lead time, by review of subsequent radiology records (38), case notes and histopathology reports (68), and theatre/operative records (17). 19 patients were lost to follow-up as the case notes were unavailable. Mismatch between original CT report and clinical outcome were categorised as technical, perceptive, interpretive and clinical outcome discrepancies (COD). RESULTS: Mismatches for all errors yielded a sensitivity of 97.1% and a specificity of 50.0% with a PPV of 91.9% and an NPV of 75.0%. When referrer error (technical errors and clinical outcome discrepancies) were removed for the purposes of statistical analysis, the diagnostic accuracy of CT improved to a sensitivity of 99.0%, specificity of 69.2%, PPV of 96.2% and NPV of 90.0%. CONCLUSION: Sensitivity compares favourably with international standards (99.0% vs 90–95%). Specificity is reduced (69.2% vs 75–80%) in this study because of overcalling small bowel thickening in 2 patients, small bowel obstruction in 1, and mesenteric lymphadenopathy in 1. Comments on wall thickening in the unprepared small bowel should be verified with a second investigation if the patient's condition allows. Clinical diagnosis should not overrule radiological diagnosis without joint review of the case.

p502
More than just a telescope-intussusceptions

Mohd-Isa, Z., Charran, A., Au-Yong, K.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVES: To illustrate the various causes and imaging appearance of intussusceptions. To recognize the different features of intussusceptions between adult and children. DESCRIPTION: Spontaneous or idiopathic intussusception in adults is rare and it is the aetiology of less than 1% of all intestinal obstruction. An underlying cause is usually present (>90%) and can be due to intraluminal lesions, malignancy, adhesions and post-surgical complications. In contrast, over 90% of intussusceptions occurring in children have no pathologic lead point and less than 10% are due to Meckel's diverticulum, polyp, lymphoma, etc. We will present high quality images using plain abdominal radiograph, ultrasound and cross sectional CT to illustrate enteroenteric, colocolic, and enterocolic intussusceptions. CONCLUSION: To recognize the different pathologies and imaging appearances of intussusceptions affecting adults and children is essential to facilitate diagnosis and directing appropriate treatment.

p503
Cystic lesions of the spleen – A pictorial review of ultrasound appearances

Thomas, R.L.
South West Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: Cystic masses are rarely encountered in the spleen. However, many different disease processes may produce appearances ranging from simple cysts to solid masses with cystic components. DESCRIPTION: With this poster we aim to provide a pictoral review of ultrasound appearances of cystic splenic masses, including congenital cysts, pseudocysts and cystic masses secondary to infection or neoplasia, supplemented by correlative imaging. We would show this poster alongside a sister poster about solid splenic lesions as easy reference for the reader. CONCLUSION: Ultrasound practitioners need to be aware of the appearance of cystic lesions in order to establish working differential diagnoses and thereby guide further clinical management.

p504
Solid focal lesions of the spleen – A pictorial review of ultrasound appearances

Brown, S.E., Raju, V., Freeman, S., Gormally, J.
South West Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: Solid lesions within the spleen are a relatively uncommon finding, yet recognition is frequently relevant. Together with clinical history, ultrasound examination is useful in establishing a differential diagnosis, and may guide further imaging and investigation. DESCRIPTION: This poster provides a pictoral review of the ultrasound appearances of solid splenic masses and correlating imaging. The lesions covered include lymphomas, metastases, primary splenic tumours, haemangiomas and other miscellaneous rare conditions. We would like to show this poster alongside a sister poster about cystic splenic lesions as easy reference

for the reader. CONCLUSION: Ultrasound practitioners need to be aware of the appearances of these solid lesions in order to establish working differential diagnoses and thereby guide further clinical management.

p505

Post-operative CT imaging findings in patients with Ivor Lewis oesophagectomy

Dyde, R.A., White, D., Hanlon, R., Wieshmann, H.N.
University Hospital Aintree, Liverpool, UK

KEY LEARNING OBJECTIVES: This pictorial review describes the typical CT imaging patterns in patients following Ivor Lewis oesophagectomy. It aims to familiarize the reporting radiologist with the characteristic imaging features that will allow identifying postoperative leak. DESCRIPTION: The University Hospital Aintree is a tertiary referral centre for oesophageal cancer. Post operative leak following Ivor Lewis oesophagectomy at the oesophagogastric anastomosis is a relatively common complication. These patients are usually too unwell to tolerate water soluble contrast swallow examination and therefore CT is the commonly used imaging modality. The postoperative imaging findings can often be challenging in particular for the junior radiologists who are not familiar with the CT appearances in these patients. METHOD: A retrospective review of all patients investigated with CT following Ivor Lewis oesophagectomy over a 12 month period. We identified typical CT imaging features that can be employed by the reporting radiologists to diagnose a leak at the anastomosis site. CONCLUSION: Knowledge of characteristic CT features in patients following Ivor Lewis oesophagectomy can guide the reporting radiologists to identify post operative complications including a leak.

p506

Gallbladder diseases on CT

Nayeemuddin, M., AuYong, K.J., Coupe, N.J., Vessal, S.
University Hospital of North Staffordshire, Newcastle-under-Lyme, UK

KEY LEARNING OBJECTIVE: A pictorial review using CT of the spectrum of appearance of gallbladder disease. DESCRIPTION: Gallbladder disease includes inflammation, infection, stones, obstruction and neoplasia. Although often not the initial study of choice in gallbladder disease, CT can be used in diagnostic challenges or to further characterize complications of gallbladder disease. The aim of this exhibit is to demonstrate the range of pathology and complications arising from gallbladder disease using high quality CT images. Gallbladder diseases are common and are important for radiologists to diagnose due to their serious complications. Recognition of the complications of gallbladder disease can allow appropriate subsequent monitoring, management and intervention. Our exhibit uses CT with multiplanar reformats and post-processing of images to demonstrate the following gallbladder pathologies: hydrops, empyema, acute acalculous cholecystitis, emphysematous cholecystitis, cholelithiasis, necrosis, perforation, cholecystocolic fistula, carcinoma, cysts, porcelain gallbladder. CONCLUSION: Radiologists must be familiar with CT imaging appearance of gallbladder disease in order to allow for prompt and timely intervention where required. Patient's morbidity and mortality can then ultimately be reduced.

p507

CT findings in blunt liver trauma: A pictorial review

Jeyaratnam, R.[1], Britton, I.[1], Kong, A.Y.[1], Khan, S.[2]
[1]University Hospital of North Staffordshire, Stoke-On-Trent, UK, [2]Queen's Hospital, Burton-On-Trent, UK

KEY LEARNING OBJECTIVES: 1. Identify the CT findings in liver injury. 2. Apply the American Association for the Surgery of Trauma (AAST) liver injury scale to liver trauma. DESCRIPTION: The liver is the second most commonly injured organ in blunt abdominal trauma. It is associated with a high mortality of between 4% and 11%. Traditionally surgery has been the mainstay of management. With improvements in CT technology, there has been increased visualization of liver injuries which has allowed better assessment and grading and now around 90% of patients are treated conservatively. Radiologists therefore need to be confident in identifying and grading liver injury on CT. We illustrate the CT findings of patients with blunt liver injury presenting to a major trauma centre. Findings include liver lacerations, subcapsular haematomas, intraparenchymal haematoma, active haemorrhage, and vascular and biliary injury. We discuss the imaging in the context of the AAST liver injury scale. We also discuss common pitfalls associated with CT imaging of the liver such as beam hardening artefact from the ribs, contrast in the stomach causing a linear artefact or hypo-attenuating fatty liver masking a low attenuation haematoma. CONCLUSION: Liver injury is common in blunt abdominal trauma and is associated with a high mortality. CT is the imaging modality of choice in liver injury and its imaging finding are important in triaging patients into their subsequent management. For these reasons radiologists need to be confident with diagnosing and grading liver injuries.

p508

Patterns of fat accumulation in the liver

Jeyaratnam, R., Watson, N., Vessal, S., Britton, I.
University Hospital of North Staffordshire, Stoke-On-Trent, UK

KEY LEARNING OBJECTIVES: 1. Recognize the imaging appearances of various patterns of fatty accumulation in the liver. 2. Understand criteria for diagnosing fatty liver disease using ultrasound, CT and MR. DISCUSSION: Between 20% and 30% of the adult population in developed countries have a fatty liver disease, increasing to 45% in people with high alcohol intake and 75% in obese people. In general radiology practice, the most common abnormality of the liver found at cross-sectional imaging is fat accumulation. The most frequent pattern is diffuse fat accumulation. We present this and rarer patterns including focal deposition, diffuse accumulation with focal sparing, multifocal and perivascular deposition. These are harder to recognize and often cause confusion with neoplastic or inflammatory conditions. Radiologists need to be aware of the different imaging manifestation of fatty liver as seen on ultrasound, CT and MR, and how to problem solve avoiding unnecessary invasive procedures. Strict criteria should be applied for the diagnosis of fatty liver whichever modality is used. Ultrasound, CT and MRI criteria and accuracy will be discussed with examples. Additional discriminators such as location, morphology, contrast enhancement, and mass effect will be discussed with examples. CONCLUSION: As numbers of people with fatty liver increase, the rarer patterns of fat accumulation in the liver are imaged more often. Radiologists need to be confident in diagnosing these by non invasive algorithms to save the patient unnecessary or invasive tests.

p509

Ultrasound guided liver biopsies: Is one pass enough

Shrivastava, V., Khan, M., Latimer, J.
North Tees Hospital, Stockton, UK

PURPOSE: Traditionally, clinicians aim to provide three liver cores to increase the histology yield. However, the potential for complications increases with increasing the number of samples. At our hospital, the radiologist takes a single sample and if macroscopically adequate, no further samples are taken. We audited our results to determine whether a single macroscopically adequate sample provides sufficient tissue for histology with reduced complications. METHODS: A retrospective review of 161 patients who had an ultrasound guided liver biopsy over a 2 year period from October 2006 to October 2008. Data was obtained from a local radiology database and from review of the case notes. A macroscopically satisfactory liver core was taken as one that was not fragmented and that rapidly sank when placed in formalin. Data were analysed using SPSS version 11. RESULTS:

Patients were divided into two groups; 134 of 161 had a single core whilst 27 of 161 patients had two or more liver core samples. There was no difference between the two groups of patients with regard to sample adequacy for histology. Of those that had two or more samples, 18 of 27 were targeted for a focal liver lesion. The incidence of shoulder tip pain was significantly higher in the group of patients that had two or more biopsies 17 vs 22, $p<0.06$. CONCLUSION: In cases where a macroscopically satisfactory liver core sample on the first pass there is no need for subsequent cores to be obtained as this increases the potential for complications.

p510

Appearances of focal liver lesions

Haslinger, T.G., Hill, R., Chiphang, A.
Southport District General Hospital, Southport, UK

KEY LEARNING OBJECTIVES: To illustrate the typical appearance of the most common focal liver lesions using different imaging modalities and to highlight some of the optimal imaging modalities for detecting and diagnosing focal liver lesions. DESCRIPTION: Characterization of focal liver lesions contributes to a significant amount of imaging workload performed by the radiology department and using an appropriate modality can reduce some unnecessary examinations. With increasing use of imaging in clinical care in recent years, there has been an increase in the incidental finding of focal liver lesions. There are a wide number of causes of focal liver lesions, both benign and malignant like cysts, abscesses, focal nodular hyperplasia, adenomas, haemangiomas, hepatocellular carcinomas, cholangiocarcinomas, metastatic lesions, but it is often difficult to characterize a lesion using standard ultrasound techniques alone. Therefore, additional imaging modalities are often required to further characterize these lesions to reach a definitive diagnosis including CT, MRI and contrast enhanced ultrasound scan. This pictorial review aims to illustrate the imaging characteristics of the most common benign and malignant focal liver lesions using a wide variety of imaging modalities including ultrasound, contrast-enhanced ultrasound, CT and MR imaging, and how these different modalities may be useful to determine the aetiology of a lesion. CONCLUSION: To illustrate and highlight the imaging characteristics of both benign and malignant focal liver lesions to aid clinical management.

p511

Autoimmune pancreatitis: MR features before and after steroid therapy

Albazaz, R., Guthrie, A., Verbeke, C.S., Sheridan, M.
St James's University Hospital, Leeds, UK

KEY LEARNING OBJECTIVES To review characteristic MR patterns of autoimmune pancreatitis (AIP) and their changes following steroid therapy. DESCRIPTION: AIP is an increasingly recognized form of chronic pancreatitis characterized by a steroid-responsive, fibroinflammatory process that predominantly involves the pancreas. AIP mimics pancreatic cancer both clinically and radiologically, with patients typically having obstructive jaundice, weight loss and focal or diffuse pancreatic enlargement. Differentiation from pancreatic cancer is crucial to prevent unnecessary surgery and allow appropriate treatment with steroids, which often lead to a dramatic improvement. Diagnosis is usually made when typical imaging features are supported by serological and/or histological findings. When the diagnosis is uncertain, it may be confirmed by normalization of imaging features after steroid therapy. The exhibit focuses on MR features of AIP at diagnosis and up to 12 months after steroid therapy, which are poorly reported in comparison with appearances on CT and ERCP. Diagnostic features on T_1-weighted images include pancreatic enlargement, a distinctive striking reduction in signal intensity on water excitation sequences, and reduced contrast enhancement. On T_2-weighted images there is typically increased signal intensity of the gland with a hypointense capsule-like rim that shows delayed contrast enhancement. Characteristic changes of the pancreaticobiliary tree are also illustrated. Following steroid therapy, there is rapid but variable normalization of these findings. Clinical, histological and laboratory features of AIP are also described. CONCLUSION: The exhibit illustrates characteristic MR features of AIP that are useful in allowing differentiation from pancreatic cancer and in monitoring response after steroid therapy.

p512

Imaging findings post pancreatic surgery and pancreatic transplant – A pictorial review

Yadavali, R.P., Biswas, S., Healey, P., Evans, J.
Royal Liverpool University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: Imaging appearances following surgery for pancreatic pathology and post pancreatic transplant. DESCRIPTION: Various procedures are performed to treat pancreatic pathology which may be by conventional surgery or less invasive interventional procedures. Benign pancreatic conditions include pancreatitis with/without its complications and benign tumours. Malignant pathology includes various types of cancers. The type of procedure performed depends upon the underlying condition and the procedure can be curative or palliative. Cyst-gastrostomy, cyst-jejunostomy and percutaneous needle aspiration may be performed to treat pseudo-cysts. Curative surgeries for pancreatic tumours include distal pancreatectomy with or without splenectomy, total pancreatectomy and radical pancreatico-duodenectomy (Whipple's procedure). Palliative surgery is performed to relieve symptoms if the cancer is unresectable. These procedures include bile duct stenting to for biliary obstruction and bypass surgeries like gastrojejunostomy to relieve duodenal obstruction. Pancreatic transplant is increasingly being performed and there are typical imaging features following such a procedure. CONCLUSION: Although the pancreatic surgeries are performed mostly in tertiary centres, initial and follow up imaging is performed in the referring centre and thus it is important for the General Radiologist to be aware of such imaging findings. The appearances post-pancreatic transplant can also pose a challenge in a non-specialist set-up particularly while assessing for complications (e.g. pancreatitis). We will present a pictorial review of imaging appearances of the pancreas and upper abdomen following surgery for pancreatic pathology and also imaging features post-pancreatic transplant.

p513

Imaging findings in unusual duodenal pathology

Janardhan, S., Collin, G., Shatwell, W., Guha, T.
University Hospital of Coventry and Warwickshire, Coventry, UK

KEY LEARNING OBJECTIVES: To demonstrate the imaging findings of a selection of less common duodenal pathologies. DESCRIPTION: There is a wide range of duodenal abnormalities, both common and uncommon. The current mainstay of investigation is upper GI endoscopy. This has limitations and is supported by the appropriate use of radiological investigations. In this poster, we present a selection of cases of less commonly encountered duodenal conditions in which the diagnosis was made with imaging alone or with radiological investigations following a non-diagnostic endoscopy. The discriminating imaging features are demonstrated to enable formation of a confident differential diagnosis. The radiologic–pathologic correlation is also considered. Salient imaging techniques are explained and the role of conventional radiographic techniques such as plain films and contrast studies are re-emphasized. CONCLUSION: Radiology has an important part in the work-up of duodenal pathology and various imaging modalities are available for reliable diagnosis of these lesions. This poster highlights the importance of considering the conventional radiological techniques in combination with the cross-sectional imaging for the diagnosis of uncommon duodenal disorders.

p514

How often do indeterminate lung nodules become metastases in colorectal cancer?

Clague, G.A., Oakhill, E.
North Bristol NHS Trust, Bristol, UK

PURPOSE: To determine the frequency with which indeterminate pulmonary nodules found on initial staging CT scan in patients with colorectal carcinoma become metastases. MATERIALS/METHODS: 675 colorectal cancer patients diagnosed between 2003 and 2007 were reviewed. Patients were included if staging CT thorax showed an indeterminate lung nodule. The tumour stage at diagnosis, site and size of the lung lesion and clinical course were recorded. RESULTS: 45 patients were identified as having indeterminate lesions; all were below 10 mm. 14 of these patients had irresectable primary disease and were excluded. 51% of indeterminate lesions were in lower lung fields and were solitary in 66% of cases. Mean size was 5.2 mm. Neither site, size or number of lesions predicted development into metastases. Of the 17 patients with CT follow-up, 3 developed confirmed metastases. All had T3 or T4 disease. 1 patient developed a lung metastasis but the original indeterminate lesions remained unchanged. The 14 patients who did not develop metastases had a range of stage (T2N0–T3N2) and 5 had nodal disease at diagnosis. 14 patients did not have a follow up CT scan within the study period. Of these 9 are alive and do not have evidence of lung metastases but CT evaluation is ongoing. CONCLUSION: 9.6% of indeterminate lung lesions below 10 mm in patients with known colorectal malignancy progress to lung metastases. Neither tumour stage at diagnosis, nor site and size of these lesions seems to predict development into metastases in patients with a colorectal primary.

p515

Pictorial review of anatomy and pathology of anal and perianal region on endoanal ultrasound and MRI

Arya, A.[1], Agrawal, K.[2], Clark, A.[1]
[1]University Hospital of North Staffordshire, Stoke-on-Trent, UK, [2]St Mary's Hospital, London, UK

KEY LEARNING OBJECTIVES: The purpose of this pictorial review is to teach the anatomy of the anal and perianal region by using Ultrasound and MRI appearances. The relevance of this anatomy is explained and illustrated. DESCRIPTION: We describe the imaging appearances of the normal anatomy of the anal and perianal region. The clinical relevance of this anatomy is explained with the help of representative examples of common diseases affecting the region. Endoanal ultrasound is an essential investigation in the assessment of the anal sphincter complex in cases of faecal incontinence in women, the most common identifiable causes including obstetric or iatrogenic surgical injuries. Anal ultrasound is also extremely useful in the evaluation of faecal incontinence in men and in pre-procedure assessment of obstructive defecation. Modern MRI techniques provide excellent visualization of anal and perianal anatomy. MRI is essential for evaluating fistulous tracks in perianal sepsis and for detailed delineation of the patho-anatomy of fistulous abscess and any communication to more proximal bowel. CONCLUSION: The anatomy of the anal and perianal region is well seen on ultrasound and MRI. The knowledge of this radiological anatomy is essential in evaluation of anorectal disorders.

p516

Radiological evaluation of anorectal malformation with fistula

Nandish, S., Arthur, R.
Leeds General Infirmary, Leeds, UK

PURPOSE: Anorectal malformation has a reported incidence of 1 in 5000 live births occurring more commonly in males than females. The most common malformation occurs in association with ectopic termination of the hindgut resulting in an imperforate or ectopically sited anus, often associated with a fistula to the perineum, vagina or urethra. The relationship of the distal rectum to the puborectalis muscle forms the basis of the standard classification of this condition, broadly dividing them into supralevator and infralevator malformations. Pena described the technique of augmented pressure distal segment colostogram in 1991 as a superior technique compared with the micturating cystogram or standard distal colostogram in the demonstration of both the level of the distal rectum and the presence or absence of a fistula. This information is crucial for the planning of surgical treatment, particularly prior to undertaking the posterior sagittal ano-reactoplasty as described by Pena (PSARP) and for counselling the parents with regard to long term outlook for continence. Failure to demonstrate the correct level of a fistula may result in an inappropriate surgical approach and urethral damage. However, there has been little emphasis of this technique in modern textbooks. This poster will review our experience in 66 cases of infants with ARM, with initial colostomy prior to definitive surgery being necessary in 27 patients, correlating the radiological appearances with operative findings. We will draw attention to the correct performance of the procedure, and describe pitfalls in the technique and interpretation.

p517

"Nipples to knees" – Exposing the abdomen

Abraham, L.J., Moore, R, Mullan, D.
Royal Liverpool University Hospital, Liverpool, UK

INTRODUCTION: Adequate clinical examination of the abdomen requires patient exposure from nipples to knees. Adequate abdominal radiographs should interrogate a similar area. However, even with a maximum field of view, important structures or review areas may not be visualized. Patient body habitus and lack of a standardised technique can contribute to suboptimal images. Unfocused clinical information hinders interpretation. The aim of this study was to complete an audit cycle for image quality, technique and clinical information regarding plain abdominal radiographs. HISTORICAL STANDARDS: Midline centring at iliac crest level. Collimation to include symphysis pubis, upper abdomen, lateral borders. LOCAL (IRMER) STANDARDS: Relevant clinical information/findings with documented region of interest. INDICATORS: % of examinations including diaphragm and/or symphysis. % adequate clinical information/stated region of interest. METHODOLOGY: We performed a retrospective review of all abdominal radiographs and requests in a 7 day period (n=150) to identify numbers of suboptimal images and clinical information. RESULTS: 29% of films visualized all relevant anatomy. 21% visualized neither diaphragm nor symphysis. 49% of requests were clinically suboptimal. REAUDIT: Following the initial audit, a programme of feedback and education was instigated to improve image acquisition. An interval reaudit over a 7 day period (n=142) demonstrated: 68% of films visualized all relevant anatomy. 3.5% visualized neither diaphragm nor symphysis. 46% of requests were clinically suboptimal. CONCLUSION: Significant gains in image quality have occurred as a direct result of the initial study. emphasis is now being placed on producing a "gold standard" for required clinical information in abdominal radiograph requests.

e518

Extrinsic compression of the common bile duct – Unusual causes of jaundice

Au-Yong, K.J.[1], Coupe, N.J.[1], Howdle, S.[2], Vessal, S.[1]
[1]University Hospital of North Staffordshire, Newcastle-Under-Lyme, UK, [2]Princess Royal Hospital, Telford, UK

KEY LEARNING OBJECTIVES: A pictorial review of the normal, variable anatomy of the biliary tree. Cases demonstrating a wide variety of causes of extrinsic bile duct compression and where possible their subsequent management. DESCRIPTION: Biliary obstruction is common with an incidence of 5 cases per 1000 per year. Intrinsic gallstones are the most common cause but obstruction can be either intrinsic or extrinsic (external to the ducts). External compression is not limited to pancreatic carcinoma with other causes including pancreatitis, vascular compression, lymphadenopathy, extraductal stones, cysts and other tumours. Ultrasound scan is most often first line imaging study for detecting biliary obstruction. However, many

patients proceed to CT or other cross sectional imaging if no cause for biliary obstruction is identified on initial ultrasound. We present multiple high-quality CT and MRCP images demonstrating a diverse spectrum of causes of extraductal bile duct obstruction. Cases like Mirizzi's syndrome, pancreatic pseudocyst, abdominal aortic aneurysm, pancreatic cancer, duodenal diverticulum and adenopathy will be included. CONCLUSION: We hope our pictorial presentation will demonstrate to the viewer the wide range of causes of extraductal biliary obstruction and their varied appearances on cross-sectional imaging. Awareness of the various imaging appearances of extraductal CBD obstruction is key to prompt diagnosis and treatment.

e519

Abdominal tuberculosis: Recognizing the many faces of an old enemy

Bharwani, N.[1], Skippage, P.[2], Nair, A.[2], Horton, A.[2], Munneke, G.[2]
[1]Barts & The Royal London NHS Trust, London, UK, [2]St George's NHS Trust, London, UK

LEARNING OBJECTIVES: 1. To review the pathophysiology of tuberculosis (TB). 2. To discuss the resurgence of the disease in recent years and the changing disease patterns. 3. To discuss and illustrate the abdominal sites of infection. BACKGROUND: The incidence of TB has increased with HIV, the development of drug resistant Mycobacterium strains and recent disease resurgence in the Western world. It remains a significant problem in developing countries but more recently has become increasingly prevalent in the developed world. Whilst most radiologists will be familiar with the pulmonary manifestations of TB, the radiological features of abdominal TB can mimic other diseases resulting in a diagnostic dilemma. Radiologists worldwide need to be familiar with the potential presentations and to maintain a high index of suspicion, particularly in high-risk populations. IMAGING FINDINGS: We will present cases from our institution that illustrate: The pathology and spread of TB. Nodal disease. Genitourinary tract involvement, e.g. stricture formation. Gastrointestinal tract involvement: seen in 80–90%. Abdominal visceral involvement with miliary dissemination. TB peritonitis. TB spondylitis. CONCLUSION: Cases of TB have shown a rapid increase in the last few years, particularly within the developed world. Radiologists need to be aware of the pattern of disease and its many potential abdominal manifestations.

e520

CT appearances of intra-abdominal tuberculosis

Chuah, J.H.H., Sukumar, S., Rudralingam, V., Jackson, K.
South Manchester University Teaching Hospital, Manchester, UK

KEY LEARNING OBJECTIVES: To describe the characteristic imaging features of intra-abdominal tuberculosis (TB) seen on CT. To illustrate the manifestations and complications of intra-abdominal TB. DESCRIPTION: Intra-abdominal TB is not a rare condition with presentation of acute abdominal pain warranted a CT examination. There are characteristic signs of this condition seen on CT that should be recognized by the reporting radiologist so as to assist in making as accurate a diagnosis as possible. To optimize patients' treatment and prevent misdiagnosis, it is necessary to be familiar with the imaging findings of the complications and manifestations of this condition. CONCLUSION: We hope that this presentation will help the viewers to be aware of the CT appearances of intra-abdominal TB as a cause of acute abdomen.

e521

Gastrointestinal carcinoid tumours and mesenteric abnormalities: The spectrum of radiological appearances

Bharwani, N., Druce, M., Grossman, A.B., Sahdev, A., Reznek, R.H., Rockall, A.G.
Barts & The London NHS Trust, London, UK

PURPOSE: A hallmark of mid-gut carcinoid tumours is fibrosis which can result in a marked mesenteric desmoplastic reaction. Fibrosis also occurs at other sites e.g. retroperitoneum, pleura, skin and cardiac valves. The prevalence and clinical significance of intra-abdominal fibrosis has been reported in few series. MATERIALS/METHODS: We included all patients with mid-gut carcinoid tumours and available imaging over the past 8 years. Notes were reviewed for demographic information, history of small bowel obstruction (SBO) and biochemical investigations. The available imaging was reviewed for mesenteric abnormalities associated with carcinoid tumours. Where available sites of extra-abdominal fibrosis were recorded. RESULTS: 32 patients were included, 16 men and 16 women. 16 patients had a mesenteric mass which was associated with coarse calcification in 7, surrounding soft tissue stranding in 11 and tissue "indrawing" in 9. Five patients had all 3 features. One patient had soft-tissue stranding without a visible mass. 11 patients had small bowel thickening. Two patients had a "misty" mesentery and 2 had early retroperitoneal fibrosis. Three patients had evidence of extra-abdominal fibrosis (pleural thickening). Imaging confirmed liver metastases in 27 patients. There was no correlation of mesenteric involvement with gender or mean 24 h urinary 5HIAA value. Of patients with radiological evidence of mesenteric fibrosis, 31% had a history of SBO, in comparison with 7% in the group without fibrosis (p>0.05). CONCLUSION: Mesenteric fibrosis is a hallmark of mid-gut carcinoid and is detected radiologically in ~50% of patients. This is more common in association with a previous clinical presentation of SBO.

e522

Imaging in the follow-up and complications of laparoscopic gastric band surgery

Mulla, M.G., Sidhu, H., Singh, R.
Plymouth Radiology Academy, Plymouth, UK

LEARNING OBJECTIVES: Define the role of imaging in Laparoscopic gastric band surgery. Review of the common complications. DESCRIPTION: Morbid obesity is a growing problem in the Western world. Body mass index more than 35 is associated with a range of both physical and psychosocial manifestations [1, 2]. Laparoscopic gastric band surgery has become the most common surgical procedure for these patients. Although the mortality is low, a number of early and late complications of this procedure have been reported [3]. As the number of these procedures increases, radiologists are likely to be involved in selecting appropriate imaging strategies in order to establish a diagnosis and guide further management. CONCLUSION: We present a pictorial review of the imaging findings relating to the common complications based on our experience at a large regional bariatric centre. References: 1. Executive summary of the clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. *Arch Intern Med* 1998;158:1855–67. 2. Wing RR, Greeno CG. Behavioural and psychosocial aspects of obesity and its treatment. *Baillieres Clin Endocrinol Metab* 1994;8:689–703. 3. Belachew M, Legrand M, Vincent V, Lismonde M, Le Docte N, Deschamps V. Laparoscopic adjustable gastric banding. *World J Surg* 1998;22:955–63.

e523

Endoscopic ultrasound and computed tomography in predicting resectability in oesophageal carcinoma

Balan, P.[1], Corr, C.[2]
[1]University Hospital of Wales, Cardiff, UK, [2]Wrexham Maelor Hospital, Wrexham, UK

PURPOSE: To study the role of endoscopic ultrasound (EUS) and computed tomography (CT) in predicting resectability in oesophageal cancer. MATERIALS/METHODS: Patients who underwent surgery for oesophageal carcinoma with intent to oesophagectomy during a

1-year period were studied. All patients underwent a PET scan pre-operatively, which showed no distant metastasis. Therefore all patients included in the study were deemed to be resectable based on pre-operative staging investigations. Local staging on pre-operative EUS and CT was compared with operative findings and histopathology reports. RESULTS: 39 patients were deemed resectable. 35 of these patients underwent oesophagectomy. 2 patients were "open and close" and in 2 patients there was "failure to achieve operative objectives". In one of the 4 patients where complete resection was not carried out, CT showed an enlarged lymphnode in the region of the hepatic artery that was PET negative. Frozen section of the lymphnode at surgery confirmed metastasis. Overall accuracy of EUS and CT in T staging was 54.2% and 50% and accuracy in N staging was 65.62% and 54.3%, respectively. However, when EUS and CT were combined, positive predictive value for resectability was 0.89. CONCLUSION: EUS and CT are complementary to each other in the pre-operative staging of oesophageal cancer and a combination of the two modalities helps in accurate prediction of resectability.

e524

Oesophageal pathology on MDCT: A pictorial review

Gadde, S., Chuah, J.H., Rudralingam, V., Sukumar, S.A.
South Manchester University Teaching Hospital, Manchester, UK

KEY LEARNING OBJECTIVES: 1. To describe the characteristic imaging features of benign and malignant oesophageal pathologies including those with atypical features 2. To illustrate the primary and ancillary findings in oesophageal trauma 3. To discuss common pitfalls in interpretation of oesophageal lesions. DESCRIPTION: Until the recent past barium studies and endoscopy have traditionally been used as the primary modalities in the diagnosis of oesophageal pathology and CT was used mainly used for staging purposes in malignancy. However, the latest advances in CT techniques especially with multiplanar reconstruction has changed this significantly with CT now being increasingly used as a first line investigation modality in both acute and chronic oesophageal pathology. CT with 3D reconstruction is proven to be superior to the conventional methods in demonstrating a range of oesophageal lesions with extraluminal extent. The secondary effects on the adjacent structures are also better perceived and this may have treatment implications especially in an acute setting such as trauma. It has an added advantage of being non invasive and is better tolerated by patients. Identifying certain characteristic features in benign lesions would certainly reduce the need for an unnecessary invasive biopsy. CONCLUSION: Knowledge of CT imaging features of common oesophageal pathologies is essential to a radiologist while awareness of characteristic features and common pitfalls that are described in this poster will make the diagnosis of atypical lesions more interesting.

e525

Pictorial review of the peritoneal spaces as demonstrated by pathology

Joshi, N.P., Koteyar, S.S.
North Manchester General Hospital, Crumpsall, UK

KEY LEARNING OBJECTIVES: To demonstrate the anatomy of the peritoneum by the pathology that can arise in the different spaces. DESCRIPTION: The peritoneal space is divided into compartments by various ligaments. The transverse mesocolon separates the peritoneal cavity into supramesocolic and inframesocolic compartments. The supramesocolic space is divided into right and left subphrenic spaces, right and left subhepatic spaces, and the lesser sac. The left subphrenic space lies between the left hemidiaphragm and the stomach and covers the spleen, while the left subhepatic space lies between the left lobe of the liver and the lesser curve of the stomach. The right subphrenic space lies between the liver and the right hemidiaphragm and is separated from the left subphrenic space by the falciform ligament. This communicates with the right subhepatic space (Morison's pouch), which is the most dependent part of the peritoneal cavity in a supine patient. The lesser sac is located posterior to the stomach and communicates with the greater sac via the epiploic foramen of Winslow, which lies between the portal triad and the inferior vena cava. It has close relationships with the stomach, caudate lobe of the liver and pancreas. The inframesocolic compartment contains the paracolic gutters, which are lateral to the ascending and descending colon, and the infracolic space. The small bowel mesentery divides the infracolic space into left and right compartments. CONCLUSION: By understanding the anatomy of the peritoneal space we can understand the origin of pathology and how it may spread.

e526

A university hospital's initial experience with contrast enhanced ultrasound of the liver

Chan, T.Y.[1], Lam, K.[1], Chiphang, A.[2], Evans, J.[1]
[1]Royal Liverpool University Hospital, Liverpool, UK,
[2]Southport and Ormskirk Hospital Trust, Liverpool, UK

PURPOSE: The Royal Liverpool University Hospital radiology department has used contrast enhanced ultrasound (CEUS) of the liver since 2003. Our retrospective study identified the number of and indications for CEUS of the liver performed between 2004 and 2006 to assess the success rate of CEUS at establishing the correct diagnosis. METHODS: 2.4 ml Sonovue (Bracco) intravenous contrast agent was used to perform CEUS with low mechanical index settings. CEUS findings were compared with other radiological modalities (ORM). Cases that did not have ORM 6 months before or after the CEUS were excluded from analysis. Cases where CEUS results are not in agreement with ORM were followed-up until December 2007. If histology results were unavailable, diagnoses from follow-up investigations are assumed to be correct. RESULTS: The indications for CEUS included characterization and monitoring of liver metastases (38%), characterization of primary lesions (13%), monitoring lesions in alcoholic liver disease (4.8%) etc. 64 of 104 patients had either CT or MR of the liver within 6 months of CEUS. We compared the CEUS reports with ORM and found that CEUS successfully provided the final diagnosis in 93% of the cases. However, only a small proportion of these patients had histological confirmation. In 4.6% of cases, CEUS provided an incorrect diagnosis in benign liver lesions that were difficult to characterize but did not miss any malignant lesions. CONCLUSION: CEUS is an accurate imaging modality in detecting, characterizing and monitoring focal liver lesions. CEUS is safe, does not expose patients to ionizing radiation and useful in patients where MRI is contraindicated.

e527

Ultrasound diagnosis of diffuse fatty liver disease: Is it all that it seems

Ratcliffe, M.R., Johnson, G., Rudralingam, V.
University Hospital of South Manchester, Manchester, UK

KEY LEARNING OBJECTIVES: 1. To review the causes of a diffusely hyperechoic liver substance on ultrasound and provide a pictorial review correlating with CT and MR findings. 2. To emphasise common pitfalls in the ultrasound reporting of a fatty liver. DESCRIPTION: The ultrasound finding of increased echogenicity of the liver substance with the inference of diffuse fatty liver disease (DFLD) is a relatively frequent occurrence. It is generally accepted that a fatty liver appears bright or hyperechoic ("white liver pattern") relative to the right kidney or spleen. However, the accurate characterization of a "bright" liver is not easy in some patients as similar ultrasound appearances are seen in other conditions, such as liver fibrosis, thus representing a diagnostic challenge in the day-to-day practice of every operator. We will cover the common pitfalls in the ultrasound reporting of diffuse fatty liver disease and provide a pictorial review with correlation between ultrasound, CT and MR findings. Ultrasound features that allow the accurate characterization of this condition will be described. CONCLUSION: A globally hyperechoic liver substance is a relatively frequent finding on ultrasound and one that is almost unanimously reported as diffuse fatty liver disease. We have presented a pictorial

review to highlight that all may not be what it seems and a checklist to allow the operator to minimize the false-positive interpretation of diffuse fatty liver disease.

e528

A pictorial review demonstrating the less common appearances of inoperable pancreatic adenocarcinoma

Wilson, D.W.A., Morgan, S., Ash-Miles, J., Roach, H., Callaway, M.
University Hospitals Bristol NHS Foundation Trust, Bristol, UK

KEY LEARNING OBJECTIVES: Pancreatic adenocarcinoma is an aggressive disease. Only 20% of patients have operable disease at presentation. The ultrasound, magnetic resonance, computed tomography and endoscopic ultrasound appearances are reviewed with particular emphasis on less common features of unresectable disease. DESCRIPTION: The disease usually involves the head of the pancreatic gland and tumours present with painless jaundice. We present the less common appearances of non obstructive lesions in the uncinate process, body and tail of the gland. We demonstrate subtle signs such as the "teardrop sign", intrahepatic tumour emboli and infiltration of the coeliac axis in the absence of a mass. We also demonstrate the more unusual patterns of metastatic, nodal and peritoneal disease. CONCLUSION: We present a multimodality pictorial review of uncommon features of pancreatic carcinoma. The aim is to assist general radiologists in confidently diagnosing features of unresectability prior to referral to specialist centres.

e529

Incidental gynaecological findings at CT colonographic screening

Chuah, J.H.H., Sukumar, S., Rudralingam, V., James, A.
South Manchester University Teaching Hospital, Manchester, UK

KEY LEARNING OBJECTIVES: 1. To illustrate the range of incidental gynaecological pathologies encountered on CT colonographic screening and to identify the benign and malignant features of the pathologies. 2. To discuss the appropriate follow up for incidental gynaecological findings that warrant additional workup. DESCRIPTION: Cross-sectional body imaging is prone to yielding incidental findings due to the detailed information available for all included organ systems. It is not uncommon to detect unsuspected gynaecological pathologies at CT colonographic screening. Detection of these findings has usually lead to additional workup. Identification of characteristic benign incidental findings would reduce unnecessary cost and anxiety of additional workup. CONCLUSIONS: Judicious handling of unsuspected gynaecological pathologies is needed to balance the cost of additional workup against the potential for early detection of important disease, as not all the incidental findings are of clinical consequences. Awareness of the characteristic features of both benign and malignant gynaecological pathologies is essential to radiologists for appropriate subsequent management of the patients.

e530

Small bowel inflammatory bowel disease: A multimodality approach?

Steward, M.J., Owen, N., Kumaradevan, J., Onnie, C., Murray, D.
Whittington Hospital, London, UK

KEY LEARNING OBJECTIVES: To review evidence for current imaging options in inflammatory bowel disease. To recognize features of small bowel disease at ultrasound, CT and MRI and appreciate the advantages and limitations of each modality. DESCRIPTION: Review of optimal ultrasound, CT and MRI imaging techniques. Typical features of acute and chronic inflammatory bowel disease: bowel wall thickening, increased mesenteric vascularity, mesenteric lymphadenopathy and fat proliferation, mural stratification and enhancement patterns, strictures and other complications, with illustrated multimodality examples. Suggested protocol for investigation and follow up of early and established inflammatory bowel disease. CONCLUSION: These described non invasive cross sectional techniques are a valuable adjunct to clinical assessment and more invasive tests of enteroclysis, colonoscopy, and capsule endoscopy. Ultrasound and MRI, with no associated radiation dose, have an important role as these patients often require long term serial imaging.

e531

Pictorial review of duodenal pathologies on multi detector computed tomography

Lee, E.Y.P., Corr, C.
Wrexham Maelor Hospital, North Wales, UK

KEY LEARNING OBJECTIVES: To highlight the importance of careful review of the duodenum on MDCT. DESCRIPTION: Duodenal pathologies can be identified either as an incidental finding or as a cause of non specific abdominal pain. Careful review of the duodenum when reporting MDCT often leads to clinically important findings. We will demonstrate a range of duodenal pathologies, many of which were first diagnosed on MDCT at our institution. These include duodenal malignancy, ulcers, and malrotations. MDCT was often the most important factor in the diagnosis, as many of these lesions were not suspected clinically, and/or not seen on endoscopy. Illustration of the different duodenal pathologies will be presented on a pictorial format. CONCLUSION: Careful review of the duodenum on MDCT often provides clinically important diagnostic findings.

