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Scientific programme abstracts Monday 2 June

0830–0930
Cervical spine trauma
0830 Invited review: Plain film basics

Adams, W.
Derriford Hospital, Plymouth, UK

The fundamentals of plain film cervical spine interpretation will be addressed. The cervical spine is one of the most commonly radiographed parts of the body and yet can be the hardest to interpret, particularly in an acute trauma setting. Injury to the cervical spine has a greater potential risk for spinal cord damage than thoracic or lumbar trauma and is a frequent cause for litigation. Poor radiographic technique and interpretation errors are responsible for a large proportion of missed cervical spine injuries. The use of multidetector CT (MDCT) for initial diagnosis rather than as a problem solving tool has led to a decrease in plain film interpretation and acquisition skills. A high index of suspicion for injury is required in the appropriate management of cervical spine trauma. This is aided by an understanding of normal anatomy and variants, physiology and an appreciation of the mechanism of injury. KEY LEARNING OBJECTIVES: Normal variants which can mimic injury; Mechanism of injury; Difficult fractures; Stable or unstable; Indications for further imaging.

0850 Invited review: Clearing the cervical spine

Sampson, M.
Southampton General Hospital, Southampton, UK

No abstract supplied.

0830–0900
Interventional drainage – tips and tricks (biopsy draining deep uretic and biliary construction)
0830 Invited review: Abdominal and pelvic drainage and biopsy techniques – or, how ultrasound can solve your access dilemmas

Weston, M.
St James' University Hospital, Leeds, UK

PURPOSE: To describe the use of ultrasound in guiding needle placement in the abdomen and pelvis. MATERIALS/METHODS: Illustrative case material describing transabdominal, transrectal and transvaginal approaches. Basic tips on drainage of abscesses and biopsy of masses. Video clips of nephrostomy insertion, omental biopsy and pelvic collection aspiration will be shown. CONCLUSION: Emphasis will be placed on the need for proper clinical indication for any procedure. Do not just treat the scan. The relative use of ultrasound and other guidance techniques will be discussed, though with an inherent bias toward ultrasound.

0855 Invited review: Biopsy and drainage: lessons from the misguided

Robertson, I.
Gartnavel General Hospital, Glasgow, UK

Image guided abstract drainage is one of the most common interventional procedures. This case led lecture will focus on key areas in successful abscess drainage including choosing image guidance: which technique? The difficult abscess: how to reach it. The most common reasons for abscess drainage failure: complications of abscess drainage.

0830–0930
From exposure to image series – basics of CR
0830 Physics of CR

Doyle, P.
Forster Green Hospital, Belfast, UK

No abstract supplied.

0855 Radiography practice with CR

Jones, T.
Morriston Hospital, Swansea, UK

No abstract supplied.

0830–0930
Picture to proton LIVE! Session 1
0830 Invited review: Seeing is believing: image contrast

Moore, E.
Philips Healthcare UK, Reigate, UK

PURPOSE: Part 1 of a 3 part teaching session aimed at radiographers, radiologists and physicists who have a very basic knowledge of MR physics. OUTCOMES: To understand the basic MR sequences and contrast mechanisms. Including spin echo and gradient echo sequences, effects of TR, TE and flip angle, STIR and flow. Based on the best selling textbook "MRI from Picture to Proton" by McRobbie, Moore, Graves & Prince (Cambridge University Press 2007 ISBN 0 521 68384 X).

0900 Invited review: Improving your image: how to avoid artefacts

Moore, E.
Philips Healthcare UK, Reigate, UK

PURPOSE: Part 2 of a 3 part teaching session aimed at radiographers, radiologists and physicists who have a very basic knowledge of MR physics. OUTCOMES: To develop an appreciation of possible artefacts in MR and be aware of artefact reduction/avoidance strategies. Including motion correction, phase errors, fat suppression, and common hardware artefacts. Based on the best selling textbook "MRI from Picture to Proton" by McRobbie, Moore, Graves & Prince (Cambridge University Press 2007 ISBN 0 521 68384 X).

0945–1050
DH Imaging Forum: Surviving as a business: will the tariff pay?
0945 Invited review: Welcome to UKRC/imaging forum

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

No abstract supplied.

0950 Invited review: Update of PBR and unbundling

Speller, J.
Department of Health, Leeds, UK

No abstract supplied.

1010 Invited review: PBR as a tool for change – a commissioning perspective

Evans, T.
Bolton PCT, Bolton, UK

No abstract supplied.

1030 Invited review: What unbundling the PBR tariff has done to the market place

Cavanagh, P.

Taunton & Somerset NHS Trust, Somerset, UK

Spells of care that have previously been paid at a single tariff can now be broken down into constituent parts to enable those parts to be commissioned from alternative providers. The overarching principle is that commissioners should not have to pay twice for diagnostics. The unbundled tariff is being used to incentivise commissioning of diagnostics as a direct access service to help reduce the amount of time people have to wait for tests and avoid inappropriate referrals to secondary care. This obviously opens up the market for alternative providers to compete with established NHS services. The Next Stage Review led by Lord Darzi due to be published in June 2008 will no doubt recommend easier access to imaging both in time and location. Unbundling the tariff is seen as one of the main levers to make this happen. As with any change there are both opportunities and threats to established services. This presentation will explore these with examples focusing how this could improve the patient's experience

1000–1130
Molecular imaging

1000 Invited review: Radionuclide therapy: a molecular approach

Mairs, R.
Cancer Research UK Beatson Laboratories, Glasgow, UK

PURPOSE: The sodium iodide symporter (NIS) transports iodine into cells. It is expressed in thyroid tissue and was recently found in a small series to be expressed in approximately 80% of human breast cancers, but not in healthy, non-lactating, breast tissue. The aim of this study was to determine whether sites of metastatic breast carcinoma could be identified with [99mTc]-pertechnetate and to quantify uptake. METHODS: 18 patients with metastatic breast carcinoma were assigned to one of two treatment groups. Patients in Group 1 (n=9) were administered 600 MBq [99mTc]-pertechnetate and patients in Group 2 (n=9) received 600 MBq [99mTc]-pertechnetate and 100–300 mg sodium perchlorate. Images were acquired at 20 min, 4 h and 24 h after injection and were reviewed by a group of evaluators who were blinded to patient history. RESULTS Sites of convincing non-physiological uptake were seen in 2/9 patients in Group 1 and 4/9 patients in Group 2. Four patients had focal areas of [99mTc]-pertechnetate activity. As a percentage of injected activity, uptake in these sites ranged from 0.2% to 1.2% at 4 h after administration and from 0.1% to 0.7% at 24 h. Physiological uptake of [99mTc]-pertechnetate impeded interpretation of images for patients in Group 1. Administration of perchlorate reduced thyroid activity although activity in the stomach and bowel was still significant. CONCLUSION: Sites of metastases from breast carcinoma were identified in 6/18 patients reviewed to date following imaging with [99mTc]-pertechnetate. Uptake in these sites encourages further study to assess potential therapeutic benefit.

1030 Invited review: Molecular neuroimaging

Tatsch, K.
University of Munich, Munich, Germany

Molecular neuroimaging has significantly broadened the knowledge provided by the conventional PET and SPECT approaches focused on perfusion and glucose metabolism. Scientists, researchers and clinicians all benefit from molecular imaging of the CNS providing almost daily new insights into basic biology and pathophysiology of brain functions and diseases. Targeting specific aspects of neurotransmission, metabolism, inflammation or plaque formation – just to mention some of the current molecular approaches – has already significant impact on establishing diagnoses, following the course of CNS disease or developing CNS drugs. Here, for three clinical relevant fields – dementias, movement disorders and glioma – recent achievements obtained by molecular neuroimaging will be discussed. Neurodegenerative dementia is an increasingly common disorder with Alzheimer's disease, dementia with Lewy bodies and frontotemporal dementia accounting for most cases. Due to the overlap in clinical symptoms their differential diagnosis may be challenging. Distinct biological differences can be helpful to confirm or exclude a specific diagnosis. In this context molecular imaging techniques directly targeting amyloid-beta plaques in the early and the differential diagnosis of Alzheimer's disease play an emerging role. Data on the time course of progression of amyloid deposits, their presence in patients with mild cognitive impairment at high risk for Alzheimer's disease and their potential role in testing new anti-amyloid drugs will provide further insights. Imaging neurotransmission increasingly gains clinical importance in patients with movement disorders. In the latter establishment of an early and accurate diagnosis has impact on patient management, helps to avoid wrong treatment and aids in the selection of patients for therapeutic trials. The well established involvement of the dopaminergic system in movement disorders is readily assessable with PET and SPECT. Recent advances in analysing tools even further improved the high diagnostic accuracy already reached for reliable diagnosis and differential diagnosis of neurodegenerative Parkinsonism, assessment of its severity, progression and response to disease modifying drugs. Assessment of newly diagnosed brain tumours as well as recurrence following multimodal treatment is also a diagnostic challenge. Currently an increasing number of different molecular pathways are followed to evaluate PET imaging in the diagnostic work-up of gliomas. Radiolabelled amino acids and its analogues are among those tracers which add indispensable information for differential diagnosis of brain tumours, delineation of tumour borders, tumour grading, estimation of prognosis, biopsy planning, monitoring therapy and assessment of recurrence. Other methods like imaging gene expression, tumour hypoxia, proliferation, membrane synthesis or neo-angiogenesis are currently evaluated and may add further perspectives on a molecular level. In summary, molecular imaging of the CNS with nuclear medicine techniques is gaining broader clinical impact and shows tremendous promise for further applications.

1100 Invited review: Molecular imaging of drug delivery

Matthews, P.
GlaxoSmithKline, Greenford, UK

No abstract supplied.

1000–1100
Trauma imaging in the future using hybrid imaging systems

1000 Invited review: Trauma imaging in the future using hybrid imaging systems

Muhr, C.
Klinikum Wels-Grieskirchen, Wels, Austria

The number and intensity of challenges facing the modern A&E environment demands that imaging keeps pace and delivers faster treatment times. Dr Muhr from the Wels-Grieskirchen Hospital in Austria will present his experiences of using a trauma hybrid solution combining a trauma X-ray unit and a CT scanner on rails in one room. He will discuss the optimized workflow experienced in his department and show the reduction in patient transfer from different systems, using the CT as the "one-stop-shop" solution for trauma patients. He will also highlight best practice patient examples and the course of treatment prescribed in the A&E department at Wels-Grieskirchen. The Wels-Grieskirchen Hospital is a 24 h emergency hospital that covers the majority of trauma patients for the region. Due to its position in a triangle of heavily used motorways, ski and climbing resorts, the hospital gets a variety of severe trauma injuries.

1015–1230
Current topics in PACS

1015 Invited review: Resolving problems with speech recognition and digital dictation

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

One of every radiologist's prime concerns is communication – receiving accurate communications from referring clinicians and communicating back the results of examinations and procedures in a timely and reliable fashion. From the earliest days of radiology reporting, the keystone of this communication has been human, predominantly in the form of a secretary/typist. Various technologies have assisted in this process – typewriters, dictaphones and more recently digital recording systems – but now technology is starting to replace the human element with the introduction of Digital Dictation and Speech Recognition. It is not entirely a happy story, and there are advantages and disadvantages which must be recognised if this technology is to be introduced without unexpected disappointments. Why should we consider Digital Dictation and Speech Recognition at all? What are the alternatives? What systems are available and what advantages does each offer compared with the others? This lecture will focus on these issues and will also provide a live demonstration of some of the key features to look for in a Digital Dictation or Speech Recognition system.