Uroradiology

p601

Intravenous urograms using digital tomosynthesis – A new technique

Gupta, R., Kulkarni, K., Hughes, N.
Queen's Hospital, Burton-upon-Trent, UK

PURPOSE: Digital tomosynthesis (DTS) is an exciting and relatively new digital technique based on conventional tomography. Tomography creates a single slice while tomosynthesis creates multiple slices in a single examination. More and more evidence is emerging of its benefits in chest, breast, bones and joints, and intravenous urography (IVU). We present our initial experience of using DTS in IVU. MATERIALS/METHODS: The study was performed in 110 consecutive patients who had IVUs using DTS from April 2008. The protocol followed was a control film followed by a post contrast DTS at 15 min. All the examinations were supervised by a radiologist and if necessary, additional conventional images were taken. The doses of IVUs using DTS were compared with the doses from 100 consecutive conventional IVUs. RESULTS: 43 (39.1%) IVUs using DTS did not need any additional films. Of the remaining 67 (60.9%) patients, 46 (68.6%) required 1 additional film, 13 (19.4%) required 2 additional films, and only 8 (12%) required >2 additional films. The most common additional view required was a full bladder view in 39 patients (46.9%). The average dose for IVUs using DTS was found to be 642.964 cG cm^{-2} as compared with 1733.969 cG cm^{-2} with conventional IVUs (nearly one-third less). CONCLUSION: The study showed significant dose reduction in IVUs performed using DTS as compared with conventional IVU in spite of additional films in 60.9% patients. Further studies are required to assess the diagnostic accuracy of the DTS IVU in comparison with CT urogram.

p602

Microscopic haematuria: First line investigations

Jain, A., Ghosh, S., Ablett, M., Meddings, R.
Ayr Hospital, Ayr, UK

PURPOSE: To evaluate the efficacy of different investigation modalities in the work up of microscopic haematuria in patients less

than 50 years of age. MATERIALS/METHODS We analysed case notes of all patients less than 50 years of age who presented with microscopic haematuria (Urology clinic of a District General Hospital) between 1996 and 2002. Results of clinical investigations including X-ray KUB, ultrasound abdomen, intravenous urography (IVU), CT scan, cystoscopy were documented. RESULTS: Adequate information was available in 50 out of 63 eligible cases and were included in the final analysis. Abnormalities were detected in 9 cases on X-ray KUB and 4 cases had abnormalities on ultrasound abdomen and 7 cases had abnormalities on cystoscopic examinations. Investigations like IVU or CT did not detect any pathology in the cases in which X-ray KUB and ultrasound abdomen were normal. However, IVU and CT were able to better delineate abnormalities already detected on X-ray KUB of ultrasound abdomen. All patients had a minimum 5-year period of follow-up from initial investigation. In those in whom initial X-ray KUB, ultrasound abdomen and cystoscopy was normal there was no recurrence of symptoms. CONCLUSION: X-ray KUB, ultrasound abdomen and cystoscopy (in selected cases) are sufficient in initial work up of patients with microscopic haematuria (less than 50 years of age). These investigations were able to detect presence of all significant pathologies. Investigations like IVU and CT scan are not needed as first line investigation.

e603

Pictorial review of the retroperitoneal spaces as demonstrated by pathology

Joshi, N.P., Koteyar, S.S.
North Manchester General Hospital, Crumpsall, UK

KEY LEARNING OBJECTIVES: To demonstrate the anatomy of the retroperitoneum by the pathology that can arise in the different spaces. DESCRIPTION: The retroperitoneum extends from the diaphragm to the pelvis and is bounded anteriorly by the posterior layer of peritoneum and posteriorly by the muscles of the back. The anterior fascia of Gerota and the posterior fascia of Zuckerkandl divide it into the perirenal space, anterior pararenal space and posterior pararenal space. The perirenal space is bounded anteriorly by Gerota's fasica and posteriorly by Zuckerkandl's fascia and contains the kidneys and adrenals. It also contains bridging septae, which divide it into multiple compartments resulting in limitation of spread of pathology with diagnostic implications. Medially it has potential for communicating with the contralateral perirenal space. The anterior pararenal space is bounded by the posterior peritoneum and Gerota's fascia and contains the duodenum, pancreas, ascending and descending colon. The posterior pararenal space is bounded by the fascia of Zukerkandl and transversalis fascia and contains fat. The transversalis fascia is continous with the pelvic fascia, while the peritoneum reflects over the pelvic organs. This results in communication between the pelvis and retroperitoneum, with communication between the paravesical spaces and the pararenal space. CONCLUSION: By understanding the anatomy of the retroperitoneum we can understand the origin of the pathology and how it may spread.

e604

Imaging features of incidentally detected renal lesions: An algorithm for follow up and management

Grieve, F.M., Ratcliffe, M., Lim, Y., Bradley, A.
University Hospital of South Manchester, Manchester, UK

KEY LEARNING OBJECTIVES: 1. To review the imaging characteristics of incidental renal lesions and provide a pictorial review correlating ultrasound, CT and MR appearances. 2. To provide an algorithm which enables the general radiologist to logically analyse incidental renal lesions and ultimately decide which can be safely ignored, which require further imaging follow up and which require referral to the urologist for consideration of excision or biopsy. 3. To emphasise common pitfalls in assessing incidental renal lesions. DESCRIPTION: Incidental renal lesions are the most common incidental findings at abdominal CT, and can be difficult to characterize without an unenhanced phase scan. We will cover the typical appearances of cysts with a review of the Bosniak classification of cyst complexity. The importance of routinely measuring Hounsfield units and the pitfalls encountered when differentiating simple cysts from more serious lesions are emphasised. We will provide a pictorial review of incidental renal lesions with correlation between ultrasound, CT and MR findings. Imaging features allowing differentiation between benign and sinister solid masses will be described. CONCLUSION: The increased use of CT in the assessment of abdominal pain has lead to an increase in the number of incidental renal lesions detected. We have presented a step by step approach to decide which lesions can be ignored, thus avoiding over investigation, and which require imaging follow up or urological review.

e605

Multi-detector computed tomography urography single phase contrast enhanced technique for examination of renal tract calculi

Porter, N.A., Bradley, A.J., Lim, Y.Y.
University Hospital of South Manchester, Manchester, UK

PURPOSE: To establish whether renal tract calculi can be detected by post-contrast only CT urography, enabling a reduction in patient dose by eliminating the pre-contrast phase, but without compromising nephrographic and excretory information. MATERIALS/METHODS: All CT urograms performed in our department between October 2007 and April 2008 inclusive, were retrospectively reviewed by a consultant uroradiologist and a specialty registrar. All studies were performed on a 16 slice Siemens Sensation scanner using a split bolus technique. Reviewers were blinded to the scan report. The post-contrast scan was reviewed using bone-windows, soft tissue windows and maximum intensity projections, recording location, size and density of calculi and collecting system opacification. Comparison was then made with a) the scout view and b) the pre-contrast scan and definitive report. RESULTS: 43 patients were included. 13 had renal calculi, multiple in 9 cases with 28 in total. Sensitivity for detecting renal calculi when assessing the post-contrast scan alone was only 50.0% (specificity 90.6%). However, when combined with the scout view the sensitivity improved to 78.6% (specificity was 87.9%). A wide variation was found regarding collecting system opacification (mean 933 HU) and density of calculi (mean 819 HU). Denser and larger calculi were more readily detected. CONCLUSION: A post-contrast scan combined with a pre-contrast scout view enables detection of the majority of calculi. All calculi over 10 mm were detected. Use of intravenous furosemide to decrease collecting system opacification will be discussed.

e606

The role of percutaneous renal mass biopsy in the new era

Adejolu, M., Narayanaswamy, S., Wilkins, C.J., Huang, D.Y.
King's College Hospital, London, UK

LEARNING OBJECTIVES: 1. To illustrate the new concept and limitation of various imaging techniques in the diagnosis of solid renal lesions. 2. To discuss the technical factors, potential complications and the emerging indications of percutaneous renal mass biopsy in the management of solid renal lesions. DESCRIPTION: The use of imaging has greatly increased recently. As a result, more small renal masses than ever have been diagnosed, often incidentally on ultrasound or CT performed for an unrelated indication. A substantial portion of small solid renal masses are benign and cannot be distinguished from malignant masses by means of imaging findings alone. In the current exhibit we present a pictorial review of the utilisation and limitation of various new concepts in the CT, MR and contrast-enhanced ultrasound (CEUS) evaluation of renal masses. In addition, we aim to describe the reported experience with percutaneous biopsy of renal masses, discuss the technical factors that contribute to results and complications, and highlight the capabilities and limitations of this procedure. Finally, we will review specific emerging clinical indications, such as consideration for percutaneous ablation, and explain the importance of biopsy in each of them. CONCLUSION: Percutaneous renal biopsies remain

an important diagnostic tool when dealing with indeterminate solid renal lesions, despite of the availability of emerging imaging concepts and advancing imaging techniques. In the appropriate clinical context, this procedure is safe, will avoid unnecessary surgery, and spare the patient the anxiety-provoking option of observation and the radiation burden of interval scanning.

e607

Audit of CT urography use

Charlesworth, B., Khanna, M., Rottenberg, G.
Guy's and St Thomas' Hospital, London, UK

PURPOSE: To evaluate CT urography (CTU) use against expert guidelines published by the European Society of Uroradiology (ESUR) on indications for CTU. METHOD: A retrospective audit of 50 patients who underwent CTU during 2008 was performed. The age, sex, clinical indication for imaging and any previous relevant imaging was recorded and evaluated against published guidelines. The ESUR recommends CTU in patients greater than 40 years of age with a medium to high risk of transitional cell carcinoma (TCC), with microhaematuria or macrohaematuria and negative previous imaging. Imaging findings in each patient were recorded along with incidental findings. RESULTS: 9 of 50 patients who underwent a CTU were less than 40 years. 2 of 9 patients underwent CTU for renal tract trauma evaluation, the 7 remaining patients underwent investigation for haematuria. 3 of these patients, despite their age, had medium to high risk for a TCC, 1 had recurrent tumour in the distal ureter. Overall 4 patients under 40 years, according to the recommended guidelines, underwent a non-recommended CTU. 31 of 41 patients over the age of 40 years underwent a CTU for haematuria/staging for a transitional cell carcinoma, 10 of 41 for other recognized indications. 2 of 31 patients over age 40 years with haematuria did not fulfil the ESUR criteria for a CTU. A TCC or renal cell carcinoma was not found in these 2 patients. CONCLUSION: 15% of CTUs undertaken for haematuria do not fulfil the ESUR guidelines. High radiation doses are associated with CTU, therefore appropriate adherence to expert guidelines on indications for imaging is paramount.

e608

CT imaging in blunt renal trauma: A pictorial review

Jeyaratnam, R.[1], Britton, I.[1], Gupta, R.[2], Kong, A.Y.[1], Khan, S.[2]
[1]University Hospital of North Staffordshire, Stoke-On-Trent, UK, [2]Queen's Hospital, Burton-On-Trent, UK

KEY LEARNING OBJECTIVES: 1. Demonstrate CT findings of blunt renal trauma. 2. Understand the clinical indications for imaging the renal tract in blunt abdominal trauma. 3. Understand the grading of renal injuries. DESCRIPTION: The kidneys are the third most commonly injured organ in blunt abdominal trauma. Serious renal injury is associated with multi-organ injury in 75% of patients and can sometimes be overlooked in favour of the more life threatening injuries. CT is the preferred imaging modality in assessing renal trauma as it provides detailed anatomical and physiological information used for grading injuries and triaging patients who need urgent intervention. We illustrate the CT imaging finding of renal injury in the context of the American Association of the Surgery of Trauma (AAST) grading system. This progresses from subcapsular haematoma to superficial and deep laceration to injury involving the collecting system or vascular injury to finally shattered kidney. Clinical indications for suspecting renal tract injury include macroscopic haematuria and hypotension. We discuss CT protocols used at a major trauma centre, for imaging blunt abdominal trauma and how they are modified when renal tract trauma is suspected. CONCLUSION: Renal trauma is a common injury in blunt abdominal injury often associated with multi-organ injury. It is best imaged with CT. It is important for radiologists to recognize the imaging finings and be able to grade injuries as this will determine if intervention is needed.

e609

Gas in urinary tract – Differential diagnoses

Chuah, J.H.H., Sukumar, S.
South Manchester University Teaching Hospital, Manchester, UK

KEY LEARNING OBJECTIVES: To describe the characteristic features of the presence of gas in the urinary tract in different imaging modalities. To be able to identify the causes of these imaging findings. To discuss common pitfalls in interpretation of finding of presence of gas in urinary tract. DESCRIPTION: Although the presence of gas in the urinary tract can be an incidental finding in radiological examination, it can also be a cause of acute abdomen which is not to be missed. We would like to present this poster on differential diagnosis of presence of gas in the urinary tract detected on different imaging modalities – CT, ultrasound and plain film. Identification of these features, when used in conjunction with relevant clinical history will help reporting radiologist to reach the accurate diagnosis. CONCLUSION: Knowledge of features of common conditions associated with presence of gas in the urinary tract is essential to a radiologist while awareness of characteristic features and common pitfalls that are described in this poster will make the diagnosis of less common conditions more interesting.

e610

Role of imaging for renal cancer in a specialist MDT setting

Riley, P.M., Gunendran, T., Lim, Y.Y., Ramani, V., Bradley, A.J.
University Hospital South Manchester, Manchester, UK

KEY LEARNING OBJECTIVES: 1. To show the value of discussion at the MDT for renal cell carcinoma (RCC) imaging and management. 2. To illustrate with case studies areas of diagnostic difficulty. 3. To answer the question "what does the urological surgeon need to know?" DESCRIPTION: The specialist multi disciplinary team meeting has produced closer working links between Urological Surgeons, Radiologists and Pathologists. This has lead to greater understanding of each others processes and requirements. High quality imaging is central to management decisions. The surgical treatments for RCC now include nephron sparing and laparoscopic surgery, as well as open nephrectomy. The treatment options may not be immediately obvious and the MDT provides a forum for deciding the appropriate action. We have chosen 5 scenarios where accurate radiological staging can change management and outcome, which we will illustrate with cases from the MDT archives. Case studies: 1. Suitability of the small centrally placed RCC for nephron-sparing surgery. 2. Classification of the doubtful cystic lesion. 3. Early renal vein involvement (T1 vs T3b staging). 4. Level of IVC involvement (I, II and III). 5. The sites and extent of metastatic disease will determine the need for a debulking nephrectomy prior to further therapy. CONCLUSION: There is benefit in discussing cases with the core members of the MDT in order to find the appropriate course of investigation and treatment.

Gynaecology/obstetrics

p701

Pelvic disorders relating to female infertility: a pictorial review

Charran, A.K., Mohd-Isa, Z., Fanou, E.M., Yong, K.A.,
Jeyaratnam, R.
University Hospital of North Staffordshire, Stoke on Trent, UK

KEY LEARNING OBJECTIVES: To demonstrate the congenital and acquired abnormalities in females presenting with infertility. DESCRIPTION: Fertility problems affect one in seven couples in the UK. Imaging is crucial in the management of these patients. Commonly performed investigations include transabdominal and transvaginal ultrasound, hysterosalpingography and more recently MRI. The causes of female infertility include disorders of the ovaries (polycystic ovarian syndrome), the fallopian tubes (hydrosalpinx and pelvic inflammatory disease), the uterus (mullerian duct anomalies, adenomyosis and leiomyoma) and pelvic endometriosis. We present a spectrum of congenital and acquired uterine and adnexal pathologies

which the radiologist encounters in the investigation of females with infertility. We highlight the roles of the current imaging modalities, their advantages and disadvantages. High quality images of examples encountered in our practice with particular emphasis on MRI will be presented. CONCLUSION: We show that imaging is crucial in the investigation and management of female infertility. In particular MRI has the advantage of providing differential diagnosis, delineating anatomy and aids in surgical planning.

p702
Pelvic insufficiency fractures following radiotherapy for gynaecological malignancy

Philip, S., Massey, H., Counsell, R., Hopkins, R.
Cheltenham General Hospital, Cheltenham, UK

PURPOSE: Pelvic insufficiency fractures (PIF) are a recognized but rare complication of pelvic radiotherapy. Based in a regional oncology centre, our study has assessed the incidence, onset and imaging appearances of PIF. We present our data and illustrate the spectrum of appearances on X-ray, bone scan, CT, MRI and PET-CT. MATERIALS/METHODS: The radiotherapy database was used to retrospectively identify all patients undergoing pelvic radiotherapy for gynaecological malignancy over a period of 2 years. We recorded the patient demographics, radiotherapy dose, interval to appearance of PIF and imaging characteristics. RESULTS: 103 patients were identified from the database. 13 were excluded due to lack of relevant imaging. Of the remainder, nine patients (aged between 35 years and 83 years) had evidence of new osteitis or fracture. The dose of radiotherapy included a four field plan to give 45 Gy in 25 daily fractions over 5 weeks. The incidence of PIF in our institution is 8.7%. Six of the PIF was initially seen on CT, three on bone scan and one on PET-CT. Three patients had more than one imaging modality demonstrating the PIF. The time between radiotherapy and presentation of PIF varied between 6 months and 24 months. Our figures are broadly comparable with other published international studies. CONCLUSION: PIF is well recognized but often under diagnosed cause of pelvic pain following radiotherapy. It is essential to differentiate PIF from osseous metastasis to avoid inappropriate treatment. Further studies are required to identify possible benefits of bisphosphonates and calcium supplements to prevent PIF in high risk patients.

p703
Atypical ectopic pregnancies: A pictorial review

Tony, G., Yong, K.A.
University Hospital North Staffordshire, Stoke-on-Trent, UK

KEY OBJECTIVES: To illustrate the radiological appearances of various atypical ectopic pregnancies and their clinical significance. DESCRIPTION: Around 10 000 ectopic pregnancies are diagnosed annually in the UK. The incidence of ectopic pregnancy in the UK is approximately 11.0/1000 pregnancies. Ectopic pregnancy was the fourth most common cause of maternal death in the UK as per the 2000–2002 Confidential Enquiry into Maternal Deaths (CEMD), accounting for 73% of early pregnancy deaths. Furthermore, it was the most common cause of maternal deaths in the first trimester. Transvaginal ultrasound remains one of the most sensitive tools for detection of an extra-uterine pregnancy. Prompt identification of atypical ectopics by ultrasound is of particular importance as they can have serious clinical implications. For example, an interstitial/cornual ectopic, if undetected, runs a higher risk of bleeding on rupture due to a dual blood supply. This poster aims to provide a pictorial review of atypical ectopic pregnancies and highlight their key radiological features. CONCLUSION: Transvaginal ultrasound remains the most valuable tool in the diagnosis of ectopic pregnancies. Therefore, operators need to be well versed with the various atypical presentations and their clinical relevance.

p704
MRI of the pregnant uterus

O'Neill, J.M., Gangoli, S.
Royal Victoria Hospital, Belfast, UK

KEY LEARNING OBJECTIVES: Illustrate the usefulness of MRI in a variety of abnormalities of the pregnant uterus by discussing cases encountered in our own institution. Consider the optimal imaging sequences used. Review current guidance on safety of MRI in pregnancy. DISCUSSION: Although typically avoided during the first trimester due to active organogenesis, MRI is not uncommonly used to aid diagnosis and management of complicated cases of ectopic pregnancy or molar pregnancy. MRI is rarely indicated during the second trimester. In the latter stages of pregnancy MRI has a role in pelvimetry and is increasingly used in our institution in the assessment of placenta praevia and/or placenta accreta, increta or percreta. This is particularly important with a history of previous Caesarean section, and it is useful in identifying the extent of praevia, the possibility of a succenturiate lobe, and the level of invasion (particularly of the bladder). This is essential in planning the surgical approach during Caesarean section, and in the case of a placenta left in situ post-partum, MRI can assess response to methotrexate therapy. CONCLUSION: By reviewing cases encountered in our own institution, we illustrate the usefulness of MRI in imaging the pregnant uterus. However, due to a theoretical risk to the developing foetus, MRI continues to be reserved for complex obstetric cases in which the benefits are likely to outweigh the potential risks.

p705
Imaging features of abdominal wall endometriomas

Rajan, S., Groves, C., Chandramohan, M.
Bradford Royal Infirmary, Bradford, UK

KEY LEARNING OBJECTIVES: Endometrial deposits have been reported in unusual sites outside the pelvis including the abdominal wall, most commonly located in surgical scars from obstetric or gynaecological procedures. It is often mistaken for other conditions such as suture granuloma, incisional hernia, primary or metastatic carcinoma. We provide a pictorial review of the imaging findings of abdominal wall endometriomas. DESCRIPTION: We present a series of ultrasound, CT and MR images from five women with a typical history of an abdominal wall mass with cyclical pain and swelling related to the menstrual cycle. Histology confirms endometrial deposits. Ultrasound features include a hypoechoic, solid mass with internal scattered hyperechoic echoes. Anechoic lacunae that are seen in larger nodules represent cystic change due to cyclical haemorrhage. The margins are often spiculated with infiltration of adjacent tissues. Abundant intralesional vascularization is seen with Doppler examination. At CT examination, abdominal wall endometriomas appear solid and isodense compared with muscle. Once again, ill-defined margins are present and enhancement is seen post-contrast due to the relatively vascular nature of these lesions. MR depicts the lesions as isointense to muscle on the T_1-weighted sequence and as high signal intensity on T_2-weighted sequence. MR gradient echo sequence is sensitive for detection of intralesional haemorrhage. Post-gadolinium, there is avid enhancement with blood vessels tracking through the ill-defined mass. CONCLUSION: Clinically, abdominal wall endometriomas are often misdiagnosed. In the appropriate clinical setting, imaging characterisation may be sufficient for a confident preoperative diagnosis without the need to proceed to biopsy.

e706
Dermoid cysts

Alwan-Walker, H., James, A., Ratcliff, M., Sukumar, S., Rudralingam, V.
Wythenshaw Hospital, Manchester, UK

KEY LEARNING OBJECTIVES: 1. To illustrate the spectrum of radiological appearances of mature (cystic) teratomas otherwise known as dermoid cysts on ultrasound, CT and MRI. 2. To describe the complications of dermoid cysts and unusual manifestations. DESCRIPTION: Dermoid cysts, otherwise known as mature (cystic) teratoma, can be confidently diagnosed with ultrasound, CT and

MRI. They are the most common benign ovarian germ cell tumour and are composed of derivatives of the three germ layers. They are known as dermoid due to the presence of large amounts of ectodermal components. The imaging appearances vary due to the varying amounts of fat, hair and calcified structures including bone or teeth, and the characteristic Rokitansky nodules (dermoid plugs). Unusual clinical manifestations of ovarian dermoid include struma ovarii. Recognition of clinical presentation and complications of dermoid for instance torsion, rupture and malignant transformation is important. The surgical approach varies and timely recognition of these complications is important to ascertain a good outcome. CONCLUSION: Knowledge of the spectrum of cross sectional imaging appearances of ovarian dermoid cysts, including the pitfalls and complications is essential to provide adequate treatment and prevent misdiagnosis.

e707

A pictorial review of hysterosalpingography with reference to normal and pathological appearances

Drake, B.E.[1], Constantine, F.[2], Rock, B.G.[1], Franklin, K.[2]
[1]Peninsula Radiology Academy, Plymouth, UK, [2]Plymouth Hospitals NHS Trust, Plymouth, UK

LEARNING OBJECTIVES: To present a pictorial review of the radiographic appearances encountered on hysterosalpingography with emphasis on normal anatomy, anatomical variants and important pathology. DESCRIPTION: As more and more couples seek a diagnosis for infertility and assisted conception, so to the demand for hysterosalpingograraphy increases. Recognizing the various radiographic appearances is crucial for prompt and accurate patient management in conjunction with the reproductive medicine team. We present a series of anatomical variants and important pathology encountered at our institutions. We highlight these findings both on imaging and on text as a learning experience. We also comprehensively review the existing literature. CONCLUSION: Interpretation of the hysterosalpingogram can prove problematic. Awareness of the potential pitfalls and characteristic imaging findings are emphasised to avoid radiological misdiagnosis.

e708

Endometriosis: A pictorial review by using MRI and transvaginal ultrasound

Saba, L., Guerriero, S., Sulcis, R., Ajossa, S., Melis, G., Mallarini, G.
A.O.U. Cagliari, Cagliari, Italy

LEARNING OBJECTIVES: The learning objectives in this work are: 1. to review MR and transvaginal ultrasound (TVS) imaging technique, by indicating accuracy of both methods in diagnosing endometriosis according to the potential different localization (uterosacral ligaments, the pouch of Douglas, the vagina, the rectum, the bladder, the fornix). 2. To understand diagnostic pitfalls and differential diagnosis. 3. To learn typical and atypical findings in diagnosing endometriosis. BACKGROUND: Endometriosis is the presence of endometrial epithelium and stroma in an ectopic site outside the uterine cavity and musculature and it is one of the most common gynaecological diseases, affecting more than 5.5 million women in North America alone. The two most common symptoms of endometriosis are pain and infertility. This pathology is usually investigated by using MR and TVS. The purpose of this work is to give a comprehensive pictorial review of endometriosis by using MR imaging and TVS. IMAGING FINDINGS: In this work we show MRI and TVS imaging findings of endometriosis, including deep pelvic localization including endometrial implants in the uterosacral ligaments, rectovaginal septum and bladder. CONCLUSION: Endometriosis is a painful disorder of the female reproductive system. In this exhibit we describe the MRI and TSV imaging features suggestive of endometriosis and their diagnostic performance.

e709

Review of radiological pelvic floor anatomy, normal and abnormal appearances on MRI

Jones, C.M.[1], Farrell, L.E.[1], Balogun, M.[1,2]
[1]Queen Elizabeth Hospital, Birmingham, UK, [2]Birmingham Women's Hospital, Birmingham, UK

KEY LEARNING OBJECTIVES: To review the MRI anatomy of the pelvic floor, and correlate with the imaging findings in normal and abnormal cases. DESCRIPTION: Pelvic floor anatomy is complex and often not clearly understood by medical personnel, but it is important in the evaluation and management of patients with pelvic and pelvic floor disorders. MRI demonstrates well the components of the pelvic floor and can be particularly helpful in assessing structural abnormalities in patients with symptoms suggestive of pelvic floor weakness such as stress incontinence or genital organ prolapse. Assessment of the pelvic floor structures for potential invasion is important in the radiological evaluation of patients with pelvic malignancy. This poster reviews the MRI anatomy of the pelvic floor, demonstrated with normal and abnormal examples. CONCLUSION: Pelvic floor anatomy is poorly understood. Abnormalities in this area can cause distressing symptoms and significantly affect management options in many patients. Radiological assessment aids the evaluation of the pelvic floor in both benign and malignant conditions, but an understanding of the normal anatomy is essential.

e710

Benign gynaecological lesions on MRI – A pictorial review

Hutchings, A.M., Ihezue, C.U.
Department of Radiology, Queen Alexandra Hospital, Portsmouth, UK

KEY LEARNING OBJECTIVES: 1. To illustrate specific imaging findings on MRI associated with a variety of benign gynaecological lesions that will aid the Radiologist in making the correct diagnosis. 2. To review the radiological anatomy of the pelvic gynaecological organs. DESCRIPTION: MRI is increasingly being used in the diagnosis and characterization of gynaecological lesions. There are many features seen on MRI in benign gynaecological lesions that should be recognized by a reporting Radiologist to avoid confusion with malignant gynaecological lesions. We present a pictorial review of a variety of benign gynaecological lesions (endometrioma, dermoid cyst, ovarian cyst, nabothian cyst, adenomyosis, ovarian fibroma, bartholin gland cyst, uterine leiomyoma, endometrial polyp). CONCLUSION: The superiority of MRI to ultrasound and multi-detector CT scan (due to its good spatial resolution and muliplanar image acquisition ability) in characterizing gynaecological lesions makes it a very useful problem-solving tool in the management of patients with gynaecological lesions, particularly in distinguishing between benign gynaecological lesions and malignant gynaecological lesions.

e711

MRI features of ovarian stromal tumours

Bharwani, N., Dilks, P., Sahdev, A., Reznek, R.H., Rockall, A.G.
Barts & The London NHS Trust, London, UK

LEARNING OBJECTIVES: 1. To review the pathophysiology of ovarian stromal tumours. 2. To discuss and illustrate the characteristic MRI features and secondary signs associated with the various tumour subtypes. BACKGROUND: Ovarian stromal tumours arise from primitive sex cord and stromal components of the ovary and account for most hormonally active tumours. They comprise approximately 8% of all ovarian tumours and can be further sub-classified according to their histological components. The most common types are granulosa cell tumours (GCTs), fibrothecomas/thecomas, and Sertoli-Leydig cell tumours. IMAGING FINDINGS: This pictorial review will demonstrate characteristic MR features of ovarian stromal tumours and associated secondary signs of excess hormone production, e.g. endometrial hyperplasia. Each sub-type of stromal tumour has characteristic imaging features. GCTs are multiloculated cystic masses with variable solid portions which can be associated with endometrial abnormalities. Fibromas and thecomas are usually solid masses with

low signal intensity on T_1- and T_2-weighted MRI and a variable degree of calcification or degeneration. Sertoli-Leydig cell tumours are generally well-defined, enhancing solid masses with intra-tumoural cysts of varying sizes. CONCLUSION: Knowledge of clinical signs and characteristic MR features of ovarian stromal tumours can be used by the interpreting radiologist to differentiate these tumours from the more common ovarian epithelial tumours. This information can help clinicians to guide further investigation, plan the extent of surgery and assess prognosis.

e712
MRI features of uterine sarcomas

Bharwani, N.[1], Jelbert, A.[1], Tunariu, N.[2], Babar, S.[2], Sahdev, A.[1], Rockall, A.G.[1], Reznek, R.H.[1]
[1]Barts & The Royal London NHS Trust, London, UK,
[2]Imperial College HealthCare NHS Trust, London, UK

LEARNING OBJECTIVES: 1. To discuss the pathology of uterine sarcomas. 2. To illustrate typical MRI appearances of common histological variants. BACKGROUND: Uterine sarcomas are uncommon, aggressive tumours of mesenchymal origin accounting for 5–8% of all uterine malignancies. Although uterine sarcomas can be indistinguishable from endometrial carcinoma or atypical fibroids on MRI, there are certain features that can suggest these rare tumours pre-operatively. The distinction between atypical fibroids and sarcomas significantly alters the patient's treatment strategy. Although distinction between endometrial cancer and endometrial sarcomas can be made on endometrial biopsy, MR features may also be helpful where the biopsy is inconclusive. Pre-operative diagnosis of a sarcoma, may avoid inappropriate surgery and potentially affect patient outcome. IMAGING FINDINGS: The most common histological variants are: leiomyosarcoma (LMS), carcinosarcoma/malignant mixed Müllerian tumour (MMMT) and endometrial stromal sarcoma (ESS). Other rarer sarcomas containing tissues foreign to normal uterine tissue include rhabdomyosarcoma. LMS are characteristically large intermediate T_2-weighted signal intensity masses replacing normal uterine architecture with pockets of high T_2-weighted signal representing areas of haemorrhage or cystic degeneration. MMMT are endometrial-based tumours, heterogeneously hyperintense on T_2, homogeneously hypointense on T_1 and enhance with gadolinium. Appearances of ESS vary with grade of tumour ranging from a simple endometrial mass to large, irregular infiltrative, aggressive tumours. CONCLUSION: Knowledge of typical MR features associated with uterine sarcomas enables the reporting radiologist to suggest this rare diagnosis pre-operatively. This is advantageous to gynaecological oncology surgeons allowing more radical surgical planning and influences patient's subsequent management.

e713
Peritoneal inclusion cysts clarified

Ratcliffe, M.R., Alwan-Walker, H., Sukumar, S.A., Rudralingam, V.
University Hospital of South Manchester, Manchester, UK

KEY LEARNING OBJECTIVES: 1. To review the imaging characteristics of peritoneal inclusion cysts and provide a pictorial review correlating ultrasound, CT, and MR findings. 2. To provide a checklist to allow confident diagnosis and differentiation of peritoneal inclusion cysts from other adnexal masses in the female pelvis, thus avoiding unnecessary surgery. DESCRIPTION: Peritoneal inclusion cysts are caused by the accumulation of fluid that is contained by peritoneal adhesions and represent a non-neoplastic reactive mesothelial proliferation. Despite being a fairly common entity, they present with substantial heterogeneity in their imaging appearance and therefore, may be confused with various other cystic adnexal masses of the female pelvis including ovarian cancer. We will provide a pictorial review of peritoneal inclusion cysts with ultrasound, CT and MR. Imaging features allowing the differentiation of peritoneal inclusion cysts from other adnexal masses will be discussed. CONCLUSION: Peritoneal inclusion cysts can be confidently diagnosed on cross sectional imaging. This condition can be managed conservatively to avoid unnecessary surgery.

e714
MRI of cervical carcinoma

Hutchings, A.M., Ihezue, C.U., Burgess, L.M.
Queen Alexandra Hospital, Portsmouth, UK

KEY LEARNING OBJECTIVES: 1. To demonstrate the spectrum of MRI findings that are of clinical importance in the staging of cervical cancer. 2. To review the radiological anatomy of the uterus/cervix on MRI. 3. To highlight potential pitfalls in MRI interpretation in cervical carcinoma. DESCRIPTION: Cervical carcinoma is the third most common malignancy of the female genital tract in developed countries and is a leading cause of cancer-related death in women in developing countries. MRI, with its multiplanar capabilities and excellent soft tissue contrast has been shown to be a reliable tool in the evaluation of cervical cancer. Cervical carcinoma is staged clinically according to the FIGO (International Federation of Obstetrics and Gynaecology) staging system. T_2-weighted spin-echo images best depict anatomical detail of the cervix. We have illustrated the stage-specific MRI findings in cervical carcinoma and highlighted key features which are of relevance to the Gynaecologists at the Multidisciplinary Team Meetings (MDT) in our institution along with pitfalls in assessing the MRI of patients with cervical cancer. CONCLUSION: MRI remains an important and increasingly used tool in staging and diagnosis of cervical carcinoma. Radiologists should be conversant with the stage-specific findings on MRI. Improvements on its accuracy continue to be made with new techniques like diffusion-weighted MRI and the use of lymph node specific contrast agents like ultra-small superparamagnetic iron oxide particles (USPIO).

e715
How to perform hysterosalpingography

Saba, L., Mallarini, G.
A.O.U. Cagliari, Cagliari, Italy

PURPOSE: Hysterosalpingography (HSG) is an X-ray of the uterus and fallopian tubes that involves the injection of radiographic contrast medium (dye) through the cervix. This technique is used to determine if the fallopian tubes are open, or if there are any apparent abnormalities or defects in the uterus. If the fallopian tubes are open the contrast medium will fill the tubes and spill out into the abdominal cavity. The purpose of this work is: 1. To review indications to perform HSG. 2. To analyse the different types of technique by underlining radiation exposure. 3. To present different pathological examples. TEACHING POINTS: 1. Indications to perform HSG. 2. The technique of HSG by underlining concentration and volume of contrast material and radiation exposure. 3. Precautions and limitations. 4. Complications of this procedure. 5. Presentation of relevant cases. IMAGING FINDINGS: We present several relevant cases which encompass the spectrum of pathologies involving uterus and fallopian tubes including anomalies of the uterus and fallopian tubes obstruction. CONCLUSION: HSG has become a commonly performed examination due to the recent advances and improvements and affords the physician a comprehensive evaluation of the female reproductive organ.

Musculoskeletal

p801
The impact of reporting osteoporosis on routine CT on long term clinician management

Rosenthal, R.C., Abubacker, M.Z.
Luton & Dunstable Hospital, Luton, UK

PURPOSE: Routine CT is increasingly performed for a wide variety of diagnoses. Traditional axial studies are now reformatted into coronal and sagittal planes, resulting in increased reporting of incidental bony abnormalities, particularly osteoporotic collapse. We looked at how reporting this impacts on long-term clinician management.

MATERIALS/METHODS: CT reports over 10 months containing "key words", e.g. osteoporosis, collapse and wedge fracture, were searched on RIS, producing 120 patients. Their notes were retrospectively reviewed 1 year later. 32 were excluded due to alternative diagnoses. Of the remaining 88 patients (F:61, M:27, age range:37–98 years, mean 67.5 years), the following criteria were noted: Was the potential diagnosis of osteoporosis acknowledged by clinicians? Were they: a) On osteoporosis treatment pre- CT? b) Started on treatment post-CT? c) Investigated further for osteoporosis? Indication for CT request. Referrer speciality. RESULTS: In 58 of 88 (66%) patients, the potential diagnosis of osteoporosis was not acknowledged. 13 of 58 were already on prophylactic therapy. 16 of 88 (20%) were started on treatment. 15 of 88 (19%) were investigated further for osteoporosis. 14 of 88 (16%) were oncology patients. 11 of these 14 were not treated. CONCLUSION: 20% of patients started osteoporosis therapy based on the CT report, decreasing risk of future morbidity, mortality and the economic burden on NHS. Regularly reporting these CT findings has a significant impact on patient outcome. Greater clinician awareness of this is needed as over 50% of patients with a potential diagnosis of osteoporosis were not acknowledged up to a year after CT.

p802

Rheumatologists beware! Pain in the sternoclavicular joint may not always be arthritis

Ridley, N.T.F., Mukhtyar, C., Collins, D., Price, E., Williamson, L.
Great Western Hospital, Swindon, UK

KEY LEARNING OBJECTIVES: There is a wide range of pathology around the sternoclavicular joint. This is often rheumatological in origin but there are a number of other conditions that radiologists, rheumatologists and other clinicians should be aware of. DESCRIPTION: We illustrate a wide range of pathologies around the sternoclavicular joints including rheumatological conditions such as SAPHO syndrome, seronegative arthropathy and osteoarthritis. In addition conditions such as renal cell carcinoma metastases, breast carcinoma and infection are included. The range of imaging with plain films, CT, MR, scintigraphy and ultrasound is discussed. CONCLUSION: It is important to be aware of the wide variety of conditions affecting the sternoclavicular joints and adjacent structures.

p803

Imaging of unresolved ankle sprain

Mansour, R.[1], Mukerjee, K.[1], Kamath, S.[1], Jibri, Z.[1], Ostlere, S.[2]
[1]University Hospital of Wales, Cardiff, UK, [2]Nuffield Orthopaedic Centre, Oxford, UK

KEY LEARNING OBJECTIVES: In this review presentation, we will highlight and discuss the possible causes of unresolved ankle sprain describing the imaging features of these conditions and the role of MRI in their evaluation. DESCRIPTION: Acute ankle injuries are common with over 5000 treated daily in the UK. Ankle sprains comprise around 85% of these injuries. The lateral ligament sprains account for 85% of these cases and isolated deltoid sprains make up 3–5%. A minority of ankle sprains affect the tibiofibular syndesmosis. The most common causes of unresolved ankle sprain are missed fractures, secondary osteoarthritis, osteochondral defects and ankle instability. Other causes include impingement syndromes, sinus tarsi syndrome, spring ligament damage, posterior tibial tendon rupture and peroneal tendon dislocation. Although examination is often sufficient to direct the clinician to the cause of unresolving ankle pain, imaging is necessary to form a definitive diagnosis and to direct therapeutic management. Weight-bearing standard AP, lateral and mortise radiographs are the first radiological investigations of unresolved ankle sprain. CT is excellent at providing fine bony detail, but is rarely required. Ultrasound has the advantage of allowing dynamic studies. MRI is usually the modality of choice when investigating these injuries. CONCLUSION: Unresolved ankle sprain can create a diagnostic challenge. It is important to recognize the possible causes of this problem which would lead to an accurate approach in their evaluation. In this review, we discuss the causes of unresolved ankle sprain providing common examples with descriptive MR images.

p804

Improving quality of referrals for foot and ankle fractures in the emergency department

Mahady, K.F., Walker, P., Briggs, R., Barron, D.
Leeds Teaching Hospitals Trust, Leeds, UK

PURPOSE: To reduce time spent by reporting radiologists and emergency department (ED) doctors in the follow up of "missed" foot and ankle fractures by improving the referral quality for X-ray in ED. MATERIALS/METHODS: Daily ED "XR misses" folders from 21 October 2008 to 21 November 2008 were examined. 41 "missed" foot and ankle fracture patients were identified and their referral and outcome information sourced. RESULTS: For >99%, referral information was available. 72% of referrals did not meet Ottawa Rules1 and in 28%, no site of bony tenderness was stated. Outcome information for 85% of patients showed fractures were treated in 57%; in 60% of those the site of bony tenderness was known. Overall, 43% were discharged without follow-up. For all referrals, radiology overcall in 7 of 35 and true missed fracture by ED in 16 of 35 was deduced. All radiology overcall referrals did not meet Ottawa Rules1. In 8 of 35 the fracture was not missed but insufficient information had been provided to the radiologist, 2 of 35 had incorrect side markers on XR and 2 of 35 were uncontactable for follow up by ED. Most (44%) of true missed fractures were metatarsal. CONCLUSION: True fractures are more likely to be detected if the site of bony tenderness is stated. If referrals for foot and ankle X-ray in ED meet Ottawa Rules1 and clinical outcome information is available, "missed" fractures are less likely to be overcalled by reporting radiologists, thus reducing the number of patients recalled to ED.

p805

Mechanism of injury and bone marrow oedema in knee MR

Boswell, W.J., Earnshaw, D.
Arrowe Park Hospital, Wirral, UK

KEY LEARNING ONJECTIVES: Understanding the different patterns of bone marrow oedema seen in knee trauma with different mechanisms of injury and how this helps predict the soft tissue structures at risk of injury. DESCRIPTION: MR is an extremely sensitive modality for the detection of bone marrow oedema and is commonly used to assess for internal derangement of the knee after trauma. We present a series of cases demonstrating the different patterns of bone marrow oedema seen following different mechanisms of injury to the knee joint. These highlight how knowledge of the pattern of bone marrow oedema can help to determine the mechanism of injury and also which of the soft tissue structures of the knee are at highest risk of injury. CONCLUSION: Knowledge of the mechanism of injury and the associated pattern of bone marrow oedema in knee trauma can help to predict which structures are most likely to be injured.

p806

Two dimensional radiological correlation of three dimensional vertebral anatomy to facilitate therapeutic injections

Ahmed, K.
Southmead Hospital, Bristol, UK

BACKGROUND: Local anaesthetic and steroid injection in the facet joints and nerve root foramina are employed for diagnostic as well as therapeutic purposes. The three dimensional nature of the vertebral anatomy renders the use of two-dimensional plain radiographs unreliable There is a need to define the radiological anatomy of these structures. OBJECTIVE: To define the radiological anatomy of lumbosacral spinal landmarks as seen on anteroposterior and lateral plain radiographs. METHOD: Dissected human cadaveric specimen of lumbosacral spine with labelled landmarks was subjected to plain radiography. A real life scenario of therapeutic injections into facet joints, sacral foramina and the sacro-iliac joints under image intensifier

was performed. CONCLUSION: The precise localisation of the inter-vertebral foramina is difficult due to superimposition of anterior and posterior margins of the vertebral body. A fair amount of caution is required when employing plain radiography in therapeutic injections.

p807

A pictorial review of percutaneous vertebroplasty: Indications, method and complications

Oh, T.C.[1], White, R.D.[2], Bhat, R.[2], Wilson, P.[1]
[1]Manchester Royal Infirmary, Manchester, UK, [2]Ninewells Hospital, Dundee, UK

KEY LEARNING OBJECTIVES: To appreciate percutaneous vertebroplasty in terms of its indications, technique and potential complications, presented through a pictorial review. DESCRIPTION: Percutaneous vertebroplasty is now an established means of providing pain relief in severe osteoporotic vertebral crush fractures. The indications have expanded to include such symptomatic vertebral conditions as haemangioma and vertebral body tumours. However, despite the availability of National Institute of Clinical Excellence (NICE) guidelines for the procedure and good evidence for its efficacy, it is still not well understood beyond the Musculoskeletal and Interventional Radiology subspecialties. This pictorial review illustrates the various conditions amenable to percutaneous vertebroplasty and provides an overview of the technique itself. Although serious complications requiring further intervention are uncommon, important examples are highlighted here. CONCLUSION: Percutanous vertebroplasty is an established method of providing symptomatic relief in a range of spinal conditions, although awareness and comprehension of the procedure is far from universal. Illustration of the indications, method and potential complications should aid in the understanding of this procedure.

p808

An audit of lumbar spine radiography requests from primary care

Basit, R., Porte, F., Howlett, D.
Eastbourne District General Hospital, East Sussex, UK

PURPOSE: Lumbar spine radiography is a common investigation for back pain in primary care though is not routinely recommended as it has been shown largely not to be associated with beneficial clinical outcome. Stringent guidelines have been laid down and disseminated by the Royal College of Radiologists (RCR) and the aim of this study was to assess the level of adherence to these within primary care. METHODS: All primary care request cards for lumbar spine X-rays at Eastbourne District General Hospital (EDGH) during the months of January to March 2008 inclusive, were vetted against the standards found within the document "Making the Best of Clinical Radiology Services, Referral Guidelines," sixth edition as published by the RCR. Request cards were then divided into the categories of valid, invalid and unclassifiable as a result of the vetting process. RESULTS: During the 3 month period, 218 lumbar spine X-ray requests were made from primary care to EDGH. Of these, 33% (72) were deemed valid, 60% (130) invalid and 7% (16) unclassifiable. Of the valid requests, the breakdown largely consisted of query osteoporotic collapse and trauma with pain – each with 21 requests, respectively. Within the invalid group, 60 requests were inappropriate due to querying chronic back pain of unknown cause, 40 querying osteoarthritis and 16 querying sciatica. CONCLUSION: The audit demonstrated a poor level of compliance to published guidelines for lumbar spine radiography as requested by primary care. MRI would be a more appropriate investigation of choice, especially for those requests deemed invalid.

p809

Static imaging for coccygodynia in symptomatic and asymptomatic patients

Haroon, A., Shah, A., Bhatt, R.
University Hospitals of Leicester, Leicester, UK

PURPOSE: Tip of normal or abnormal coccyx can lie above the baseline curvature as part of a loop and the junction of first and second coccyx can form an acute angle (modified inter-coccygeal angle; MIC). We aimed to measure angle between the top of the sacrum and the tip of the coccyx (modified sacrococcygeal angles; MSA), assess the alphabetical configuration of coccyx and correlate symptomatic and asymptomatic groups. METHOD: Retrospective review of coccyx radiographs of 29 symptomatic patient's (10 M; 19 F; age: 12–94 years) were matched with sagittal CT images (64 slice MDCT 0.5 mm collimation) of 29 asymptomatic control group (17 F and 12 M; age 18–89 years). We analysed configuration (C, S, L or I shape), modified angles and vertical alignment of coccyx. RESULTS: The symptomatic groups had varied configuration (12 L; 2S; 1I and 14C) as compared with all C-configurations in control group. The majority of cases in control group had midline alignment (right scoliosis 2) as compared with symptomatic patients (left scoliosis 1; right scoliosis 4). The MIC (300–960; Av: 590) was greater in symptomatic group as compared with control group (26.30–89.30; Av: 490). MSA was less (34.90–94.50 Av: 65.30) in symptomatic vs control group (41.90–950; Av: 77 0). CONCLUSION: The configuration of coccyx can be varied. It can form a "C", "S", "L" or "I" shape and can be easily inferred from plain radiographs. Modified inter-coccygeal and sacro-coccygeal angles supplement previously known variables for assessment of coccygeal anatomy.

p810

Sacral insufficiency fractures. A "sufficient" pictorial review

Shetty, S., Young, R., Planner, A., Ridley, N., Beale, A.
Great Western Hospital, Swindon, UK

KEY LEARNING OBJECTIVES: Sacral insufficiency fractures are a cause of morbidity in the elderly, often due to osteoporosis, and are easily missed. MRI, CT and nuclear medicine can all aid diagnosis. DESCRIPTION: A number of sacral insufficiency fractures are demonstrated using CT, MRI and nuclear medicine imaging. Characteristic findings are shown which help delineate these fractures from other pathologies. Sacral fractures typically are oriented vertically, parallel to the sacroiliac joints, a soft-tissue mass is absent, bone destruction is lacking, and adjacent fascial planes are preserved. Coronal reconstruction can assess fractures that are oriented transversely. MRI shows decreased signal on T_1-weighting and increased signal on T_2. Signal changes are seen as linear bands within the sacral ala and body. On isotope bone scans, the typical H-shaped pattern of uptake in the sacrum is diagnostic of insufficiency fracture. The vertical limbs of the H lie within the sacral ala while the transverse limb of the H extends across the sacral body. Concomitant findings of 2 or more areas of uptake in the sacrum and at another pelvic site are considered diagnostic of insufficiency fractures. CONCLUSION: Sacral insufficiency fractures are an important differential diagnosis to be considered when patients present with low back and pelvic pain. This is especially of importance with an increasing elderly population. These fractures can cause significant morbidity. A high clinical suspicion and knowledge of the appearances of these fractures is crucial to the effective management of the patient.

p811

Radiography of the scaphoid – Impact of anatomical variation and radiographic technique on image appearances

Walton, C., Spooner, M., Yaqub, Z., Nadeem, A., Salameh, R., Hardy, M.
University of Bradford, Bradford, UK

The standard radiographic projections of the scaphoid commonly include a DP projection with cranial angulation. This projection, also known as a stretchers, zitters or "banana" projection, facilitates evaluation of the longitudinal scaphoid surface without foreshortening as a result of the orientation of the scaphoid bone within the wrist carpus. However, description of appropriate technique to obtain a

high quality DP projection with cranial angulation varies between text books. Although all authors advocate cranial angulation, the degree of angulation is inconsistent, varying between 15 and 45 degrees. The problem of identifying the most appropriate cranial angulation to be adopted is further compounded by the natural variation in scaphoid orientation within the carpus and it is uncertain whether differences between the diameter of the proximal and distal forearm contribute to this variation. This poster reports the findings of a first year student radiography project considering the evidence base for radiography of the scaphoid. It will provide a photographic review of the variation in scaphoid orientation within the carpus and demonstrate how differences in forearm diameter may impact on scaphoid orientation. Finally, evaluation of the appropriateness of commonly recommended cranial angulations will be undertaken based on the research evidence.

p812

Are we justifying the requests for skull radiographs as per the RCR guidelines?