1040 Invited review: Administrating a city wide PACS

Somerville, A.
Glasgow Royal Infirmary, Glasgow, UK

NHS Greater Glasgow & Clyde Health Board has undertaken a strategic restructure of diagnostic services across the city aiming to streamline patient care through increased efficiencies and to promote changes to traditional workflow patterns through subspecialization in radiology and the separation of the reporting process from the image capture. The introduction of PACS and improvements to the RIS is a key player in the restructure of the service by improving efficiencies and by facilitating many of the required changes. The move away from a traditional hospital based diagnostic IT service to an integrated pan Glasgow model required a new approach to many aspects of the service including the administration/operational management of the PACS and RIS services in the eight acute hospitals with PACS across the city. The challenges encountered have been wide ranging including cross city system administration, human resource issues, information governance issues, working practice changes, team management/leadership and of course changes to extant cultures and beliefs. A variety of solutions have been introduced including a new general management structure, new programme structures, changes to roles and responsibilities of individuals, embracing opportunities from technological advances and encouraging change to long standing working practices including the harmonization of the Consultant Job Planning process. The ambitious programme of work in Glasgow is progressing to schedule and producing results in terms of efficiency and realisation of benefits. Many lessons have been learned along the way and the presentation aims to provide an overview of the Glasgow Diagnostics services, secondly to describe the problems encountered and lastly to outline the solutions adopted to resolve them.

1105 Invited Review: Current and future trends in digital image storage

Johnston, J.
Midwestern State University, Wichita Falls, TX, USA

As the world of medical imaging increasingly embraces the digital age, new challenges arise with the storage and retrieval of digital data. This lecture will first cover the current storage and retrieval methods. Next will be an overview of the anticipated problems with space, retrieval speed and cost. The lecture concludes with a presentation of holographic data storage, a technology that holds promise as a solution to the looming digital storage and retrieval challenges.

1135 Life's a batch – increasing the efficiency of speech recognition software

Patel, P.·Pathak, S.
King's College Hospital, London, UK

PURPOSE: SRS (speech recognition software) must eventually succeed traditional reporting methods since incorporating SRS with PACS and RIS expedites clinical decision making and is associated with shorter inpatient stay. SRS also allows immediate transcription thus minimizing clinical risk from errors. However, the association of SRS with reduced individual productivity is well established. Most SRS users perform multiple steps in series consisting of dictation, correction and verification (Serial Reporting). It has been postulated that the traditional method of batch dictation followed by batch correction and verification (Batch Reporting) is more efficient since it complies with modern industrial theory where a single step of a multistep process is performed repeatedly. We present a prospective study determining whether batch reporting is more productive than serial reporting and discuss additional methods to increase the productivity of SRS. MATERIALS/METHODS: 9 Radiologists batch and serially reported 2 sets of 30 random, consecutive plain films under identical conditions. Time to verification of all 30 films was recorded in addition to the number of errors. RESULTS: Mean time to report 30 films using batch reporting was 36.4 min and 33.8 min using serial reporting (p=0.565). There were no major errors. The mean number of minor errors was 2.2 with batch reporting and 2.8 with serial reporting (p=0.418). CONCLUSION: Contrary to modern industrial theory, batch reporting was not shown to be more efficient than serial reporting. Nevertheless, SRS will inevitably replace traditional reporting and other measures increasing individual productivity (training, IT support and software evolution) should be actively pursued.

1145 Evaluating the impact of voice recognition reporting on radiology training

Hart, J.·Shah, V.·Blunt, D.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: Whilst there is evidence to demonstrate the profound impact of voice recognition reporting (VRR) on report completion times and departmental workflow, there has been no adequate evaluation of the effect on training in either quantitative or qualitative terms. METHODS AND MATERIALS: Individual RIS data were gathered for trainee radiologists for a 6-month period pre- and post-introduction of VRR (December 2004). These were grouped and analysed according to imaging modality. RESULTS: During the study period, the mean total number of studies per month was 17 342 of which a mean of 2352 (14%) were reported by trainees. No significant change in the overall number or percentage of reports produced by trainees was noted following the introduction of VRR. However, the mean number of cross-sectional (CT/MR) reports increased significantly from 32 to 59 per trainee per month (two-tailed students t-test; p=0.012). CONCLUSIONS: VRR has not reduced the number of studies reported by trainees, contradicting available (anecdotal) evidence. Trainee cross-sectional (CT/MR) modality report numbers have increased significantly. In addition, there are unmeasured qualitative benefits. With VRR, studies are reported, amended and checked rapidly in real-time. This facilitates "parallel reporting" which is of particular value in cross-sectional imaging lists. The ability to discuss cases and review reports in real-time improves trainer–trainee interaction, allowing added emphasis on report quality in addition to analysis of radiological findings. Clarity of expression and appropriate emphasis in radiology reports is an important (and possibly neglected) aspect of radiological training which can be improved with VRR.

1155 Assessment of radiology report quality/accuracy and output efficiency using voice recogntion software

Barros D'Sa, I. J.·Phillips, C.·Lindley, P.·Goodfellow, T.·Wellings, R.
University Hospital Coventry & Warwickshire, Coventry, UK

PURPOSE: "Dragon Naturally Speaking 8.1" software was installed in May 2006 alongside a RIS/PACS system. The software transcribes the spoken word into the RIS. We assessed the software's impact on departmental reporting. MATERIALS/METHODS: Retrospective review of two consultants' reports, over 13 months (Apr'06–Apr'07). Plain film/ultrasound/CT/MRI reports were assessed before installation and also after 1, 3, 6, 9, 11 months. Reports were scored 0–3. 3/3: Fully comprehensible report, no errors. 2/3: Minor spelling/grammatical

errors, report comprehensible. 1/3: Significant spelling/grammatical errors with confusing report. 0/3: Incomprehensible report. Results recorded were: total report numbers, % reports achieving 3/3 and mean report score for each month. RESULTS: 11 209 reports were assessed. Radiologist 1, pre-Dragon, reports scoring 3/3 was 89–99%. Mean score range, 2.90–2.99. After the first month, CT reports scoring 3/3 dropped to 62.5%. After 6 months, ultrasound accuracy/mean score, recovered fully. CT/MRI took 9–11 months. Radiologist 2, ultrasound and plain film only; pre-dragon reports 3/3, ranged from 99.3% to 99.6%. Mean score range, 2.9–3. After 6 months, accuracy/mean score improved to pre-Dragon standards. Report output improved over the year. Significant improvements were made with report turn around time (RTAT). Overall average RTAT showed a 59% reduction from 7.3 days to 3 days. The most significant change involved plain film reporting; Average RTAT reduced from 8.5 days to 3 days. CONCLUSION: The use of digital transcription software is a valuable addition to radiology but a learning curve occurs before pre-introduction report accuracy is achieved. The software is beneficial to the radiologist with improved efficiency, increased report productivity and faster RTAT.

1205 Digital images viewed on PACS workstation compared with PC-based system in an emergency department setting

Chicklore, S.·Gallacher, D.·Jaye, P.·Vijayanathan, S.
St. Thomas' Hospital, London, UK

PURPOSE: To compare picture archiving and communication system (PACS) diagnostic workstation and less expensive web-based imaging system on a personal computer for accuracy of interpretation by emergency physicians. MATERIALS/METHODS: A total of 320 plain radiograph interpretations were made: 16 randomly chosen plain radiographs reviewed by 20 Emergency Medicine registrars. The radiographs were divided into two groups (a & b). Each group had four upper limb films and four lower limb films which were matched. The doctors were randomly assigned to two groups. The first group (A) reviewed the radiographs "a" on the PACS workstation first and then reviewed "b" films on web image. The second group (B) reviewed "a" radiographs on web image and then reviewed "b" radiographs on PACS workstation. Ultimately both groups reviewed the same plain radiographs. The interpretation was collated by a single independent observer and compared with the final radiological interpretation by an experienced Musculoskeletal Consultant Radiologist. RESULTS: The diagnostic accuracy of interpretation from PACS workstation was noted to be 73.03% (sen. 82.14%, spec. 39.47%). The diagnostic accuracy of interpretation from web based imaging was noted to be 72.51% (sen. 79.29%, spec. 41.94%). Our study did not show any significant difference between the two groups. The diagnostic accuracy increased with level of training. CONCLUSION: Web based imaging system has similar diagnostic accuracy to PACS workstation. Low cost favours greater use of web based imaging as we move away from conventional hard copy radiography. Accuracy of diagnostic interpretation can be improved by specialty training.

1215 The feasibility of using PDAs with high resolution displays for viewing and reporting of non-contrast cranial CT series by radiologists

Ryan, P.[1]·McEntee, M. F.[2]·Brennan, P. C.[2]·Ryan, J.[2]
[1]Beaumont Hospital, Dublin, Ireland, [2]UCD, Dublin, Ireland

PURPOSE: This study investigates whether diagnostic information contained in a CT-brain series can be represented on a commercially available PDA allowing accurate remote reporting when compared with traditional workstations in radiology reporting environments. METHOD AND MATERIALS: 30 non-contrast cranial CT cases were converted to uncompressed, BITMAP images and transferred to a PDA. 12 cases had acute intracranial haemorrhage present and the remaining scans had no recent haemorrhages. All scans were separately reviewed in a blinded manner by six radiologists using the PDA. Each scan was graded using a 10 point forced choice Likert scale for the presence of a recent intracranial haemorrhage. After a 4-week interval the same scans were reviewed in DICOM format on a reporting workstation in a blinded manner. The same grading system was used. Data was analysed using the Dorfman-Berbaum-Metz multireader multicase ROC analysis and an analysis of variance (ANOVA). RESULTS: The ROC analysis and ANOVA showed no significant difference between performance of the PDA and radiology workstation. Mean difference in AUCs for both modalities was 0.0056. Examining sensitivities and specificities across all cut points for both modalities showed the PDA having best balance of sensitivity and specificity at cut point >7 and the workstation at cut point >5. CONCLUSION: The PDA is as accurate as the reporting workstation for determining the presence of acute intracranial haemorrhage for readers and cases sampled. An adapted reporting technique (using a higher decision threshold) when using the PDA may avoid generation of excessive false positive diagnoses.

1030–1210
Gastrointestinal Scientific Session

1030 Abdominal radiographs during a hospital outbreak of *Clostridium difficile*

Hawtin, K.·Blunt, D.
Charing Cross Hospital, London, UK

PURPOSE: To assess the utility and indications for plain abdominal radiography during an outbreak of C. difficile in a large teaching hospital setting. To offer rational evidence based recommendations for this examination in this group of infectious patients. MATERIALS/METHODS: 148 patients with positive isolates of C. difficile were reviewed. 52 underwent plain abdominal radiographs for a variety of indications. The indications, number of examinations and positive findings were recorded. The abnormalities were grouped in order of likelihood of positive findings. RESULTS: 25 patients underwent a single film, 16 multiple films (range 2–15, median 3), and 11 where the indication did not relate to the C. difficile. The most common indications yielding positive results were diarrhoea, possible toxic megacolon, pain and distension. Indications not yielding positive findings included raised CRP, reduced Hb, positive isolate in the absence of symptoms and tachycardia >90. CONCLUSION: Abdominal radiographs in infectious patients should be limited to those in whom there is a likelihood of abnormality, based on clinical parameters. Infection control measures present considerable challenges in performing these examinations. A rational policy for abdominal radiographs in C. difficile will be presented.