Dadayal, G.K., Raneem, A., Mankad, K., Simpson, J.
Calderdale and Huddersfield NHS Foundation Trust, Huddersfield, UK

KEY LEARNING OBJECTIVES: As per RCR and NICE guidelines, the skull radiograph (SXR) is not recommended in patients with head injury (except in suspected non-accidental injury). However, it is still routinely performed in several hospitals with various indications which differ between hospitals. The aim of this study was to assess the appropriateness of SXR requests based on RCR guidelines. DESCRIPTION: A retrospective study was performed on 151 consecutive patients who underwent a SXR for any indication over a period of 3 months from November 2007 to January 2008. 70% of the SXRs were performed in patients with head injuries, while 5% were performed in patients with history of seizure, chronic headache or in the post-operative period. All these requests were non-justified as per RCR guidelines. Only a quarter of SXR requests were justified in cases to rule out metallic foreign body, abnormal shape of the head and Paget's disease amongst others. In a few cases of severe head injury, a negative SXR provided false reassurance and led to a delay in the diagnosis and management by 24–72 h. CONCLUSION: The majority of SXRs being performed currently do not meet RCR guidelines. Appropriate training should be provided to A&E doctors, radiographers and junior radiologists to enable the judicious use of SXR in line with RCR guidelines.

e813

Unusual stress fractures of the metatarsal bones caused by a structural foot deformity

Theodorou, S.J., Theodorou, D.J., Boutin, R.D., Fliszar, E., Resnick, D.
University of California, San Diego, CA, USA

PURPOSE: Stress fractures of the metatarsal bones are typically located in the second and third rays of patients engaged in increased levels of weight-bearing activity. Our objective is to describe the imaging findings of unusual stress fractures involving the lateral metatarsals (fourth and fifth rays) and present this entity as a cause of forefoot pain. MATERIALS/METHODS: Review of the radiographic and MRI studies of the foot in patients with a documented diagnosis of stress fractures of the lateral metatarsal bones who presented with forefoot pain, swelling and an impaired gait was performed. Patient population included eleven patients (6 women and 5 men), who ranged in age from 25 to 61 years. Two radiologists evaluated the type, number, and location of fractures, the morphology of the involved foot, and performed specific measurements. RESULTS: Stress fractures were found in the lateral (n=17) and the medial (n=5) metatarsals. A solitary fracture was present in 6 patients, and multiple fractures were evident in 5 patients. One patient had bilateral metatarsal fractures. The locations of the stress fractures were in the proximal one-third of the metatarsals in 19 instances (86%) and in the middle one-third in 3 instances (14%). Varying degrees of forefoot adduction were noted, measuring between 21 and 37 degrees. CONCLUSION: Stress fractures of the lateral metatarsal bones should be entertained as a cause of forefoot pain in the appropriate patient population. Familiarity with this entity and its imaging characteristics may prove helpful in diagnosis and prevention of metatarsal fractures.

e814

High patient satisfaction with guided injection: Is it because they feel involved with pain relief

Kiu, A., Khan, S.H.
Royal Blackburn Hospital, Blackburn, UK

OBJECTIVES: Role of guided injections in pain relief and patient satisfaction. METHODS: Data of 63 patients with joint and soft tissue pain were collected from a questionnaire. Joint injection sites include hip, glenohumeral, sacroiliac, facet, subtalas and talonavicular joints while soft tissues injections include ischial, trochanter and subacromial bursae, as well as Achilles, plantar fascia and ring finger tendon sheaths. Patients were able to view the procedure on a screen. 50 responded to whether they would re-undergo procedures and 55 responded to care provided by radiology staff. RESULTS: Of the 50 that responded, 96% were satisfied and would return or recommend such a procedure whereas 4% would not. For care provided by staff; there was 0% unsatisfied, 2% satisfactory, 9% believed it was good and 89% hailed it as excellent. Interestingly, although 11 had pain returned to its pre-procedural state, only 2 of these patients declined a repeat procedure, showing strong support for guided injections. CONCLUSION: There is a very high satisfaction rate from guided injections (96%). Although to a large extent this is due to pain relief afforded by steroid/ostenil injections but it may also be due to more involvement of patients in the pain relief process (by observing the injection). This finding places interventional radiology in a positive light for future management of patients with joint or soft tissue pain, especially when patients themselves have voted for it. Moreover, it is a positive feel for staff and the hospital that patients have high recommendations for patient care.

e815

The use of ultrasound-guided wire localization in orthopaedics and head and neck surgery

Sriskandan, N.[1], Chettiar, K.[2], Ross, K.[2], Howlett, D.C.[2]
[1]Guy's and St. Thomas' NHS Trust, London, UK,
[2]Eastbourne District General Hospital, Eastbourne, UK

KEY LEARNING POINTS: Ultrasound-guided wire localization (UGWL) is established in breast surgery but not well described in other specialties. The technique and four cases of UGWL in orthopaedics and head and neck surgery are described. DESCRIPTION: Ultrasound is used to identify the lesion and, under local anaesthetic, a 14-gauge needle is used to place the guidewire either within or adjacent to the lesion. Cases: i) A 63-year-old lady presented with left thigh pain. MR identified a possible schwannoma within the lateral compartment of the thigh. Ultrasound identified the impalpable lesion and a localization wire was placed in close proximity. The lesion was safely excised; histology confirmed the diagnosis; ii) MR pelvis in a 15-year-old with back pain and fever revealed a right sacroiliitis and adjacent abscess. The abscess could not be located at surgery. A localization wire, inserted by a radiologist in theatre, guided the successful, second approach; iii) a 40-year-old patient underwent UGWL of an impalpable, but uncomfortable, complex subhyoid cyst. Histology from the subsequent Sistrunk's operation revealed a thyroglossal cyst; v) a cystic swelling in the anterior triangle of the neck of a 37-year-old patient was aspirated under ultrasound guidance. Cytology revealed a branchial cyst, which was now impalpable. UGWL was utilised to minimize surgical access and ensure complete excision. CONCLUSION: UGWL has potential uses in many branches of surgery and can be performed in the radiology department or theatre. The technique aids operative planning and improves tissue conservation, leading to improved patient recovery.

e816

Look at the scout

Gadde, S., Taylor, D., O'Longain, D., Sathyanarayana, R.,

Napier, N., Crone, M.D., Grey, A.C.
Musgrave Park Hospital, Belfast, UK

LEARNING OBJECTIVES: Appreciate the importance and range of pathology identified by routinely reviewing the scout/localizer sequences in every-day MRI of the lumbar spine. DESCRIPTION: Prior to the PACS era, printed films generated from MSK examinations, especially lumbar spine studies, routinely optimized the layout, magnifying the area of interest and cropping "non-relevant" areas such as the retroperitoneum. Localizer or scout sequences were usually not printed principally due to financial implications. Now PACS is in common use and it is increasingly recognized that many additional imaging findings can be seen in the "non-relevant" areas, which can be of significant clinical importance. The whole MR study, including the scout sequences are now routinely stored in electronic archive, potentially storing such information – which may in future may be viewed as reading "misses" forever, with obvious medico-legal consequences. We illustrate a selection of important cases, identified on the scout sequences in routine lumbar spine MRI studies performed in a specialist MSK imaging centre. Additional multi-modality correlation is provided where available and appropriate. CONCLUSION: This exhibit emphasises the importance of routinely reading the additional imaging information obtained on localizers/scout sequences and demonstrates the range of pathology that can be present. This serves as a useful reminder to established radiology consultants and provides an important learning tool for registrars. The concept could be generalized to all MR and CT studies that use a localizer.

e817

Correlation of MRI and plain radiography findings in the diagnosis of sacroiliitis

Patel, P.N., Elias, D.A.
King's College Hospital, London, UK

PURPOSE: To correlate MRI and plain film findings in patients with suspected sacroiliitis. MATERIAL/METHODS: We present a retrospective study that identified 102 sacroiliac (SI) joints imaged with MR in a 1 year period from June 2007 to March 2008. Pre- and post-contrast images were acquired. The number of these SI joints also imaged by plain radiography was noted. On plain film, sacroiliitis was graded using the New York criteria. The view performed for each plain film was also recorded. Comparison was then made between MRI and plain film findings. RESULTS: 37 out of 51 patients (74 of 102 SI joints) were imaged by both MR and plain radiography. 30 out of 102 SI joints (15 out of 51 patients) demonstrated appearances consistent with sacroiliitis on MRI, these were all cases of bilateral sacroiliitis. Plain films had been performed in 11 out of 15 patients (22 out of 30 SI joints) with a positive MR for sacroiliitis; plain film was positive for sacroiliitis in 10 out of the 11 patients (20 out of 22 SI joints) with MR findings of sacroiliitis. CONCLUSION: In this study, the detection rate of sacroiliitis on plain film is comparable with that on MRI. If plain films are clearly positive for sacroiliitis i.e. New York grades III or IV, then the need for MRI is questionable in terms of diagnosis.

e818

Imaging the extensor mechanism of the knee

Proctor, R.D., King, L.J.
Southampton University Hospitals NHS Trust, Hampshire, UK

KEY LEARNING OBJECTIVES: To review the radiological anatomy, function and imaging of the extensor mechanism of the knee plus the range of pathologies which are commonly encountered in clinical practice. DESCRIPTION: The extensor mechanism of the knee is a complex musculo-tendinous and osteo-articular complex which is essential for normal function of the lower limb and is prone to a range of pathologies and functional disorders. These conditions may be readily imaged using a number of modalities and the appropriate choice of modality coupled with accurate interpretation of the findings will aid prompt diagnosis and treatment. The relevant radiological anatomy and variations of anatomy are reviewed in detail along with a comprehensive description of the commonly encountered disorders including: developmental abnormalities including multipartite patella and dorsal defects; traumatic injuries of the extensor mechanism; degenerative disorders including chondromalacia patellae, osteoarthritis, pyrophosphate arthropathy and tendinosis; inflammatory conditions including bursitis; chronic avulsion conditions such as Osgood Schlatter and Sinding-Larsen-Johansson syndromes; patellar impingement syndromes; patellar maltracking; other rarer bony lesions such as aneurysmal bone cysts. CONCLUSION: We present a comprehensive illustrated review of imaging of the extensor mechanism of the knee outlining how the components may best be imaged and illustrating the various pathologies which may be encountered.

e819

Spectrum of cyst-like conditions found in and around the knee

Buzzi, A., Hjelt, M., Suarez, M.V.
Dlagnostico Médico, Buenos Aires, Argentina

LEARNING OBJECTIVES: To recognize the different types of fluid filled structures (normal and abnormal) frequently found in the knee and in the surrounding soft tissues. BACKGROUND: There is a broad spectrum of cyst like or water containing structures adjacent or within the knee. The purpose of this exhibit is to classify and describe these different fluid filled structures. IMAGING FINDINGS: Three types of fluid filled structures can be found. Bursae, recesses and cysts. Bursae are sinovial lined sacs found between structures that move against each other, whose main purpose is to reduce friction between these structures: the suprapatellar bursae, the subcutaneous prepatellar bursae, the superficial and deep infrapatelar bursae, the pens anserine bursae, the gastrocnemius bursae and the medial collateral ligament bursae. Recesses are considered direct extensions of the articular cavity. They include Baker's cyst and distended hiatus popliteus. Cysts are liquid masses, including meniscal cysts and ganglion cysts (anterior and posterior cruciate ligament ganglions, intraosseous ganglion and proximal tibia fibular ganglion). CONCLUSION: MRI is an excellent method to evaluate the different types of water containing structures that are frequently found in and around the knee.

e820

How can we improve radiological diagnosis of Lisfranc's injury

Yap, L.
The East Lancashire NHS Hospital Trust, Blackburn, UK

KEY LEARNING OBJECTIVE: Lisfranc's injuries may be subtle and difficult to recognize. Up to 20% of Lisfranc's injuries may be missed and overlooked Lisfranc's injury may predispose the patient to chronic pain and disability. The purpose of this study is to help participants to: 1. Understand the anatomy of the foot. 2. Establish a simple systematic method of assessing a foot radiograph. 3. Improve the radiological diagnosis of Lisfranc's injury. DESCRIPTION: (a) Procedure. 17 participants, comprising of 10 junior orthopaedics doctors and 7 junior casualty officers were recruited for the study. Each participant took part in a pre-study survey which comprise of a questionnaire regarding the understanding of foot anatomy and radiography; and picture quiz containing of a set of 12 foot radiographs which could be normal, Lisfranc's injury or other bony pathology. A set of lecture notes on anatomy and radiographic evaluation of foot, and Lisfranc's injury were then distributed for the participants to study at their own leisure, before a post study survey is performed. Each participant was given another set of 12 foot radiographs (similar to pre-study quizzes) to analyse and a questionnaire on the beneficial of the learning session to complete. (b) Result. Diagnostic accuracy improved after the learning session. The proportions of correct diagnosis of Lisfranc's

injury increase from 53% to 92%. 59% felt the learning session to be very beneficial and 41% found the session useful. CONCLUSION: This study demonstrated the effectiveness of a simple learning tool in improving radiological diagnosis of Lisfranc's injury.

e821

Mesenchymal chondrosarcoma of soft tissue: Imaging findings with pathologic correlation

Theodorou, S.J.[1], Theodorou, D.J.[1], Agnantis, N.[2], Kakitsubata, Y.[1]
[1]University of California, San Diego, CA, USA, [2]University of Ioannina, Ioannina, Greece

KEY LEARNING OBJECTIVES: To evaluate the spectrum of imaging appearances of mesenchymal chondrosarcomas (MCSs). The underlying histopathology is emphasised and correlated with the imaging features of tumour. A multimodality imaging approach is illustrated with emphasis on radiographs, ultrasound, bone scintigraphy, CT and MRI. DESCRIPTION: Mesenchymal chondrosarcoma is a rare tumour accounting for less than 10% of all chondrosarcomas. The majority of MSCs arise from the skeleton, while only 22% have an extraosseous origin. Of the extraskeletal locations, tumours commonly involve the thigh. Because of its aggressive clinical behaviour, MCS is regarded a high-grade sarcoma that usually offends young adults. There is a female predilection. On histopathology this malignancy shows a bimorphic pattern, with primitive mesenchymal cells and well-differentiated cartilaginous tissue. Radiographs often reveal a nonspecific soft tissue mass with granular calcifications. Areas of chondroid matrix mineralization are best depicted on CT images. Erosion of underlying bone with or without periosteal reaction can be present. MCS typically is displayed as a lobular lesion of intermediate signal intensity on T_2-weighted MR images. Areas of tissue necrosis can be seen with high signal intensity on T_2-weighted images. Diffuse heterogeneous enhancement is noted after administration of intravenous gadolinium. Serpentine high-flow vessels may also be demonstrated in the tumour. CONCLUSION: Although the imaging features of MSC are nonspecific, the presence of chondroid-type calcifications within a large, soft tissue enhancing lobular lesion is suggestive of a chondroid neoplasm. Recognition of the imaging spectrum and pathologic basis of MSC is vital for diagnosis, biopsy, staging, and treatment.

e822

Fibrolipomatous hamartoma of peripheral nerves: MRI – Pathological correlation

Theodorou, S.J.[1], Theodorou, D.J.[1], Kakitsubata, Y.[1], Shibata, M.[2], Yuge, M.[2], Yuki, Y.[2], Hatakeyama, K.[2], Yokouchi, T.[2]
[1]University of California, San Diego, CA, USA, [2]Miyazaki Medical College, Miyazaki, Japan

KEY LEARNING OBJECTIVES: To describe the essential MR findings of fibrolipomatous hamartoma (FLH) of peripheral nerves and their branches. To present the broad differential diagnosis for FLH and to provide clues to correct diagnosis. To correlate the MRI findings of FLH with histological features. DESCRIPTION: FLH is a rare tumour-like condition involving peripheral nerves. This abnormality typically presents in early adulthood in the volar aspect of the hand, wrist, or forearm. Clinical symptoms and signs usually include localized swelling, neurological deficits, macrodystrophia lipomatosa, and macrodactyly. Radiographs are either normal or may disclose a non-specific soft-tissue mass. On MRI, a fusiform well-defined mass, which follows the anatomic distribution and branching pattern of the involved nerve, is seen. The lesion shows the signal intensity characteristics of fat; that is increased signal intensity on T_1- with corresponding decreased signal intensity on T_2-weighted images. The fascicular sign comprising a clustered group of nodular or longitudinally oriented structures of low signal intensity on all sequences is characteristic of neurogenic tumours. At histological analysis, these structures correspond to thickened nerve bundles and endoneural and perineural fibrosis. Overgrowth of fatty tissue is typically observed. CONCLUSION: The diagnosis of FLH can be suggested from its MRI appearances including the pathological changes of fibrofatty overgrowth of nerve, the presence of enlarged nerve bundles within the mass, and distribution of the lesion along the course of individual nerve(s). MRI is indispensable for making the correct diagnosis that allows differentiation of FLH from other nerve tumours.

e823

Plantar nerves: Dedicated magnetic resonance imaging and anatomic correlation in cadaveric feet

Theodorou, S.J., Theodorou, D.J., Farooki, S., Trudell, D., Resnick, D.
University of California, San Diego, CA, USA

PURPOSE: To explore the appearance of the plantar nerves using dedicated MRI of the foot in cadavers and to correlate nerve anatomy with the presence of compression neuropathy causing subcalcaneal heel pain. MATERIALS/METHODS: High-resolution MR studies were performed in 16 cadaveric feet and images were analysed. Subsequently, the feet were sectioned in planes corresponding to those at imaging for anatomic correlation. The normal anatomic appearance of the medial and lateral plantar nerves and the first branch of the lateral plantar (FBLP) nerve were analysed and described. RESULTS: Normal anatomy of the plantar nerves distal to the tarsal tunnel as well as the FBLP nerve was identified. The medial and lateral plantar nerves were found arising from the posterior tibial nerve. The trifurcation of the posterior tibial nerve could be best evaluated on sagittal images. Cross-sectional depiction of the anatomic course of plantar nerves was best seen on the serial coronal and axial images of the feet, providing detailed description of regional anatomy and derangements. CONCLUSION: A myriad of different conditions can cause subcalcaneal heel pain, ranging from plantar fasciitis, calcaneal enthesophytes, osteoarthritis, tenosynovitis and painful heel pad to entrapment neuropathy. Differentiating between abnormalities requires an in-depth understanding of the normal regional anatomy of the plantar nerves. Because of the complex anatomic detail of the plantar neurovascular structures, ascertaining the cause of pathologic changes can often prove challenging. MRI enables accurate visualization of the plantar nerves that allows for assessment of the patient with chronic heel pain and compression neuropathy.

e824

MRI appearances of synovial pathology - A pictorial review

Gadde, S., Napier, N., Taylor, D., O'Longain, D., Crone, M.D., Grey, A.
Musgrave Park Hospital, Belfast, UK

LEARNING OBJECTIVES: Synovium is a specialized vascular tissue lining joints, bursae and tendon sheaths and is involved in various localized and diffuse synovial based disorders. MRI can accurately depict synovial pathology and is the imaging modality of choice in assessment of these disorders. This pictorial review will illustrate the typical MRI findings in various synovial based pathologies. DESCRIPTION: Synovium is affected by benign and malignant proliferative lesions such as PVNS, synovial osteochondromatosis, lipoma arborescens, localized nodular synovitis, synovial haemangioma, synovial sarcoma and metastases. Synovium is the primary site of involvement in rheumatoid arthritis and is also frequently affected in post traumatic synovitis, infective, inflammatory and haematological disorders, where as synovial cysts are also frequently encountered in association with asymptomatic individuals. Thickening of synovial plica in plica syndrome is a rare cause of internal derangement of knee. The synovial thickening itself is non specific in most of these conditions. However, other associated findings and clinical correlation will provide vital clues in suggesting the likely diagnosis and will play important role in early diagnosis and management of these patients. CONCLUSION: Synovium is affected by diffuse and localized inflammatory, infective, post traumatic and neoplastic processes. Some of these conditions have pathognomonic

MRI appearances, where as in others MRI is helpful in providing vital clues to early diagnosis and to assess disease extent which is crucial for guiding treatment and complete surgical resection. Knowledge and familiarity of characteristic appearances of these synovial based pathologies would help in early and appropriate treatment.

e825

Morel-Lavallée lesions

Kishore, R., Wardle, P., Rhys, R.
Royal Glamorgan Hospital, Llantrisant, UK

KEY LEARNING OBJECTIVES: 1. To recognize the condition. 2. To understand the mechanism of injury. 3. To recognize the ultrasound features. 4. To understand the evolution of the MRI findings. 5. To discuss treatment options. DESCRIPTION: Morel-Lavellée lesions are rare and interesting lesions, classically seen in the trochanteric and upper thighs. They are closed degloving injuries, occurring as a result of traumatic shearing of the subcutaneous tissue from the underlying fascia. They are composed of haemolymphatic fluid with a variable mixture of viable and necrotic fat. They have a broad spectrum of radiological features depending on the age of the lesion. CONCLUSION: The radiological findings of Morel-Lavellée lesions are distinctive, and often under-diagnosed. We present a review of the condition and illustrate its interesting radiological features.

e826

Diagnostic yield of percutaneous biopsy in suspected infectious discitis

Kumar, P., Witham, F.
Queen Alexandra Hospital, Portsmouth, UK

Septic discitis is an inflammatory process of the intervertebral disc with an incidence of 1:250 000. Typically, it manifests with non-specific symptoms of discomfort with a slow or insidious onset that may be difficult to distinguish from neck or back pain due to other causes. Presentation may be acute or chronic, and neurological symptoms may or may not be present. Most patients are older than 50 years and in addition, may have other causes of back pain. While *Staphylococcus aureus* is the most frequently identified organism, a wide variety of organisms are capable of causing discitis. Culture is therefore necessary to enable targeted therapy. We performed a retrospective study to establish the diagnostic yield of CT-guided biopsies in the setting of suspected infectious discitis over a 5 year period (June 2003 to June 2008). 18 suspected cases of infectious discitis were biopsied based on their appearances on MRI. Microbiological analyses of the CT-guided biopsy specimens were positive in 6 patients, with *Staphylococcus* being the most common organism isolated. Our e-poster analyses the results of this retrospective audit, examining potential reasons for the low diagnostic yield. In addition, it demonstrates common MRI appearances of infectious discitis so as to aid the Radiologist-in-training when interpreting MRI images.

e827

Radial tunnel syndrome: Ultrasound guided injections – A useful tool in diagnosis and treatment

Fernando, S.R., Toms, A.P., Chojnowski, A.J.
Norfolk and Norwich University Hospital NHS Trust, Norwich, UK

OBJECTIVES: Compressive entrapment of the posterior interosseous branch of the radial nerve causes radial tunnel syndrome. Accurate diagnosis and careful selection for surgical intervention is important in managing this condition effectively. The aim of this poster is to describe the diagnosis of radial tunnel syndrome with ultrasound guided injection. DESCRIPTION: Patients who attend the Orthopaedic Hand Clinic with clinical diagnosis of radial tunnel syndrome are subsequently referred to the Radiology department for ultrasound guided steroid and local anaesthetic injection into the radial tunnel. Informed consent includes a description of subsequent temporary paralysis of wrist extension. The procedure is performed with the patient sitting in front of the radiologist. Under direct ultrasound guidance a 21 G needle is inserted through the common extensor muscles and through the superficial head of supinator. The radial tunnel is dissected using 1% Lidocaine taking care to avoid posterior interosseous vessels. Once the plane of the tunnel has been reached 40 mg of Depomedrone and 2 ml of Lidocaine 1% are injected. Effective placement of the injection is indicated by a complete, but temporary, extensor compartment paresis. Patients whose symptoms recur after an initial period of improvement are considered for surgical decompression. CONCLUSION: This technique provides more certainty in the diagnosis of radial tunnel syndrome than with clinically guided injections. An adequate, although temporary, response to ultrasound guided injection can be used as a selection criterion for surgical intervention. The injection may also provide an effective, long term, non-surgical, therapeutic intervention.

Neuroradiology

p901

Imaging delayed presentation minor head injury: Do the NICE guidelines need to be modified?

Mortimer, A.M., Regi, J.M., Munro-Davis, L., Roach, H.
Bristol Royal Infirmary, Bristol, UK

PURPOSE: Use of CT to investigate patients with delayed presentation (>24 h) GCS 15 minor head injury is controversial. Furthermore, there is presently no temporal aspect to the NICE guidance. We have undertaken a survey of CT head examinations performed in these patients over 18 months. We aimed to identify the proportion and characteristics of injuries. Additionally we aimed to identify what proportion met NICE guidelines for imaging and whether following the guidelines increased abnormality pick-up. METHODS: Using the hospital PACS system, demographics, imaging findings and clinical presentation were recorded. RESULTS: 132 patients were identified. 98% of scans were normal. Three abnormalities were noted: two undisplaced skull fractures (1.5%) and one small intracerebral contusion (0.8%). Of those who did have CT abnormalities, all presented with persistent vomiting. No patients required neurosurgery. No one presenting after 3 days had a CT anomaly. 70.4% of cases fulfilled NICE criteria. Using chi-squared test, no statistical significance (p=0.25) was identified in the number of positive scans between those who did and did not meet the NICE criteria. CONCLUSION: Significant post traumatic pathology rarely presents following a delay of 24 h in GCS 15 patients and is extremely unlikely to require surgery. Many of the patients were suffering from post concussion syndrome involving only symptoms of headache, nausea and dizziness. Scanning of these patients is unnecessary. Furthermore, we suggest that the NICE guidelines should be modified for these patients. Judicious scanning would avoid inefficient use of resources and irradiation of a young population.

p902

NICE guidelines for the investigation of head injuries. An anticoagulant loop hole?

Prowse, S.J., Sloan, J.
Countess of Chester Hospital, Chester, UK

PURPOSE: The NICE guidelines provide clear indications for the investigation of head injuries with CT. A patient on anticoagulation is required to have lost consciousness to warrant CT scan, unless obvious stronger indications exist. We recently observed 3 warfarinized patients following head injury that did not fulfil the NICE criteria for a CT scan, but who were subsequently found to have significant brain injury. This experience prompted us to examine how patients with head injuries were being investigated, and adherence to NICE guidelines. METHODS: All patients presenting to the emergency department with isolated head injuries investigated with CT scan were included for the 3 month period April–June 2008. Notes were examined retrospectively to look at age, sex, mechanism of injury, coexisting coagulopathy, indication for CT scan, and the corresponding CT scan result. RESULTS: 39 patients were included. 28 of 39 CT scans were

unremarkable. 11 identified acute pathology. 23 scans were performed according to NICE guidelines which revealed pathology in 10 patients. 10 scans were not performed according to NICE guidelines and none of these revealed pathology. 6 scans were performed for unclear reasons and 1 revealed pathology. 6 of 39 patients were taking warfarin. 3 of these 6 scans revealed intracranial pathology. The mean age of these 6 patients was 84. CONCLUSION: Whilst NICE guidelines provide a valuable tool for the investigation of head injuries, we feel that elderly patients on anticoagulation may be at risk of having significant head injuries missed, and a lower threshold for scanning should be adopted.

p903

CT brain perfusion: Is it technically feasible and effective in the setting of acute stroke?

Mortimer, A.M., O'Leary, S., Renowden, S., Taylor, J., Gibson, L., Bradley, M.
Frenchay Hospital, Bristol, UK

PURPOSE: The principle use of CT perfusion is to identify patients with acute stroke who may benefit from thrombolysis and/or endovascular thrombectomy by discriminating potentially salvageable tissue from irreversible ischaemia or infarction. However, the procedure is feasibly limited by several factors: it requires both patient co-operation to minimize motion artefact and selection of the correct tissue block including the region of ischaemia/infarction. In the setting of acute stroke where time constraint and patient confusion are common, it is conceivable that optimal imaging is not always possible and as a result the imaging may not impact on patient management. METHODS: We reviewed all patients who underwent CT perfusion within 3 h of the onset of symptoms of acute stroke. The proportion of successful examinations, image quality (assessed for evidence of artefact and accurate tissue block selection) and reproducibility of results were assessed. Additionally, modification of management based on imaging features was investigated. RESULTS: Preliminary results suggest that 30 patients underwent CT brain perfusion imaging between April 2007 and November 2008 in the setting of acute stroke. One examination was abandoned due to patient in-cooperation. Of those performed, two were judged useless because of movement artefact; one examination was degraded but still clinically useful. The correct area of interest was selected on all occasions. Thrombolysis was with-held on seven occasions because of imaging findings suggestive of irretrievable tissue or no perfusion deficit. CONCLUSION: CT perfusion using modern multi-slice scanners allows imaging in patients with acute stroke with potential to modify patient management.

p904

Imaging of cranial nerve palsies – A pictorial review

Godhamgaonkar, V.A., Domjan, J.
Queen Alexandra Hospital, Portsmouth Hospitals NHS Trust, Portsmouth, UK

INTRODUCTION: Imaging of cranial nerve palsies is a complex territory of diagnostic neuroimaging which often includes meticulous, protocol led and high resolution MR scanning. It is therefore infrequently endeavoured by radiologists. Some other reasons also include complexity of cranial nerve anatomy and a variety of pathological processes leading to cranial nerve palsies. LEARNING OBJECTIVES: After reviewing this poster, the delegates will be able to: 1. Enumerate commonly encountered disorders causing various cranial nerve palsies; 2. Identify the imaging features that characterize these disorders; 3. Correlate the imaging features with radiological anatomy of the cranial nerves. DESCRIPTION: We present a comprehensive pictorial review of CT and MR imaging of various cranial nerve palsies in this poster. We have attempted to include most of the commonly encountered disease processes leading to cranial nerve palsies and their imaging features. These include a wide spectrum of disorders such as neoplastic, infectious, inflammatory, vascular, idiopathic, etc. A brief pictorial description of the radiological anatomy and correlation with the imaging features has been emphasised. Imaging features of multiple lower cranial nerve palsies and those of clinically significant isolated cranial nerve palsies (VIIth, Vth nerve palsies etc.) are well illustrated. High quality images, clear legends with short educational take-home messages are some of the other strengths of our poster. CONCLUSION: We intend to provide the delegates a pleasant learning experience through this well presented and educational pictorial tour.

p905

Small vessel disease in vascular dementia

Deshpande, A., Cherryman, G.
University Hospitals of Leicester, Leicester, UK

PURPOSE: Evaluation of CT head reports to determine if leukoriosis is mentioned. To determine qualitative assessment of the vascular change and further detailed assessment. To determine accuracy of the reports by re-evaluating the CT heads for small vessel white matter change as per ARWMC criteria (Age Related Whited Matter Change). MATERIALS/METHODS: Retrospective review of CT head reports and images of 80 patients over 60 years of age, from March 2008. Patients were identified from the CRIS system. These were 20 each from falls clinic, stroke, general medicine, Leicester primary trust. RESULTS: Presence or absence of leukoriosis was mentioned in 45 patients (56%). Qualitative assessment in the 45 patients was not made (13), mild (16), moderate (13), severe (3). Further detailed assessment of the leukoriasis was made in 2 patients. Evaluation of the CT head scans as per ARWMC criteria compared with the report showed same degree of leukoriasis in 32 patients. They were mild (13), moderate (8), severe (3), no leukoriasis (8). Of the remaining 13, white matter change reported as mild was found to be absent in 3, moderate as mild in 5, no white matter change was found to be mild in 3 and moderate in 2. Reports were accurate in 32 of 45 (71%). There was discrepancy in 13 cases with undercall in 5 and overcall in 8 cases. Evaluation of the CT heads in which there was no report revealed no disease (22), mild (10), moderate (3) white matter change. CONCLUSION: Increasing incidence of vascular dementia in patients over 60 years warrants accurate assessment of small vessel ischaemic change. Regardless of the reason for CT head, documentation of the presence and severity of the disease is good practice. ARWMC criteria is a useful tool to accurately quantify white matter change.

p906

Posterior reversible encephalopathy syndrome: Clinical and imaging features

Ayer, R.V., Nagadi, A.N.
Southampton University Hospitals NHS Trust, Southampton, UK

KEY LEARNING OBJECTIVES: 1. To draw attention to this poorly understood but potentially reversible neurological condition. 2. To provide a review of the clinical and imaging features. 3. To understand the pathogenesis of the condition. 4. To emphasise the critical role imaging plays in suggesting the diagnosis. DESCRIPTION: Posterior reversible encephalopathy syndrome (PRES) is a neurotoxic state associated with a unique CT or MR imaging appearance. It is characterized clinically by headaches, confusion, seizures and visual loss. It has a number of recognized causes including hypertension, pre-eclampsia, drugs, bone marrow transplantation and chemotherapy. The pathogenesis is thought to be due to impaired vascular autoregulation leading to endothelial dysfunction and vasogenic oedema. However, the diagnosis can rarely be made on clinical grounds alone and the radiologist may be the first person to suggest the diagnosis. The imaging appearance is often characteristic and predominates in the posterior white matter although other atypical sites are seen. It is manifest on CT as symmetrical hypodensity and on MR as increased signal on T_2 weighted imaging and facilitated diffusion on diffusion weighted imaging in the posterior white matter. Recognizing this condition is important as prompt control of hypertension or other precipitating factors can lead to resolution of the clinicoradiological abnormality.

If unrecognized, irreversible cytotoxic oedema and neurological deficit may result. CONCLUSION: Knowledge of PRES is important to clinical practice. Radiology is crucial in early diagnosis and treatment. This poster will summarise the clinical features, discuss the pathogenesis and review the imaging appearances of this condition.

p907

Vomiting as a predictor of acute intracranial bleed on CT in setting of head injury

Shafi, B.B.B., Wieshmann, H.
University Hospital Aintree, Liverpool, UK

KEY LEARNING OBJECTIVES: Vomiting has been consistently identified as a high risk variable in patients with head injury. According to NICE guidelines a patient who presents with more than one episode of vomiting should have a CT with in 1 h of the request. In our cohort of patients vomiting in isolation was not a high risk variable. DESCRIPTION: Clinical history and CT head results of 60 patients, who presented with more than 1 episode of vomiting post head injury at 2 teaching hospitals were analysed retrospectively. Patients were divided into 2 groups. Group A included 40 patients who had vomiting as their predominant symptom and reason for the scan. CT scans of all these 40 patients were normal. Group B had 20 patients in which the patient had other symptoms in addition to vomiting. In this group 3 patients had acute intracranial bleed. 2 of these patients had reduced GCS in addition to vomiting. One patient had amnesia and loss of consciousness along with vomiting. CONCLUSION: In our cohort of patients vomiting in isolation was not found to be a high risk variable in patients with head injury.

p908

Assessing the diagnostic yield of MR brain in patients with recent CT imaging

Ravi, R., Ganguly, A., Wieshmann, H.N., Hanlon, R.
University Hospitals of Aintree, Liverpool, UK

KEY LEARNING OBJECTIVES: Compared with CT, MRI provides more detailed anatomical images and superior contrast for a variety of important cerebral pathology. It is unknown how often this additional information provided by MRI is clinically useful in patients with diagnostic uncertainty. A previous audit at our hospital showed that one in ten patients with normal CT had an abnormal MRI. This study aims to compare the pattern of clinical requests for diagnostic brain imaging with the previous study. We have attempted to establish the added diagnostic yield of MRI brain in addition to CT in patients with acute neurological deficit. DESCRIPTION: All acute inpatients who had a CT brain followed by an MR brain investigation at the University Hospital, Aintree between October 2007 and March 2008 were reviewed. The initial CT and final MRI diagnoses were compared, and the clinical discharge summary reviewed to determine the clinical benefit. CONCLUSION: There has been a significant increase in the number of patients who underwent CT brain followed by an MR brain compared with the previous study performed 5 years ago. In our current audit, 126 patients underwent both CT and MR brain investigations as compared with 61 patients in our earlier audit. However, the ratio of additional structural abnormalities identified by MRI is very similar to our previous findings. In the large majority of acute patients, an investigation with CT head alone provided clinically acceptable information. Additional structural abnormalities were identified by MRI in 11 patients.

p909

A pitstop tour of the pituitary for the general radiologist

Nagra, I., Senthil, L.
University Hospital Birmingham, Birmingham, UK

KEY LEARNING OBJECTIVES: The pituitary gland is an important structure in the central skull base without which other endocrine glands and end-organ systems would fail to function successfully. We will discuss a systematic approach to assessing intrasellar and juxtasellar lesions. DESCRIPTION: Knowledge of the microanatomy of the pituitary fossa is crucial to understanding the clinical presentation of patients with mass lesions in the sellar region. The radiologist can then accurately assess the extent of disease and guide the clinician appropriately. MR with its exquisite soft tissue detail and multiplanar capability forms the modality of choice, although CT can be a complimentary method in selected cases, to evaluate the degree of calcification within a lesion and to assess bony detail. A diagnostic pathway for assessing intrasellar and juxtasellar pathology is presented with particular reference to the anatomical and clinical picture. The most common pathologies such as pituitary adenomas, apoplexy, craniopharyngioma and infundibular abnormalities are discussed, as well as more unusual pathologies such as granulomatous lesions and dural AV fistulas. Diagnostic dilemmas with potential for misinterpretation can occur and are addressed. Radiological input is vital in guiding the optimal treatment with management involving both medical and surgical therapy. Specific cases will be used to illustrate various pathologies and their management, including current surgical techniques. Furthermore, post-treatment follow-up imaging will be outlined. CONCLUSION: Radiological input is important when assessing sellar and juxtasellar pathology. It is important for all radiologists to be aware of the common radiological features and pitfalls when assessing this complex area.

p910

Subarachnoid haemorrhage: A headache for CT?

Flood, K., Guthrie, A.
Leeds Teaching Hospitals NHS Trust, Leeds, UK

PURPOSE: Subarachnoid haemorrhage (SAH) is a devastating condition which carries a high morbidity and mortality. British neurosurgical guidelines recommend early diagnosis with CT to allow intervention via endovascular or neurosurgical techniques, thereby preventing the risk of rebleeding and reducing mortality. However, negative CT does not exclude a SAH and a lumbar puncture should be performed to confirm the diagnosis. This study was performed to audit the use of the guidelines within the Leeds Teaching Hospitals Trust. METHODS: A prospective audit between 1st January and 31st March 2008. All patients having a CT head for SAH were included and scan results were recorded. Those patients with a negative scan and no contraindication to lumbar puncture were searched for on the ICE results server to confirm whether a CSF sample had been sent. RESULTS: During the 3 month period, 112 patients had a CT head for SAH. 58% female (age 21–80 years), 42% male (16–71 years). 9 (8%) had a positive scan: 7 SAH; 1 parenchymal haemorrhage; 1 MCA infarct; 103 (92%) had a negative scan, with no contraindication to LP. 50 (49%) underwent LP, 53 (51%) didn't have an LP. CONCLUSION: Currently the management guidelines are not being strictly adhered to. Either awareness of the neurosurgical guidelines needs to be increased, or the provisional diagnosis of SAH is being utilized by clinical teams as a tool to obtaining a prompt scan.

p911

Is subarachnoid haemorrhage just another differential for a headache?