1040 The CT features of small bowel enteritis caused by *Clostridium difficile*

Wee, B. B.·Poels, J.·McCafferty, I.·Taniere, P.·Olliff, J.
Queen Elizabeth Hospital, Birmingham, UK

PURPOSE: Clostridium difficile associated disease is an increasingly common cause of morbidity and mortality. Pseudomembranous colitis following hospital administered antibiotic treatment is the most common symptomatic manifestation. Small bowel enteritis caused by C. difficile, however, is rarely described, with only 21 cases reported. We describe a series of 5 cases in our institution and discuss the predisposing factors and CT findings. MATERIALS/METHODS: Only patients with both positive C. difficile toxins and histopathological specimens were selected. Five patients were identified in whom features of a mucosal enteritis was demonstrated on small bowel histopathological examination. C. difficile toxins (CDT) A and B were demonstrated by enzyme linked immunosorbent assay (ELISA) in stool samples (C. difficile Tox A/B II kit, Techlab, Blacksburg, VA), and CT (Lightspeed plus, General Electric, Milwaukee, WI) were available. The clinical notes, CT images and pathological specimens were reviewed. RESULTS: All 5 cases had antibiotics prior to becoming symptomatic. 2 had prior gastrointestinal surgery. 1 patient had no large bowel disease. 2 patients died. The common CT findings include free abdominal fluid, intramural gas and mural thickening. Mesenteric stranding was invariably present but minor. CONCLUSION: C. difficile can affect the small bowel and is associated with non-specific CT signs. Appropriate knowledge of the risk factors and a high index of suspicion is required.

1050 Spectrum of CT imaging findings in eosinophilic gastroenteritis (EGE) in a series of ten patients at a tertiary care centre in southern India

Lakshmaiah, S.
Manipal Hospital, Bangalore, India

PURPOSE: To highlight the typical and atypical state of the art CT imaging findings in EGE in a series comprising of 10 patients. MATERIALS/METHODS: A total of 10 patients (age range 8–55 years; M:F ratio: 7:3) who presented with abdominal pain, vomiting or diarrhoea was investigated. Duration of symptoms 1.5 months (3 weeks to 2 years). All patients underwent esophagogastroduodenoscopy, ultrasound and CT scan. All patients had histological confirmation. Two patients were subjected to endoscopic mucosal biopsies. Rest of the patients diagnosis was obtained following diagnostic laparoscopy and full thickness biopsy of the involved bowel. RESULTS: Of 10 patients all had abdominal pain, 6 had vomiting and 4 had diarrhoea. Four patients had history of allergy and rashes. Lab findings revealed peripheral eosinophilia in six patients. Abdominal CT revealed, site of involvement: stomach 0, duodenum 2, jejunum 6, ileum 3, pattern of involvement: circumferential wall thickening with dilatation, mucosal fold prominence, mesenteric hyperaemia. Associated findings were lymphadenopathy and ascites in four patients each. Histopathology revealed mucosal form in two, muscularis form in six and serosal form in four patients. All patients were treated with oral prednisolone or Azothiaprine. Median follow up period: 6 months. Follow up imaging were available in 4 out of 10 patients which showed complete resolution of the intestinal and mesenteric inflammation. Rest of the patients were symptom free. CONCLUSION: In view of heterogeneity of clinical presentations CT can be invaluable adjunct tool in clinching the diagnosis of EGE.

1100 Endoscopic-designed device confirms malignancy on cytology from some biliary brushings obtained during PTC without biopsy

Schembri, N.[1]·Zealley, I.[2]
[1]Leighton Hospital, Mid-Cheshire Hospitals NHS Trust, Crewe, UK [2]NHS Tayside, Ninewells Hospital, Dundee, UK

PURPOSE: To evaluate the diagnostic performance during percutaneous radiological procedures of a biliary brush cytology device developed for endoscopic use. METHOD & MATERIALS: We retrospectively reviewed the results of biliary brush cytology obtained from 31 patients who were subsequently proven to have malignant biliary strictures. In 15 patients biliary brushings were obtained at endoscopic retrograde cholangiopancreatography (ERCP) using a Cook Cytomaxx TM device. In a further 16 patients biliary brushings were obtained using the same device during percutaneous radiologically-guided biliary drainage and stenting procedures (PTC). Gold standard determination of malignant disease was by surgical/pathological findings in 6 patients, percutaneous biopsy in 3 patients, and confirmation of clearly progressive malignant disease characteristics on follow-up imaging in 22 patients. RESULTS: When a C5 cytology result is taken to indicate the presence of a malignancy the sensitivity of biliary brushings obtained at PTC was 38% (6/16) and ERCP 7% (1/15). When a C4 or C5 cytology result is taken to indicate the presence of a malignancy the sensitivity of biliary brushings obtained at PTC was 50% (8/16) and ERCP 33% (5/15). CONCLUSION: In patients with malignant biliary strictures brush cytology obtained at PTC (using an endoscopic-designed device) is at least as likely to provide cytological confirmation of malignancy as when the same device is used at ERCP. Clinical relevance/application: Taking brush cytology samples during PTC procedures, using an endoscopic-designed device, provides cytological confirmation of malignancy in up 50% of patients with malignant biliary strictures without the need for further percutaneous biopsy procedures.