Mehrotra, P., Kolla, S., Halbert, H., Lavell, K., Sookhoo, S., England, S.
Sunderland Royal Hospital, Sunderland, UK

PURPOSE: CT is the accepted first line investigation for patients with a suspected subarachnoid haemorrhage (SAH). In these patients, a normal CT should be followed by lumbar puncture (LP) to detect xanthochromia. We studied the practice of performing a LP following a negative CT in patients with a clinical suspicion of SAH in a District General Hospital. MATERIALS/METHODS: The study was conducted in two phases. In the first phase (23 January 2000 to 20 November 2002), CT and LP results of patients investigated for suspected SAH were prospectively recorded. The results of the first audit were presented to the referring clinicians (audit 1). In the second

phase (1 January 2003 to 29 November 2005), data were collected to study any change in practice (audit 2). RESULTS: In the first audit, 36 of 61 patients (59.0%) with a normal CT had a subsequent LP compared with 67 of 104 (64.4%) in the second audit (p=0.51). In the first audit, xanthochromia was detected in 1 of 36 patients (2.8%) who had a LP following a negative CT, compared to 1 of 67 patients (1.5%) in the second audit (p=1.0). CONCLUSION: Approximately a third of patients with symptoms of SAH in both audit periods did not undergo LP following a negative CT scan. The recommendations made after the first audit have not been implemented. This is an important finding, as a negative CT does not exclude SAH and by not proceeding to LP, clinicians may not be correctly diagnosing SAH.

p912

Management of giant intracranial aneurysms

Sandhu, V.[1], Nagra, I.[1], Sandhu, R.[2]
[1]University Hospital Birmingham, Birmingham, UK, [2]Stevenage General Hospital, Hertfordshire, UK

KEY LEARNING OBJECTIVES: To describe the imaging features of giant intracranial aneurysms and to discuss the various treatment options including conservative, radiological and surgical. DESCRIPTION: Giant aneurysms are those greater than 25 mm in size. They can present with cranial nerve palsies, optic field defects, retro-orbital pain and intracranial haemorrhage. We provide examples of CTA, MRA and angiogram images showing characteristic imaging features of giant aneurysms such as internal thrombus, curvilinear calcification and bony erosion. We describe the different treatment options and the features used in deciding between conservative, radiological and surgical management. CONCLUSION: Management of giant aneurysms depends on the clinical symptoms, size and location and can be either conservative, radiological or surgical. We provide examples of each, and describe the features used in deciding between different types of management.

p913

Craniosynostosis: A pictorial review

Rodriguez, C.L., Parry, C., Liu, A.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: To illustrate the radiological appearances of the neonatal skull and present the imaging findings of the various types of craniosynostoses, with an emphasis on 3D-CT. To discuss the diagnostic pathway for children with suspected craniosynostosis. DESCRIPTION: Craniosynostosis refers to the premature closure of skull sutures. Primary craniosynostosis results from a failure of primary ossification and is less common than secondary craniosynostosis which results from a failure of cerebral growth. Skull radiography has been used to diagnose prematurely fused sutures through the detection of absent sutures and ridging of the suture line. Cranial CT scanning with 3D reconstruction is markedly superior to radiographic methods, from a diagnostic perspective and for surgical planning. Furthermore, imaging of the brain parenchyma for other associated abnormalities is simultaneously carried out. Controversy exists on the most suitable diagnostic method for diagnosis. Primary radiological signs of craniosynostosis include bony bridging, a bony ridge, sclerosis and narrowing of the suture. Secondary findings include craniofacial asymmetry, changes in the shape and altered timing of closure of fontanelles, and facial anomalies. CONCLUSION: The decision as to what investigation is most appropriate in investigating the child with suspected craniosynostosis depends on the clinical index of suspicion. In high risk syndromic patients, 3D-CT scanning is the most effective approach – it provides optimal assessment of the presence and extent of craniosynostosis, as well as associated facial and intracranial abnormalities. In lower risk children, radiographic approaches may be sufficient, with subsequent 3D CT scanning if the diagnosis is confirmed.

p914

Hypertrophic olivary degeneration: A neuroimaging paradox – A review of MR appearances

Harris, L., Bradley, N., Padmanabhan, R.
James Cook University Hospital, Middlesborough, UK

KEY LEARNING OBJECTIVES: Discuss the pathogenesis of hypertrophic olivary degeneration (HOM). Demonstrate the salient MR findings of HOM. Review conditions which may mimic the MR findings of HOM. DESCRIPTION: HOM is a form of transynaptic degeneration resulting in enlargement, as opposed to atrophy, of the inferior olivary nucleus. It is a condition characterised clinically by palatal myoclonus, dentatorubral tremor and ocular myoclonus. This is as a result of a lesion interrupting the dentatorubral–olivary pathway of the Guillain-Mollaret triangle situated in the brainstem. Common lesions causing this condition include haemorrhage, ischaemic infarction, degenerative disorders, syphilis, trauma and demyelination. There are three distinct MR stages in HOD. The first stage, occurring within the first 6 months, shows increased signal on T_2 and PD weighted MR images without hypertrophy of the oliva. The second stage shows both increased signal and hypertrophy until hypertrophy resolves, leading to the indefinite third stage with persistent hyperintensity. HOM is often misdiagnosed as neoplasia or infarction. Knowledge of the anatomical associations of the Guillain-Mollaret triangle are required to confidently recognize HOM at MRI. We present a series of three patients with this interesting condition. CONCLUSION: This is an interesting condition which although degenerative is characterized by hypertrophic as opposed to atrophic degeneration and hence is often misdiagnosed as malignancy.

p915

Meningioma – Atypical sites and appearances

Ganguly, A.[1], Ravi, R.[1], Katti, A.[1], Nedumaran, A.[1], Das, K.[2]
[1]University Hospital Aintree, Liverpool, UK, [2]Walton Centre for Neurology & Neurosurgery, Liverpool, UK

KEY LEARNING OBJECTIVES: Meningioma is the most common extra-axial central nervous system tumours in adults comprising 15% of all intracranial tumours. Most of these are found in the supra-tentorial compartment, while only 10% are located infratentorially. They are more common in middle aged women. They form an important differential for various common and uncommon tumours at intra and extra cranial sites. The aim of the poster is to help a general radiologist to identify and describe meningioma effectively, especially so when encountered in an unusual location. We also discuss some of the uncommon imaging appearances of meningioma. DESCRIPTION: Our poster briefly describes the various imaging features of meningioma with illustrated examples. We then emphasise the various atypical sites and appearances of meningioma with pictorial illustrations. CONCLUSION: With this educational poster, we aim to present a pictorial library of meningioma involving different parts of the central nervous system with a focus towards atypical sites and appearance.

p916

Discs masquerading as tumours: A pictorial review

Crossley, R.A., Germon, T.J., Adams, W.M.
Derriford Hospital, Plymouth, UK

PURPOSE: Degenerative disc herniation can be seen in up to 20% of asymptomatic individuals and is a far more common cause for symptomatic presentation than a spinal neoplasm such as schwannoma. The distinction can occasionally be difficult to make. We present a review of 20 cases where the definitive diagnosis was at odds with the preoperative imaging and presumptive diagnosis. METHODS: Selective correlative review of images and pathological specimens from cases assessed and treated at a combined neuroradiological/spinal neurosurgical referral centre over a 6 year period. RESULTS: A pictorial review demonstrating the varied appearance of prolapsed intervertebral disc (PID) which can mimic other pathologies such as schwannoma, abscess, discitis and other inflammatory conditions. We also assess certain discriminating features associated with the different pathologies. The variables analysed include signal intensity on

MR, degree and patterns of enhancement, the site of the lesion within the spinal canal, neural exit foramen, lateral recess and relationship to the disc. CONCLUSION: We have provided a pictorial overview highlighting the imaging features to distinguish between prolapsed intervertebral disc and other pathologies. We have also produced a semi-quantitative analysis to weigh the value of the different imaging features to be considered with respect to each of the differential diagnoses.

e917

A pictorial review of on-call neurological emergencies

Patel, K., Narayanaswamy, S.
King's College Hospital, London, UK

KEY LEARNING OBJECTIVES: To present a pictorial review of various imaging appearances of neurological emergencies To understand the role of ASPECT (Alberta Stroke Programme Early CT) score in stroke imaging. DESCRIPTION: Most of the training programmes in UK expect the radiology registrar to start performing on-calls from the second year of their training. This exposes them suddenly to recognize and report wide variety of pathologies. Majority of the on-call work includes reporting CT heads. This pictorial review provides examples of various pathologies commonly or uncommonly encountered during an on-call scenario. We discuss the salient features required to accurately report most of these pathologies. Several examples of intra axial and extra axial haemorrhages, brain herniations, diffuse axonal injury, skull fractures, primary brain tumour and metastasis presenting acutely, venous sinus thrombosis and cord compression will be discussed. We also discuss the role of ASPECT score in stroke imaging and also its importance in determining the need for thrombolysis. A brief review of CT perfusion imaging will be provided. CONCLUSION: It is important to recognize the imaging appearances of various neurological emergencies commonly encountered in an on-call situation. Most of these pathologies, if missed or misinterpretated can have very serious consequences. This review by providing examples and salient features of different pathologies may help the radiologist, particularly the radiology registrars, in recognizing both common and uncommon on-call neruoradiological emergencies.

e918

CT perfusion in acute stroke: A pictorial guide to aid interpretation

Adejolu, M., Siddiqui, A.
King's College, London, UK

KEY LEARNING OBJECTIVES: 1. To explain the significance of the various parameters of CT perfusion imaging namely, the cerebral blood flow (CBF), cerebral blood volume (CBV) and mean transit time (MTT). 2. To illustrate with perfusion CT Images, the spectrum of changes seen in acute strokes and in the normal brain. DESCRIPTION: CT perfusion helps to select those patients who are suitable for thrombolytic therapy by demonstrating the presence of a "penumbra" of potentially reversible brain ischaemia around a core of infarcted brain parenchyma. It is also useful if there is a clinical uncertainty in diagnosis or if the time of onset of stroke is not clear. One of the main attractions of CT perfusion imaging is that it can be done without a time penalty allowing for prompt administration of thrombolytic therapy when indicated and preventing the unnecessary administration of thrombolytic agents in patients with acute strokes with no salvageable brain tissue. In infarcted brain the MTT is prolonged, while the CBF and CBV are decreased. Ischemic brain will also demonstrate a prolonged MTT and reduced CBV but the CBF is maintained as a result of auto-regulation. The changes in the perfusion parameters are illustrated as colour coded map of the brain to aid interpretation. CONCLUSION: Perfusion CT provides physiological information that can be extremely useful in the selection of patients for thrombolytic therapy.

e919

Imaging of cavernous sinus syndrome

Tang, Y., Steward, M., Booth, T., Solbach, T., Wilhelm, T.
Royal Free Hospital, London, UK

KEY LEARNING OBJECTIVES: To understand the range of pathology that affects the cavernous sinus. To Illustrate key imaging features of some typical and atypical presentations. DESCRIPTION: Cavernous sinus syndrome is caused by a wide range of pathologies, with signs and symptoms related to the numerous crucial structures traversing and surrounding the cavernous sinus. Cavernous sinus syndrome is defined by its signs and symptoms, namely ophthalmoplegia, chemosis, proptosis, Horner's syndrome and trigeminal sensory loss. Imaging plays a key role in determining the cause of the syndrome. The anatomy of the cavernous sinus, clinical presentation and vascular presentation will be reviewed. CT and MRI images of the different causes of cavernous sinus syndrome will be demonstrated. Examples of infection, inflammation, tumours, and trauma leading to cavernous sinus syndrome will be included. CONCLUSION: Cavernous sinus syndrome is defined by its resultant signs and symptoms. Imaging techniques can delineate complex anatomical detail and is used in conjunction with associated clinical findings to determine the underlying pathology.

e920

A pictorial review of lesions affecting the trigeminal nerve

Ananthakrishnan, G., Gibson, R.J., Summers, D.
Western General Hospital, Edinburgh, UK

KEY LEARNING OBJECTIVES: Demonstrate the anatomy of the trigeminal nerve and its nuclei. Show examples of the various lesions affecting the trigeminal nerve. Discuss imaging strategies and pitfalls. DESCRIPTION: Lesions of the trigeminal nerve and its nuclei are a common cause of facial sensory symptoms. Trigeminal neuralgia and neuropathy may be caused by pathology in the brainstem, upper cervical cord, the subarachnoid space, the skull base or deep facial spaces. Various pathologies at these sites can present with trigeminal neuralgia and careful evaluation is necessary on both CT and MRI scans. CONCLUSION: Knowledge of the anatomy of the trigeminal nerve is essential in evaluating CT and MRI scans for facial pain. This poster aims to combine this with common pathologies and imaging strategies which would help in diagnosis.

e921

Imaging of the subarachnoid space – An overview of the imaging anatomy and pathology

Katti, A.[1], Nedumaran, A.[1], Ganguly, A.[2], Das, K.[2]
[1]*University Hospital Aintree NHS Trust, Liverpool, UK,*
[2]*Walton Centre for Neurosciences, Liverpool, UK*

KEY LEARNING OBJECTIVES: To demonstrate the cross sectional anatomy of the subarachnoid space and identify the named CSF cisternal spaces. To demonstrate various pathology involving the subarachnoid space either directly or indirectly. DESCRIPTION: To demonstrate systematic evaluation of the subarachnoid space and the cisterns on CT and MR imaging with neuroanatomical depiction of the named cisternal spaces including cisterna magna (cerebello meduallary cistern), interpeduncular cistern, pre-pontine cistern, quadrigeminal cistern and ambient cistern. We demonstrate the role of CT and different MR sequences in evaluating the subarachnoid space. To demonstrate various pathology related to the subarachnoid space including subarachnoid haemorrhage (methods to identify the source of haemorrhage using CT, CT angiogram, digital substraction angiogram and MR angiogram), meningeal diseases like meningitis, carcinomatosis, and examples of laeukamic infiltration ruptured dermoid. To demonstrate the importance of obliteration of cisternal spaces including intracranial hernias, raised intracranial pressure, primary or secondary neoplastic lesions of subarachnoid space. To illustrate the importance of CSF flow studies and methods for detecting CSF leaks. Also demonstrate imaging findings of intracranial hypertension and intracranial hypotension. CONCLUSION: Learn the

anatomy and several pathology related to the subarachnoid space using routine and advanced cross sectional imaging techniques.

e922

Spinal dysraphysm: A pictorial review

Adejolu, M., Siddiqui, A.
King's College, London, UK

KEY LEARNING OBJECTIVES: Recognition of closed neural tube defects (spina bifida occulta) and the various cutaneous and spinal cord abnormalities commonly seen in association with it. Recognition of the open neural tube defects. Recognition of associated congenital brain abnormalities. DESCRIPTION: Spinal dysraphism or neural tube defects are a group of congenital spinal abnormalities which result from defective closure of the neural tube in early foetal life. This results in varying degrees of defective/absent midline structures particularly the skin and posterior vertebral arches. Imaging pays a pivotal role in the diagnosis of these disorders and helps to predict the degree of neurological deficit. Some of these abnormalities may be very subtle and accurate radiological diagnosis will help ensure prompt surgical intervention if appropriate, to help minimize neurological deficit. We will illustrate with MR images, the varied imaging appearances of closed neural tube defects and other associated spinal cord abnormalities such as low lying cord and cord tethering, thickened/fatty filum terminale, dorsal dermal sinus tract, dermoids/epidermoids, diastematomyelia, intraspinal lipomas and lipomyelomeningoceles. Images of open neural tube defects such as meningocoele and meningomyelocoeles will also be illustrated. Congenital brain abnormalities associated with open neural tube defects such as Arnold Chiari type 2 malformation will also be reviewed. CONCLUSION: MRI appearances of neural tube defects and associated spinal cord abnormalities have been illustrated and reviewed in this exhibit.

e923

CT-guided percutaneous intraspinal needle aspiration for diagnosis and treatment of epidural collections and syringomyelia

Kokkinis, C., Peteinelli, A., Stathopoulou, S., Fragopoulou, L., Makris, N., Theodorakopoulos, G., Papadopoulou, P., Pantou, S., Zavras, G.M.
St. Paul Hospital, Athens, Greece

PURPOSE: To describe CT-guided percutaneous drainage of epidural abscesses-haematomas and syringomyelia as a contribution in patients management. MATERIALS/METHODS: CT-guided percutaneous intraspinal needle aspiration was performed in 7 patients, after MRI examination of the spine that showed possible diagnosis. There were 4 cases with posterior epidural abscesses in the thoracic or lumbar spine, 2 with posterior epidural hematomas in the lumbar spine and one case with syringomyelia in the thoracolumbar junction. All patients had minimal to mild neurological deficit. RESULTS: In the four cases with epidural abscesses, CT-guided aspiration showed purulent material confirming diagnosis and the culture specimen determined the causative organism. A partial decompression was obtained in all cases. In two cases the spinal epidural abscess completely resolved after 4 weeks of antibiotic therapy. In the other two cases with neurological deficit progression a surgical decompression was decided. In the two cases with epidural haematomas, a moderate drainage was performed but surgical evacuation was avoided as the patients remained neurologically stable and they were poor surgical candidates. The haematomas resolved after 6 weeks. In the case of syringomyelia (hydromyelia), there was significant clinical improvement after partial drainage of the syrinx. As the patient was clinically stable and the MRI examination after one year showed no significant increase of syrinx, the need of surgery determined as not necessary. CONCLUSION: CT-guided percutaneous intraspinal needle aspiration is a safe and successful technique for diagnosis and in some cases may provide a therapeutic alternative to surgery of epidural collections and syringomyelia.

Head & Neck

p1001

Radiological review of non malignant causes of head and neck uptake with PET/CT

Lip, G., McAteer, D.
Aberdeen Royal Infirmary, Aberdeen, UK

KEY LEARNING OBJECTIVES: 1. To demonstrate that PET/CT is sensitive but not specific in malignancy. 2. To illustrate that there are other causes of uptake besides malignancy in the head and neck. DESCRIPTION: Functional imaging with positron emission tomography (PET) has an important role in functional imaging, the diagnosis and treatment of malignant disease and treatment monitoring. While the uptake of Fluorine 18 labelled fluorodeoxyglucose analogue is associated with increased uptake in malignancy and an increase in enzymatic activity, there are also physiological and other non malignant causes of uptake. We detail cases from our experience in the head and neck service with PET/CT with cases dealing with physiological, metabolic and systemic uptake including sarcoid disease, pseudotumour and thyroid uptake. CONCLUSION: PET/CT is an excellent tool in assessment of disease in the head and neck but not all uptake is malignant and various other pathological and physiological processes can also demonstrate increased uptake.

p1002

Optimizing SPIR sequences in head and neck imaging

Semple, J.C.[1,2]
[1]*Oxford Radcliffe Hospitals NHS Trust, Oxford, UK,*
[2]*University of Cumbria, Lancaster, UK*

BACKGROUND: SPIR (Spectral Presaturation with Inversion Recovery) sequences provide either fat or water saturation but they do require good B0 homogeneity. Unfortunately, in head and neck imaging B0 homogeneity can be poor due to multiple bone/air interfaces, dental amalgam and post surgical vascular clips resulting in poor fat saturation on images. AIMS/OBJECTIVES: The objective was to evaluate techniques to optimise SPIR sequences in head and neck imaging. METHOD: Using a 1.5 Tesla Philips Achieva® scanner (Koninklijke Philips Electronics N.V., Eindhoven, The Netherlands) two techniques were employed – frequency selective offset and volume shimming. RESULTS: Both techniques gave good results, with improved image quality and more uniform fat saturation. The optimised techniques either required very little or no extra scanning time. CONCLUSION: Two easy techniques to perform in a clinical scanning situation have been developed. Either technique can be applied when performing SPIR sequences in head and neck imaging, but the frequency selective offset method is better employed in axial scanning where as the volume shimming method is better for coronal scans.

p1003

Laryngocele – A pictorial review

Kibriya, N., Jayawardena, M., Ganguly, A., Gough, V., Lewis-Jones, H.
University Hospital Aintree, Liverpool, UK

KEY LEARNING OBJECTIVES: This is an educational poster that reviews laryngoceles of the head and neck. Laryngoceles usually present with either thick or intermittent masses in the neck. There is an association with patients who are chronic coughers or wind instrument players. We illustrate the anatomy of the larynx and demonstrate the laryngeal saccule which is the organ of origin of the laryngocele. The relevant anatomy is demonstrated through cross sectional imaging in CT and MRI. DESCRIPTION: Laryngoceles may be air or fluid filled masses. We present 10 cases which emphasise the differing imaging appearances of laryngoceles. This includes internal and external laryngoceles. The important group to consider are those laryngoceles which are of secondary origin. While the main mass in the neck may

be related to the laryngocele, we show cases where small laryngeal ventricle mass has given rise to secondary laryngoceles. We also demonstrate laryngoceles secondary to radiotherapy for laryngeal carcinoma. A rare case of a cyst adenoma of the larynx is also present. CONCLUSION: The crucial imaging features involve demonstration of the deep internal extension of the cystic mass to the level of the laryngeal ventricle which allows a confident diagnosis of laryngocele to be made. The features that suggest secondary laryngocele are emphasised.

p1004

Pathophysiology of Zenker's diverticulum. Does gastro-oesophageal reflux, hiatus hernia and oesophageal dysmotility predispose?

Mortimer, A.M., Corrigan, A., Virjee, J.
Bristol Royal Infirmary, Bristol, UK

PURPOSE: Since its first description, the aetiology of Zenker's Diverticulum remains uncertain. However, there has long been a suggested association between Zenker's diverticulum and various forms of upper gastrointestinal pathology including gastro-oesophageal reflux, hiatus hernia and oesophageal dysmotility. We aimed to investigate this association between these oesophago-gastric features and the presence of Zenker's diverticulum using barium imaging. METHODS: Using a database of upper gastrointestinal barium investigations, we undertook a case control study to investigate the proportion of patients with Zenker's diverticulum who exhibited co-existent gastro-oesophageal reflux, hiatus hernia and oesophageal dysmotility relative to an age and sex-matched control group. RESULTS: 74 patients with Zenker's diverticulum were identified. Reflux was present in 27 (36%), hiatus hernia in 21 (28.4%) and dysmotility in 46 (63.5%) patients. However, none of these proportions were statistically significant ($p>0.05$) when compared with age and sex-matched controls. In particular, reflux to a cervical level (8 patients: 10.8%) was no more common in Zenker's diverticulum patients compared to controls. CONCLUSION: The results of this case controlled study question the previously suggested association between oesophageal pathology and formation of Zenker's diverticula. Our results favour alternative theories for diverticula formation including an intrinsic cricopharyngeal anomaly.

p1005

Can ultrasound characterize parotid lesions accurately? Results in 220 patients

Sriskandan, N.[1], Hannah, A.[2], Howlett, D.C.[3]
[1]Guy's & St. Thomas' NHS Trust, London, UK, [2]Brighton and Sussex Medical School, Brighton, UK, [3]Eastbourne District General Hospital, Eastbourne, UK

PURPOSE: Accurate high-resolution ultrasound diagnosis may reduce or guide the need for biopsy and further imaging. The aim is to assess the accuracy of ultrasound in characterising benign and malignant parotid lesions. MATERIALS/METHODS: A retrospective analysis of 220 ultrasound examinations (in 220 patients) of palpable parotid lesions over an 11-year period was performed. All patients had final pathological diagnosis (fine-needle aspiration cytology, core or surgical biopsy). Lesions were evaluated using fixed criteria, assessing greyscale and colour Doppler features. The following were compared i) reported ultrasound findings and diagnosis with the final histological diagnosis; ii) the ultrasound features for a given histological diagnosis with those previously reported in the literature. RESULTS: Histology was available in all patients: 201 had focal lesions: 29 carcinomas, 21 lymphomas and 170 benign lesions (including, 69 pleomorphic adenomas and 54 Warthin's tumours); 19 had no focal lesions. The ultrasound report was indeterminate in 25 of 201 focal lesions. In the remaining 176 lesions, ultrasound had 91% sensitivity and 93% specificity for malignancy. Diagnostic accuracy was 93%. Non-focal disease was also accurately diagnosed. There were 4 false-negatives and 9 false-positives with certain "benign" characteristics observed in malignant lesions and vice versa; these will be discussed with examples included. CONCLUSION: Ultrasound can accurately differentiate benign from malignant lesions and diagnose non-focal disease. Some characteristics are seen in both benign and malignant pathology and correlation with the history and examination is imperative in all cases. Biopsy may be avoided in certain patients, e.g. the elderly, following diagnostic ultrasound examination.

p1006

Ultrasound guided botox injection for sialorrhoea in Parkinson's disease; evidence, technique and outcomes

Wilkinson, C., King, D.
York Hospitals NHS Foundation Trust, York, UK

KEY LEARNING OBJECTIVES: 1. Sialorrhoea is a severely debilitating symptom for patients with Parkinson's disease. 2. Ultrasound-guided injection of botulinum toxin is a simple and safe treatment option for sialorrhoea. 3. A one-stop clinic comprising both radiologist and physician is a way of offering this treatment that provides excellent results. DESCRIPTION: Parkinson's disease affects 120 000 people in the UK and up to 80% of patients suffer with hypersalivation and drooling (sialorrhoea). Established treatments are often ineffective or poorly tolerated. Ultrasound-guided injection of botulinum toxin into the salivary glands is a highly effective treatment but is not widely offered in many centres. It has been shown to decrease saliva production in up to 90% of patients and significantly improves quality of life. In our institution, a large district general hospital, we offer a one-stop clinic with a radiologist and physician working together. This provides a successful environment for symptom evaluation and the provision of ultrasound-guided botulinum toxin injections. We briefly outline the current evidence for the use of ultrasound guidance in this treatment. Using illustrations and ultrasound images we describe our technique for ultrasound guidance and injection, providing key tips for a successful outcome. CONCLUSION: Ultrasound-guided injection of botulinum toxin is a highly effective treatment option for sialorrhoea that could be easily offered in many institutions.

p1007

Parotid incidentalomas detected during thoracic positron emission tomography, implications on management

Basit, R., Sharma, N., Maxwell, D., Howlett, D.
Eastbourne District General Hospital, East Sussex, UK

PURPOSE: To describe the further management of parotid incidentalomas found on thoracic PET staging. MATERIALS/METHODS: Three patients aged between 60 years and 78 years (two female, one male, each with no significant past medical histories) all had radiological and histological evidence for non small cell lung cancer. CT staging in each case did not demonstrate metastatic disease and these patients were considered as surgical candidates and proceeded to PET as part of the pre-operative workup. In each patient, PET revealed unilateral intense focal uptake in the parotid gland that was deemed to be of uncertain significance. High resolution ultrasound of the parotid gland was performed, with each patient demonstrating a focal hypoechoic lesion corresponding with the PET findings. Ultrasound guided core biopsy (18 G needle) was undertaken in each case. RESULTS: Histology from the core biopsies confirmed benign parotid neoplasms in all 3 patients, with Warthin's tumour in two patients and pleomorphic adenoma in the remaining individual. The patients were referred to ENT surgery for further management of their lesions and all three patients were deemed to have resectable lung cancer and were referred on for thoracic surgical assessment. CONCLUSION: There was diagnostic uncertainty in these cases as to whether the increased uptake on PET represented another synchronous malignancy, metastasis or possibly benign parotid disease. Ultrasound proved to be effective in parotid tissue characterization and coupled with guided core biopsy was shown to be effective in avoiding "over-staging" in this patient series.

p1008

Pictorial review of sialographic imaging of parotid duct pathology

Lip, G., McAteer, D.
Aberdeen Royal Infirmary, Aberdeen, UK

LEARNING OBJECTIVES: 1. To describe the characteristic features of parotid duct disease in plain film sialography. DESCRIPTION: Plain film sialography continues to be the gold standard for diagnosis and assessment of pathological disease in the parotid duct and gland. However, this procedure is often performed by a limited number of radiologists with a specialist interest. The aim of this poster is to review the common pathology and imaging encountered in parotid sialography. Plain films of sialograms with pathology ranging from sialectasis, stone disease and Sjogrens encountered by the authors in practice are collated with relevant information and methods of interpretation. CONCLUSION: Plain film sialography is an important tool in the assessment and management of parotid duct disease. Familiarity with imaging appearances of the various types of ductal pathology will aid the practitioner in diagnosis and patient management.

p1009
The pterygopalatine fossa: An imaging review

Ravi, R., Ganguly, A., Abhyanker, M., Kibriya, N., Sinha, A., Lewis-Jones, H.
University Hospitals of Aintree, Liverpoool, UK

KEY LEARNING OBJECTIVES: The pterygopalatine fossa and the pterygomaxillary recess are small anatomical areas of the skull base which are difficult to visualise for the radiologist. The contents of these anatomical areas are of specific clinical importance and involvement of these spaces allows spread of head and neck tumours into important compartments of the head and neck. The aim of this poster is to depict the complicated anatomy of this area with the help of representative CT/MR images. We also look at some clinical cases to illustrate pathology involving this area. DESCRIPTION: Our poster illustrates the anatomy of this area using clear line diagrams with multislice reformatted CT and MR correlation. The poster will also illustrate the anatomical relationships of the pterygopalatine canal, the Vidian canal, the inferior orbital fissure, foramen rotundum and the pterygomaxillary fissure. We then present more than 10 clinical cases of involvement of this area by pathology and demonstrate the pattern of spread of tumours arising from the sinuses, the facial skeleton and head and neck tumours which have spread in a specific perineural pattern to infiltrate this area. CONCLUSION: This educational exhibit will help the general radiologist to understand the complicated anatomy of the pterygopalatine fossa and the pterygomaxillary recess. We also illustrate some examples of pathology involving this area.

p1010
Imaging for precochlear implant evaluation

Chapman, P.[1], Mukonoweshuro, W.[1], Crossley, R.[1], Carswell, A.[2]
[1]Peninsula Radiology Academy, Plymouth, UK, [2]Derriford Hospital, Plymouth, UK

LEARNING OBJECTIVES: The aims for this presentation are to identify and demonstrate the imaging features relevant in the pre-operative work-up for cochlear implantation. We demonstrate normal anatomy and identify the variants which need to be recognized by the ENT surgeon to avoid operative complication. BACKGROUND: Cochlear implantation involves inserting an electrode into the cochlea through the round window or by drilling out the cochlea's internal walls if excessively thickened. As such it is necessary to carry out careful pre-implantation evaluation to identify the cause of the hearing loss, determine if the insertion of the cochlear implant electrodes will be anatomically possible and to check for any unexpected but relevant findings [1]. Possible causes of hearing loss: Bilateral acoustic schwannomas. Bilateral obliterative labryinthe ossification. Anatomical considerations: Cochlear patency (does bone obliterate the labyrinthe? Is the round window open?) Congenital cochlear anomalies. Facial nerve, carotid artery and the sigmoid sinus anatomy. Hypoplasia of the internal auditory canal. Size of the middle ear cavity. Screening for unsuspected findings: Ongoing middle ear infections. Fractures. IMAGE FINDINGS: Presentation of relevant axial, multiplanar, reformatted volume rendered CT and MRI images. CONCLUSION: An understanding of normal anatomy with the emphasis on relevant surgical concerns improves the comprehensive pre-operative assessment that the radiology department can offer. Reference: 1. Grossman R, Yousem D. Neuroradiology: The Requisites second edition. 2003; Mosby.

p1011
Small but vital: The middle ear

Charran, A.K., Balasubramaniam, M., Yong, K.A.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVES: 1. To understand the anatomy of the middle ear. 2. To describe the imaging findings of benign and malignant mass in the middle ear. DESCRIPTION: Tumours in different areas of the ear behave differently. The middle ear is composed of air-filled spaces that contain the ossicles and are divided into epitympanum, mesotympanum and hypotmpanum. The causes of middle ear mass can be classified mainly into 3 categories; inflammatory, neoplastic and vascular. CT is very helpful in detecting subtle bone changes and assisting surgical planning whereas MRI is useful in demonstrating the infiltration of the tumour into the soft tissue and dura. Several high quality images incorporating CT and MRI are presented, demonstrating the normal anatomy of the middle ear and interesting cases of typical and atypical middle ear masses. CONCLUSION: The anatomy of the middle ear is complex and difficult to examine clinically. Imaging has a vital role in providing a comprehensive assessment of middle ear and an aid to differential diagnosis.

p1012
CT sinuses: Pictorial review of pre and post operative findings

Tripathi, S., Jones, H.-L., Kribriya, N., Weishmann, H., Hanlon, R.
University Hospital Aintree, Liverpool, UK

BACKGROUND: CT Sinuses provides and anatomical guide for sinus surgery. In post operative cases normal anatomy is distorted and it causes difficulty for general radiologist to define anatomical landmarks and assess pathology. OBJECTIVES: a) We aim to describe the anatomical features of post operative sinuses. b) To summarize salient features of the commonly observed pathologies in recurrent sinus diseases. c) A comparative review with normal sinuses is presented with common and uncommon anatomical variants. CONCLUSION: With the increasing incidence of re-operation on sinuses, it is essential for radiologists to be familiar with normal pre- and post-operative anatomical features of sinuses including their anatomical variants. In our exhibit we have tried to demonstrate post operative appearances of sinuses with reference to normal sinus anatomy.

p1013
Ultrasound guided fine needle biopsy of thyroid lesion – Does technique matter?

Wan, M.Y.S., Wadhwani, S., Parkin, C., Hodgson, D.I.
Victoria Hospital, Blackpool, UK

PURPOSE: The British Thyroid Association's guideline for the management of thyroid cancer (2007) recommended the performance of operators performing fine needle biopsy of thyroid nodule be monitored. Two accepted techniques are used in our hospital to sample thyroid lesions, namely fine needle aspiration (FNA) and fine needle capillary (FNC) techniques. A study published in *Clinical Radiology* last year showed FNC achieved superior diagnostic yield and this sparked renewed controversy in our department. Our aim is to audit the local diagnostic yield achieved by the different techniques. MATERIALS/METHODS: In our department, two consultant radiologists consistently use the FNA technique and one uses the FNC technique. Patients who had undergone fine needle biopsy were

identified retrospectively over a 3 year period. Cytology reports were reviewed to determine if it yielded sufficient material. Range of diagnostic yield of fine needle biopsy of thyroid lesions published in the literature varies from 80% to 96% in the literature. 85% was arbitrarily set as preliminary standard. RESULTS: 64 lesions were sampled from 61 patients. 41 samples were obtained by FNA technique, of which 35 yielded adequate sample (85%). 23 were taken by FNC technique of which 21 were adequate (91%). No significant difference has been shown by the diagnostic yield of the two different techniques (p=0.7, Fisher's exact test). CONCLUSION: Diagnostic yield by the two techniques in our hospital has shown no significant difference between each other and are comparable with published data. There is a suggestion that FNC is more accurate. Further investigation is required.

p1014
Ultrasound characteristics of thyroid malignancy

Patatas, K.[1], Albazaz, R.[1], Paes, R.[2]
[1]Leeds Teaching Hospitals NHS Trust, Leeds, UK, [2]Calderdale and Huddersfield NHS Trust, Huddersfield, UK

KEY LEARNING OBJECTIVES: Thyroid nodules are very common but thyroid cancer is rare, representing <1% of all malignancies. Thyroid ultrasound is used in an attempt to differentiate benign from malignant nodules and to guide FNA for nodules suspected of being malignant. Several features have been described that may predict malignancy. Our aims were to evaluate: diagnostic accuracy of ultrasound characteristics of thyroid nodules that should undergo FNA based on the Society of Radiologists in Ultrasound recommendations; FNA sensitivity. DESCRIPTION: 31 consecutive malignant thyroid nodules, diagnosed at surgery over a 5 year period, were retrospectively evaluated by two radiologists (21 female, 10 male; mean age 46.6 years, range 17–89 years). The following ultrasound features were assessed: nodule size, margin, echotexture, echogenicity, calcification, vascularity and presence of a halo. FNA cytology and histology reports were also analysed. RESULTS: Ultrasound features with the highest sensitivity for malignancy were: intranodule vascularity (65%), irregular margins (61%), solid composition (48%) and hypoechogenicity (29%). 61% of nodules had 2 or more of the assessed features. 12 of 31 nodules had undergone ultrasound guided FNA and subsequent cytological evaluation. FNA sensitivity was 50%, with 17% of specimens being non-diagnostic or inadequate. CONCLUSION: Ultrasound characteristics suggestive of thyroid malignancy and ultrasound guided FNA are helpful when used in conjunction for the discrimination of malignant thyroid nodules.

e1015
Cystic lesions of the mandible

Bhatnagar, G., Sidhu, H., Vendhan, K., Suresh, P.
Derriford Hospital, Plymouth, UK

KEY LEARNING POINTS: Lucent lesions of the mandible often present a diagnostic challenge. These lesions have varied radiographic patterns. The differentiation of benign and aggressive lesions will be discussed by illustrating the imaging of lesions such as: Radicular cyst – develops at the apex of a carious tooth and is the most common mandibular cyst. Dentigerous cysts – associated with an impacted tooth. It has the ability to expand asymptomatically and displace or resorb adjacent teeth or bone. Ameloblastomas – extremely aggressive and infiltrative. Following treatment patients must be monitored radiographically. Odontogenic keratocysts – may demonstrate aggressive growth, making them indistinguishable from ameloblastomas. Also rare lesions such as Stafne's cysts will be described. DESCRIPTION: This exhibit will review the classification and imaging of cystic lesions of the mandible. Cysts occur more commonly in the jaw than in any other bone, and are frequently an incidental finding. More than 80% of jaw lesions are radiolucent. Primary lesions of jaw arise in either odontogenic or nonodontogenic tissues. Secondary involvement may occur through various pathways. Radiographic density and margination are important criteria in evaluating jaw lesions. Also important in assessing a lesion is its precise anatomic location within the jaw and the specific relationship to a tooth or portion of tooth. CONCLUSION: The majority of mandibular lesions are benign. Radiology plays an important role in assisting with the diagnosis. Radiological features in association with clinical presentation help narrow the differential diagnosis.

e1016
Ultrasound guided submandibular gland injection of botulinum toxin for hypersalivation in cerebral palsy

Sriskandan, N.[1], Hannah, A.[2], Hodges, S.[3], Moody, A.B.[3], Howlett, D.C.[3]
[1]Guy's & St Thomas' NHS Trust, London, UK, [2]Brighton and Sussex Medical School, Brighton, UK, [3]Eastbourne District General Hospital, Eastbourne, UK

KEY LEARNING POINTS: Hypersalivation is a troublesome occurrence in patients with neuromuscular disorders. The use of botulinum toxin-A (BTX-A) injection of the submandibular glands (SMG) is not well described but its utility is being recognized. Injections are best performed under ultrasound guidance and, therefore, the radiologist and clinicians should be aware of the role of BTX-A and the technique used. The learning points are: i) the use of BTX-A for hypersalivation; ii) the role of ultrasound guidance and safe administration of BTX-A; iii) the potential hazards of BTX-A injections of the SMG and associated consent issues; iv) a potential treatment algorithm for these patients. DESCRIPTION: Technique: The procedure was performed under general anaesthesia with written consent. 20–25u of BTX-A, diluted with normal saline, was injected into the superficial and deep lobes of each SMG using a 22 G spinal needle. Ultrasound guidance was used to avoid inadvertent injection of nearby structures. Case series: There procedure was performed in 4 patients with cerebral palsy associated hypersalivation. Questionnaires conducted prior to and 4 weeks following the procedure revealed a subjective improvement in 3 patients and clinical improvement in all 4. One patient reported a side effect of difficulty in retaining their prosthetic globes. CONCLUSION: SMG injection of BTX-A reduces hypersalivation and improves quality of life for the patient and carer. Ultrasound guidance enables accurate administration of the toxin, thus minimizing side effects. Patients and carers should be advised that the treatment is still novel and the side effect profile yet to be established.

e1017
Triple assessment of palpable parotid lesions

Sriskandan, N.[1], Howlett, D.C.[2]
[1]Guy's and St Thomas' NHS Trust, London, UK, [2]Eastbourne District General, Eastbourne, UK

KEY LEARNING OBJECTIVES: One-stop and triple assessment (comprising clinical examination, imaging and histology) breast clinics are well established. NICE guidelines 2004: Improving outcomes in head and neck cancers recommended development of one-stop clinics for these patients with emphasis on clinically-guided fine-needle aspiration cytology (FNAC) led service. This document only alludes to the use of ultrasound which, alongside ultrasound-guided core biopsy (USCB), is increasing. Learning points are to understand the roles of: i) FNAC and USCB; ii) high resolution ultrasound (HRUS) in the management of parotid lesions in one-stop and triple assessment clinics. DESCRIPTION: FNAC and USCB are safe with few complications. USCB, unlike FNAC, cannot provide immediate results but does permit grading and typing of carcinomas and differentiates lymphoid hyperplasia from low grade lymphoma. This reduces the number requiring surgical biopsy. The accuracy of FNAC falls without experienced on-site cytologists and their ability to perform and analyse ancillary techniques. USCB is increasingly the mainstay of tissue sampling in breast surgery and is likely to increase in head and neck cancers. HRUS can identify, characterize and differentiate benign from malignant pathology. The complementary roles of clinical, imaging and histological findings are illustrated by

cases of i) false-negative FNAC and USCB with true-positive clinical and ultrasound findings, and ii) false-negative examination, FNAC and ultrasound with true-positive USCB results. CONCLUSION: Triple assessment of palpable parotid lesions is recommended, with correlation of clinical, ultrasound and histological findings. USCB is the preferred method of obtaining histology due to reduced patient morbidity and shortage of cytologists.

e1018

Do the results of conventional sialography make a difference to patient outcome?