1110 Local interim analysis of a pilot bowel cancer screening centre

Malaki, M.·Preston, P.·Williams, S.
Norfolk and Norwich University Hospital, Norwich, UK

PURPOSE: To assess the impact of the bowel cancer screening programme (BCSP) on the radiological presentation/staging of tumours at a teaching hospital colorectal multidisciplinary meeting. METHODS: All patients recruited through the pilot BCSP between September 2006 and March 2008 (18 months) will be compared with those referred via the 2-week wait (2WW) pathway for suspected colorectal cancer during the same time period to assess whether their tumours are detected at an earlier stage. The primary end point is to compare the radiological and histological staging of the tumours between the two groups. The initial staging CT scan will be independently reviewed by two expert radiologists for a TNM classification and correlated with the histological diagnosis from resected specimens. The secondary end point is to compare total number of referrals via the 2WW pathway in the preceding 18 months prior to September 2006 to those referred via the same route during the study period. Data will be compared between groups using chi squared and correlations made using the Pearson correlation coefficient. RESULTS: Full data collection will be complete by March 2008. Interim analysis of 130 patients demonstrates that the proportion of polyps to carcinomas detected in the BCSP is higher than in the 2WW group. The latter also have a more advanced tumour histolgically and radiologically ($p<0.05$). There is good correlation between the radiological and histological staging in both groups ($r=0.9$; $p<0.05$). CONCLUSION: Interim analysis of BCSP shows that screening leads to detection of tumours at an earlier stage, histolgically and radiologically.

1120 Monitoring response to chemo-radiotherapy using dynamic MRI in rectal cancer patients

Gilbert, F. J.[1]·Semple, S.[1]·Yule, S.[2]·Samuel, L.[2]·MacDonald, G.[2]·Murray, G.[1]
[1]University of Aberdeen, Aberdeen, UK, [2]Aberdeen Royal Infirmary, Aberdeen, UK

PURPOSE: To examine the relationship between pre- and post-treatment dynamic MRI examinations using compartmental modelling, and pathological response grading on the surgical specimen in patients with rectal cancer. MATERIALS/METHODS: 48 patients with biopsy proven rectal adenocarcinoma had pelvic radiotherapy (45 Gy or 50 Gy) over 5 weeks, 40 also receiving concurrent chemotherapy. All patients had a pre-treatment dynamic MRI and a repeat examination at the end of treatment, prior to surgical resection. Pathological staging gave conventional TN stage and Duke's stage, and a tumour response grading (as compared with initial biopsy) from 1 to 4 (1 no tumour response, 2/3 partial response, 4 complete response). MRI were analysed using the "Tofts" and "Brix" multicompartment models to derive pharmacokinetic parameters to describe tumour dynamics. RESULTS: There was no correlation between path response and any of the baseline pharmacokinetic parameters. There was a strongly significant correlation ($p<0.01$) between the change in input transfer parameters of both multicompartment models (Ktrans for "Tofts" model and "k21" for Brix model) between the baseline and second MRI examination and pathological response. These parameters are both related to blood flow and tumour permeability. CONCLUSION: Quantitative analysis of dynamic MRI using multicompartment models can be used to assess tumour response in rectal cancer, by assessment of vascular parameters. This mirrors work previously performed in large, locally advanced breast tumours where a change in vascular parameters is observed prior to any change in tumour size. This method may potentially be used to assess new drug treatments, particularly anti-vascular, and anti-angiogenic therapies.

1130 Introduction of PET-CT into the pre-operative staging pathway for potentially operable oesophageal carcinoma

Salahudeen, H.·Balan, A.·Naik, K.·Mirsadraee, S.·Scarsbrook, A.
Leeds General Infirmary, Leeds, UK

PURPOSE: To retrospectively evaluate the role of integrated PET-CT in oesophageal carcinoma staging, in predicting prognosis and its influence on surgical management. MATERIALS/METHODS: 25 consecutive patients with potentially operable, biopsy proven oesophageal

malignancy underwent PET-CT from September 2004 to April 2007 and were included in this study. Chi-square and Fisher's exact tests were used to compare the accuracy of N staging with PET-CT and CT/EUS using post-operative loco-regional nodal histology as the reference standard. Using logistic regression, the prognostic value of primary tumour SUVmax was derived. Correlation of primary tumour SUVmax with tumour site and histological type was analysed using univariate analysis of variance. RESULTS: 17 men and 8 women with a mean age of 62 years were studied. All tumours showed abnormal FDG uptake. 15 patients underwent surgical resection. There was high concordance between N staging at CT/EUS (14/15) and final histology. PET-CT N staging was discordant with final nodal histology in over half of the patients (8/15). PET-CT detected occult metastases in 5 patients (20%) that were not identified on CT and new synchronous tumours in two patients (8%) Patient management was altered in 10 patients (40%) as a direct result of PET-CT. No statistically significant association was observed between SUVmax and clinical outcome (p=0.65). CONCLUSION: Integrated PET-CT has a significant incremental value over conventional staging investigations mainly in the detection of distant metastases and synchronous tumours and frequently impacts on patient management.