Loney, E.L., Krishan, S.
Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UK

PURPOSE: to examine the results of conventional sialography over an 18 month period and determine whether the findings made a difference to patient management. MATERIALS/METHODS: All sialogram results from 1 January 2006 to 31 August 2007 were retrospectively reviewed and patients' notes were pulled to assess management outcomes. The results of any salivary ultrasound examinations performed on these same patients were also obtained and compared. RESULTS: 53 patients underwent 55 examinations and notes were available for 42 of these. 66% of examinations demonstrated an abnormality with 16 stones, 13 strictures, 12 cases of sialectasis and 1 of CLL. In the "normal" group all but 1 were discharged to their GP with no follow-up. All cases of sialectasis were discharged and those with stones and strictures underwent a variety of procedures/ follow-up. 17 patients also had ultrasound examinations. Of the 15 who could be assessed 12 had results concordant with sialography and 3 had subtle sialectatic changes shown on sialography only. CONCLUSION: Conventional sialography still appears to have a role in salivary disease assessment. It picks up more subtle abnormalities than ultrasound and when normal/showing only sialectasis allows patient discharge from follow-up. We recommend initial provocation ultrasound in all patients to look for masses/duct dilatation/stones. If normal and symptoms persist sialography remains useful, especially for demonstrating strictures and minor sialectatic change. We have changed our practice accordingly.

e1019

CT sinuses for chronic rhinosinusitis: Audit of referral pathway at Belfast City Hospital

Gibson, E.R.[1], Foster, J.[1], Basha, S.[2]
[1]Belfast City Hospital, Belfast, UK, [2]Craigavon Area Hospital, Craigavon, UK

PURPOSE: To audit the referral sources for CT of the sinuses. We aimed to review the current guidelines involving CT investigation of chronic rhinosinusitis and establish if referral criteria are adhered to at our institution. METHODS AND MATERIALS: A position paper on chronic rhinosinusitis (2005) from The European Academy of Allergology and Clinical Immunology was reviewed to establish referral criteria. AUDIT AIM: 100% CT sinus referrals should come from an ENT consultant planning FESS (Functional Endoscopic Sinus Surgery). CT Sinuses over a 1 year period were assessed to record referral source, clinical details and CT findings. Whether or not the patient went on to have FESS was also recorded. RESULTS: 170 patients included. 95% of patients had CT evidence of sinus disease/ features that predispose to impaired mucociliary clearance. 74% of referrals came from an ENT source. Of the 26% of non-ENT referrals most of these (16% of the total referrals) came from Respiratory Consultants. 28% of patients had FESS. CONCLUSION: CT sinuses should not be carried out as a diagnostic tool. It is evident from the results that too many CT sinuses are being requested at our institution as only 28% of patients go on to have FESS. This may be because CTs are being requested before a 3 month trial of medical treatment has been completed (as recommended by the EAACI). We recommend closer adherence to the EAACI position paper 2005.

e1020

Imaging of sinonasal tumours and tumour-like lesions

Rashid, S., Vaidhyanath, R.
University Hospitals of Leicester NHS Trust, Leicester, UK

KEY LEARNING OBJECTIVES: Imaging features of sinonasal tumours and tumour like conditions will be presented using histology proven cases. DESCRIPTION: Neoplasms of the sinonasal region are rare. They are derived from a multitude of tissue types and are broadly classified as epithelial or mesenchymal. They usually present at an advanced stage with grave overall outlook. Improved imaging technology has resulted in superior tumour mapping and hence realistic treatment planning. Radiologist should be aware of critical areas of tumour extension that will alter surgical or radiotherapy planning. CONCLUSIONS: Accurate radiological diagnosis and tumour mapping of sinonasal tumour is necessary to improve treatment outcome and to prevent undesirable deformity or prolonged morbidity.

e1021

Spectrum of orbital pathology on CT brain: A site to remember

Jacob, A.D.C., Aurangabadkar, A.V., Jain, Y., Subramanian, K.
Blackburn Royal Infirmary, Blackburn, UK

OBJECTIVES: 1. To delineate normal orbital and demonstrate a spectrum of orbital pathology identified on routine CT brain scans. 2. Describe normal lacrimal fossa and nasolacrimal duct anatomy and review commonly occurring pathology at this site. INTRODUCTION: As a part of CT imaging of the brain images through the orbits and lacrimal fossa also acquired. This has especially become more relevant with the use of thin slice acquisitions through the skull base as routine. CT brain is frequently done for nonspecific symptoms like headaches, blurred vision, photophobia and frequent falls. Some of these symptoms can be attributed to direct orbital pathology and needs careful evaluation on routine CT. Equally the orbits and lacrimal fossa needs due attention while evaluation head/facial trauma. Similarly infections and tumours in this region may not be obvious on preliminary clinical examination but will however be vital in patients' treatment. In our pictorial review we present: 1. congenital/benign orbital pathology like lipomas and angular dermoid cysts; 2. orbital trauma, emphysema and infection; 3. thyroid disease and pseudotumour; 4. orbital lymphoma and metastasis; 5. orbital nerve and vascular lesions; 6. lacrimal fossa lesions like dacroadenitis and cystic tumours. CONCULSION: We aim to demonstrate normal orbital and lacrimal fossa anatomy on routine CT and illustrate an extensive spectrum of imaging abnormalities in this region. This will act as an atlas for students, radiographers, trainee radiologists and encourage radiologists to review the orbits as a part of routine reporting practice.

e1022

Optimal imaging for orbital blow out fractures

Acharya, A.V., Khan, A., Messios, N.
Leicester Royal Infirmary, Leicester, UK

PURPOSE: To assess correlation between plain X-ray findings and CT for cases blow out fractures of orbit. To assess the correlation between clinical history and fracture positive results. MATERIALS/ METHODS: We retrospectively looked at the imaging referrals for orbital blow out fractures over a period of two years. A total of 44 patients had orbital blow out during this time as documented in the hospital radiology information system and had both plain films and CT available for reviewing. All the plain X-rays and CT scans of the blow out fractures were reviewed by two consultant radiologists and opinions documented. We also reviewed the medical notes of these patients and documented the clinical symptoms and signs at the time of initial presentation. RESULTS: Of the 44 plain films, reviewing radiologists could diagnose fractures in only 23% where as all reviewed CTs in these patients confirmed blow out fractures. Taking CT as gold standard, 34 out these 44 fractures could not be identified by the reviewing radiologists on the plain films. With regards to clinical presentation of these patients most common signs

and symptoms included diplopia (68%), parasthesia (41%), restricted eye movements (32%) and enophthalmos (30%). CONCLUSION: Plain film has poor sensitivity and therefore limited role in cases of suspected cases of blow out fracture. We recommend CT should be the first line of investigation in suspected blow out fractures of the orbits. Prompt CT imaging should be considered when there are suspicious clinical features such as diplopia, parasthesia, enophthalmos and restricted eye movements.

e1023
Parathyroid scintigraphy – A pictorial review

Roy, A.A., Garvie, N.W.
Saint Bartholomew's and The Royal London Hospitals, London, UK

KEY LEARNING OBJECTIVES: 1. Discuss the current role of parathyroid scintigraphy (PS) in the context of other modalities. 2. Illustrate the evolution of PS, from Thallium subtraction studies to MIBI SPECT/CT fusion imaging. 3. Demonstrate the manifestations of hyperparathyroidism on bone scintigraphy, with particular reference to extra-osseous uptake. DESCRIPTION: Pre-operative localization of parathyroid pathology minimizes surgical risk while enabling the procedure to be precisely targeted to the abnormal gland. This is particularly important in cases of parathyroid ectopia or post-surgical recurrence. Thallium-201 subtraction scintigraphy was developed in the early 1980s, with a significant advance in 1989 when Tc-MIBI/I-123 subtraction scintigraphy was first described, followed by the simpler MIBI wash-out technique. Subsequently, with technology improvements, SPECT versions of these techniques have become available, with commensurate improvements in sensitivity and specificity, although their principal advantage may lie in enabling pre-operative depth localization in mediastinal or intra-thyroidal adenomas. The most recent advance involves usage of MIBI SPECT/CT to localize the adenoma in relation, particularly, to the vascular structures within the upper mediastinum. Examples will be provided with reference also to parathyroid carcinoma, hyperplasia and ectopia, and a discussion of their advantages and limitations compared with alternative imaging. Finally, emphasis will be placed upon the recognition of subtle soft-tissue uptake appearances associated with hyperparathyroidism on bone scintigraphy, within lung, gastric mucosa, myocardium and elsewhere. CONCLUSION: Parathyroid scintigraphy has evolved radically since its first inception, but a precise understanding of its correct application in relation to clinical circumstances and other available techniques is still important.

e1024
High resolution ultrasound assessment of the thyroid gland

Sriskandan, N.[1], Pienaar, W.E.[1], Desai, A.U.[1], Howlett, D.C.[2]
[1]Guy's and St Thomas' NHS Trust, London, UK, [2]Eastbourne District General Hospital, Eastbourne, UK

KEY LEARNING OBJECTIVES: To understand: i) the normal ultrasound anatomy and close relations of the thyroid gland; ii) the ultrasound features of benign and malignant lesions of the thyroid gland; iii) the role of ultrasound guided fine-needle aspiration and cytology (FNAC) of the thyroid lesions. DESCRIPTION: Description of the HRUS technique, including a review of complementary imaging modalities, and the technique of ultrasound-guided FNAC. The ultrasound appearances of: i) normal thyroid anatomy; ii) benign lesions – simple/complex cysts, thyroid adenomas, colloid and hyperplastic nodules; iii) follicular and Hurthle cell lesions with particular reference to management and the diagnostic difficulties that may arise in ultrasound and cytological assessment; iv) malignant disease, including papillary, follicular, medullary and anaplastic carcinoma, lymphoma and metastatic disease; v) Inflammatory/autoimmune disease – Hashimoto's and De Quervain's thyroiditis; vi) thyroid incidentalomas. CONCLUSION: The thyroid gland is a superficial structure, making it readily amenable to ultrasound assessment. HRUS is the initial imaging modality of choice in the evaluation of the diverse range of diseases that involve the thyroid. It enables characterization of thyroid lesions and can guide FNAC in order to establish a cytological diagnosis, however, caveats apply.

Paediatrics

p1101
Imaging in paediatric epilepsy – A pictorial review

Godhamgaonkar, V.A., Harrison, R.
Queen Alexandra Hospital, Portsmouth Hospitals NHS Trust, Portsmouth, UK

LEARNING OBJECTIVES: After reviewing this poster, the delegates will be able to: 1. Enumerate various pathologic conditions manifesting as seizures and their imaging findings. 2. Discuss the role of MRI in diagnosing structural abnormalities in paediatric epilepsy. DESCRIPTION: Diagnosing and treating paediatric epilepsy is challenging. We present a comprehensive pictorial review of various aetiologies presenting as seizures or epilepsy in children. Although imaging is not routinely indicated following a simple febrile convulsion, it is vital in the assessment of children with a focal neurological deficit, developmental delay, neurocutaneous syndromes, simple and refractory complex partial seizures, etc. We have attempted to include MRI of wide spectrum of disorders presenting as acute onset seizures with neurological symptoms such as infection, haemorrhage, tumour, suspected NAI, etc. We have emphasised the crucial role of detailed MRI examination to reveal structural abnormalities in chronic seizure disorders or refractory epilepsy. Temporal lobe epilepsy and mesial temporal sclerosis, focal cortical dysplasia are some such entities. We have included brief pictorial description of various developmental disorders, e.g. scizencephaly, polymicrogyria, hemimegalencephaly, etc., neurocutaneous syndromes, metabolic disorders, congenital infections, hypoxic ischaemic encephalopathy, etc. Childhood neoplasms like DNET, giant cavernoma, etc. have been included. To conclude, we have briefly touched upon the role of SPECT and PET, functional MRI and spectroscopy etc. in the imaging work up of patients with option of possible curative surgery. CONCLUSION: We intend to provide the delegates a pleasant learning experience through this well presented, educational pictorial tour.

p1102
A handheld database of paediatric plain film radiography

Paetzel, M., Barkhausen, J.
University Clinics of Schleswig-Holstein, Luebeck, Germany

We provide an expanded, updated and free program for PocketPC handheld devices as a reference database in paediatric plain film radiography for the well and less experienced radiologist. Over 450 images in paediatric skeletal radiography can be displayed in radiographic standard settings, categorised by body regions, age and gender. The database's information has been expanded, with further descriptive information for each image. The database can be queried through selection of all three criteria or by choosing each criterion separately. The latter offers itself mostly for determination of bone age using the left hand. Each mode provides the user with at least one reference image according to each body region, age and gender. This program is a free reference database for both older PDA models as well as newer ones. It includes almost all standard images in plain film radiography, from infancy to adulthood. The database serves the radiologist on-call and the less experienced paediatric radiologist to differentiate between physiological age-specific and pathological findings.

p1103
The acute paediatric scrotum

Duncan, K.A., Walker, S.M., Galea, J.
Royal Aberdeen Children's Hospital, Aberdeen, UK

KEY LEARNING OBJECTIVES: Requests for urgent assessment of the scrotum are not uncommon in Paediatrics and any Radiologist or Sonographer providing an emergency imaging service may be

faced with one. They are not restricted to the Paediatric Imaging Department. The aim of this poster is to illustrate the range of underlying pathologies which can present with an acute scrotum. DESCRIPTION: A range of pathologies will be presented with a short clinical description and an accompanying image. CONCLUSION: It is hoped that by illustrating the variety of conditions which may be encountered in boys, not all of which are seen in adults, that when next faced with this clinical scenario the general radiologist or sonographer will feel more confident in their assessment.

p1104

Hip screening in cerebral palsy: The first year

Duncan, K.A., Barker, S.L.
Royal Aberdeen Children's Hospital, Aberdeen, UK

PURPOSE: Hip displacement occurs in approximately one third of children with cerebral palsy. There is a broadly linear relationship between the severity of the disease and the likelihood of hip problems. Based on this we have introduced a local protocol to guide clinical and radiological monitoring of hips at risk in children with cerebral palsy. The children are clinically monitored by community paediatricians and referred at intervals for radiographs depending on their age and level of disability. METHOD: An AP pelvic film is taken in a standardized radiographic position with the lumbar lordosis abolished. The acetabular indices and migration percentages are calculated using software on our PACS equipment and a report issued. If there is evidence of migration of 30% or above, children are referred to one of the Orthopaedic Surgeons for further assessment and management. RESULTS: Since introducing this screening policy in the summer of 2008 we have screened 30 children and to date have detected 15 hips in 9 children requiring orthopaedic referral. CONCLUSION: In this relatively small group of patients we have detected abnormality in almost 30% which had not been previously suspected clinically. By earlier detection and referral for management it is hoped that the degree of bony incongruity can be minimised, facilitating easier surgical management and preserving mobility.

p1105

A pictorial review of causes of sensorineural deafness in children

Narang, G., Wilson, D., Hawkes, R., Thyagarajan, M.
Bristol Royal Hospital for Children, Bristol, UK

Identification of sensorineural hearing loss (SNHL) in a young child is essential to establish early treatment for developing normal speech. SNHL is due to congenital or acquired causes of abnormalities of the vestibulocochlear nerve (cranial nerve VIII), the inner ear or central processing centres of the brain. The most common cause of SNHL is due to abnormality of the "Organ of Corti" in the cochlea, but other causes are also important and can be seen on imaging. A relatively new form of treatment for SNHL is the cochlear implant. CT and MRI are both important imaging modalities for the work up of these patients. The role of radiology is to identify any existing structural abnormality and to ensure no contraindication exists to the placement of cochlear implants. At our centre, which is the regional centre for cochlear implantation for the Southwest of England, we have performed about one hundred cross-sectional examinations including CT and MRI over a 24 month period. Some of the structural abnormalities identified are Mondini cochlea, enlarged vestibular aqueducts, hypoplasia of internal auditory canal and absent cochlear nerve. In our educational poster, we will present a review of the abnormalities that we commonly see, along with some rarer causes.

p1106

Role extension in a small paediatric radiology department

Duncan, K.A., McDonald, S., Clubb, K., Moir, A., Farquhar, B.,
Campbell, L., Robertson, S., Kelman, I., Wilkie, W.
Royal Aberdeen Children's Hospital, Aberdeen, UK

PURPOSE: Work patterns within Radiology Departments have changed dramatically over recent years. Demand increases, new technologies emerge, the needs of our workforce, our patients and our referrers change. In many departments and in many areas role extension has been embraced to help address such issues. The aim of this presentation is to illustrate how we have integrated role extension into our service in a small dedicated Paediatric Radiology Department. MATERIALS/METHODS: Review of all areas of radiographer extended clinical imaging activity within the department. RESULTS: Radiographers are undertaking a wide range of activities – Ultrasound – general, cranial, hip: Reporting – Bone ages, Leg Length assessment: Screening – urodynamics, micturating cystourethrography, pH monitor placement, pharyngography. Our referrers and parents have been delighted by the wider range of available appointments. Waiting lists have been kept to a minimum. We have had many positive comments about the quality of the radiographers' reports and audits have shown that our reporting turnaround has improved. As part of a teaching hospital a range of trainees also pass through the department, the radiographers are closely involved in teaching skills such as ultrasound. The radiographers enjoy taking on new roles, and recruitment and retention is outstanding in these times of radiographer shortage. CONCLUSION: Our service is greatly enhanced by the broader contribution of the radiographers. We plan to continue to explore other areas to expand their involvement.

p1107

Imaging characteristics of necrotising pneumonia and their complications in paediatric population

Chidambaram, V., Au-Yong, K., Nayeemuddin, M., Jones, M.
University Hospital of North Staffordshire NHS, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVE: To review the imaging characteristics of necrotising pneumonia in children. To illustrate the range of appearances with special emphasis on CT cross sectional imaging. DESCRIPTION: Community acquired pneumonia in children can be complicated by necrotising pneumonia which is characterized by liquefaction and cavitation of lung. Necrotising pneumonia is important to recognize as most children need to be hospitalized with longer course of antibiotics than for children with uncomplicated pneumonia. Common causes include *Staphylococcus aureus*, streptococcus, gram negative bacteria. It leads to severe morbidity and prolonged hospital stay. We illustrate the radiological manifestations of necrotising pneumonia in children using high quality pictures from different modalities like chest X-rays, ultrasound and multi-detector CT with multi planar reformats. CONCLUSION: Radiologists should recognize the appearance of necrotising pneumonia and its associated complications in order to help the clinicians to initiate appropriate management.

p1108

Audit of hip ultrasound follow-up of infants in breech presentation at 36 weeks gestation

Duncan, K.A., Cheyne, C.A.
Royal Aberdeen Children's Hospital, Aberdeen, UK

PURPOSE: Breech presentation is associated with an increased risk of developmental dysplasia of the hip. Screening with hip ultrasound is therefore recommended. Work has been undertaken previously looking at the follow-up of breech deliveries, but the follow-up of infants known to be breech at 36 weeks who subsequently converted to a cephalic presentation had not been reviewed. Women with breech presentation at 36 weeks presentation are offered ECV (external cephalic version). If successful, or if the infant spontaneously changes position, hip ultrasound should still be undertaken as these infants remain at risk of DDH. This audit was undertaken to look at all women attending for ECV to determine whether the infants were subsequently referred for hip ultrasound. STANDARD – All infants in breech presentation at 35 weeks gestation should be referred for hip ultrasound screening. METHOD: The names of women attending for

ECV over a 4 month period were identified from ward records. Their case notes were reviewed to confirm that the presentation was breech and the infant records then checked to ensure that hip ultrasound had been undertaken. RESULTS: In total 36% of the breech presentations at 35 weeks gestation (8 of 22) were not referred for hip ultrasound. CONCLUSION: The following action plan was implemented. Policy to indicate in hand held notes that hip ultrasound referral is required, was introduced. Leaflet produced for parents with confirmed breech presentation at 36 weeks explaining the need for hip ultrasound screening. Reaudit in 12 months time.

p1109

Delayed presentation of developmental dysplasia of the hip and retrospective review of screening ultrasound

Wray, A.R., Sweeney, L.E.
The Royal Belfast Hospital for Sick Children, Belfast, UK

PURPOSE: To review the outcomes of patients screened with static ultrasound for developmental dysplasia of the hip (DDH), highlighting false negative cases. MATERIALS/METHODS: The results of all hip ultrasounds carried out in our unit in 2006 for screening of DDH in high risk patients were reviewed and compared with subsequent radiology results up to April 2008. The details of all children treated for DDH in this time period were obtained and compared with any previous ultrasound findings. Cases of discrepancy were reviewed by a consultant paediatric radiologist. RESULTS: The records of 563 patients were reviewed, with 15 cases being excluded because of inadequate follow up. The ultrasound was reported as normal in 397 cases and of these, 4 patients subsequently developed DDH. On review of these cases it was felt that 2 had been misreported. However, in the other 2 the ultrasound was accurately reported as normal, yet the patients had subsequently developed DDH. Both patients presented at 5 months of age with dislocated hips, requiring surgical intervention. The finding of "immature hips" that subsequently normalized on follow up imaging without any intervention was present in 105 patients. In total, 50 patients were found to have hip dysplasia, confirmed on follow up pelvic X-ray, requiring orthopaedic follow up and/or treatment. CONCLUSION: Ultrasound is an effective screening tool for DDH, however there are rare cases that develop subsequent to a normal investigation, as highlighted by the 2 cases in this study.

p1110

Developmental anomalies in aortic arch

Chidambaram, V., Au-Yong, K., Tony, G., Bakalinova, D.
University Hospital of North Staffordshire NHS, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVES: To review the embryology of the formation of the aortic arch. To review the imaging characteristics of some of the developmental anomalies in aortic arch. DESCRIPTION: The various developmental anomalies in aortic arch occur early in embryological development. These anomalies make up less than 1% of all congenital cardiac defects. It is due to the abnormal development in the embryonic pharyngeal arches. The age of presentation may vary, but most are identified in early infancy. They can cause physiologic abnormalities including tracheo-bronchial or oesophageal compression and abnormal blood flow. We review the normal development of the aortic arch. Our exhibit demonstrates some of the common arch anomalies using a combination of imaging modalities including chest X-ray, barium swallow and contrasted CT scans. CONCLUSION: This exhibit raises awareness of various developmental anomalies of aortic arch and their imaging appearances.

p1111

Clinical experience with gadobenate dimeglumine for contrast-enhanced MRI in children

Colosimo, C.[1], Pasowicz, M.[2], Demaerel, P.[3], Tortori-Donati, P.[4], Gao, P.[5]
[1]*Catholic University of the Sacred Heart, Rome, Italy,* [2]*Krakow Hospital John Paul II, Krakow, Poland,* [3]*University Hospital K.U. Leuven, Leuven, Belgium,* [4]*Institute G. Gaslini, Genoa, Italy,* [5]*Beijing Tian Tan Hospital, Beijing, China*

PURPOSE: To summarize safety and efficacy of the higher-relaxivity gadolinium (Gd) agent gadobenate dimeglumine (Gd-BOPTA) in children. MATERIALS/METHODS: Safety was evaluated in 177 subjects receiving Gd-BOPTA at a dose of 0.1 mmol kg^{-1}, 85 of whom participated in a comparison study in which 89 subjects received equimolar gadopentetate dimeglumine (Gd-DTPA). Image quality was evaluated in 70 patients receiving Gd-BOPTA, including 29 children with enhancing lesion compared with 34 children receiving Gd-DTPA. Serial 24 h blood and urine collections were used to determine Gd-BOPTA pharmacokinetics (PK) in 25 healthy children. RESULTS: 19 of 177 patients (10.7%) experienced adverse events (AE), most of which were mild. The most commonly reported AE were fever and headache. Modest increases and decreases in vital signs were recorded, but no significant changes in laboratory parameters or ECGs were observed. In the comparison study, AE rates were similar after Gd-BOPTA (11 subjects, 13%) and Gd-DTPA (13 subjects, 14%), p=0.75. PK data best fit a 2-compartment model, with >80% recovery in urine at 24 h. In children with enhancing lesions, contrast enhancement was considered good to excellent in all subjects. Gd-BOPTA resulted in improved definition of disease extent, lesion border delineation, and visualization of lesion internal morphology. In the comparison study, postdose changes in lesion visualization were significantly greater for Gd-BOPTA than Gd-DTPA at the lesion (p=0.011) and patient level (p=0.008). CONCLUSION: Gd-BOPTA is well tolerated, with safety and pharmacokinetics comparable to other Gd agents. Compared to Gd-DTPA, Gd-BOPTA performed significantly better for visualization of CNS tumours in paediatric patients.

p1112

Cycling: A safe form of transport? Patterns of bicycle related solid organ injury in children

Laurence, I., Hawkes, R.
University Hospitals Bristol, Bristol, UK

KEY LEARNING OBJECTIVES: To provide a comprehensive review of the patterns of abdominal injury seen in children involved in bicycle accidents. To review the American Association for the Surgery of Trauma classification of severity of organ injury and its pertinence to management. DESCRIPTION: Bicycle accidents account for 5–14% of blunt abdominal trauma in children, with frequent disparity between the apparently minor circumstances of these accidents and the seriousness of the injuries sustained. Abdominal ultrasound is often the first line investigation in children, but may not allow confident exclusion of solid organ injury in all cases. Cross sectional techniques are helpful adjuncts, and where ultrasound is equivocal the threshold for performing additional imaging should be a low. We present a series of cases of blunt abdominal injury in the paediatric population resulting from falls from bicycles. Liver, spleen, renal and pancreatic injuries are demonstrated on a combination of CT, ultrasound and MRI. Additional information from multiplanar reformatting is included. A review of the American Association for the Surgery of Trauma grading system for abdominal organ injury is provided in combination with practical surgical guidelines. CONCLUSION: This presentation aims to enable radiologists to interpret the imaging findings of bicycle related blunt abdominal trauma on differing radiological modalities. The ability not only to diagnose, but also to grade abdominal organ trauma, is important as the degree of injury will influence the surgical management.

p1113

Renal mass in the newborn and young infant – A pictorial review

Fanou, E.-M., Yong, K.J.A., Grima, M., Bakalinova, D.
University Hospital North Staffordshire, Newcastle-under-Lyme, UK

KEY LEARNING OBJECTIVES: To highlight the various causes of renal mass in the newborn and young infant. To illustrate the typical imaging appearance of renal mass in this age group. DESCRIPTION: Abdominal masses in the newborn and young infant are predominantly benign lesions. They usually represent defects in embryonic development. 55% of these abdominal masses are renal in origin. Malignant neoplasm is rare at this age and the prognosis in general is good. The common causes include hydronephrosis, multicystic kidney, polycystic kidneys, renal vein thrombosis, nephroblastomatosis or mesoblastic nephroma and renal ectopia. Ultrasound is the primary imaging modality. We will present high quality pictures to illustrate the examples of above conditions. CONCLUSION: Radiology has an important role in diagnosing renal mass in the newborn and young infant. Their imaging appearance combined with clinical information, will usually allow a specific diagnosis or a very limited differential list.

p1114

Comparison of two different screening methods for congenital hip dysplasia

Romsauerova, A., Sanjay, S.
Ninewells Hospital, Dundee, UK

PURPOSE: In the UK we use two main types of screening for hip dysplasia namely the Graf's and the Harcke's methods. We aimed to see if comparing practice across 4 hospitals in Tayside would provide an idea about the superiority of either method. MATERIALS/METHODS: We retrospectively identified records of all patients screened for hip dysplasia between January 2006 and July 2008. Information on age at first scan, reason for scanning, degree of dysplasia, frequency of follow-up scans and treatment instituted were extracted from the radiology information system. RESULTS: 1496 hip screenings were performed. Graf's method was used in 1259 (84%) patients and Harcke's method in 237 (16%). Significantly greater number of abnormal scans were identified by Harcke's method compared to the Graf's method (22% vs 15.5% Pearson's p=0.014). Harcke's method graded 75% as mild, 17% moderate and 8% severe dysplasia whereas Graf's method graded 89% as mild, 7% moderate and 4% severe dysplasia. Treatment was instituted in 71% and 31% of abnormal scans detected by Harcke's and Graf's methods respectively. Graf's method resulted in 61% rescans vs 29% using the Harcke's method. CONCLUSION: Harcke's method appears to pick up a greater number and severity of dysplasia than the Graf's method and is associated with fewer recalls for confirmation of diagnosis. Direct comparison of methods was, however, difficult in this observational study and we need randomized controlled trials to confirm if our findings are indeed true.

e1115

Chronic recurrent multifocal osteomyelitis

Kumaraguru, J.J.[1], Kandasamy, N.[2], Symeonidou, C..[3], Offiah, A.[2]
[1]Barnet General Hospital, London, UK, [2]Great Ormond Street Hospital, London, UK, [3]Royal Free Hospital, London, UK

KEY LEARNING OBJECTIVES: To review the varied imaging appearances of chronic recurrent multifocal osteomyelitis (CRMO) and highlight the importance of its prompt identification. We also emphasise the role of imaging during follow up and assessment of complications. DESCRIPTION: Chronic recurrent multifocal osteomyelitis is an unusual clinical entity of uncertain aetiology. It is distinct from bacterial osteomyelitis. This condition primarily affects children and adolescents and has a prolonged and fluctuating course which may span years. The condition is often multifocal with involvement of the tubular bones and clavicle and less commonly the spine and pelvis. Histopathological and laboratory tests are usually inconclusive and it is a diagnosis of exclusion, made after excluding infection and tumour. Diagnosis is established by assessing the course of the disease with conventional radiography supplemented with MRI and scintigraphy if necessary. CONCLUSION: CRMO needs to be recognized promptly as this can prevent unwarranted aggressive surgical and medical management.

e1116

Paediatric cranio-cervical junction measurements on MDCT

Rao, B., Dickinson, F.
University Hospitals of Leicester NHS Trust, Leicester, UK

PURPOSE: Conventional cranio-cervical junction measurements are based on plain radiographs. We reviewed these measurements on MDCT in the paediatric population (16 years and below) and compared it with the normal accepted range. MATERIALS AND METHODS: We measured the basion-dens interval (BDI), atlanto-dens interval (ADI), basion-posterior axial line interval (PAI), Powers ratio, atlanto-occipital interval (AOI) and atlanto-axial interval (AAI) on MDCT of 18 consecutive paediatric patients with normal cranio-cervical junction and compared the values to previously accepted range on plain radiographs. RESULTS: BDI was less than 8.5 mm, ADI was less than 3 mm and PAI was less than 9.5 mm in our study group, whereas previously accepted values on plain radiographs are less than 12 mm for BDI, less than 5 mm for ADI and less than 12 mm for PAI. Powers ratio, AOI and AAI did not show significant difference compared to previously accepted values from plain radiographs. CONCLUSION: Cranio-cervical measurements on MDCT are significantly different from the accepted ranges of normal on plain radiographs. Our pilot study suggests that a new reference standard is needed for MDCT scans in the paediatric population.

e1117

Paediatric elbow fractures: Dark art of interpreting paediatric elbow trauma

Zavareh, A.T.[1], Cousens, C.[2], Chellamuthu, S.[3], Kakani, N.[2]
[1]Peninsula Radiology Academy, Plymouth, UK, [2]Derriford Hospital, Plymouth, UK, [3]Sheffield University Hospital, Sheffield, UK

KEY LEARNING OBJECTIVES: Review of paediatric elbow fractures, complications and their correct diagnosis. DESCRIPTION: Elbow fractures are a common injury seen in the paediatric population. Several patterns of elbow fractures have been identified with more complex ones associated with nerve and vessel injuries. Evaluating paediatric elbow can at times be challenging to the trainee due to the lack of clear understanding of the anatomy and ossification centres. Difficult positions during acquiring X-rays due to lack of adequate analgesia can make interpretation more difficult. Incorrect diagnosis can have devastating consequence for the child and cause life long disability. From supra condylar fractures to more complex fractures involving the nonossified epicondyles, findings can be subtle at times, and unless looked for can be easily missed. However, when specific criteria and rules are observed, most anxiety form radiological interpretations can be reduced. All types of elbow fracture including combination fractures, which could result in potential nerve injury, will be discussed with relevant images to compliment text. Use of fluoroscopy as well as newer imaging techniques such as CT and MRI in more difficult cases will be discussed. CONCLUSION: The aim of this poster is to educate trainees on how to correctly evaluate a paediatric elbow following trauma, and to be able to confidently identify injury and point the clinician in the right direction. This poster will aid as a refresher to interpreting paediatric elbows with difficult cases to test ones interpretation skills.

e1118

Abnormal air in the paediatric abdomen – A pictorial review

Gupta, R.[1], Jeyaratnam, R.[2], Palaniappan, M.[1]
[1]Queen's Hospital, Burton-upon-Trent, UK, [2]University Hospital of North Staffordshire, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVES: 1. To identify the normal gas pattern in a paediatric abdomen. 2. To identify abnormal gas patterns

in the paediatric abdomen, primarily on plain films. DESCRIPTION: In paediatric abdominal radiographs, especially in neonates and very young infants, the gas pattern can be very difficult to interpret. It is important for general/trainee radiologists to have an understanding of the normal gas patterns so that they can identify abnormal gas distribution. This can be intra- or extra-luminal, intraperitoneal, retroperitoneal, intramural, intravascular, biliary, intraparenchymal or submucosal. The initial examination in paediatric acute abdomen is usually a plain radiograph. Hence, it is important to have a basic knowledge of the gas distribution so that a diagnosis can be made without resorting to further imaging which will reduce unnecessary radiation. In this review, the normal and abnormal gas patterns in paediatric abdominal radiographs of a wide range of conditions are illustrated. CONCLUSION: It is vital for general radiologists and trainees to recognize the normal and abnormal distribution of air in a paediatric abdominal radiograph, so that they can provide referring clinician with the diagnosis or relevant differential diagnosis. This is important for prompt referral and treatment.

Nuclear medicine

p1201

Incidentalomas found at PET-CT scan in patients investigated for lung malignancy: Sheffield region experience

Matthews, S., Ford, A., Chopra, A., Lorenz, E., de Noronha, R.
Northern General Hospital, Sheffield, UK

PURPOSE: Unexpected findings at PET/CT in patients investigated for lung disease, as per the NICE guidelines, are common. The final diagnoses and significance of these findings were assessed. MATERIALS/METHODS: All patients having PET/CT for the investigation of lung disease between January 2006 and March 2008 referred to the Sheffield Regional PET/CT service were reviewed. The final diagnoses for these incidental findings were sought from the referring clinicians. RESULTS: 818 patients were investigated for lung disease in the study period. 176 (21%) patients had incidental findings (99 males; 77 female: mean age 70.1 years, range 43–89 years). In 82 patients the incidentaloma was not further investigated; in 44 due to advanced lung cancer. 62% incidental findings investigated were due to pathology, most commonly related to the gastrointestinal tract: 4 colorectal carcinomas, 21 tubulovillous adenomas, 1 gastric carcinoma, 4 diverticular disease and 4 miscellaneous. Further tumours were detected in the breast (2), pituitary (2), parotid (2), ovary, tongue and spinal cord. Other detected abnormalities included multinodular goitre (9), atrophic thyroid, follicular thyroid lesion (unclassified), thyroiditis, adrenal mass (resolved spontaneously), tonsillitis, complex ovarian cyst and laryngeal nerve palsy. Overcalling of incidental findings was most common within the pharynx and larynx. CONCLUSION: Overall 7% patients with lung disease having a PET/CT scan had an incidental finding. This was significant in 4.5%. Most significant findings were in the gastrointestinal tract. The presence of lymphoid tissue within the pharynx resulted in a high false positive reporting rate in this region.

p1202

Chest X-ray triage for V/Q scans – How normal should a normal chest X-ray be?

Biswas, S., Jayan, R., Smith, M.L.
Royal Liverpool University Hospital, Liverpool, UK

PURPOSE: British Thoracic Society Guidelines suggest that a normal chest X-ray (CXR) is a pre-requisite for ventilation–perfusion (V/Q) scanning for suspected pulmonary embolism (PE). Patients with abnormal CXRs should have a CT pulmonary angiography. A significant percentage of the CXRs however can have minor abnormalities. This study was aimed at assessing the effects of CXR findings on V/Q scan interpretation. MATERIALS/METHODS: Retrospective RIS analysis of CXR and V/Q scan results of patients investigated for suspected PE, over a period of 4 months (February'08 to May'08) was performed. CXR were categorised as Normal, Near-normal (minor atelectasis, cardiomegaly, emphysema, etc.) and Abnormal (consolidation, pleural effusion, fibrosis, bronchiectasis, cardiac failure/ pulmonary oedema). The patients had a follow up of 6–9 months. RESULTS: 280 (M:F=109:171) patients were included. 271 had CXR prior to V/Q scans. CXR findings were normal in 167 (62%), Near Normal in 51 (19%) and Abnormal in 53 (19%). V/Q scan results were normal in 87 (31%), Low Probability in 141 (50%), Intermediate Probability in 15 (5%) and High Probability in 37 (14%). Among the patients with Normal and Low Probability scans (227) only 1 patient showed evidence of PE on subsequent investigations in the follow up period. CONCLUSION: Using chest X-ray as a triage, V/Q scan had only a small number of intermediate probability results (5%). The patients who had normal or low probability studies had very low incidence of demonstration of PE on subsequent imaging. Minor abnormalities on chest X-ray do not interfere significantly with V/Q scan interpretation. The effect of different abnormalities affecting interpretation is illustrated.

p1203

99m Technetium bone scintigraphy following total hip or knee arthroplasty: A retrospective study

White, R.D.[1], Bartholomew, P.H.[2], Davidson, J.[1], Peakman, D.J.[2], Banaszkiewicz, P.A.[2]
[1]Ninewells Hospital, Dundee, UK, [2]Queen Elizabeth Hospital, Gateshead, UK

PURPOSE: 1. To assess the role of 99m Technetium bone scintigraphy in determining the need for total hip or knee prosthesis (THR or TKR) revision surgery. 2. To evaluate the role of inflammatory markers and plain radiographs as predictors for abnormal bone scan results. MATERIAL/METHODS: All patients who had undergone bone scans, as requested by Consultant Orthopaedic Surgeons following THR or TKR, in our centre between June 2004 and May 2005 were included in this retrospective study. A combination of case notes, clinic letters and blood results were reviewed for information regarding indications, investigations and interventions. RESULTS: 54 suitable patients were identified, of whom 12 had abnormal, 12 had equivocal and 30 had normal bone scan results. Revision surgery was performed significantly more frequently in those with abnormal (6/12) or equivocal (5/12) bone scans compared with normal results (3/30); p=0.01 and p=0.02, respectively (Fisher's Exact Test). In patients in whom inflammatory markers were checked, 3 of 13 with abnormal results subsequently had an abnormal bone scan versus 4 of 19 with normal blood results. 4 of 15 patients with radiographic evidence of prosthetic loosening subsequently had an abnormal bone scan versus 8 of 39 patients without documented evidence (neither being statistically significant). CONCLUSION: Within our study group, 99m Technetium bone scintigraphy has been shown to be a useful investigation in evaluating the need for THR/TKR revision surgery. However, raised inflammatory markers and radiographic features of prosthetic loosening have not been shown to be sensitive predictors of abnormal bone scan findings.

p1204

Sentinel node lymphoscintigraphy and biopsy in malignant melanoma: Radiological, pathological and surgical correlation

Edmonds, K.M.[1], White, R.D.[2]
[1]London Deanery Surgery-in-General Training Scheme, London, UK, [2]Ninewells Hospital and Medical School, Dundee, UK

PURPOSE: Regional lymph node metastasis is the single greatest predictor of outcome in malignant melanoma. Sentinel node lymphoscintigraphy and biopsy (SNB) is used to identify patients in whom nodal clearance would be beneficial, in the absence of clinically-palpable lymphadenopathy. We examine the role of this procedure in a central London teaching hospital, focussing on correlation between radiological, surgical and pathological findings. MATERIALS/METHODS: All patients with malignant melanoma who had undergone regional lymph node clearance between September 2004 and September 2007 were included in this retrospective study. Patients were identified by searching the operating theatre database, and the

pathological and radiological reports obtained and scrutinised for all suitable patients. RESULTS: 47 suitable patients were identified, of whom 21 had a positive SNB prior to clearance. Nodal spread at clearance was detected significantly more frequently in those without prior SNB (22/26) compared with those who initially had SNB (2/21); $p<0.0001$, Fisher's Exact test. There was a statistically significant tendency for the Breslow score to be higher in the group proceeding directly to positive clearance (median 5.5 mm, range 1–52 mm) compared with those with a positive SNB prior to clearance (median 3 mm, range 1–13 mm); $p=0.03$, Mann-Whitney U-test. CONCLUSIONS: In some patients with malignant melanoma, SNB is sufficient to remove all micrometastatic disease, although clearance still needs to be performed to exclude spread beyond sentinel nodes. Breslow score has been shown to be a useful predictor of the presence of micrometastatic versus macrometastatic nodal disease.

p1205

Parathyroid subtraction scintigraphy – A look at sensitivity and possible mechanisms for improvement

Roy, A.A.[1], Newell, M.[2], Garvie, N.E.[1]
[1]Saint Bartholomew's and The Royal London Hospitals, London, UK, [2]The Royal London Hospital, London, UK

PURPOSE: In primary hyperparathyroidism (PHPT), the sensitivity of dual-isotope radionuclide imaging ranges from 40% to 90%. One of the principal reasons for this variation is that the technique is operator-dependent. In the final stages of processing, the thyroid scan is motion-corrected and then partially subtracted from an image of both thyroid and parathyroid tissue. This process is inherently subjective. In this study, we seek to establish whether it can be assisted by visual assessment of the original combined image. MATERIALS/METHODS: A retrospective study of 47 patients undergoing parathyroid subtraction scintigraphy with biochemical evidence of PHPT was performed. Either 201Tl/99mTc subtraction, or 99mTc-sestamibi/123I or 99mTc-pertechnetate subtraction was used. When positive, it was observed that the lesion was frequently associated with the lobe containing the higher count density on the initial, pre-subtraction image, possibly reflecting the concealed presence of the parathyroid adenoma. Can reprocessing those cases where no lesion was identified, with particular reference to the "dominant" side of initial uptake, aid diagnosis? RESULTS: In 38 of 47 cases the adenoma was identified on initial processing. In 30 cases the adenoma was seen to lie on the side containing the highest count density. The remaining 9 studies were then reprocessed with reference to the "dominant" side, when present. In 1 of the patients, a further lesion was thereby identified. CONCLUSION: Processing of parathyroid scintigraphic studies is highly subjective and lesion localization may be assisted by close inspection of the initial image.

p1206

Back pain in patients with previous primary carcinoma. Is the bone scan the first step?

Chin, J.Y., Ahmed, N., Garvie, N.
Royal London Hospital, London, UK

PURPOSE: Existing guidelines indicate that patients with acute lower back pain (LBP) should be imaged if a serious underlying condition is suspected. MR is frequently used for this purpose. This study, however, evaluates the utility of bone scintigraphy (BS) compared against diagnostic radiology (DR), as the primary investigational tool in patients with LBP of recent onset, when a background of primary carcinoma (PC) exists. MATERIALS/METHODS: BS was performed in 50 patients with LBP and a history of PC. When abnormal, BS was primarily classified as showing skeletal metastases (SM) or degenerative changes (DC) only if uptake was confined to a disc level or within the facet joints. Comparison was then made with the relevant radiological findings. RESULTS: 21 of 50 (42%) bone scans were abnormal, of which 8 (16%) were interpreted as SM, and 11 (22%) as DC. Subsequent radiology confirmed this interpretation in all but 2 cases where both scintigraphic and radiological findings were equivocal. Of the 50, 34% had breast cancer and 30% prostate cancer, with SM confirmed in 6% and 20% of these groups, respectively. Patients <60 years were more likely to demonstrate SM (25%) rather than DC (13%) whereas >60 years the reverse was found (18% vs 27%). CONCLUSION: The results show a significant proportion of patients presenting with LBP and a background of PC had spinal metastatic disease, and therefore support the need for diagnostic imaging in this situation. The high subsequent correlation between BS and radiology reinforces the role of scintigraphy in this clinical context.

e1207

A pictorial review of the range of abnormalities identifiable on cholescintigraphy

Mohaghegh, P., Gibbings-Isaac, D., Garvie, N.
St. Bartholomew's and The Royal London Hospitals, London, UK

KEY LEARNING OBJECTIVES: 1. Recognize the range of abnormal appearances detectable on cholescintigraphy. 2. Understand the pathophysiology underlying various cholescintigraphy appearances. 3. Appreciate the clinical implication of different abnormalities on cholescintigraphy. DESCRIPTION: A 5 year retrospective review (January 2002 to end of December 2007) of 122 patients with right upper quadrant pain who underwent cholescintigraphy in our institution was carried out, and the various abnormalities identified were categorised. Cholescintigraphy was normal in 62 cases (51%) and abnormal in 60 patients (49%) with 81 different abnormalities recognized under 11 categories. The abnormalities identified were: delayed gall bladder contraction (biliary dyskinesia – 27%), delayed output into small bowel (sphincter of Oddi dysfunction – 23.5%), non-visualized gall bladder (post cholecystectomy or acute cholecystitis – 13.6%), poor gall bladder uptake (chronic cholecystitis – 12.4%), leak (8.6%), gastric reflux (6.2%), cystic duct reflux (2.5%), cholangitis (2.5%), hepatomegaly and cholangiocarcinoma (2.5%) and liver metastases (1.2%). Examples from the above categories are demonstrated, the pathophysiology explained, and the clinical implication discussed. CONCLUSION: In this 5 year review approximately 50% of patients who underwent cholescintigraphy had an abnormal study. The range of abnormalities identified and their clinical implication demonstrates the versatility and value of cholescintigraphy in the management of right upper quadrant pain.

e1208

Are inconclusive bone scan results followed up?

Wan, M.Y.S.[1], Riley, P.M.X.[2], Wheeler, P.[3], Corkan, E.J.[3]
[1]Victoria Hospital, Blackpool, UK, [2]Royal Preston Hospital, Preston, UK, [3]Royal Albert Edward Infirmary, Wigan, UK

PURPOSE: It is well recognized that bone scintigraphy is a highly sensitive but less specific imaging technique. To provide a definitive answer to a clinical question, appropriate correlative imaging is often required. Our study assesses the frequency of our bone scan report being conclusive and whether patients with inconclusive bone scan results are followed with correlative imaging. MATERIALS/METHODS: Retrospective review of the reports of all bone scans performed over a one year period in Wigan was undertaken. Conclusive reports were defined as those clearly stated as normal or with mention of only a single diagnosis and no recommendation for further correlative imaging. Where a bone scan report was inconclusive, the department's database was interrogated to identify any correlative imaging performed as a result of the inconclusive bone scan. RESULTS: 683 bone scans were performed in the study period. 384 (56%) were conclusive. 299 (44%) were inconclusive. 246 further imaging tests were performed. The majority were plain radiographs but also included MR, CT and further nuclear medicine study. 60 patients (20%) did not have further imaging despite an initial inconclusive result. This included 69 further radiological investigations which were suggested in the bone scan report but was not performed. CONCLUSION: Bone scan alone provided an answer to the clinical question in only 56%. A significant number of patients did not have correlative imaging performed despite

an inconclusive bone scan. The reason for this was multifactorial and included patients', clinicians' and radiologists' factors. Corresponding strategies to improve this would be discussed.

Oncological imaging

p1301

Audit of pelvic abnormalities in breast cancer patients undergoing CT

Wijendra, D., Taylor, M.B.
The Christie NHS Foundation Trust, Manchester, UK

PURPOSE: To determine whether pelvic abnormalities detected in breast cancer patients undergoing CT alter patient management. METHODS: The reports of all breast cancer patients undergoing CT at a large cancer centre over 5 months were reviewed and pelvic abnormalities were correlated with previous imaging findings. The medical notes of patients with potentially significant abnormalities were reviewed to determine the effect of CT on management. RESULTS: 448 CT examinations were performed in 359 patients, the pelvis was included in 263 examinations (58.7%). In 81 of 263 examinations (30.8%) pelvic abnormalities were reported and classified as bone metastases in 42 cases (52%), adnexal masses in 24 cases (30%) and "other" in 15 cases (19%). Overall, 16 of the 81 cases (20%) were considered "potentially significant". On review of medical notes, management was directly affected in only 7 of these 16 cases. These included 2 patients with pelvic pain in whom CT showed new bone metastases, 3 patients in whom pelvic CT led to probable unnecessary investigations (one cystoscopy and MRI, one gastroenterology referral, one early repeat CT) and 2 cases who may potentially have benefited from pelvic CT (one small pelvic lesion which was the earliest sign of progression and one large dermoid). CONCLUSION: Pelvic CT detected a potentially significant abnormality in 16 of 263 (6%) of cases, but only 2 cases (0.8%) showed possible benefit and in 3 cases (1.2%) CT findings led to unnecessary investigations. The pelvis should not be routinely included in CT examinations of breast cancer patients without pelvic symptoms.

p1302

The ovarian vein: An important review area in the assessment of spread of gynaecological malignancy

Nagadi, A.N., Tung, K.T.
Southampton University Hospitals NHS Trust, Southampton, UK

KEY LEARNING OBJECTIVES: To recognize the characteristic features of ovarian vein thrombosis on CT and MRI. To appreciate its importance as a possible route of spread in pelvic malignancies. DESCRIPTION: Ovarian vein thrombosis is known to occur in a variety of clinical contexts including puerperium, following gynaecological surgery, dehydration and pelvic sepsis. It is also increasingly recognized in pelvic malignancies, where it may represent direct tumour spread or thrombosis following chemotherapy or surgery. We reviewed patients with ovarian vein thrombosis in our institute over a period of 1 year and illustrate examples from five cases. Ovarian vein filling defects were found in patients with ovarian, endometrial and fallopian cancers as well as in patients with metastatic leiomyosarcoma and intravascular leiomyomatosis. This poster aims to emphasise the importance of routine review of the gonadal veins whilst reporting scans of patients with gynaecological malignancies. Features suggesting tumour spread as opposed to bland thrombus are described. Imaging pitfalls will be briefly discussed. CONCLUSION: Spread of disease in gynaecological malignancy is commonly along the transcoelomic, lymphatic and vascular routes. Direct tumour invasion of the gonadal vein is a recognized but uncommon mode of spread. Review of the ovarian veins should be routinely undertaken when reporting scans in patients with gynaecological malignancies as early recognition of ovarian vein thrombosis could have important treatment implications.

p1303

Omental and mesenteric pathology: Imaging features and clinical tests to confirm a diagnosis

Hopkins, R.E.
Cheltenham General Hospital, Cheltenham, UK

LEARNING OBJECTIVES: This educational exhibit aims to cover the clinical presentation, the imaging findings, the differential diagnosis, imaging pitfalls of a broad range of omental pathologies. DESCRIPTION: This presentation reviews the mode of clinical presentation and the imaging features of a broad spectrum of omental and mesenteric diseases. Imaging modalities included are ultrasound, CT, MRI and PET-CT. The cases are pathologically confirmed. Conditions covered including omental metastases: from ovarian, pancreatic and gastric cancers, primary peritoneal carcinoma, peritoneal mesothelioma, omemtal torsion & epiploic appendagitis, inflammatory conditions: acute appendicitis, acute pancreatitis, peritoneal TB, fibrosing mesenteritis, vascular causes: mesenteric ischaemia and mesenteric venous thrombosis, omental haemorrhage. The appropriate use of additional clinical tests needed to confirm the diagnosis and the place of biopsy is discussed. CONCLUSION: Careful review of the imaging features in conjunction with the clinical history will assist in making an accurate diagnosis in most cases of omental and mesenteric pathology. Occasionally additional clinical tests or biopsy is required.

p1304

The influence of accurate categorisation of pelvic and retroperitoneal lymph node groups on pelvic cancer staging

Arya, A.[1], Agrawal, K.[2], Jones, Y.[3], Clark, A.[1]
[1]University Hospital of North Staffordshire, Stoke-on-Trent, UK, [2]St Mary's Hospital, London, UK, [3]Liverpool Heart & Chest Hospital NHS Trust, Liverpool, UK

KEY LEARNING OBJECTIVES: To highlight the importance of accurate categorisation of pelvic and retroperitoneal lymph node groups into regional or metastatic spread for various pelvic cancers. DESCRIPTION: The pelvic and retroperitoneal lymph node groups are important sites of spread of pelvic malignancies and are therefore pivotal in pelvic cancer staging. On CT and MRI, the size at which pelvic lymph nodes are regarded as significantly enlarged varies between lymph node groups. Furthermore, the same group of lymph nodes can be regional spread for one pelvic cancer while being metastases for another pelvic cancer. This review illustrates the locations of the various lymph node groups with CT and MRI, offers a size at which the nodes are deemed significantly enlarged and categorizes each lymph node group as regional or metastatic spread for different pelvic cancers. CONCLUSION: Accurate knowledge of the lymph nodes to which pelvic cancers spread and the influence of this on the cancer stage is essential to guide best treatment and accurately suggest prognosis. Furthermore, correct assignment of involved nodes and accurate staging aids communication and promotes reproducibility, within and especially between institutions.

e1305

Retroperitoneal masses: Imaging findings with key diagnostic clues

Bharwani, N., Sahdev, A., Reznek, R.H., Rockall, A.G., Khatri, P.
Barts & The London NHS Trust, London, UK

BACKGROUND INFORMATION: Masses arising in the retroperitoneum are varied and can be primary or secondary, benign or malignant. Primary lesions are rare and originate outside the major viscera in this space. The majority (~80%) of primary lesions are malignant sarcomas. TEACHING POINTS: 1. Anatomical boundaries of the retroperitoneum. 2. Diversity of retroperitoneal mass lesions. 3. Imaging clues to determine tumour origin and key features to aid in narrowing the differential diagnosis. KEY IMAGING FINDINGS: Clues to lesion characterization arise from the location,

pattern of growth, tissue composition and vascularity. Determination of retroperitoneal location can be assessed by displacement of normal retroperitoneal structures. Masses can arise from normal retroperitoneal structures, e.g. adrenals and kidneys, which can sometimes be difficult to ascertain. We will illustrate specific imaging signs, e.g. "beak" sign, which can help determine the organ of origin of a lesion. When this cannot be determined the diagnosis of a primary retroperitoneal tumour becomes probable. This exhibit will discuss and illustrate a wide range of retroperitoneal tumours including benign lesions e.g. neuromas, primary malignancies e.g. liposarcoma and metastatic disease e.g. from testicular tumours. CONCLUSION: Pathologies arising within the retroperitoneum are diverse and often pose a diagnostic challenge. We illustrate the important radiological clues that aid in tumour localization and determination of invasion. This knowledge helps to narrow the differential diagnosis and provide clinically relevant information.

e1306

State of the art radiofrequency ablation in oncology: Liver, lung and renal

Mangat, N.S., Rajeswaren, G., Khan, N., Sharma, B.
Royal Marsden Hospital NHS Foundation Trust, London, UK

BACKGROUND: Radiofrequency ablation (RFA) is increasingly becoming established as a primary and complimentary therapy in managing cancers involving the liver, lungs and kidneys. Radiologists are increasingly exposed to RFA imaging and are required to appreciate indications, contraindications, benefits, risks and limitations of the technique. This exhibit aims to aid the reader in managing these challenges. KEY LEARNING OBJECTIVES: 1. Overview of RFA theory. 2. Pre RFA imaging and clinical assessment – key facts. Key organ specific assessment criteria and planning issues to optimise patient workup. 3. Presentation of common pre and post RFA appearances of liver, lung and renal lesions relating to CT, MRI and PET imaging and assessment of early treatment efficacy and follow up. CONCLUSION: This exhibit will assist the reader in gaining an appreciation of RFA as an essential tool in managing oncology patients and an understanding of key planning, implementation and follow up issues to optimize patient outcome.

e1307

Can SUVmax in different regions within the mediastinal blood pool be used interchangeably?

Arora, P., Poon, W.-Y., Dempsey, M.F., Poon, F.W.
West of Scotland PET-CT Centre, Glasgow, UK

PURPOSE: The standardized uptake value (SUVmax) is the measured activity of PET tracer uptake at a certain region of interest (ROI) within the body. SUVmax at the "mediastinal blood pool" is often used as a reference value for background uptake. However, placement of such reference ROIs for measuring SUVmax varies among different centres. The aim of this study was to compare measurements of mediastinal blood pool SUVmax. MATERIALS/METHODS: This study was performed using retrospective analysis of 30 cancer patients' ^{18}F-FDG PET/CT data. SUVmax was measured in the thoracic aorta, pulmonary artery and abdominal aorta. Without a gold standard for comparison, statistical analysis was performed to investigate the comparability between each of the different measurements. RESULTS: The mean SUVmax measured in the thoracic aorta, pulmonary artery and abdominal aorta using different ROI were 1.65, 1.64 and 1.91, respectively. The min SUVmax values measured 1.1, 1 and 1.1 with max SUVmax values standing at 2.4, 2.3 and 3, respectively. Statistical analysis showed that SUVmax measured in the thoracic aorta agreed with SUVmax measured in the pulmonary artery (r=0.75, p<0.05) and abdominal aorta (r=0.42, p=<0.05). Likewise, SUVmax measured in the pulmonary artery agreed with SUVmax measured in the abdominal aorta (r=0.53, p<0.05). CONCLUSION: This study shows that measurements of reference SUVmax using different ROIs (thoracic aorta, abdominal aorta and pulmonary artery) can be used interchangeably. However, for ease of measurement, we advocate the use of the thoracic aorta.

e1308

State of the art imaging: PET, CT, MRI and other techniques; The gastrointestinal malignancies

Mangat, N.S., Rajeswaren, G., Khan, N., Sharma, B.
Royal Marsden Hospital NHS Foundation Trust, London, UK

BACKGROUND: PET/CT is now increasingly available within the UK and across the world for oncology patient management. The use of CT, MRI and PET in the gastrointestinal malignancies varies widely across units. There is a considerable confusion regarding the strengths and weaknesses of PET/CT relative to other modalities in these patient cohorts. Patient imaging pathways consequently vary widely. KEY LEARNING OBJECTIVES: 1. Key points regarding PET, CT and MRI in colorectal, oesophageal, pancreatic and hepatobiliary tumours. 2. Focus on patient primary and metastatic restaging, chemotherapy and radiotherapy response evaluation and follow up. 3. Strengths and weaknesses of the techniques are addressed and appropriate patient imaging pathways proposed. Algorithm re rising tumour markers of uncertain significance are also proposed, including appropriate further evaluation when PET/CT is negative in this situation. The situation of PET/CT re mucinous histolgical subtypes is specifically addressed. 4. Role of PET/CT, CT and MRI in liver staging for radical treatment (resection) is specifically addressed, together with the appropriate use of these modalities re workup for radiofrequency ablation (RFA), and evaluation of RFA efficacy. CONCLUSION: This exhibit will provide the reader with a comprehensive overview of imaging issues relating to gastrointestinal oncological imaging.

e1309

State of the art imaging: PET, CT, MRI and other techniques: Skeleton, liver, adrenals and lungs

Mangat, N.S., Rajeswaren, G., Khan, N., Sharma, B.
Royal Marsden Hospital NHS Foundation Trust, London, UK

BACKGROUND: The issue of the indeterminate lesion in oncology remains a real problem. This commonly applies to 'indeterminate' liver, bone, adrenal and lung lesions – the aetiology of such lesions radically influencing patient management. Practice varies widely across different units regarding characterization of such lesions, with wide variation of imaging techniques employed. Often, patients may be subjected to invasive diagnostic procedures yielding indeterminate results in a significant percentage. KEY LEARNING OBJECTIVES: 1. Review of strengths/weaknesses of PET/CT, CT and MRI in characterizing such indeterminate lesions. 2. Appreciate key oncological imaging issues and specify the current state of the art role of different imaging techniques in these indeterminate lesion situations – detailing whether indeed intervention is required. CONCLUSION: This exhibit will offer the reader a complete imaging strategy for characterizing common otherwise indeterminate lesions of the skeleton, liver, adrenals and lungs. In doing so, a more focused approach should reduce unnecessary invasive investigations and consequent patient morbidity.

e1310

State of the art imaging: PET, CT, MRI; Lung cancer and melanoma

Mangat, N.S., Rajeswaren, G., Khan, N., Sharma, B.
Royal Marsden Hospital, London, UK

BACKGROUND: 18-FDG PET/CT is now increasingly available for patient management within the UK and remainder of the world. UK NICE guidance dictates all lung cancer patients being considered for radical treatment should undergo PET/CT staging workup. KEY LEARNING OBJECTIVES: 1. Appreciate the strengths and crucially the weaknesses of PET/CT in relation to lung cancer and melanoma. In particular, issues regarding sub 1 cm lung lesions, pleural effusions, the implications of low grade activity, the adrenal glands, liver, bony

skeleton and post pleurodesis imaging. 2. Understand the potential role of PET/CT in post chemo/radiotherapy response and follow up. 3. Role of PET/CT in malignant melanoma relating to efficacy in assessing different body compartment particularly the craniospinal axis. CONCLUSION: This state of the art educational review will detail the precise current role for PET/CT relative to all other relevant techniques in lung cancer and melanoma, enabling appropriate and optimal patient management.

e1311

Investigating metastatic spread in early and intermediate stage malignant melanoma – The role of lymphoscinitgraphy and sentinel node biopsy

Chapman, G.
University of Bradford, Bradford, UK

The lymphatic metastatic spread of melanoma tumours generally progresses in an orderly fashion via the regional lymph nodes before continuing on to distant sites. The first lymph node encountered by metastatic deposits is called the "sentinel node" and evidence suggests that accurate assessment of the pathological status of the sentinel lymph node may predict the pathological status of the whole nodal basin and therefore impact on patient prognosis and care management. It has been suggested that the early detection and removal of diseased lymph nodes may improve patient survival rates. However, a reliable and accurate method of preoperative mapping of lymphatic drainage from a melanoma is required. Lymphatic mapping using lymphoscintigraphy, combined with intra-operative tracing using a gamma radiation-detecting probe, assists in the location and identification of sentinel lymph nodes. These can then be surgically removed and biopsied to determine the presence of metastatic deposits. This presentation will summarize the findings of a third year student project which asks whether lymphoscintigraphy, coupled with sentinel node biopsy, should be the standard investigative procedure for determining the level of metastatic spread in patients with early and intermediate-stage malignant melanoma compared to radical regional lymph node dissection or conservative watchful-waiting?

Multisystem disorders & miscellaneous

p1401

A pictorial review of extra-nodal lymphoma

Jones, Y.M., Clark, A., Adapala, R., Boswell, W.
Clatterbridge Centre for Oncology, Wirral, UK

KEY LEARNING OBJECTIVES: To demonstrate the wide spectrum of extra-nodal disease in Hodgkin's and Non-Hodgkin's lymphoma using imaging examples. DESCRIPTION: Extra-nodal disease in lymphoma is found in up to 12% of Hodgkin's disease patients and up to 40% of Non-Hodgkin's lymphoma patients. Extra-nodal lesions can be found in virtually any organ, and imaging demonstrates the extent of the disease. CT is the most commonly used modality for lymphoma evaluation. However, MRI can also be useful, particularly for neurological and musculoskeletal disease, as included in our review. Lymphoma can have a multitude of appearances, and may often masquerade as infection or malignancy. The imaging findings presented here include lymphomatous involvement within the following systems: cardiac, pulmonary, neurological (cauda equina, cerebral) gastrointestinal (small bowel, colon) genitourinary (kidney), intra-abdominal (spleen, liver, adrenals, pancreas) musculoskeletal (bony, soft tissue, subcutaneous) and orbital extra-nodal disease. CONCLUSION: Extra-nodal lymphoma can involve any system, and has an extensive array of appearances. This review presents interesting imaging findings from a range of systems, and highlights the necessity of considering lymphoma within the differential diagnosis of malignancy and infection.

p1402

Radiology utilization trends in HIV patients in a tertiary referral centre from 2004 to 2007

Datta, A.N., Banerjee, A.K., White, D.J., Taylor, S.
Heart of England Foundation Trust, Birmingham, UK

PURPOSE: The incidence of HIV continues to rise in the UK and worldwide. Since introduction of HAART therapy, patients with HIV are living longer with increasing instances of morbidity and subsequent investigations. In this study we have analysed the patterns of radiological investigations performed in this cohort of patients over the last 4 years. MATERIALS/METHODS: All radiological investigations carried out in HIV patients, both from outpatient and inpatient settings were analysed from a computer database. Modalities included were: plain films, ultrasound, CT scan, MRI and interventional studies. RESULTS: Of 440 HIV patients registered in the tertiary centre from 1 January 2004 to 31 December 2007, the total patient-episodes numbered 1079. Radiological investigations were performed in 829 (76.83%) instances of the latter. The annual rate of investigations varied from 171 in 2005 to 265 in 2007. The majority had chest X-rays, with a total of 487 (58.74%). Other modalities utilized in descending order were: CT scans in 113 (13.63%), Ultrasound in 78 (9.4%) and MRI in 46 (5.54%). The abdomen was the most common site for ultrasound scan. The brain was the most common area of investigation for both CT and MRI. Interventional studies were done in 25 instances (3.01%). A detailed sub-analysis of the annual data will be presented. CONCLUSION: This study will provide a benchmark for planning radiology service provision for HIV patients

p1403

What's in a name? Eponymous signs in radiology

James, J.A., Bull, M.D.
Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: Familiarization with common eponyms in radiology. DESCRIPTION: The medical literature is littered with references to eponymous signs and syndromes. Many of these are recognized across a wide range of medical specialties. We describe some of the common and more obscure eponyms that are exclusive to radiology, provide characteristic images and introduce the people behind the names. CONCLUSION: Eponyms enrich medical terminology and are regularly used by radiologists and clinicians alike. Understanding of the appearance of radiological eponymous signs is important for every clinical radiologist.

e1404

Imaging findings in patients with succinate dehydrogenase gene mutations

Bharwani, N., Sahdev, A., Rockall, A.G., Srirangalingam, U.,
Chew, S., Reznek, R.H.
Barts & The Royal London NHS Trust, London, UK

LEARNING OBJECTIVES: 1. To be familiar with the range of appearances of paragangliomas in patients with succinate dehydrogenase (SDH) gene mutations and to understand how they differ from non-familial tumours. 2. To appreciate diverse distribution of paragangliomas and potential for malignancy associated with this mutation. BACKGROUND: Mutations in genes encoding SDH are responsible for the majority of familial paragangliomas and also a significant proportion of "sporadic" cases. Paragangliomas associated with SDH mutations tend to occur in diverse anatomical locations and have a greater potential for malignancy. Theories for tumourigenesis include mitochondrial resistance to apoptosis and failure to inactivate hypoxic inducible factors resulting in unsuppressed angiogenic stimulation. IMAGING FINDINGS: The distribution of tumours and the various imaging modalities that can be used in their detection will be discussed and illustrated in this pictorial review. At our institution screening of carriers is performed using MRI to avoid use of ionising radiation. Lesions are typically high signal intensity on T_2-weighted imaging, a feature which is accentuated with the use of fat-suppressed sequences. The tumours are generally intermediate signal intensity on T_1-weighted imaging and enhance avidly with administration of

contrast. Functional imaging using MIBG and PET-CT can be used to detect metastatic disease and help identify patients suitable for treatment with radiopharmaceuticals. CONCLUSION: This pictorial review describes the spectrum of disease associated with SDH gene mutations and highlights the typical sites of paragangliomas and imaging features.

e1405

Pictorial review of Von Hippel-lindau syndrome

Chin, K., Jones, C., Oliff, J.
Queen Elizabeth Hospital, Birmingham, UK

KEY LEARNING OBJECTIVES: To be familiar with the multisystem radiological appearances of Von Hippel-Lindau syndrome (VHL). To know the malignant processes which occur in this patient population. To be aware of the importance of screening patients with a known diagnosis of VHL, or a family history of VHL. DESCRIPTION: VHL is a rare hereditary disease which has serious implications for morbidity and mortality. Patients can present with a variety of symptoms as it involves multiple body systems, with symptoms commonly presenting in the second or third decade of life. It is important to be aware of the manifestations of VHL, to enable early diagnosis, close monitoring and early intervention prior to complications developing. Patients with VHL should be kept under surveillance as there is a high risk of malignant complications. In patients at genetic risk of VHL, MRI of multiple parts of the body is used as a screening tool and awareness of the many manifestations is required. We will review some of the common, and also less common, radiological manifestations of VHL in our pictorial review. CONCLUSION: It is important to be familiar with the multisystem appearances of VHL to enable early diagnosis and treatment of the multitude of pathologies which arise in patients with VHL. A basic knowledge is presented in this pictorial review.

e1406

The importance of reviewing imaging both before and after knowledge of the clinical history: A pictorial review of 10 illustrative cases

Balan, P.[1], Patel, N.[2], Corr, C.[2]
[1]University Hospital of Wales, Cardiff, UK, [2]Wrexham Maelor Hospital, Wrexham, UK

KEY LEARNING OBJECTIVES: To illustrate the importance of initially reviewing imaging on its own merits without the bias of knowing the clinical history, before re-reviewing with knowledge of the history. DESCRIPTION: The clinical history is very important in helping guide a radiological diagnosis. However, prior knowledge of this history can lead to an element of bias when reviewing the imaging. As a result unexpected pathologies may be missed or positive findings may be incorrectly interpreted in order to fit with the clinical history. We present a review of 10 interesting cases from our workload, which illustrate the importance of initially reviewing imaging without prior knowledge of the clinical history before reviewing the images again with the clinical history in mind. Cases include both routine and emergency work over a range of imaging modalities. We present several cases which demonstrate how an unbiased fresh review of the imaging led to a correct diagnosis. Had these cases been interpreted purely on the basis of the clinical history then this may have led to the wrong diagnosis. CONCLUSION: We suggest that where possible imaging should be reviewed both before and after knowledge of the clinical history. This working practice will remove the element of bias when reporting imaging. We accept that this practice will usually not be possible with emergency work. In these circumstances it is important to keep an open mind with respect to possible radiological diagnoses and to have a technique for systematic review of each study.

e1407

Unusual pelvic masses – A comprehensive pictorial review

Balan, P.[1], Griffiths, G.[1], Kishore, R.[1], Morris, E.[2], Davies, G.[2]
[1]University Hospital of Wales, Cardiff, UK, [2]Royal Glamorgan Hospital, Llantrisant, UK

KEY LEARNING OBJECTIVES: The purpose of this exhibit is to: 1. Present a spectrum of unusual pelvic masses. 2. Demonstrate findings using different imaging modalities, which will help in accurate diagnosis of these lesions. 3. Highlight potential pitfalls in diagnosis. DESCRIPTION: Using a comprehensive pictorial review we present a range of unusual pelvic masses including congenital, infective, inflammatory, neoplastic lesions and foreign bodies. We describe the imaging findings and specific features on different imaging modalities, including ultrasound, 64 MDCT, and MRI, which will help in accurate diagnosis. We also highlight the pitfalls in diagnosing these lesions, which could potentially lead to inappropriate treatment. CONCLUSION: The major learning points are: 1. Provide a differential diagnosis for unusual pelvic masses. 2. Use of different imaging modalities to help in troubleshooting and help differentiate between neoplastic and non-neoplastic causes.

e1408

Pictorial review of CT findings in penetrating injuries

Patel, K., Narayanaswamy, S.
King's College Hospital, London, UK

KEY LEARNING OBJECTIVES: To recognize various CT appearances following penetrating injuries. To emphasise the role of CT in the management of complications arising from the penetrating injuries. DESCRIPTION: There has been a gradual increase in the incidence of penetrating injuries in the recent past. The penetrating injuries are most commonly caused by stabbings and gunshots. This pictorial review illustrates the different CT appearances following penetrating injuries. We provide various examples of solid and visceral organ injuries, vascular injuries, thoracic and cranial injuries. We also discuss the role of CT in identifying these potentially treatable complications, which if undetected can contribute to an increase in the mortality. We also discuss the radiological management of some of the complications following penetrating injuries. CONCLUSION: An early but correct diagnosis is crucial in patients with penetrating injuries to decrease the mortality and morbidity. With the advancement of the technology, MDCT play a major role in the diagnosis of complications arising out of penetrating injuries and also aid in further management of the patient.

Education & training

p1501

Establishing an online radiology resource for medical students at Brighton and Sussex Medical School

Basit, R., Vincent, T., Taylor, N., Gainsborough, N., Fairclough, J., Cohen, J., Vincent, R., Howlett, D.
Eastbourne District General Hospital, East Sussex, UK

PURPOSE: In order to effectively deliver radiology teaching to year 5 medical students at Brighton and Sussex Medical School (BSMS), geographical and logistical barriers have previously proven problematic to overcome. To standardize curriculum delivery, an innovative purely online, case based modular system was developed and piloted to supplement traditional techniques. MATERIALS/METHODS: In 2007, a list of radiology learning objectives and outcomes were devised and online delivery via the BSMS website was divided into three categories. The first category involved an on line module consisting of over 250 clinical case scenarios with a radiological aspect to the majority. Students gave their answers in an MCQ format with cumulative feedback/scoring and explanations provided where necessary. Within this category there were 50 dedicated radiology cases. The second category consisted of on line system based modules; systems included the imaging of the chest, abdomen, musculoskeletal etc. where students were guided through the salient topic aspects. The final category which went live in 2008 involves an interactive radiology

case of the month scenario utilizing a web-blog format where students are able to discuss cases on-line with their peers and tutors. RESULTS: By June 2008 the database contained 2462 questions with over 400 radiological images. Student utilization was recorded with a mean of 170 cases completed each and a hit rate of 275 000. A high level of student satisfaction was demonstrated on feedback. CONCLUSION: The online system though only in its infancy, has proven effective in the delivery of radiology teaching to final year medical students.

p1502

Radiology on call: A beginner's guide

Jackson, K.C., Greaves, M.
South Manchester University Hospital Trust, Manchester, UK

KEY LEARNING OBJECTIVES: To provide the radiology registrar new to on call with an easy step by step approach of dealing with common on call CT emergencies. DESCRIPTION: As the need for emergency imaging is becoming greater the role of the on call registrar is becoming more demanding. The on call registrar is often put in a situation where they are required to review complicated CT imaging to provide relevant information which is used to instigate treatment and plan early management often before consultant support is available. For the registrar to be able to give a confident and complete evaluation of the investigation requested it is important that they are thoroughly equipped to do so. We have looked at 10 common emergency situations and the questions often put to the on call radiologist. By using a pictorial review to show imaging findings and check lists on how the images should be evaluated we hope to help the junior registrar new to on call in dealing with these problems. The emergency situations are described as the clinical questions often put to the registrar and the check list provides a step by step approach from what to ask from the on call CT radiographer to what actually you need to be looking for in the patient with suspected mesenteric ischaemia/a leaking aneurysm etc. CONCLUSION: This review provides a pictorial review and checklists on how to deal with common radiological emergencies for those new to on call.

p1503

"Going back to basics", a guide to IVU interpretation

Nensey, R.R.[1], Var, V.V.[1], Gafoor, N.F.[1], Ninan, T.[1], Mahajan, V.[2], Kakani, N.[2]
[1]Peninsula Radiology Academy, Plymouth, UK, [2]Derriford Hospital, Plymouth, UK

LEARNING OBJECTIVE: The aim of this exhibit is to refresh and present common and uncommon findings in IVU and correlate the findings to CT urography and ultrasound. Self-assessment will be provided. DESCRIPTION: IVU is being replaced by CT urography in many institutions. However, IVU still has its value in modern day radiology. It is a simple, cheap and easily available modality and can be a valuable tool to diagnose a large number of renal pathologies. As trainees in modern radiology departments it is easy to forget the basic appearance of common pathology on IVU such as tumours, tubular necrosis and papillary necrosis. We aim to provide a pictorial review of the common and uncommon appearance of disease pathology on IVU enabling the reader to easily remember and recall the causes. This will prove to be most helpful not only to trainees but also to radiographers who perform and read IVU as part of skill mix. CONCLUSION: We hope that this will be an aide-mémoire for trainees as well as radiographers and will be a valuable source of reference.

p1504

On-call reporting of CT head – Are trainees doing a good job?

Navaratne, S., Watson, T., Walker, P., Mankad, K., Mirsadraee, S., Macmullen-Price, J.
Leeds Academy of Radiology, West Yorkshire, UK

AIM: To determine concurrence and discrepancy rates between registrar and neuroradiology consultant reporting of out-of-hours CT head; To review the patterns and intensity of such discrepancies to develop an educational model of training. METHODS: Out-of-hours head scans performed between September 2008 and October 2008 in a level I trauma centre/teaching hospital setting were analysed prospectively. Inclusion criteria adopted was all trauma and non-trauma requests from A&E and in-patients. Scans provisionally reported by the on-call registrar and subsequently by a neuroradiologist were compared for minor and major (those that could affect clinical outcomes) discrepancies. False positive (overcalls) and false negative (under-calls) discrepancies were documented. Kappa statistics was used to quantify the level of agreement. RESULTS: Reports on 100 out-of-hours CT head examinations were analysed. The overall discrepancy rate was 13%, discordance rate for major events being 5% and the minor 8%. The measure of diagnostic agreement between consultants and registrars was outstanding 87% (Kappa=0.822, p-value<0.0001). Misinterpretations by junior registrars (year 3) were significantly higher when compared with those of senior registrars (year 4 and 5) (two-sided p = 0.0427 using Mann-Whitney U-test). There were 13 false negative reads and 5 false positive interpretations. CONCLUSIONS: Our figures compare well with similar studies from other centres. There was no reported adverse patient outcome as a result of misinterpretations. Level of radiology training has a significant effect on the rate of discrepancy. Keeping a personal log of errors as a part of continuing education may be the way forwards.

p1505

Predicting success at the final radiology fellowship examination

Bugg, W., Kibiro, M., Williams, S., Toms, A.
Norwich Radiology Academy, Norwich, UK

PURPOSE: This pilot study assesses the significance of reporting statistics and internal formative assessments as predictors for candidate success in the FRCR Part 2B exam at the first attempt. METHODS: 19 registrars have attempted the FRCR Part 2B exam since the inauguration of the Norwich Radiology Training Scheme. The result of their first attempt provided two groups, pass (n=12) and fail (n=7). Comparison was made for first reporter plain film statistics, recorded as a per month average for the initial 3 years of training, and also for results achieved at internal formative assessment of "in-patient film" and "out-patient film" reporting, both taken during the second year of training. Statistical analysis was made with a 2-tailed independent t-test. RESULTS: Mean results of internal formative assessments were higher in the Pass group (in-patient p=75.3% F=66.1%. Out-patient p=78.0% F=68.0%). This was statistically significant for the Outpatient test only (p=0.042). The Pass group had higher mean monthly reporting figures for all 3 training years (Year 1: p=65.8, F=35.7. Year 2: p=207.1, F=157.6. Year 3 p=271.8, F=179.5). However, no statistically significant difference between the groups was found. CONCLUSIONS: It is possible to write exams which accurately assess a candidate's progress towards the FRCR Part 2B exam. Reporting more plain films, particularly in the first year of training, may also be a predictor of success. The results of this pilot study indicate that a further 2 years of candidates will provide a statistically significant data set, for conclusive assessment of these trends.

p1506

Triage skills for student radiographers in minor injuries: A future development

Delay, G., Chester, R.
University of Derby, Derby, UK

KEY LEARNING OBJECTIVES: Enable student radiographers to learn triage skills for future role development. DESCRIPTION: Radiographers are highly skilled professionals with a resilience for role extension and skill mix. A recent NHS report emphasised the need to empower frontline staff giving them greater freedom to use their expertise and skills to improve patient care. Radiographers of the future will play an important role in the initial assessment of patients

at the point of entry into minor injury units. Triage should be seen as a shared skill across Nursing and all Allied Health Professionals leading to a streamlined system, paving appropriate treatment. The radiographer of the future should be suitably trained for minor trauma image analysis and be competent in the process of triage for minor injuries. At the University of Derby we offer student radiographers a module in the fundamentals of radiographic image analysis. The module embeds basic appreciation of skeletal fractures and associated terminology. Integral to this we have recently introduced a session on triage. The session allows the students to learn transferable skills of physical examination for future role development. Student feedback has been very positive, fortifying the need for its inclusion within this module. CONCLUSION: Within a demand driven service, patient triage is necessary to streamline patient diagnosis and treatment. Radiographers of the future will play an important role in the initial assessment of patients at the point of entry into minor injury units. We see triage as a shared skill across Nursing and Allied Health Professionals.

p1507

Who wants to be a radiologist? Ask the medical students

Yeung, A.[1], Dennison, C.J.[1], Worthy, S.[2]
[1]Newcastle Radiology Training Scheme, Newcastle upon Tyne, UK, [2]Royal Victoria Infirmary, Newcastle upon Tyne, UK

PURPOSE: There has been recent interest in the medical student experience of Radiology fuelled by the introduction of Modernising Medical Careers (MMC) and the drive for earlier career planning. We evaluated Medical Students' perceptions of Radiology both academically and as a potential career. MATERIALS/METHODS: All 1550 Medical Students of University of Newcastle upon Tyne were invited to complete an online questionnaire. Question categories: Undergraduate exposure to Radiology, entry into Radiology training, Radiology as a career, and student knowledge of Radiology. RESULTS: 401 students (26%) responded across all year groups. There was demand for clinically-integrated Radiology exposure earlier in the course, linked to anatomy teaching, and delivered by Radiologists. By final year, 59% of respondents felt they had insufficient exposure to consider Radiology as a career. Only 3% showed definite career interest in Radiology. There was little insight into the high competition-ratios for entry into Radiology, with students ranking Radiology below General Medicine, Surgery, Emergency Medicine, and Paediatrics. Radiology-related special modules and electives were identified as being student opportunities that would aid future training applications although only 20% thought that an intercalated anatomy degree would help. Basic radiological knowledge was good. However, 32% of final-year respondents failed to appreciate that Radiology is a radiation exposure-prone specialty. CONCLUSION: In the MMC era, medical professionals' achievements as undergraduates have become increasingly relevant to their career choices. This study suggests that medical students wish for earlier, clinically-orientated, Radiologist-led teaching allowing them to improve their clinical competence and to consider Radiology as a potential career.

p1508

Delivering mammographic interpretation in China: Can low-cost displays help?

Chen, Y.[1], Gale, A.G.[1], Scott, H.[1], Wang, X.Y.[2], Liu, H.H.[3], Xie, A.M.[4]
[1]Applied Vision Research Centre, Loughborough University, Loughborough, UK, [2]Wuhan Xiehe Hopspital, Wuhan, China, [3]Hunan XiangYa No. 3 Hospital, Changsha, China, [4]Hunan People's Hospital, Changsha, China

PURPOSE: The death rate from breast cancer among urban Chinese women has increased 38.9% over the past 10 years. Thus, an increased demand and limited capacity are placing pressure on breast cancer detection. Consequently there is a critical need to train an increasing number of mammogram film readers to examine and report breast cases. With a shortage of digital mammography workstations, low-cost computer displays, such as PCs or laptops, could be used as an additional training resource. However, it is not known whether such alternative display devices could be used effectively to deliver mammogram interpretation training or whether these devices would be acceptable to breast radiologists. MATERIALS/METHODS: Three experienced Chinese symptomatic radiologists examined 60 recent breast screening cases displayed on film and another 60 cases, as reduced size images, on a Tablet PC (without any image interaction functions) and for each case indicated whether an abnormality was present, specifying its location and classified the case. Participants also commented on the potential of using low-cost display for training. RESULTS: Data indicated that there was a significant difference in the sensitivity ($p<0.05$) and specificity ($p<0.05$) between using the film and the Tablet PC condition. Despite this, participants were positive about using low-cost displays for training. Also, the performance of each participant in each condition was measured within a signal detection framework. CONCLUSION: In order to enable low-cost computer displays for mammographic interpretation training, suitable image interaction techniques need to be employed appropriately.

p1509

Reporting by radiographers – Neurological magnetic resonance imaging examinations of the head and cervical spine

Piper, K.J.
Canterbury Christ Church University, Canterbury, UK

AIM: To present the objective structured examination (OSE) results of the first cohort (n=7) who successfully completed the first post-graduate certificate (PgC) programme (accredited by the College of Radiographers) which prepares radiographers to report MRI neurological investigations of the head and cervical spine. METHOD: 40 MRI investigations (prevalence of abnormal cases = 50%) were used in the OSE which included the following abnormal appearances: haemorrhage/infarction (acute/old), infection, demyelination, tumours (glioma, adenoma, meningioma, astrocytoma, and metastases); intervertebral disc morphology (degenerative/traumatic), vertebral collapse, spinal stenosis and/or nerve root involvement, and syringomyelia. The radiographers indicated if the appearances were normal or abnormal and provided a description and interpretation of any abnormal appearances. Responses (n=280) were compared with the expected answers previously agreed with a consultant radiologist external examiner. Sensitivity (Sn) and specificity (Sp) rates were calculated on the normal/abnormal decision and the total percentage agreement rates were calculated using a pre-determined marking scheme. RESULTS: The seven radiographers who successfully completed the PgC programme correctly identified all abnormal cases (Sn=100%). The % rates (and 95% confidence intervals) for specificity and agreement were 99.3% (97.5–101.0) and 87.9% (85.7–90.0), respectively. Mean agreement with the primary diagnosis was 93.4%. CONCLUSION: These results suggest that this group of radiographers can report MRI neurological examinations of the head and cervical spine to a satisfactory level of competence to be of benefit to clinical departments committed to achieving recent guidelines. Further work is required to confirm the clinical application of these findings.

p1510

The Bristol Radiology Report Assessment Tool (BRRAT): Developing a workplace based assessment tool for radiology reporting skills

Wallis, A.G.[1], Isaac, A.[1], McCoubrie, P.[2]
[1]Bristol Royal Infirmary, Bristol, UK, [2]Southmead Hospital, Bristol, UK

LEARNING OBJECTIVES: We are developing a workplace based assessment tool for RRs that will give the trainee a standardised approach to reporting. BRRAT will be a robust feasible and educationally beneficial assessment tool, and the first of its kind in radiology. The poster will detail the existing work on BRRAT, the research methodology behind it and other assessment tools, and future plans for development. DESCRIPTION: The radiology report (RR)

is a vital method of communication between radiologist and referrer. Radiology training programmes place emphasis on radiographic interpretation but little on reporting style. Despite DoH and GMC interest in assessment, no formal assessment tool of the RR exists. BRRAT is a unique and exciting project. The assessment needs of a radiology trainee are different to trainees in other clinical specialties for whom assessment tools are already in use. BRRAT is a criterion referenced tool, with a strong evidence-based foundation based on an extensive literature search that has identified key standards across 4 areas for assessment: Evaluation of the Study, Findings, Analysis of findings and Reporting style. BRRAT will be developed further through a Delphi study enabling the assessment tool to reflect best practice and adding to the validity and reliability of BRRAT. This will be completed in early 2009 prior to a pilot study. CONCLUSION: BRRAT will be the first assessment instrument in radiology. It is criterion referenced and workplace based. Following completion of the Delphi study it will be piloted to ensure its validity, reliability and feasibility.

p1511

Is the teaching of skeletal image-interpretation at undergraduate level effective in preparing students for practice?

Willis, S.J.[1], Heales, C.J.[1], Cousens, C.[2], Iyengar, S.[2], Knapp, K.M.[1]

[1]University of Exeter, Exeter, UK, [2]Peninsula Radiology Academy, Plymouth, UK

PURPOSE: To investigate the effectiveness of a third year skeletal image interpretation module on student radiographers' perceptions of their preparedness to practice. BACKGROUND: At practitioner level new graduates are required to be able to perform a full range of general and modified radiographic techniques but are unlikely to be required to undertake image comment writing without additional experience, education and support. However, the aim of the module is to provide a sound knowledge base upon which students can base their future practice. METHOD: Final year undergraduate radiography students (*n*=51) from the 2007–08 cohort were invited to participate in the study. Data were gathered, in June 2008, using questionnaires which were distributed using a census sampling method. A response rate of 71% (*n*=36) was achieved. RESULTS: 97% of students felt the module improved their image interpretation skills, 92% felt they were better able to identify abnormalities on a range of skeletal images and 89% felt the module contributed to an improvement in their practical radiographic skills. CONCLUSION: The results from the study suggest that students felt that the module had not only improved their image interpretation abilities but had also had a positive impact upon their practical radiographic skills, thereby further enhancing their perception of their preparedness for professional practice. ETHICS: Ethical approval was granted by the School of Physics Ethics Committee, University of Exeter prior to the commencement of data collection.

p1512

Are radiology on calls getting busier? A 1 year on comparison study

Briggs, R.H., Groves, C., Chandramohan, M.