1140 Does FDG PET/CT change management in patients with oesophageal carcinoma being considered for surgical resection or radical radiotherapy? Experience in a UK setting

Douis, H.[1]·Candish, C.[2]·Wittkop, B.[1]·Hewin, D.[3]·Vipond, M.[3]·Wadley, M.[3]·Elyan, S.[2]·Shepherd, N.[4]·Barr, H.[3]·Lyburn, I.[1]
[1]The Cheltenham Imaging Centre, Cheltenham, UK, [2]Gloucestershire Oncology Centre, Cheltenham, UK, [3]Department of Surgery, Gloucestershire Hospitals NHS Foundation Trust, Cheltenham, UK, [4]Department of Pathology, Gloucestershire Hospitals NHS Foundation Trust, Cheltenham, UK

PURPOSE: The use of PET/CT in the evaluation of oesophageal carcinoma is increasing. However, little has been published on the impact of PET/CT on the management of oesophageal malignancy in the UK. In this retrospective study, we determine the role of PET/CT in the management of patients with oesophageal carcinoma. MATERIALS/METHODS: All 69 patients who had oesophageal cancer and were being considered for surgical resection or radical radiotherapy referred to our institution for PET/CT over a 16 month period were included. Referring clinicians were contacted and the medical records, CT and PET/CT reports were analysed for TNM-staging prior to and after PET/CT, with changes in the management plan identified. RESULTS: PET/CT changed the management of 18.8% (13) of all patients with oesophageal carcinoma. Surgery was discounted in 10 patients (14.5%) due to presence of metastases whilst one patient underwent radical (1.4%) instead of palliative radiotherapy. Two patients (2.9%) underwent surgery after PET/CT who were previously thought to be inoperable on CT. PET/CT did not change the management in 58% (40 patients). In 23.2% (16 patients) this information was not available. Using the TNM-classification, 15 patients (21.7%) were upstaged, 12 (17.4%) were downstaged and in 28 patients (40.6%) the TNM staging was unchanged. In 14 patients (20.3%) this data was not available. CONCLUSION: PET/CT significantly altered the management in nearly 1 in 5 patients with oesophageal carcinoma – this supports the role of PET/CT in the evaluation of patients who are being considered for radical treatment in the UK healthcare system.

1150 Usefulness of PET-CT in changing management of oesophageal carcinoma

Kulshrestha, R. K.[1]·Virdee, S.[1]·Hill, J. C.[1,2]·Stockwell, R.[3]·Coffey, J. P.[1]·Kane, T. P.[4]
[1]Lancashire Teaching Hospitals NHS Foundation Trust, Preston, UK, [2]University of Salford, Salford, Manchester, UK, [3]Lancashire Teaching Hospitals NHS Foundation Trust, Chorley, UK, [4]Blackpool, Fylde and Wyre Hospitals NHS Trust, Blackpool, UK

PURPOSE: PET-CT already has a role in the pre-operative staging of oesophageal cancer by delineating the craniocaudal extent and by more accurately detecting regional and distant nodes and metastases (RCR Guidelines, Recommendation for Cross-Sectional Imaging in Cancer Management). The evidence for this is limited and anecdotal with no published data from the UK. We aim to show its usefulness in changing management for a large cohort of patients. MATERIALS/METHODS: It involved the analysis of the CT and PET-CT report of 94 oesophageal cancer patients. We also compared the CT image with the PET-CT images where possible. We then categorised patients into having extensive FDG lesions on PET-CT, lesions not FDG avid, and also where PET-CT was in concordance with CT. The presence of possible secondary carcinomas was also noted. RESULTS: 27 out of 94 patients (29%) showed extensive FDG lesions, 40 out of 94 patients (42%), showed non-FDG avid lesions, and in 27 patients (29%), the PET-CT report agreed with CT. 6 out of 94 patients (6%) had findings on PET-CT suspicious for secondary carcinomas. CONCLUSIONS: In 67 out of 94 patients or 71% of patients , either metastatic or non-metastatic nodes were more accurately detected on PET-CT compared with CT, which has significantly changed management by either avoiding unnecessary surgery (in M disease), or advocating it in N0 disease. This has enormous patient, cost and resource implications and the possibility of replacing CT with PETCT in the pre-operative staging of oesophageal cancers may be considered.

1200 Value of SPECT/CT in the assessment of infection and inflammation

Tomas Hernandez, S.·Han, S.·Poon, F.·Neilly, J. B.
Royal Infirmary, Glasgow, UK

PURPOSE: Hybrid imaging using single photon emission computerized tomography (SPECT) and CT has been used to overcome the limitations of planar scintigraphy due to overlapping activity in different organs. Our aim is to quantify the value of combining these techniques in the localization and diagnosis of inflammation and infection. MATERIALS/METHODS: 21 consecutive cases (12 female, 9 male; age 21–84 years, mean 42 years) who had white cell imaging with SPECT/CT during June–November 2007 were retrospectively reviewed by a radionuclide radiologist and a physician. Indications were to assess activity of inflammatory bowel disease in 19 cases and to detect septic focus in 2 cases. Images of planar scintigraphy, SPECT and SPECT/CT of each patient were analysed for location of the lesions, diagnosis and reporters' confidence (graded 1–5; 1 = do not know, 5 = definite). RESULTS: SPECT/CT changed the localisation of lesions in 30% of cases and changed the final diagnosis in 15% compared with SPECT. SPECT/CT changed localization in 50% of cases and final diagnosis in 20% compared with planar images. Mean reporters' confidence in lesion localization was planar 3.0, SPECT 3.7 and SPECT/CT 4.7. Mean confidence in diagnosis was planar 3.6, SPECT 3.9 and SPECT/CT 4.6. CONCLUSION: This study shows that combined functional and anatomical imaging with SPECT/CT can improve the localization of inflammatory/infective lesions and diagnosis. It also improves the reporters' confidence in significant proportions of patients.