Bradford Royal Infirmary, Bradford, UK

PURPOSE: A little over 1 year ago our institution implemented a full first on-call cover by registrars. We have analysed the referral pattern with respect to imaging modality, referrer speciality and work load intensity and compared it with data collected 12 months previously. METHOD: On-call investigations performed during a 4-week period between October and November 2008 were compared with data from the same period in 2007. Data was collected using the computer record system. Direct referrals to the consultant on call were excluded. RESULTS: 102 patients were scanned as compared with 86 in 2007. The increase was mainly due to additional ultrasound scanning 26 in 2008 compared with 16 the previous year. 72 patients had CT scans compared with 70 in the previous year. CT head was the most common investigation in both years accounting for around 40% of scans. A&E was the most common source of referral providing around 60% of the workload. Patients CT scanned for head and neck at a single attendance doubled from 10 to 20 in 12 months. The on call intensity remained similar with most scans performed before 2am during the week or on the weekend day mornings. CONCLUSION: Concern regarding general indication creep has not proved well founded however additional neck scanning during a head scan attendance showed a significant increase and may represent a more cautious approach to clearing C-spines by A&E clinicians. Most of the additional ultrasounds were abdomens referred by surgical teams on weekend day mornings.

p1513

An investigation into undergraduate radiographers' knowledge of NICE principles for preventing healthcare-associated infections

Burnett, S., Crompton, S., Hiley, A., Lynch, S., Willis, S.J.

University of Exeter, Exeter, UK

PURPOSE: To investigate undergraduate radiography students' knowledge of the National Institute of Health and Clinical Excellence Principles for preventing healthcare-associated infections. Specifically those relating to; hand hygiene, protective equipment and handling of sharps. BACKGROUND: Infection control is an issue of significant importance in modern healthcare delivery. Not only does infection control prevent the transmission of nosocomial infection, but also inspires confidence amongst patients in all aspects of healthcare delivery. Previous research has suggested that the changing nature of the delivery of infection control education from formal academic settings to the clinical settings, combined with reductions in the formal assessment of knowledge, may have resulted in a reduced awareness of correct procedures. METHOD: Second year undergraduate radiography students were from the 2007–08 cohort invited to participate in the study (*n*=58). Data were gathered, in October 2008, using questionnaires which were distributed using a census sampling method. A response rate of 91% (*n*=53) was achieved. RESULTS: Respondents' knowledge of infection control procedures relating to hand hygiene, protective clothing and the correct use and disposal of sharps was good with over 90% of respondents correctly identifying the NICE guidance, however some gaps in respondents knowledge existed relating to practical application. CONCLUSION: This study's findings have echoed that of other studies. Such findings may indicate that further infection control education during both academic and clinical placements may result enhanced practical application of principles. ETHICS: Ethical approval was granted by the School of Physics Ethics Committee prior to the commencement of data collection.

p1514

The manipulation of digital radiographs to create a vigilance training aid

Mucci, B., Nicolson, C.

South Glasgow University Teaching Hospitals, Glasgow, UK

LEARNING OBJECTIVES: To illustrate how digital radiographic images can be altered by simple commercially available software, and demonstrate, using examples how altered images could be used as a tool for developing vigilance skills. DESCRIPTION: Vigilance skills in radiologists have traditionally been developed by exposure to radiographs containing pathology. An additional approach would be to create abnormalities on digital images and use these to train, test and maintain radiologists' vigilance skills. Digital radiographs can be easily manipulated by the use of inexpensive proprietary photographic software. We have used such software to alter images and created a set of comparative images which can be used as an enjoyable visual skills teaching tool. Procedure details: Chest radiographs were saved from PACS as JPEG images. Using simple photographic enhancement software (Adobe Photoshop Elements, Adobe Systems Incorporated) a series of changes were made to the images. The altered images, paired with the original image were mixed with pares of unaltered images. The image pairs are being used to asses and improve radiologists' vigilance skills. We demonstrate how images can be manipulated. We will discuss image manipulation and demonstrate some paired images. We discuss how this

can be used to teach and test vigilance for image changes for example from prior radiographs. CONCLUSION: Readily available photographic manipulation software is easily adaptable to digital radiographs. Altered images can be a useful training and testing tool for vigilance skills.

p1515

How well do medical students interpret fractures?

Chaudhry, M.A.[1], Ahmad, A.[2]
[1]Pinderfields General Hospital, Wakefield, Yorkshire, UK, [2]University Hospitals Coventry and Warwickshire, Coventry, Warwickshire, UK

KEY LEARNING OBJECTIVES: An audit was performed to evaluate whether the teaching standards at medical school led to the accurate interpretation of radiographic features of common fractures. DESCRIPTION: Medical Students at Warwick Medical School in week 8 of their Trauma & Orthopaedic rotations (8-week rotation) were asked to fill out a questionnaire comprising of two parts. Section one incorporated the interpretation of nine common radiographs of fractures. Two consultant radiologists verified these as being within reading capabilities of students. Section two focussed on the amount of radiology teaching received and student satisfaction with level of teaching (1–5 scale). There were 28 participants. Average score was 5.5/9 (61%) for interpretation. None of the students interpreted all the fractures correctly. Best performance was on mid-shaft clavicular fracture (100%) and worst was on Monteggia fracture (11%). The average amount of radiology teaching each student received was 11.4 h. Satisfaction with the radiology teaching received during the rotation was 2.25 (1–5 scale). CONCLUSION: It was identified that on average the student interpretation of fractures is good. Overall, the students were satisfied with the level of radiology teaching received. Radiology teaching of fracture interpretation, whether delivered in a formal or informal setting, does contribute to improved competency. Improvements can be made by introduction of two "fracture interpretation clinics" in the timetable. A session can be dedicated to the upper limb and the lower limb fractures. Radiologists should be involved in the delivery of these sessions.

p1516

Beginner's guide to radiology on-calls

Shuen, V., Gafoor, N., Nensey, R., Kakani, N.
Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: Educate new trainees on common emergency on-call cases. DESCRIPTION: With increasing work load, demand for timely investigations and advancing technology, on call can be daunting for new radiology trainees. The knowledge of acquisition and key points in interpretation can be useful in accurate diagnoses and in avoiding errors. We aim to cover common on-call emergencies based on imaging modalities such as ultrasound, CT and MRI covering emergencies such as trauma, pulmonary embolism, aortic dissections, acute abdomens, acute strokes, intracranial haemorrhage, compromised renal transplants and spinal cord compression. CONCLUSION: Provide a concise relevant summary of on-call protocols, scanning techniques and interpretation of essential imaging modalities. Additionally, this information will be provided in pocket-guide format for on-call purposes.

e1517

Opening the floodgates – What happens when radiology registrars go first on-call?

Amerasekera, S.S., Amerasekera, L.A., Sadek, T., McGuirk, S., McDonald, G., McGlynn, E.
Good Hope Hospital, Birmingham, UK

PURPOSE: Our institution is a medium sized district general hospital. It recently implemented a change in the out-of-hours service, where Radiology registrars, rather than consultants, are first on-call. We hypothesised that there would be an increase in the frequency of requests for CT during anti-social hours (0000 to 0800). METHODS: We used the Radiology Department computer system to collate data for 22 weeks prior to and following the change, recording time of scanning, the body part(s) scanned and the subsequent report. Assuming that the number of scans within the 22 weeks had a poisson distribution [rate (λ) = 19], we tested the null hypothesis that the rate of scans remained constant. RESULTS: In the 22 weeks before the rota change, 19 patients had 22 areas scanned (16 brain, 4 cervical spine, 2 abdomen/pelvis). 11 scans were positive. After the change, 42 patients had 50 areas scanned (31 brain, 8 cervical spine, 3 thorax and abdomen and pelvis, 1 thorax, 4 abdomen/pelvis). 18 scans were positive. We found that, with 99.9% confidence, the rate of scans after the change was different to the rate of scans prior to the change. CONCLUSION: There has been a statistically significant increase in the amount of CT performed overnight following a change in the on-call, with a reduction in the proportion of positive scans. This has significant implications for workforce planning for radiologists, radiographers and support staff.

e1518

Formal medical student radiology firm; Addressing the underutilization of radiology in the undergraduate medical curriculum

Rajpopat, M., Johnston, M.
Brighton & Sussex Medical School & Brighton and Sussex University Hospitals NHS Trust, Brighton, UK

KEY LEARNING OBJECTIVES: The innovative use of medical imaging within the undergraduate curriculum is a hallmark of medical education at Brighton and Sussex Medical School. Interactive imaging practicals delivered using MRI and dedicated PACS software are combined with traditional methods to teach anatomy and physiology. Now imaging is further integrated into the curriculum with the introduction of a formal radiology firm for fourth year medical students. The aim of the firm is to gain an understanding of the patient journey from receipt of a request form to the issue of a report. Students learn; the applications, indications and contraindications of common imaging modalities; the roles of different members of the imaging team; interpretation of normal anatomy/pathological diagnosis; and gain insight into the patients' experience. DESCRIPTION: Firms of five medical students complete a radiology attachment each week. Students interview patients before and after an examination for six different radiological modalities, observe the examination and spend time with different imaging team members. By reflecting on information collected during the week, they produce an in depth report of one patient journey at the end of the firm and complete a formal assessment. CONCLUSION: Imaging is increasingly recognized as a useful yet underutilized teaching resource. Furthermore, the central role of imaging within medical practice is not currently reflected within the undergraduate medical curriculum. Despite its significance to every specialty, radiology is highly under-represented in the curricula of many traditional medical schools and is more relevant to most practicing doctors than many peripheral specialties.

e1519

Diverse applications of a clinical assessment tool for imaging students in the north of England

Newton-Hughes, A.M.[1], Westmoreland, A.[2], Coals, J.[3], Boynes, S.[4], Holmes, K.[5], Crohn, N.[2], Robinson, H.[6], Hyatt, A.[7], Elkington, M.[7], Sloane, C.[5], Williams, C.[3]
[1]University of Salford, Salford, UK, [2]University of Leeds, Leeds, UK, [3]University of Liverpool, Liverpool, UK, [4]University of Bradford, Bradford, UK, [5]University of Cumbria, Lancaster, UK, [6]University of Central Lancashire, Preston, UK, [7]Sheffield Hallam University, Sheffield, UK

PURPOSE: A group of Universities delivering undergraduate radiography education met to discuss the effective assessment of students in the hospital environment. A common assessment "tool" was devised which could be used within a variety of schemes. The poster will demonstrate the implementation of the "tool" into a range of clinical assessment schemes. MATERIALS/METHODS: After discussion programme leaders and clinical coordinators from several universities decided that whilst the development of a common assessment scheme was not practicable it was feasible to devise a common tool which could have applications in a variety of assessment schemes. Over a 2 year period a common tool was devised in consultation with clinical and academic staff, service users and students. Following piloting, use of the tool was implemented in the assessment schemes of 7 universities. The tool is now used in both formative and summative assessment schemes across a range of practice areas at all levels of undergraduate radiography training. Examples of its use within a variety of schemes will be demonstrated within the poster. RESULTS: It has been demonstrated that the developed "tool" can be used within a variety of assessment schemes to successfully evaluate the students' clinical skills, developed in practice. Evaluation of the "tool" after 1 year's use will be conducted later in the academic year. CONCLUSION: The poster demonstrates the application of the tool within the assessment schemes in a variety of universities.

e1520

CT head reporting by radiographers: Results of an objective structured examination

Williams, I.J., Piper, K.J.
Canterbury Christ Church University, Canterbury, UK

PURPOSE: To present the results of a small group of radiographers who successfully completed a postgraduate module (accredited by the College of Radiographers) in reporting of CT head examinations. METHODS: One of the summative assessments, an objective structured examination (OSE), consisted of 25 CT head investigations which included the following abnormal appearances: infarction (acute/chronic); haemorrhage-acute/old (intracerebral/intraventricular/sub-arachnoid); and metastasis (solitary/multiple). Approximately 50% of the investigations included were normal. The radiographers indicated if the appearances were normal or abnormal and provided a description and interpretation of any abnormal appearances. Responses (n=125) were compared with the expected answers previously agreed with a consultant radiologist external examiner. Sensitivity (Sn) and specificity (Sp) rates were calculated on the normal/abnormal decision and the total percentage agreement rates were calculated using a pre-determined marking scheme. RESULTS: The radiographers (n=5) correctly identified all abnormal cases (Sn=100%) and the specificity rate (and 95% confidence interval) was 95.8% (90.4–101.2%). The pass mark for agreement in the OSE was 85% and 4 of the 5 radiographers achieved this level. Mean agreement with the primary acute diagnosis was 99.5%. The majority of marks deducted related to non-acute findings which would have been of little, if any, clinical significance in the immediate management of the patient. CONCLUSION: These results suggest that this group of radiographers can report CT head investigations to a satisfactory level of competence to the benefit of clinical departments committed to achieving recent guidelines. Further work is required to confirm the clinical application of these findings.

e1521

Radiology podcasts – A review of a developing educational resource

Johnson, R.J.[1], Mole, T.[2], Qureshi, M.[1]
[1]*Manchester Radiology Training Scheme, Manchester, UK,*
[2]*University of Manchester Medical School, Manchester, UK*

This presentation aims to bring to the attention of the radiological community the audio (podcast) and video (vodcast) digital media material freely available over the internet. There is an expanding volume of regularly updated material of radiological interest available. Some podcsts may be downloaded directly from the provider/authors' website whilst others require software to be installed on the users personal computer. Once downloaded they may be reviewed at the users convenience on a home computer or portable digital media player. This presentation guides the novice through the necessary steps to begin exploring podcasts for themselves. We also review some of the material available of particular interest to the radiological community.

e1522

Teaching hysterosalpingograms: What can educational theory offer when teaching intimate examinations?

Upadhyay, N.[1], Rajpopat, M.[2], Hemingway, A.[1]

[1]*Imperial College Healthcare NHS Trust, London, UK,*
[2]*Brighton and Sussex University Hospitals NHS Trust, Brighton, UK*

KEY LEARNING OBJECTIVES: To gain the necessary knowledge, skills and attitudes to competently perform a hysterosalpingogram. DESCRIPTION: The Royal College of Radiologists acknowledge that teaching intimate examinations such as hysterosalpingograms (HSGs) raises training issues which require sensitive handling of both the trainee and the patient. A natural reluctance to be examined by inexperienced trainees means it is particularly important to gain the technical skills quickly. We propose a model for teaching HSGs based on relevant aspects of educational theory. Behaviour theory suggests that breaking down a task into small steps and repeating these steps aids learning. The process of performing an HSG is broken down into three main steps: passing the catheter, acquiring the correct images and passing the speculum. The steps are taught in this order, rather than the sequence in which the procedure is conventionally performed, to reflect increasing level of difficulty. The trainee completes the Kolb's cycle for each step before moving onto the next, facilitated by the trainer. Allowing time for reflective observation and abstract conceptualization between steps develops confidence. The final step, which potentially causes the most patient discomfort whilst only constituting a small part of the overall procedure, is only attempted once all the other technical skills have been achieved. CONCLUSION: This framework is a designed to deliver the practical skills quickly with minimum patient discomfort. In parallel, the trainees improve their knowledge about indications, contraindications and side-effects from clerking the patients and develop appropriate attitudes when counselling the patients and their partners.

e1523

Freeware to assist radiologists in creating file and hardware sharing networks

Yap, K.S.
Leeds Teaching Hospitals NHS Trust, Leeds, UK

KEY LEARNING OBJECTIVES: To review the freeware program "Bonjour" – a comprehensive utility for integrating workstations within a network. To demonstrate how networks for sharing files, hardware services and training materials are created with "Bonjour". To illustrate the potential uses of the program in radiology education, administration, research and MDT. DESCRIPTION: 1. Introduction to Bonjour. 2. Advantages of a Bonjour network versus standard networks. 3. Creating a file and hardware service sharing network. 4. Using Bonjour to access remote workstations. 5. Adding/restricting workstation services on a network. 6. Potential uses of Bonjour in Radiology: i. Education – sharing files, hardware, and training material. ii. Administration. iii. Audit. iv. MDT. CONCLUSION: Bonjour is a cost effective method of integrating databases and services on separate (Windows and Macintosh) workstations on a network. Sharing files on a network negates the need for memory sticks and CD ROMs to store and transport patient details avoiding compromise of sensitive information. This provides a powerful tool for radiologist to

focus departmental resources, making file sharing more efficient and improving workflow.

Service delivery

p1601

The evolution of the advanced radiographer practitioner at the Mid Yorkshire Trust

Field, L.J., Snaith, B., Lancaster, A., Flintham, K.
Mid Yorkshire NHS Trust, UK

PURPOSE: Since the reporting service commenced at the Mid Yorkshire Trust in, there has been an expansion in the numbers of examinations reported by radiographers. In 2007 more than 55 000 examinations where reported by the advanced practitioners (ARPs). There are currently 8 plain film reporting advanced practitioners employed at the Mid Yorkshire Trust, alongside a consultant radiographer in emergency care. The role has been redesigned following AfC banding to utilize the skills, extend the scope of reporting and change the way services are delivered. MATERIALS/METHODS: A new job plan was agreed which expanded all the attributes of the ARPs. This paper will describe the development of the job scope, whereby each Practitioner spends 50% of their role reporting, maintains clinical experience and has a personal development session to undertake and lead audit, teach and lead on policies/practice. The reporting scope includes musculoskeletal, chest and abdominal examinations. Reporting numbers have increased steadily since, with significant increases in non-ED work. The turnaround time for reporting has decreased. CONCLUSION: The benefits of the new job role are that the ARPs work autonomously in reporting whilst providing other skills in and outside the Radiology department. Reporting is available 7 days a week and due to the increase in reporting capacity there has been the introduction of immediate access for GP referrals for trauma and radiographer led discharge.

p1602

Implementing trust wide electronic radiology requesting – A 5 year experience

Norris, P., Evans, R.
Mayday University Hospital, Croydon, UK

PURPOSE: Electronic requesting of radiology investigations using order comms has significant benefits including reduced delays, less clinical risk, and increased referrer convenience. In spite of this technology is not widely used and there are many challenges to implementation. We aim to share lessons learned in a successful trust-wide project. MATERIALS/METHODS: We conducted a retrospective review of our experience implementing Order comms for all diagnostic tests including radiology in a single trust between 2005 and 2008. RESULTS: Almost 100% usage has been achieved in a step wise implementation starting with inpatient referrals, progressing through accident and emergency, and finally outpatients. Technological, clinical, process redesign, and organizational challenges and solutions are outlined, as well as key tips for implementation. The future plan is to roll out to primary care and all investigations. CONCLUSION: Full electronic requesting of radiology investigations can be effectively implemented and benefits to patient care realised with effective organizational planning and cooperative working between information technology and clinical departments.

p1603

Impact of delayed access to ultrasound scans in surgical patients – A single centre observational study

Yazbek-Hanna, M., Leung, E., Lightbody, T., Osmon, K., Vakis, S., Eccersley, J.
Queen's Hospital, Burton-on-Trent, UK

INTRODUCTION: Abdominal ultrasound scan is a useful diagnostic test in surgical patients. Immediate access to ultrasound is often not possible, potentially leading to delay in patient management and discharge. This study aimed to assess the clinical and financial impact of delayed ultrasound for surgical patients. METHOD: All surgical in-patients' ultrasounds performed between May and July of 2005, 2006 and 2007 were retrospectively included. These ultrasounds were sub-categorised into office-hours, weekday out-of-hours and weekends requests. The collected data were compared with the gold standards set out by the radiology department. The cost implication of any delays was also examined. RESULTS: There were 311 ultrasounds performed. Overall, 65%, 13% and 62% of all office-hours, out-of-hours and weekend requests, respectively, were delayed; which resulted in extra 45 days in-hospital stay over the study period. A potential cost of £60 000 per year was accounted for delayed discharge for surgical patients, consequent to delayed ultrasound. CONCLUSION: Given the cost of an additional ultrasonographer session per week is only £240; extra sessions per week would improve clinical benefits and cost effectiveness. Further audits are underway to assess such benefits in adopting two additional ultrasound sessions per week.

p1604

Patterns of current practice among general practitioners with direct access to MRI

Din, I.U., Shafi, B.B.B., Lea, S., Evans, P.
Wirral University Teaching Hospital NHS Foundation Trust, Wirral, UK

PURPOSE: Direct access to MRI scanning is available to GPs in the Wirral. We aimed to look at the local service provision at Wirral University Teaching Hospital and assess appropriateness of MRI requests based on local guidelines. MATERIALS/METHODS: Retrospective audit of 91 (randomly selected out of a total of 180) patients in whom MRI was requested by GPs between 30 June 2008 and 28 July 2008. MRI request forms and final reports were reviewed. Patient outcomes were discovered by using electronic health records and contacting patients and GPs. RESULTS: There were 47 females and 44 males with mean age of 52.33 years (range 15–86 years). Areas scanned included spine 48 (53%), knee 24 (26%), brain 11 (12%) and others 8 (9%). The average waiting time for scans was 16.5 days; with 40 (44%) scans performed within 2 weeks. Average reporting time was 4.7 days; with 73 (80%) scans reported within 1 week. Plain films prior to MRI were indicated in 30 (33%) cases but were only done in 11 of 30 (37%) cases. MRI requests did not follow local guidelines in 29 (32%) cases: knee 16, brain 6, spine 4, shoulder 3. 55 (60%) of MRI reports were abnormal, 26 (29%) showed insignificant pathology and 10 (11%) were normal. Following MRI, 45 (49%) patients were referred to secondary care. CONCLUSION: The waiting times for MRI scanning and reporting appeared reasonable. However, significant number of MRI requests did not follow local guidelines. Increased awareness of local/national guidelines is essential to prevent inappropriate MRI scanning and improve service provision.

p1605

Radiology of major disaster and conflict

Datta, A.N.[1], Chand, D.[2]
[1]Good Hope Hospital, Birmingham, UK, [2]Sandwell and West Birmingham NHS Trust, Birmingham, UK

PURPOSE: This poster highlights examples of Radiological management of major disaster and conflict in war and peace. MATERIALS/METHODS: No management of major disaster and conflict is complete without radiological service input. Radiological services are an integral part of management and care of the individual and group of casualties. Services provided in any major disaster fall into three-tier categories: Role 1: Immediate care with available facilities and manpower with the support of ambulance services, fire brigade and police in addition to medical, paramedical and allied staff. Role 2: More advanced care with resuscitation, diagnostic and surgical facilities in neighbouring general hospitals. Role 3: Advanced treatment provided by specialist hospitals. This poster highlights the examples of the injuries encountered and the types and modalities of radiological investigations performed.

RESULTS: The introduction of digital radiographic imaging and hand held ultrasound has lead to the utilization of diagnostic imaging directly at the disaster sites; thus ensuring prompt diagnosis and provision of treatment within the Golden Hour. Mobile CT Scan services are also be provided. Most of the major trauma can be imaged initially in the established or temporary Resuscitation Bays – at the very site of disaster, to save lives. CONCLUSION: Flexible, comprehensive and accessible diagnostic services are integral to the management of any major disaster or conflict.

p1606

Outcomes of using Lean to improve radiology services

Martin, A.J.
Royal Bolton Hospital NHS Foundation Trust, Bolton, UK

PURPOSE/MATERIALS: Lean has a long and interesting history. The reference model for lean and quality is the Toyota Production System, developed in the motor industry. The fundamental principles of lean production can be used in any industry and healthcare is no exception. As Fillingham highlights, there are often long delays in diagnostics suggesting that the use of lean could be extremely beneficial in this service. METHODS: Lean methodologies were used to streamline processes within the Radiology Department. This presentation reviews the journey so far within CT, ultrasound, plain imaging and the appointments cell at the Royal Bolton Hospital, exploring the challenges faced and the successes achieved through using lean methods to help us provide a better service. RESULTS: Using lean we have: l reduced GP reporting from 7 weeks to 2 days maximum. Changed templates in ultrasound and CT to create better flow with more capacity and ability to image one stop patients from ENT. Third HCA in ultrasound has improved flow. Speedier diagnosis, reduced admissions and bed nights by developing ultrasound service in the Emergency Department. Stroke patients scanned within 30 mins during daytime. Reduced waits for orthopaedic patients. Developed dedicated orthopaedic radiology department. Reduced the appointing process from max. 9 days to max. 3 days. Projected savings of £35 000 in clerical staff. Created a better working environment. Increased staff morale. Improved patient satisfaction. Reduced waiting time for ultrasound by 1 week. CONCLUSION: Lean has successfully improved Radiology Services.

p1607

Optibolus – A bolus shaping software used to reduce the amount of contrast given to patients during CT examinations without reducing diagnostic confidence

Cattini, G.H.
St James's University Hospital, Leeds, UK

KEY LEARNING OBJECTIVES: Due to the increasing speed and sensitivity of CT scanners now available, it seems relevant to look at ways to manipulate protocols and contrast delivery to minimise the amount of contrast media given without compromise to the patient's diagnosis. DESCRIPTION: Optibolus is software that can be plugged into the back of an Optivantage dual headed injector to enable this reduction to be carried out. Two groups of patients for either general or vascular examinations were consented to be part of a study to look at how much contrast media amounts could be reduced, without compromising the patient's diagnosis. This is also very important in the management of renal impaired patients. The patients were a cross section of ages and weights to ensure this technique could be used in any CT department. All patients were weighed and this was recorded along with other variables. CONCLUSION: All the patients were given reduced amounts of contrast media. For the general abdomen/pelvis work this varied between 7% and 25%. For the vascular work the saving was up to 35% in contrast volumes per patient. This means that the department could use 75 ml pre-filled syringes for selected patients, thereby reducing waste and allowing the tailoring of contrast administration to each patient.

p1608

The Aberdeen CT rapid improvement kaizen event – Lean management evaluation survey

Lip, G., McAteer, D.
Aberdeen Royal Infirmary, Aberdeen, UK

PURPOSE: In our institution, it was recognized that there were persistent problems in gaining access to CT within acceptable waiting times for both inpatients and outpatients. A week long focused rapid improvement kaizen event was organized to identify areas in which improvements in practice or management could be made. The kaizen event is derived from Toyota management practices where staff from all fields are given time off to evaluate and analyse current working practices from all angles and derive methods and targets for an improvement in services. This survey is directed to the participants of the kaizen event and their opinion on the value of the process. MATERIALS/METHODS: There were 12 members of staff from varying fields who took part in the CT kaizen from radiographers and radiologists to secretaries and IT staff. The survey aimed to address the aims of the event, expectations post kaizen, short and long term targets and their opinion on external support, information dissemination and barriers to implementation. CONCLUSION: work in progress, to be completed by February 2008 with repeat follow up survey in May 2008.

p1609

Increasing out-of-hours imaging to facilitate emergency pathway for inpatients with abdominal pain

Unwin, E.A., Meagher, T., Mclaren, A., Cranston, A., Appleton, S.
Buckinghamshire NHS Trust, Stoke Mandeville, UK

INTRODUCTION: Imaging plays an important role in the assessment of patients admitted with acute abdominal pain. It may confirm a suspected diagnosis, identify unsuspected pathology or assess severity of pathology which may alter management. The purpose of this study was to evaluate the impact of increasing out-of-hours imaging on duration of patient stay, time to theatre and assess accuracy of both clinical and radiological diagnosis. METHODS: Patients acutely admitted to the surgical firm between January and February 2008 were included in the review. Patients with abdominal pain secondary to trauma or with known advanced cancer were excluded. In February extra lists were introduced in CT, ultrasound and MRI during weekday evenings and afternoon weekends. No change was made to the method of surgical practise or review. The data from the two cohorts was compared. RESULTS: Length of stay was unchanged at 5.1 days following the introduction of increased out-of-hours imaging. Time to complex imaging fell from 11.5 h to 9.7 h. Initial clinical diagnosis matched discharge diagnosis in 54% of patients and radiological diagnosis matched discharge diagnosis in 86% of patients. A total of 86% had complex imaging. CONCLUSIONS: Solely increasing out of hours imaging did not affect length of stay. Imaging adds significantly to diagnostic accuracy, but it is important to ensure whole system changes are put in place before considering major changes in out-of-hours capacity rather than incrementing radiology capacity alone.

p1610

A year of on-call radiology: A review of out-of-hours service provision

Brown, S.E., Rock, B., Drake, B.
Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: Increasing clinical reliance on diagnostic imaging modalities has resulted in an increase in the volume of out-of-hours work being performed. An accurate assessment of current out-of-hours imaging requests and service provision is of use, to help plan future strategies for providing out-of-hours diagnostic imaging services. DESCRIPTION: Every out-of-hours call made to 2 radiology registrars participating in the general radiology on-call rota at 2 busy district general hospitals was recorded prospectively over a 2 year period. The nature of the request/scan indication, type of scan performed (if any), and scan outcome was recorded. The log was retrospectively analysed to provide information on out-of-hours

service provision. CONCLUSION: Given increasing reliance on diagnostic imaging modalities, an accurate evaluation of current out-of-hours service requirements is essential in planning future strategies for providing out of hours services. This review provides a snap-shot of current out-of-hours service provision.

p1611

Radiographers perceptions of equality and career progression in the National Health Service

Hussain, Z., Bogg, J.
University of Liverpool, Liverpool, UK

KEY LEARNING OBJECTIVES: This study evaluated radiographers' perceptions of equality, diversity and career progression in the National Health Service (NHS) by means of a quantitative national survey in which 120 radiographers responded. The data was extracted from a multi national survey conducted by the Breaking Barriers project. DESCRIPTION: The majority of respondents thought that equality and diversity policies could make a difference and that the NHS was working hard to promote equality and diversity. However, the data revealed a number of negative views. 45% of respondents stated that equality and diversity policies in the NHS were not enough to make a difference and 22% stated that they were not aware of their organizations equality and diversity policy. 33% of men and 56% of women, agreed that women experience barriers to career progression. 53% of thought that minority groups experienced barriers to career progression. 67% agreed that disabled people experience barriers to career progression. 49% thought that the workforce did not reflect the community it served and 66% of respondents think that those from ethnic minorities are not well represented in their organization. Findings also suggested that a lack of career progression opportunities which maintain a clinical focus is a concern for women. CONCLUSION: In the light of the introduction of the Single Equality Scheme and Equality Impact Assessments it is important that radiographers' perceptions of equality and diversity are evaluated. Funding and workforce planning must also enable experienced practitioners to remain clinically focused, yet have the opportunity to progress.

p1612

Simple measures reduce risk of nephrogenic systemic fibrosis in patients receiving gadolinium-based contrast

Prowse, S.J., Dixon, R.E., Sissons, G.R.
Countess of Chester Hospital, Chester, UK

PURPOSE: Patients with renal insufficiency receiving gadolinium-based contrast agents are at risk of developing nephrogenic systemic fibrosis. We completed an audit cycle which looked at the potential risk our patients were exposed to before and after the implementation of safety guidelines. METHODS: We examined the documentation of 100 patients receiving Gadolinium based contrast from June to September 2007 to assess whether any attempt had been made to identify patients at risk of NSF. The documentation scrutinised included patients renal function and relevant medical history. Due to alarming results, the department introduced a safety protocol whereby radiographers were required to complete a checklist, recording patient's renal function and diabetic status. We then analysed a further 100 patients and compared results. RESULTS: In the first group, 46 (46%) patients had no documentation relating to renal function. Following the implementation of the safety guidelines, 1 (1%) patient did not have any record of renal function. Of 153 patients that had their renal function considered, 4 were identified as being at risk of NSF. CONCLUSION: NSF is a serious illness which is caused by the use of gadolinium based contrast agents in patients with renal insufficiency. Whilst it may take some time for the greater medical community to be educated about NSF, we need to make sure our policies within Radiology departments are safe. We have shown that by adding a simple checklist, educating our staff to consider and record renal function and medical history, we are moving to decrease the risk of NSF.

p1613

Role of the intensive care radiologist

Prescod, K.[1], Gad, A.[2]
[1]North Bristol Hospital, Bristol, UK, [2]Glostrup Hospital, Copenhagen, Denmark

KEY LEARNING POINTS: Highlighting the expanded role of radiologists in the Intensive care setting. DESCRIPTION: With the advances in imaging, radiologists are having an increasing role outside of the X-ray department, for example in the intensive unit (ITU). Our communication with ITU is no longer just a endless ream of chest X-rays. Evaluating the investigation database of several large hospitals have shown that radiologists are now called upon to perform a variety of bedside ultrasound guided interventional procedures. Chest X-rays are now about 60% to 70% of workload, CT 10%, with Ultrasound providing about 20–30%. Under ultrasound, pleural, peritoneal, nephrostomy and abscess drain placements; and vascular access are the more popular interventional procedures requested. Coupled with this we conducted a survey of the Intensive Care clinicians on god points and suggested improvements of the coordinated service from the radiologists in our department. CONCLUSION: Intensive care radiology is now a diversified workload for the radiology department, which not only requires image interpretation skills but interventional expertise. Furthermore, there is the suggestion that a dedicated Radiologist works coordinated with the Intensive department to optimize patient care especially for patients who have had a long and/or complicated course.

p1614

Radiology in a urology diagnostic centre

Charlesworth, B., O'Brien, T., Viney, Z., Griffin, N., Rottenberg, G.T.
Guys' and St Thomas' Hospital NHS Foundation Trust, London, UK

A new urological diagnostic centre was established at Guys' Hospital in January 2008 in a purpose built centre. The unit contains a 2 room ultrasound suite which is run by consultant radiologists and sonographer for the thrice weekly new patient clinics. This presentation outlines the results of the first 3 month radiological investigations, and discusses the issues associated with moving radiologists out of the radiology department into a clinical unit. 918 patients attended in the first 3 months, of whom 478 (51%) had an ultrasound examination; renal ultrasound being the commonest performed (74%, *n*=390) or testes (18%, *n*=95), as well as a small number of pelvic, transrectal and abdominal scans. There was significant variation in the number of patients being sent for ultrasound in each clinic, varying from 21% to 76%. The mean number of scans performed per clinic was 13, with a range of 7 to 19. Work flow varied significantly during clinic with the number of requests per 30 min period varied from 0 to 6. Additional investigations such as prostate biopsy were arranged and performed in the clinic, and second line investigations were often arranged on the same day. The issues associated with supporting such a novel centre will be discussed.

p1615

Audit of open access services to primary care, with reference to body imaging

Dheer, A., Shatwell, W., Wai, D.
University Hospitals Coventry and Warwickshire NHS Trust, Coventry, UK

PURPOSE: 1. To assess the uptake and understanding of the newly offered pathways. 2. To assess the impact of the service and appropriateness of referrals by GPs. METHODS: Presentations for body imaging pathways to facilitate open access were given to GPs. Pathways as per the RCR guidelines – "Making the best use of clinical radiology services" (MBUR6) were highlighted. Electronic data on the uptake of the service were collected over a 12 month period and reviewed. Appropriateness of referrals was assessed according to pathways and MBUR6 guidelines. RESULTS: The pattern of referrals for MRI and CT were compared with ultrasound requests from GPs in the Coventry PCT and Warwickshire PCT areas. The majority of

cases initially had an ultrasound request. Age-ranges, sex and imaging request details were reviewed to assess the referral pattern. We reviewed the clinical information provided, the appropriateness of the request and whether the report answered the clinical query. We also checked if the investigation affected the out-patient referral pathway. A minority of cases had inappropriate referrals and details/reasons were reviewed. Interesting cases or further imaging obtained in a small percentage of patients were reviewed along with incidental findings. CONCLUSION AND RECOMMENDATIONS: The majority of referrals for CT and MRI were appropriate. Successful implementation of the service requires initial education to increase utilization of this service and providing access to communicate directly with a radiologist. Open access to CT and MRI can direct patients to appropriate clinical pathways leading to quicker management.

p1616

Should surgeons order CT KUBS for renal colic patients instead of A&E staff?

Rahman, F.M., Raveendran, R., Briggs, T.
Barnet General Hospital, London, UK

PURPOSE: Prior to September 2007 patients with suspected renal colic had a CT KUB within 24 h ordered by A&E staff. Following analysis of the total number of CT KUBs and the percentage which were positive over 2 months, the policy was changed so that these patients were evaluated by the surgical team who ordered necessary investigations. The number of positive CT KUBs in the 2 month period following this change was reaudited. METHODS: The total number and results of CT KUBs in July and August 2007 were collected. CT KUBs for inpatients and from Urology Clinics were excluded as all other CT KUBs were ordered by A&E. CTs were classified as positive if calculi (renal, ureteric or bladder) was seen. All others were classed as negative. Following policy change in September, this was repeated for November-December 2007 and the differences in number of positive scans calculated. RESULTS: In July–August 2007, 97 CT KUBs were performed through A&E, of which 45 were positive. After policy change in September, 107 scans were performed, of which 59 were positive. The 9% increase in the number of positive scans was not found to be significant ($p<0.05$) using the paired *t*-test. CONCLUSION: There was no significant change in the percentage of positive CT KUBs ordered by surgical staff compared with A&E. Evaluation of patients with suspected renal calculi can be carried out by A&E staff without surgical referral, which could lead to shorter patient waiting times and decreased on call surgical workload.

p1617

Anaphylaxis within a radiology department: How prepared are we?

Roberts, A.C., Jayawardena, M., Powell, S.
Royal Liverpool and Broadgreen University Hospitals NHS Trust, Liverpool, UK

PURPOSE: Routine administration of intravenous drugs and contrast is commonplace within a radiology department and can on occasion result in anaphylactic reactions, with severe consequences. All areas within the radiology department where intravenous contrast is administered should be fully equipped for the treatment of anaphylaxis, including access to correct drugs, oxygen, relevant administration equipment, in addition to adequate staff knowledge, with a clear protocol poster on display. MATERIALS/METHODS: Evaluation of emergency preparedness was conducted via spot checks on drugs and equipment within clinical areas and with a staff survey to evaluate response in an acute anaphylaxis scenario. RESULTS: Of 13 clinical areas evaluated, all rooms where contrast was administered had valid emergency drug boxes and oxygen available with correct administration equipment. Only 7 of 13 (54%) rooms had the relevant anaphylaxis guidelines poster on display. In the event of a severe anaphylactic reaction, overall, only 63% of staff knew to give adrenaline and 42% would think to call the crash team. 5% of staff did not know the correct number for the crash team. Most responses gave incorrect adrenalin dose, route of administration and frequency in the treatment of anaphylaxis. CONCLUSION: Recommendations were made to improve overall departmental management of anaphylaxis. Ongoing education in the recognition and treatment of anaphylaxis, for appropriate staff, with maintenance refresher lectures. Continued use of pre-filled adrenalin syringes. Appointment of personnel and documentation for maintenance of emergency drug boxes and equipment. Replace anaphylaxis protocol posters in deficient rooms. Local audit presentation to increase awareness. Re-audit annually.

p1618

Unravelling the mystery of clinical coding

Koutroumanos, N., Cox, J.
County Durham & Darlington Foundation Trust, Durham, UK

KEY LEARNING OBJECTIVES: Clinical Coding – What happens behind the scenes? Auditing the clinical coding in your practice. Top-10 tips for accurate coding in radiology. DESCRIPTION: Clinical coding is the process by which information in clinical case notes is translated into codes which are stored in the hospitals' databases. This is the most crucial step of the process by which hospitals are paid for their activity either by the state or by insurers. Hospitals within the National Health Service are reimbursed according to the number and complexity of cases treated. This system relies on highly accurate patient-level data about activity in order to assign the appropriate tariff to and receive correct payment. Healthcare institutions, whether state or privately financed, are not exceptions to the current increasing fiscal pressures in our economy. Through effective and accurate clinical coding, everyone can play a role in healthcare economics resulting in more sustainable allocation of resources. We audited the clinical coding of 129 therapeutic interventional radiology procedures in our hospital over 3 years. Our results demonstrated that performance of the non-clinical Coding Department was good, but identified a number of potential practice improvements and suggestions, through which clinicians can help improve this complicated, but fundamental process. CONCLUSION: To date, there has not been a published audit of the accuracy of coding of interventional radiology procedures. Some centres suggest that accurate coding can only be performed by clinicians. Our experience differs.

p1619

Nosocromial infections in the radiology department

Amir, R.[1], Barker, C.[2]
[1]Norfolk and Norwich Hospital, Norwich, UK, [2]Queen Elizabeth Hospital, Bury St. Edmunds, UK

OBJECTIVE: Hospital departments with high patient traffic are an infection control risk. Infection can transferred between patients on inanimate objects such as instruments and furniture. The aim of this study was to identify areas of fomite infection control risk in a department of radiology. METHODS: Potential risks in the department were identified during a review of the department by a Consultant Microbiologist and an SpR in Radiology. Areas of high patient throughput combined with suspected areas of repeated skin contact were targeted. A total of 32 swabs of radiological equipment, including ultrasound probes, CT and MR tables, digital plates were obtained over a 2 week period. The number of colonies of bacteria were observed on a standard blood agar plate. RESULTS: Bacterial cultures were isolated from 13 of the 32 (40%) swabs. Most of these cultures (12 out of 32; 37%) grew coagulase-negative commensal skin flora. One sample grew an environmental organism, Bacillus sp., which rarely causes infection. No Methicillin Resistant Staphylococcus Aureus (MRSA) was cultured. The positive cultures were found on the pieces of equipment which included: CT table and head cradle, MR head cradle, curvilinear low frequency ultrasound probe and X-ray machine chin rest. CONCLUSION: Radiological equipment remains a potential source of nosocomial infection. The results of this study identify those areas were transfer risk is highest and can be used to modify cleaning practices in radiology departments.

p1620

Magnetic resonance services in the English National Health Service

McEwan, L.[1], Wright, C.[2]
[1]Alliance Medical, Banbury, UK, [2]University of Cumbria, Carlisle, UK

PURPOSE: To evaluate the status of MRI services in the light of recent government initiatives, and identify potential sources of further improvement. MATERIALS/METHODS: Both quantitative and qualitative data were collected from 7 NHS Trusts in each of the 10 SHAs in England, selected by stratified random sampling. RESULTS: Continued investment in MRI scanners is evident, however changes in working practice to meet the 26 week (2006) and 13 week (2007) waiting targets have proved more influential than new hardware provision. Commitment to 'extended working' is evident with only 23 of the scanners working what could be considered conventional hours. 87% of MRI departments scanned private patients and 46% of these were integrated within standard NHS lists. Block booking by anatomical region improves efficiency, yet only 29% of MRI departments adopt this approach. Little correlation is evident between departments for the number of sequences performed per body-part and the time slot allocated. 57% of MRI sessions are radiologist supervised, yet 97% of MRI departments use standard protocols. 38% of the departments consider radiologist availability to be the main influence on reporting times, rather than radiologist shortage. CONCLUSION: Despite most working non-conventional hours, 60% of scanners have capacity for further expansion of services. Scanning private patients during standard NHS lists has a negative effect on waiting times. Utilization of the Independent Sector has had significant impact in reducing waiting times to meet the 13 week target. Radiologist working practices require detailed review. Potential for radiographer reporting in some areas may be appropriate.

e1621

Imaging in bariatric surgery: Service set-up, post-operative anatomy and complications

Shah, V., Shah, S., Muthu, S., Ahmed, A., Blunt, D., Gishen, P.
Imperial College Healthcare NHS Trust, London, UK

KEY LEARNING OBJECTIVES: To describe challenges and solutions in setting up imaging for a bariatric surgery service, provide an overview of commonly used surgical procedures, post-operative imaging anatomy and examples of complications. DESCRIPTION: Bariatric surgery is increasingly performed to control morbid obesity when medical approaches fail, and results in more effective and sustained weight loss when compared with nonsurgical therapies. There are several issues faced by the radiology department in setting up the imaging arm of such a service. Examples include fluoroscopy and CT weight limits, ensuring diagnostic image quality, training of radiologists and radiographers, and provision of timely diagnostic and interventional services to manage the post-operative patient. Three categories of procedure exist. Restrictive procedures induce weight loss through early satiety; examples include laparoscopic adjustable gastric banding (LAGB) and sleeve gastrectomy. Malabsorptive procedures limit the gut surface area for digestion and absorption, but these procedures are not now commonly performed. Roux-en-Y gastric bypass (RYGB), which is commonly performed laparoscopically, combines restriction and malabsorption. Fluoroscopy and CT are the main post-operative imaging modalities; radiologists should understand the surgical anatomy in order to identify normal findings as well as complications. Complications of RYGB include gastrojejunal anastomotic leak and abscess formation, gastrogastric fistula, and small bowel obstruction secondary to strictures or internal herniae. Band slippage and stomal stenosis can occur after LAGB. CONCLUSION: Providers of radiology services should be aware of the technical and staffing requirements, surgical anatomy and post-operative imaging findings of bariatric surgery.

e1622

The larger patient and ultrasound

Khan, Z.A.[1], Enver, M.K.[2], Hegarty, S.[1]
[1]Salisbury District Hospital, Salisbury, UK, [2]Southampton General Hospital, Southampton, UK

PURPOSE: About 46% of men in England and 32% of women are overweight and an additional 17% of men and 21% of women are obese. Ultrasound energy is attenuated by fat tissue, e.g. at the frequency range normally used for abdominal imaging, 50% of the beam intensity is attenuated when the beam travels through 1 cm of fat. Remarkably, the extent of inadequate imaging secondary to a high BMI is still not known. We sought to determine the proportion of patients in which abdominal ultrasound imaging was inadequate. MATERIALS/METHODS: All patients attending the ultrasound department were scanned over a 2-week period. Their weight and height were measured and BMI calculated. A questionnaire was filled in following the scan to determine if body habitus was a limiting factor in the ability to confidently exclude pathology in intrabdominal solid organs (liver, biliary system, kidneys and spleen). 92 patients were included in the study. 35 patients were overweight; 25 patients obese and 5 patients were morbidly obese. RESULTS: In patients with a BMI of 30 or above, ultrasound was unable to exclude pathology in the liver and biliary system, which when compared with the non-obese group was statistically significant ($p<0.001$ Fisher's exact test). CONCLUSION: When imaging obese patients, referring clinicians need to be aware of this finding, and alternative imaging considered as deemed appropriate.

e1623

Ultrasound measurement of intra-abdominal fat as an accurate measure of obesity and cardiovascular risk

Culverwell, A.D.
Leeds Radiology Academy, Leeds, UK

KEY LEARNING POINTS: A review of the role for ultrasound measurement of intra-abdominal fat thickness as a means for assessing cardiovascular risk and in the management of obesity. To provide a guide for the ultrasound techniques involved in measuring intra-abdominal fat. DESCRIPTION: There is increasing evidence showing that visceral fat plays a critical role in metabolic syndrome and subsequently cardiovascular disease and insulin resistance. Intra-abdominal fat content has a higher positive predictive value for metabolic syndrome and cardiovascular disease than measures of general obesity such as body mass index and hip:waist circumference ratio. MRI and CT examination has previously been adopted to measure intra-abdominal fat, however this is expensive and not readily available. Ultrasound scanning offers a non-invasive method with can be used to image body fat without radiation exposure. Several methods of ultrasound assessment of obesity have been proposed, including pararenal, perirenal, subcutaneous, pre-peritoneal and mesenteric fat thickness. The current presentation reviews the evidence behind the various methods for measuring intra-abdominal fat and provides a pictorial tutorial of the techniques used, with a particular emphasis on mesenteric and subcutaneous fat thickness. CONCLUSION: Intra-abdominal fat thickness as a measure of cardiovascular risk and obesity management has a growing evidence base and it is likely that many ultrasound departments may be required to introduce ultrasound assessment of intra-abdominal fat to assess cardiovascular risk and response to obesity management strategies. This review will provide a guide on how and why this should be done.

e1624

Service improvement and clinical efficiency model for radiologists

Narula, S.
West Hertfordshire NHS Trust, West Hertfordshire, UK

KEY LEARNING OBJECTIVES: The presentation aims to discuss: 1. Principles for successful service improvement. 2. Techniques to increase clinical efficiency. 3. Methodology for demand management. 4. Lean Thinking. DESCRIPTION: Radiology services need to be improved in the current environment of increasing demand and government initiatives for health reforms and reducing waiting times. To achieve minimal wait imaging service, clinical efficiency needs to be maximized. The principles for success include assessing capacity and demand using statistical process control charts and process mapping. Radiology departments need to validate waiting lists, use skill mix, employ lean thinking and reduce report turnaround time to meet the targets. CONCLUSION: Radiology departments share common problems and services can be improved by following simple principles. The sustainability however, will depend on robust data collection, staff involvement, strong clinical leadership, managerial support and feedback.

e1625
Audit of NM bone scans

Harding, J., Mortimer, A., Wakeley, C.
Bristol Royal Infirmary, Bristol, UK

PURPOSE: To improve the quality of bone scan reports by audit of the clinical information supplied by radiographers. MATERIALS/METHODS: Data were collected prospectively over two comparable audit periods, 9 months apart. Radiographer supplied information was collected from all patients undergoing bone scan at our institution using the forms in current clinical use. Results of the initial audit period were shared and discussed with the relevant radiographers prior to re-audit. Radiographers were blind to both audit periods. RESULTS: Initial audit revealed that the injection site was recorded in 42 of 55 (76.4%) cases rising to 60 of 62 (96.7%) in the re-audit. Extra clinical information was given in only 11 of 55 (20%) of the first audit rising to 20 of 62 (32.3%). Failure to document injection site in the first audit caused reporting problems in 6 of 13 cases but 0 of 2 cases in the re-audit. Similarly, extra clinical information was given in 9 of 16 cases when it would have been beneficial to the reporting radiologist in the initial audit, rising to 9 of 12 cases in the re-audit. CONCLUSION: Initial audit established the importance of documenting the site of radioisotope injection and documenting relevant clinical information to enable appropriate reports. On both counts, performance markedly improved in the re-audit though have not yet reached the audit standard. We propose a change in practice where patients complete their own extra clinical information form whilst awaiting their scan and if there is none relevant, positive recording of this to supply the reporting radiologist with all the required relevant information.

e1626
Impact of PACS in fracture clinics

Shuen, V.[1], Gray, R.[1], Conroy, D.[2], Cooper, J.[2]
[1]Plymouth Hospitals NHS Trust, Plymouth, UK, [2]University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK

PURPOSE: Picture Archiving and Communications System (PACS), enables images to be stored electronically and viewed on screens, so that images can be accessed and compared conveniently. Current literature suggests conflicting evidence on whether PACS can improve business efficiency and productivity gain. The aim was to determine the efficiency of PACS in an imaging dependent fracture clinic by measuring patient journey time pre and post introduction of PACS. METHODS: A prospective observational study from the fracture clinic of a teaching hospital. 2 weeks of patient journey times were recorded pre-introduction of PACS, 2 weeks and 18 weeks post introduction of PACS. RESULTS: 1454 patients were seen in the fracture clinics in this 6 weeks period. 453, 516, 485 patients were seen in the pre-introduction, 2 weeks and 18 weeks post introduction of PACS, respectively. Using analysis of covariance, the total number of patients seen in these three different periods had a *p*-value 0.18. The difference in the total patient journey time in these three periods had a *p*-value 0.821. CONCLUSION: From this study, there is no significant difference in patient journey time pre and post introduction of PACS. The benefits of PACS in terms of no lost films, the ease of locating and comparing images, does not increase the efficiency of fracture clinic. Thus, it raises the question of cost-effectiveness of implementing PACS in the clinical setting.

Developments in technology

p1701
Dual energy plain film imaging of the chest

Oates, A.J., Bhartia, B.
Leeds General Infirmary, Leeds, UK

KEY LEARNING OBJECTIVES: To understand the physics and principles of dual energy radiography in plain film chest imaging. What is dual energy imaging? Involves the acquisition of radiographic images using two different energy levels of X-ray photons, typically 60–80 kVp and 110–150 kVp simultaneously or in quick succession. The images obtained at the lower kVp energy level will exhibit relatively greater contrast between calcium and soft tissue due to the predominance of photoelectric interactions. Conversely, with the high kVp energy levels, the contrast of calcium containing structures compared to soft tissue will be reduced. Using a subtraction algorithm it is possible to separate tissues containing high atomic number material such as calcium and iodine, from soft tissue. In chest radiography the information is displayed as three images: (a) Standard PA image; (b) Soft-tissue, an image of the chest with the bones eliminated; (c) Bone, an image of the skeleton with soft tissues eliminated. CONCLUSION: The PA and lateral chest radiograph have a low sensitivity for the detection of pulmonary nodules. Recent studies have demonstrated that dual-energy subtraction radiography can improve the detection of lung nodules by eliminating overlying bony structures.

p1702
Experiences of computed radiography in The Breast Screening Programme

Howard, K.[1], Worrall, M.[1], Mercer, C.[2], Maxwell, A.[2]
[1]The Christie NHS Foundation Trust, Manchester, UK, [2]Royal Bolton Hospital NHS Foundation Trust, Bolton, UK

PURPOSE: The Cancer Reform Strategy requires all NHS Breast Screening Units to implement digital mammography by 2010. A number of computed radiography (CR) systems have been approved for screening. We present our experiences of the Konica Minolta Regius 190 CR system with CP-1M cassettes (44 μm resolution) which is being clinically evaluated at Bolton Breast Screening Unit. MATERIALS/METHODS: Medical physics commissioning and QA checks of the CR system and GE DMR X-ray unit were performed. 240 of the intended 500 women have been screened to date. Softcopy images were assessed using Eizo 5 megapixel monitors. Training was provided to staff on image acquisition, storage and transfer. Film readers were trained in softcopy reporting. Parameters evaluated included appointment time, equipment faults, image quality and mean glandular dose (MGD). Staff also recorded a log of their observations throughout the trial. RESULTS: Image quality of the system assessed using TOR(MAM) and CDMAM test objects was excellent. The MGD to the standard breast was 2.04 mGy. There were some initial difficulties regarding data transfer to the reporting workstation. Although Konica provided prompt solutions it was necessary at the start of the trial to extend appointment times to ensure continuity of patient throughput. CONCLUSION: This has been an excellent learning experience for the move to digital screening. It has provided an opportunity for film readers to develop softcopy reporting skills. We have an enhanced awareness of areas where problems are likely to arise and how these can be resolved with minimum impact on the service.

p1703
Characteristics and reproducibility of the arterial input function in renal DCE-MRI studies

Mendichovszky, I.A.[1], Cutajar, M.[2], Gordon, I.[2]
[1]University of Manchester, Manchester, UK, [2]UCL Institute of Child Health, London, UK

PURPOSE: The aim of this study was to investigate the characteristics of the aortic input function (AIF) in renal DCE-MRI studies and their effect on renal functional parameters (perfusion and glomerular filtration rate – GFR) calculated using a two-compartment model analysis. Inter-observer agreement, effect of size of region of interest (ROI) in the aorta and reproducibility has been evaluated. METHODS: Ten healthy volunteers underwent two identical renal DCE-MRI studies under similar physiological conditions. After data acquisition two independent observers drew two different sized ROIs on each study and plotted the average signal intensity over time. The assessed parameters were maximum height, FWHM and area under the AIF. Each AIF was used in conjunction with a parenchymal renal ROI to generate renal perfusion and GFR. *t*-tests were performed to quantify differences between the two observers, the two AIF ROI sizes, the two studies performed on different days and the effect of AIF on renal functional parameters. RESULTS: Paired *t*-tests showed inter-observer agreement (correlation coefficients > 0.85, *p*-values > 0.82) for all AIF parameters. The size of the aortic ROIs significantly affected all calculated AIF (*p*-values < 0.039) and functional renal parameters (*p*-values < 0.011). Good intra-individual reproducibility was found (*p*-values > 0.22) but with a wide standard error of the estimate of AIF parameters (correlation coefficients range 0.66–0.82). CONCLUSION: AIF parameters are reproducible over time and within individuals (with good inter-observer agreement), but the size of the AIF is crucial for renal perfusion and GFR calculation in DCE-MRI studies.

p1704
Computer aided quantification of lumbar intervertebral disc degeneration in MRI

Michopoulou, S.[1], Costaridou, L.[2], Kazantzi, A.[3],
Panagiotopoulos, E.[4], Speller, R.[1], Panagiotakis, G.[2], Todd-Pokropek, A.[1]
[1]Department of Medical Physics and Bioengineering, University College London, London, UK, [2]Department of Medical Physics, University of Patras, Patras, Greece, [3]Department of Radiology, University of Patras, Patras, Greece, [4]Department of Orthopaedics, University of Patras, Patras, Greece

PURPOSE: According to recent studies disc signal intensity is the most sensitive indicator of disc degeneration, and the earliest degenerative change seen in MRI. Currently, the evaluation of disc degeneration severity is based on visual interpretation or semi-quantitative measurements of disc signal intensity. In this study, an image analysis system for automated segmentation of intervertebral discs and quantification of disc intensity inhomogeneity is introduced, aiming to characterize disc degeneration severity. MATERIALS/METHODS: 170 intervertebral discs from T_2 weighted midsaggital MR images of 34 patients' lumbar spines were analysed. All discs were segmented utilizing a hybrid algorithm combining fuzzy clustering with atlas based segmentation, requiring 2 user defined landmarks. 4 first and 28 second order (co-occurrence) textural descriptors were extracted from each segmented intervertebral disc region. Mean signal disc intensity was used as reference for testing the discriminant power of descriptors in evaluating disc degeneration severity. RESULTS: The hybrid segmentation algorithm demonstrated robust behaviour and achieved high accuracy (Dice Similarity Index=0.87). Entropy and variance inhomogeneity descriptors derived from co-occurrence matrices were found to be highly correlated to discs' mean signal intensity (Pearson's r=0.92 and r=0.91, respectively). Measurements repeatability, subject to manual landmark variation, was very high resulting in Intraclass Correlation Coefficients greater than 99%. CONCLUSION: The potential of disc signal inhomogeneity descriptors in evaluating disc degeneration severity was demonstrated. The proposed image analysis system will be a valuable tool in hands of imaging experts and clinicians for automated evaluation of disc degeneration severity, in a precise and repeatable manner.

e1705
Computer aided detection systems in the diagnosis of pulmonary nodules

Saba, L., Mallarini, G.
A.O.U. Cagliari, Cagliari, Italy

LEARNING OBJECTIVES: 1. To review the current indications for performing pulmonary nodule computer aided detection system (CAD). 2. To describe a pulmonary nodule CAD system and logical pathway to obtain the nodule detection. 3. To learn the CT technical parameters and the software to be used. 4. To understand the actual limits of CAD systems and with a focus on the "False Positive" problem. BACKGROUND: Lung cancers keep ranking as the leading cause of cancer-related death in the Western World. Early detection of lung cancer may allow a more timely therapeutic intervention and a more favourable patient prognosis. The sensitivity of multi-detector-row CT is higher in the detection of lung cancer than chest radiography and the development of multi-detector-row CT technology has made possible to acquire data of lungs with unprecedented spatial resolution. PROCEDURE DETAILS: We present an educational exhibit where we will analyse: 1. Indications for performing pulmonary nodule CAD, underlining radiation exposure, cost, diagnostic efficacy, sensitivity and specificity. 2. Mathematical introduction about pulmonary CAD and principles of segmentation. 3. Logical pathway to obtain the nodule detection. 4. CT technical parameters and the software to be used. 5. Limits of CAD systems. CONCLUSION: The efficacy of CAD systems is very high by using it together with radiologist. In CT data analysis a problem to be solved is the high number of false positive.

e1706
Clinical applications of T-Class technology in MRI

Moore, K.A.
Siemens Healthcare, Frimley, UK

KEY LEARNING OBJECTIVES: An understanding of: Siemens T-Class technology (Powered by TIM (Total Imaging Matrix) technology). The applications and uses of T-Class. The advantages of T-Class to clinicians, operators and patients. DESCRIPTION: TimCT is the latest innovation in MRI scanning where the table moves continuously moves during scanning similar to a CT scanner. This technique can be utilized in examinations where a large FOV is required for whole body MRA examinations and in the staging of malignant diseases. The advantages are; fast workflow through the ease of examination set up and post processing, increased patient comfort and improvements in image quality. syngo Composing enables automatic image composition of multi-step examinations, using either an anatomical or angiographic algorithm. Adjacent images are fused into one image with full coverage of the extended FOV. In addition to viewing large body regions as one image, composed images can be loaded into the examination card for planning purposes. Tim Planning Suite: TPS software allows the simultaneous planning of multiple anatomical areas of the same image weighting, using set'n'go protocols on composed images. TPS provides the operator with an optimized workflow for scanning multiorgan regions or large FOVs. CONCLUSIONS: The use of T-Class technology brings remarkable clinical advantages to MRI. This feature has many advantages for scanning the whole body, whole spine and in MRA examinations, not to mention its application in the scanning of patients in short bore systems.

e1707
Higher concentration contrast media for MDCT of the liver

Lepanto, L.
CHUM Hospital of St Luc, Montreal, QC, Canada

PURPOSE: To evaluate the potential benefit of higher concentration CM (HCCM, 370-400 mgI ml^{-1}) for multiphasic MDCT of the liver. MATERIALS/METHODS: Two recently conducted studies compared a moderate concentration CM (320 mgI ml^{-1}) with a HCCM for first pass angiography and equilibrium phase MDCT imaging of the liver. In both trials, all patients received equiiodine (40 gI) doses of CM injected at 4 ml s^{-1}, improving the likelihood that any observed differences can be ascribed solely to the CM concentration. RESULTS: In one trial, 121 patients undergoing liver MDCT received iodixanol-320 (n=61) or iopamidol-370 (n=60) [1]. The HCCM iopamidol-370 provided significantly higher HU values in abdominal aorta during the arterial phase of enhancement for both readers (R1: 301.3 vs 273.6 HU, p=0.02; R2: 302.0 vs 275.1 HU, p=0.03). In a second trial, 183 patients undergoing liver MDCT received iodixanol-320 (n=92) or iomeprol-400 (n=91) [2]. Iomeprol-400 produced significantly greater enhancement of the aorta during the arterial phase for both blinded readers (R1: 337.3 vs 294.9 HU, p=0.0004; R2: 325.7 vs 295.3 HU, p=0.01) and greater enhancement of liver parenchyma during the portal-venous phase (R1: 115.1 vs 108.6 HU, p=0.04; R2: 115.2 vs 109.3 HU, p=0.05). CONCLUSION: The use of CM with higher iodine concentration (370–400 mgI ml^{-1}) results in greater enhancement for vascular phase imaging. The finding that parenchymal phase imaging may also be improved with the use of HCCM deserves further clinical evaluation. References: 1. Sahani DV. *Invest Radiol* 2007. 2. Romano L. *Br J Radiol*. 2009.

e1708

In vivo relationship between cross-sectional area and CTDI in abdominal MDCT with automatic exposure control

Meeson, S., Alvey, C.M., Golding, S.J.
University of Oxford, Oxford, UK

PURPOSE: Patient mass and body mass index are not ideal estimates of patient size as they ignore differences in build and physical symptoms such as abdominal distension. In CT, cross-sectional area may be a suitable measure of patient size and the relationship between patient cross-sectional area and both volume CT dose index (CTDI) and dose–length product (DLP) was explored for abdominal CT *in vivo*. MATERIALS/METHODS: As part of a year-long retrospective survey of patients with multidetector row CT scans for symptoms of abdominal sepsis, cross-sectional areas were estimated using customised ellipses at the level of the middle of vertebra L3. The relationship between cross-sectional area and the exposure parameters was explored. Scans were performed using a LightSpeed 16 system (GE Healthcare Medical Systems, Slough, UK; Milwaukee, WI) operated with automatic tube current modulation. RESULTS: From a survey of 94 patients the CTDI increased with the increase in patient cross-sectional area. The relationship was logarithmic rather than linear, with a least-squares fit to the data (R^2 = 0.80). Considering area only, the DLP also rose with increasing cross-sectional area and the relationship was non-linear. CONCLUSION: For abdominal CT cross-sectional area gave a measure of patient size from the region of the body to be exposed. Exposure parameters increased with increasing cross-sectional area and the greater radiation exposure of larger patients was partly a consequence of their size. Given increasing obesity levels, patient size should also be considered when accounting for population dose increases associated with CT.

Radiation Protection

p1801

Risk from dental cone beam computed tomography and risk reduction – SEDENTEXCT Project

Theodorakou, C.[1], Walker, A.[2], Horner, K.[3], Bogaerts, R.[4], Lindh, C.[5], Baciut, M.[6], Tsiklakis, K.[7], Ivanauskaite, D.[8], Walker, A.[9]
[1]Christie Hospital & School of Dentistry, University of Manchester, Manchester, UK, [2]Christie Hospital, Manchester, UK, [3]University of Manchester, Manchester, UK, [4]Katholieke Universiteit Leuven, Leuven, Belgium, [5]Malmö University, Malmö, Sweden, [6]"Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania, [7]National and Kapodistrian University of Athens, Athens, Greece, [8]Vilnius University, Vilnius, Lithuania, [9]Leeds Test Objects Ltd, Boroughbridge, UK

The SEDENTEXCT project (2009–2011) is a collaborative European project that aims to acquire key information essential for sound and scientifically-based clinical use of dental Cone Beam Computed Tomography (CBCT). A further aim of the project is to use the information to develop evidence-based guidelines dealing with justification, optimization and referral criteria and to provide a means for dissemination and training for users of CBCT. It is supported by the 7th European Framework Programme of the European Atomic Energy Committee (EURATOM) and it is a collaboration of six European universities and one UK company. Dental CBCT is an emerging X-ray technology and its ability to provide three-dimensional imaging makes it an attractive method for many dental applications. It is, however, associated with a higher radiation risk than conventional X-ray dental imaging. In addition, in most European countries, dentists can use CBCT units without any additional training. There is evidence in the literature of inappropriate and excessive use of conventional dental X-ray imaging and of poor image quality due to insufficient quality assurance programmes. The motivation behind this project is the concern that dental CBCT will be used inappropriately which might result in an increase of the radiation risk to adult and paediatric patients. This poster aims to provide the scientific and medical community with detailed information on the aims, objectives, work packages and participants of the SEDENTEXCT project.

p1802

Area radiation monitoring and designation for the first stereotactic radiosurgery (SRS) CyberKnife Unit in the UK

Khan, S.
Radiation Consultancy Services Ltd., Twickenham, UK

The dose delivery technique from the CyberKnife, manufactured by Accuray™, is fundamentally different to conventional linear accelerators. The unit is used for stereotactic radiosurgery and comprises a linear accelerator mounted on the arm of a robotic system. Although in principle numerous beam direction and positions are possible, in practice the irradiation angles are limited both on the horizontal and vertical planes. Furthermore, the beams are required to pass through a small spherical volume around the isocentre. The first UK CyberKnife facility is located in the basement of a historic building in central London. The shielding design had to take into account space limitations and restrictions due to permanent construction features; the shielding material of choice was lead and a direct-shielded door was incorporated. The existing facilities and activities around the treatment room included offices, waiting areas, treatment and examination rooms, utility rooms, corridors, lifts and service shafts. Following on from the initial shielding test of the facility, a comprehensive passive area radiation monitoring programme was incorporated to re-confirm the expected time averaged dose rate values and to review the area designations. This presentation will summarize the results of the initial shielding tests and detail the passive radiation area monitoring. The arising area designation and radiation protection management measures will also be discussed.

p1803

Measuring environmental and adventitious doses around X-ray insulations

Khafaji, M.[1], Rawlings, D.[2], Moore, M.[2]
[1]King Abdulaziz University, Jeddah, Saudi Arabia, [2]Freeman Hospital, Newcastle upon Tyne, UK

OBJECTIVE: To demonstrate the validity of using computed radiography (CR) imaging cassettes as a means, other than via

personal monitoring results, of measuring X-ray scatter dose to public and workers. METHODS: CR plates were used to measure scatter doses in both a CT room and an orthopaedic theatre. CR plates from both Agfa and Kodak systems are used to measure the dose in a fluoroscopy station at different time intervals. FINDINGS: CR plates were found to measure doses as low as 0.1 μGy. CONCLUSION: CR plates can be used to measure environmental scatter dose around X-ray insulations. DISCUSSION: There is a ongoing requirement, as defined in the UK Ionising Radiations Regulations (1999) (IRR99), to carry out environmental monitoring within and around radiation controlled areas. Passive detectors, such as those routinely used for personal monitoring do not generally have sufficient sensitivity to allow integrated dose measurements over the timescale of an individual patient procedure. CR plates are readily available within X-ray departments and enable local staff to measure scatter resulting from an individual patient procedure and therefore satisfy an important requirement of IRR99.

p1804

Dose reduction in CT – A phantom study into the use of post-processing filters

Bateman, L., Hiles, P.A., Bhonsle, U.S.
North Wales NHS Trust, Bodelwyddan, UK

Advanced adaptive post-processing filters are being produced to enhance image quality by simultaneously reducing image noise and enhancing edges and low contrast details. This has the potential of leading to a reduction in the radiation dose required. They vary from traditional processing algorithms by examining the significance of each pixel in an image in relation to the wider context in which they appear. In this way, once the structure is identified and analysed, noise can be suppressed and the true structure, however weak, can be emphasised and seen more clearly. This assessment consisted of acquiring CT images of CATPHAN image quality phantom using a range of mAs settings. The resulting images were then processed using "Adaptive contextual filtering" provided by SharpView CT and the quality of the resultant images assessed by qualitative and quantitative methods (including low contrast detectability and image noise measurement) and compared with images acquired using local standard scan protocols. Diagnostic performance and dose saving results will be presented.

e1805

Regional diagnostic reference level for cephalometric examinations

Howard, K., Walker, A.
The Christie NHS Foundation Trust, Manchester, UK

PURPOSE: To produce a regional diagnostic reference level (DRL) for cephalometric examinations in terms of entrance surface dose (ESD). METHODS: In dental radiology, national DRLs exist at present for orthopantographic and intra-oral examinations, but not for cephalometric examinations. Questionnaires were sent to all 35 users of cephalometric equipment within the North Western Medical Physics customer base in the North West, requesting protocol information. These data and measurements of the equipment (tube output, filtration and geometry) were used to calculate ESDs and set a "regional" DRL. RESULTS: Protocol data were received from 60% of users. The mean ESD was 132 μGy and the third quartile was 146 μGy. This is 50% of the ESD quoted in the ICRP Supporting Guidance 2 document, published in 2002. CONCLUSION: It was possible to set a "regional" DRL, using the third quartile of the spread of data. Local results are now compared against the "regional" DRL as a first step in the optimization process.

e1806

Incorrect patient positioning affects radiation dose and image quality in CT with automatic exposure control

Gudjonsdottir, J.[1,2], Svensson, J.R.[3], Campling, S.[3], Brennan, P.C.[4], Jonsdottir, B.[2]
[1]University of Iceland, Reykjavík, Iceland, [2]Röntgen Domus Medica, Reykjavik, Iceland, [3]Anglia Ruskin University, Cambridge, UK, [4]UCD School of Medicine and Medical Science, Dublin, Ireland

PURPOSE: This study evaluated the effects of patient centring on tube-current–time product (mAs) and image noise when AEC was used. MATERIALS/METHODS: An oval shaped acrylic phantom was scanned in various off-centre positions, at 30 mm intervals within a 500 mm field of view, using three different CT scanners (GE Lightspeed Pro, Phlilips Brilliance and Siemens Somatom Definition). mAs values were recorded and noise measured in the images using E-film. mAs and noise was correlated with phantom position using Pearson correlation analysis. RESULTS: In all three scanners the mAs delivered by the AEC changed with phantom elevation. When the phantom was positioned higher in the gantry the mAs values were higher in scanners A and B ($r=0.98$, $p<0.001$), but lower in scanner C ($r=-0.98$, $p<0.001$). Compared with isocentre positioning of the phantom, the mAs varied with elevation by up to +70%, -34% and +56% in scanners A, B and C, respectively. For scanners A and B, noise in ROIs in the lower part of the phantom decreased with elevation (r from -0.95 to -0.86, $p<0.02$). With lateral off-centring, mAs changed by a maximum of 4.9% from the isocentric position and significant noise relationships ($p<0.005$) were only seen in scanner A. CONCLUSION: This study demonstrates that patient centring markedly affects the mAs delivered by the AEC and that changes vary between scanners. Image noise is also affected. Off-centre patient positions cause errors in tube current modulation that can outweigh the dose reduction gained by AEC use and image quality is affected.

e1807

Dose exposure levels in 16-MDCT and 64-MDCT

Irwan, R., de Vries, H.B.K.
Toshiba Medical Systems Europe, Zoetermeer, The Netherlands

PURPOSE: To evaluate the impact of scan length on the exposure levels at 16-row multidetector computer tomography (MDCT) and 64-row MDCT. MATERIALS/METHODS: For air dose measurements we used a calibrated pencil dosimeter that is put exactly in the isocenter of the gantry. As these were point measurements, the number of rotations represented the object length. Collimations were 16×0.5 mm and 64×0.5 mm, respectively, and rotation time was set to 500 ms. Control of effective mAs is necessary to keep constant image quality. Tube current and voltage were therefore kept the same; that is 139 mAs and 120 kV, respectively. Dose–length product (DLP) values were determined to compare exposure levels in 16- and 64-row MDCT. RESULTS: For scan slice thickness under 2 mm, the exposure levels of 64-row MDCT are lower than those of 16-row MSCT when scanning an object larger than 12.3 cm. At this value the plots of the 16- and 64-row DLP values versus scan length cross. CONCLUSION: The crossing of DLP curves obtained in MDCT at different numbers of detector rows has not been published before. Differences in object size may thus explain apparent discrepancies between previous studies reporting either higher or lower effective exposure levels at 64-row MDCT as compared with 16-row MDCT.

e1808

Computed tomography radiation doses: What you should know and how to minimize it

Oh, T.C.[1], Liew, S.[1], White, R.D.[2], Wilson, P.[1]
[1]Manchester Royal Infirmary, Manchester, UK, [2]Ninewells Hospital, Dundee, UK

KEY LEARNING OBJECTIVES: 1. To understand CT radiation doses in terms of cancer risk posed. 2. Be aware of the methods for reducing

CT radiation dose by understanding the contributing parameters. DESCRIPTION: CT usage is ever increasing in the UK, and it has become the "standard examination" in many clinical scenarios. Multi-phase examinations and repeated exams are frequently performed, often in young patients. However, despite its increasing use, many clinicians seemingly fail to appreciate the quantity of radiation delivered to the patient, i.e. the radiation dose. Understanding why CT radiation doses are potentially higher than other radiation sources is key. Standard doses in CT and other examinations are compared, and relative cancer-causing risks evaluated. We explain the concepts of CT dose index (CTDI) and dose–length product (DLP) and focus on how dose can be reduced by applying knowledge of the variables involved (e.g. tube current, peak kilovoltage, pitch and gantry rotation time). Alternative strategies are examined and consideration for alternative imaging modalities. CONCLUSION: It is estimated that the annual number of CT examinations in the UK has increased over 7-fold in the last 15 years, contributing to over 40% of the collective effective dose. Therefore, it is important to educate clinicians on patient dose from CT examinations, ensuring comprehension of radiation risk estimates and protocol optimisation along with various dose-minimization strategies.

e1809

Dose reduction in CT – An anthropomorphic phantom study into the use of post-processing filters

Hiles, P.A., Bateman, L., Bhonsle, U.S.
North Wales NHS Trust, Bodelwyddan, UK

It is desirable to lower the dose from CT examinations as much as possible without reducing diagnostic performance. Mathematical post-processing filters are one tool to achieve dose reduction. The product SharpView® CT is an adaptive non-linear filter based on mathematical algorithms that resemble the human vision system. The software analyses each part of the picture and removing random noise whilst enhancing contrast and edges. This technology is said to improve image quality and can be used as a tool to reduce CT radiation dose. This assessment consisted of acquiring CT images of an anthropomorphic phantom using a range of mAs settings. The resulting images were then processed using "Adaptive contextual filtering" and the quality of the resultant images assessed by CT Radiologists and compared with images acquired using local standard scan protocols. Diagnostic performance and dose saving results will be presented.

Equipment & quality assurance

p1901

An investigation of the inter-operator precision associated with two different methods of ultrasound quality assurance

Green, L., Pickett, N., Rendell, L., Knapp, K., Summers, I.R.,
Heales, C.J.
University of Exeter, Exeter, UK

PURPOSE: Ultrasound quality assurance (QA) typically relies upon subjective measurements of phantoms. This work seeks to compare a conventional method of ultrasound QA with an objective, software-driven 3D Ultrasound QC System (Northern-Physics). MATERIALS/METHODS: A Sonoline Versa-Pro ultrasound machine, 7.5 MHz probe, and abdomen default-settings were used with a 3D-artificial cyst-phantom (TCC-instruments). The phantom was scanned and analysed, 5 times by 3 independent operators, recording parameters relating to void detectability, spatial resolution, and working range. The probe was then positioned in a step-driver and 3D-data acquired and analysed recording spatial resolution, SNR and working range, 10 times by the 3 operators, using the Northern-Physics software. RESULTS: The inter-operator precision for the manual readings of the cyst-phantom ranged from a co-efficient of variance (CV) of 10.55% to 24.43% for the cyst/void visualization, (the best precision being associated with the 3 mm and 4 mm cysts/voids and the poorer precision with the 1 mm cysts/voids). The CV for the working range was 12.94%. Using the RTI software, the precision for resolution (autocorrelation) ranged from a CV of 3.74% in the azimuthal plane to 7.10% in the axial plane. The CV for SNR was 3.11% and for the working range was 7.14%. CONCLUSION: It would appear that using a more objective system (Northern-Physics test-tool) provides a more precise method for the measurement of ultrasound QA parameters. Further work is required to determine the medium and long-term precision of such a technique, and to determine its sensitivity in terms of detecting small changes in ultrasound probe performance.

p1902

New quality assurance techniques for digital dental equipment

Bate, N.S.[1], Darragh, C.[2]
[1]NHS Lothian, Edinburgh, UK, [2]NHS National Services Scotland, Edinburgh, UK

PURPOSE: The intra-oral dental radiography service in NHS Lothian has recently begun the transition from film to digital acquisition. Two dental phantoms have been assessed, CDDENT and TO.UniDENT, for their capability to quantify image quality. Linking image quality with dose enables advice to be given to users regarding optimal equipment settings in the clinical environment. METHOD: The systems used were Instrumentarium and Kodak X-ray units in conjunction with Instrumentarium Sigma-M and Schick digital sensors. The phantoms were imaged using a range of dose levels to investigate the dose/image quality trade off with each system. The CDDENT software analysed each image and calculated a figure of merit (IQFInv). By assessing the IQFInv data, peak image quality settings could be suggested. TO.UniDENT is a subjective test, requiring the user to decide on the dose at which tissue-mimicking materials deliver the required density to an image to ascertain optimal exposure conditions. Once these conditions are determined, anatomical phantoms can be utilised to monitor the appearance of clinical details. RESULTS: Optimized exposures were determined for each combination of sensors and X-ray unit, allowing individual recommendations to be made. This will make a direct contribution to ensuring clinical images being used for patient diagnosis are good quality, in addition to adhering to the underlying radiation protection principle of utilizing radiation doses which are as low as reasonably achievable, commensurate with the required clinical image quality. CONCLUSION: The phantoms evaluated both have their place in the setting up of digital dental X-ray systems.

p1903

The impact of ultrasound-probe frequency on signal-to-noise, spatial resolution and working range

Green, L., Pickett, N., Rendell, L., Summers, I.R., Heales, C.J.
University of Exeter, Exeter, UK

PURPOSE: Ultrasound operators select the frequency probe depending on the clinical application, with lower frequency probes being used when a greater working-range is required. However, the trade-off is that spatial resolution is reduced. The aim of this work is to quantify, using the TCC 3D Ultrasound QC system (Northern-Physics), the associated changes in signal to noise ratio (SNR), working-range and resolution between two different frequency ultrasound probes, providing an objective demonstration of the impact that probe choice makes on ultrasound image quality. MATERIALS/METHODS: A Sonoline Versa-Pro ultrasound machine, and abdomen default-settings were used with both the 3.5 MHz and 7.5 MHz ultrasound probes. The RTI phantom was scanned and analysed 10 times, and the parameters relating to SNR, spatial resolution and working-range recorded. RESULTS: With the 3.5 MHz probe, the working-range was 12.07 cm (SD 0.21), reducing to 5.54 cm (SD 0.42) with the 7.5 MHz probe. The resolution (auto-correlation) for the 3.5 MHz probe, in the elevational plane was 1.52 ACwEl. 0.5 (mm) (SD 0.13) and 0.78 ACwEl. 0.5 (mm) (SD 0.03) for the 7.5 MHz probe. The SNRmax was also lower for the 3.5 MHz probe, 4.5 (SD 0.21) compared with 9.71 (0.31) for the 7.5 MHz probe. CONCLUSION: The RTI ultrasound QA test tool provides a quantifiable means of demonstrating the impact that the choice of ultrasound probe has on ultrasound image quality, which may be of use to learners.

p1904

An investigation of the sensitivity of two ultrasound quality assurance systems to changes in probe performance

Green, L., Pickett, N., Rendell, L., Knapp, K., Summers, I.R., Heales, C.J.
University of Exeter, Exeter, UK

PURPOSE: An ultrasound quality-assurance phantom needs to be able to detect subtle changes in performance which might impact upon diagnosis. The aim of this work is to compare a conventional resolution-phantom (CIRS) with the TCC 3D-Ultrasound QC-System. Both methods provide information about void-detectability, spatial-resolution and working-range, using different parameters. MATERIALS/METHODS: A Sonoline Versa-Pro ultrasound machine, 7.5 MHz probe, and abdomen default-settings were used with both phantoms. Each phantom was scanned and analysed five times, and the parameters relating to contrast, spatial-resolution and working-range recorded. Measurements were repeated with the addition of two layers of thin tape over the probe to mimic probe degradation. RESULTS: Both systems detected differences in contrast and resolution following the addition of tape. The mean epth at which the different sized artificial-cysts could be visualised on the CIRS phantom reduced in all cases, typically by less than one row. The SNRmax measurements from the TCC system demonstrated a reduction from a mean of 9.86 (SD 0.21) to 9.36 (SD 0.11), and a measureable decrease in resolution (autocorrelation) 0.714 ACwEl(mm) (SD 0.10) in the elevational plane to 0.724 ACwEl(mm) (SD 0.05)). The RTI system revealed a difference in working-range from 5.4 cm (SD 0.07) to 5.2 cm (SD 0.10) whereas the CIRS system did not detect a difference. CONCLUSION: Both systems are equally sensitive to the induced changes in probe performance, other than the measure of working-range. Further work is required to determine the amount of variation in these parameters which would be associated with an adverse clinical impact.

Digital imaging & health informatics

p2001

Is your PACS performing?

Prescod, K.[1], Gad, A.[2], Regi, j.[1], Isaac, A.[1]
[1]North Bristol NHS Trust, Bristol, UK, [2]Glostrup Hospital, Copenhagen, Denmark

KEY LEARNING OBJECTIVES: An initial comparative table of European PACS systems. DESCRIPTION. Most hospitals have now established inbuilt PACS and DICOM systems with technical support and have had a few years for the information system to acclimatise with the average workflow through the hospital. However, as with driving a car, not everything works perfectly. Fortunately, for car drivers, there are many independent comparative reviews with an objective assessment and comparison of features before buying. In choosing a PACS/DICOM system for a hospital or region, however, the approach is different. Multiple offers from different manufacturers to a multifaceted team consisting of the users, IT department and financial controllers. We have compiled an evaluation of the PACS specifications from IT development department from medium to large teaching hospitals combined, simultaneously, with a questionnaire highlighting the god aspects and short fall in the respective systems. We aim in our investigation to provide a basic comparison of the existing PACS systems in use for PACS drivers. CONCLUSION: A comparative guide to the different PACS systems available from manufactures is necessary as guide in choosing which system implement and the support and accessories necessary to maintain adequate running of PACS for any given hospital/region.

p2002

An audit looking at the quality of teleradiology in emergency out-of-hours CT and MR scans

Udani, S.D., Mole, T.B., Seriki, D.
Lancashire Teaching Hospitals, Preston, UK

PURPOSE: The use of teleradiology is rapidly expanding. The purpose of this audit was to provide quantative data and to examine how teleradiology is affecting the quality of our out-of-hours emergency care at Lancashire Teaching Hospitals. MATERIALS/METHODS: 75 patients who had either emergency out-of-hours CT or MR scans where selected from our Picture Archiving and Communications System (PACS) database. Details of scan times, verbal report times and times of issuing full reports where collected from this system. The clinical notes where examined for documentation of the teleradiology reports. The times of reports as well as quality of information conveyed was assessed. RESULTS: We present data of the time difference between scanning, issuing of a teleradiology provisional report and then issuing of a full report. Also we present data of whether information via teleradiology is accurately conveyed to the clinical teams. CONCLUSION: The audit will provide an insight in to our use of teleradiology in the emergency out-of-hours setting. If there are any deficiencies we suggest ways for improvement.

p2003

Audit of PACS performance in a stand alone system, prior to connection to a national network

Duncan, K.A.[1], Ryall, C.[2], Jacob, P.[1], Steel, J.[1]
[1]Royal Aberdeen Children's Hospital, Aberdeen, UK, [2]Royal Liverpool University Hospital, Liverpool, UK

PURPOSE: Recent years have seen rapid expansion of PACS throughout Radiology Departments in the UK. The majority of systems are now connected to Regional or National networks allowing review of patient images from other departments and sharing of storage facilities. The experience of this has been varied with some users finding that image delivery is slow, hampering normal workflow. Locally we installed PACS in a new build hospital prior to National procurement and installation and are still working independently. This audit was carried out to assess how well the system is currently working and will allow us to draw comparisons when linked to the national system sometime in 2009. STANDARD – a plain film image should load in 2 s. METHOD: Using both the PACS reporting system and the ward web based system, a series of 30 each CXRs, CT heads and CT body examinations were reviewed. The amount of time to fetch, load and display each examination was determined and an average calculated. RESULTS: PACS CXR 2.7 s average. Web CXR 1.9 s average. PACS CT head 2.7 s average. PACS CT body 3.0 s average. CONCLUSION: We have not noted any issues with the fetch, load and display performance of our PACS system since its installation almost 5 years ago. The display time for a CXR exceeds the standard of 2 s but includes the fetch, load and display of previous comparative images also, with a range of 1.3–4.1 s.

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