1030–1220
Developments in MR contrast agents

1030 Invited review: Techniques and agents for vascular imaging

Ludman, C.
University Hospital Nottingham, Nottingham, UK

Since its development and acceptance as a diagnostically important technique, contrast enhanced MR angiography (CE-MRA) has continued to advance becoming increasingly sophisticated in its image quality and the scope of its applications. In this talk, I will aim to discuss the basic principles of CE-MRA as they relate to developments in system hardware and performance, scan optimization and post processing. More recently contrast agent developments have also had a considerable impact on the quality and breadth of CE-MRA techniques. I will discuss how these advances tackle demands such as first pass arterial imaging, venous imaging, large field of view

coverage, high resolution and high temporal resolution imaging. The recent appreciation of the association between gadolinium based contrast agents and NSF has also had a huge impact on the field and I will discuss some of the clinical issues surrounding the current concerns.

1050 Invited review: Specific agents versus whole body solutions

Dawson, P.
University College Hospital, London, UK

A survey will be made of the available MRI contrast agents and a discussion presented of their essential character, properties, applications and problems. Future developments will be discussed.

1110 Invited review: Future prospects for target-specific agents

Brindle, K.
University of Cambridge, Cambridge, UK

We have been developing non-invasive and clinically applicable MR-based methods for detecting the early responses of tumours to therapy. A primary focus has been on the development of methods for detecting tumour cell apoptosis, or programmed cell death, since the level of tumour apoptosis after drug treatment has been shown, in pre-clinical and clinical studies, to be a good prognostic indicator for treatment outcome. Thus by monitoring tumour cell death an oncologist may get an indication of whether a particular drug is working very early during treatment, possibly within 24–48 h, and long before there is any evidence of tumour shrinkage. In this lecture I will briefly describe the different approaches that we, and others, have taken in detecting and imaging cell death in tumours using MR, before focusing on recent developments using hyperpolarized 13C-labelled cell substrates. Sensitivity in the NMR experiment can be increased dramatically (>10 000x) using nuclear spin hyperpolarization techniques. We showed recently that exchange of hyperpolarized 13C label between the carboxyl groups of 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 suggested that this technique could be used in the future for response monitoring in the clinic, in much the same way as 18FDG has been used with PET.

1130 Invited review: Update on gadolinium contrast agents and NSF

Dawson, P.
University College Hospital, London, UK

No abstract supplied.

1200 Nephrogenic systemic fibrosis: incidence in patients investigated by CE-MRA for chronic kidney disease Stages 3 & 4

Collidge, T.[1]·Thomson, P.[2]·Mark, P. B.[2]·Digby, S.[2]·Holmes, S.[1]·Blessing, K.[1]·Simpson, K.[1]·Roditi, G.[1]
[1]Glasgow Royal Infirmary, Glasgow, UK, [2]Western Infirmary, Glasgow, UK

PURPOSE : Nephrogenic systemic fibrosis (NSF) is a rare disorder in patients with severe chronic kidney disease (CKD), a temporal association has been shown to enhanced MRI with an incidence of 3.1% in dialysis patients (CKD stage 5 – eGFR < 15 ml min-1) administered high doses of linear chelate gadolinium contrast. The incidence in lesser degrees of CKD is unknown hence this study. METHODS : All patients with stable stage 3 or 4 CKD (eGFR 30–59 & 15–29) referred through the regional renal units for contrast-enhanced MRA (CE-MRA) as part of investigation of suspected renovascular disease over 6 years were identified by cross correlation of the unified renal unit electronic patient record (EPR) and Radiology Information System (RIS). This cohort in turn was cross related to the pathology database for skin biopsy samples along with textfinder searches of the EPR for skin biopsy and dermatological problems. Any skin biopsy was reviewed for evidence of NSF. Dose and type of contrast agent were recorded. RESULTS: No cases of NSF are identified in a cohort of 764 stable CKD stage 3 & 4 patients. The majority of CE-MRA were performed with the linear gadolinium chelate Gadodiamide at ~0.2 mmol kg-1 dose. CONCLUSION: The incidence of NSF in stable CKD 3 & 4 is very low such that we have not found any cases in a large cohort of patients exposed to high dose linear chelate CE-MRA.

1210 Nephrogenic systemic fibrosis/nephrogenic fibrosing dermopathy: histopathological variability of dermopathy correlated with clinical outcomes

Digby, S.[1]·Collidge, T.[2]·Thomson, P.[1]·Mark, P. B.[1]·Holmes, S.[2]·Blessing, K.[2]·Simpson, K.[2]·Roditi, G.[2]
[1]Western Infirmary, Glasgow, UK, [2]Glasgow Royal Infirmary, Glasgow, UK

PURPOSE: Nephrogenic systemic fibrosis/nephrogenic fibrosing dermopathy (NSF/NFD) is a rare disorder occurring in patients with severe renal disease. The majority have been shown temporally related to administration of high doses of linear chelate gadolinium contrast for MRI with an incidence of 3% in patients on dialysis. The majority manifest symptoms within 3 months, but in others the onset may be very delayed calling into question direct causality. Furthermore, the clinical course is variable ranging from rapidly progressive multisystem fibrosis to an indolent limited dermopathy. The histological features of NSF/NFD include an increase in dermal cellularity of CD34 positive spindle cells and dermal mucin. Histopathology is not uniform and must be clinically correlated for diagnosis which is clinicopathological. Our aim was to correlate histpathology with clinical disease course. METHODS: Skin biopsies from patients with clinicopathological diagnosis of NSF/NFD were reviewed evaluating degree of spindle cells proliferation in the dermis and/or subcutis, the predominant cellularity of the lesion and the presence or absence of dermal mucin, these were correlated with clinical findings. RESULTS: Degree of dermal cellularity and positive mucin staining was variable in the 14 patients, as was location as regards the dermis/subcutis. Correlation with clinical course in terms of rapidity of disease onset, progression and severity reveals that more severe disease is associated with a high degree of cellularity and its presence in the subcutis indicating a more "systemic" process. CONCLUSION: High cellularity in the subcutis indicates severe type NSF/NFD.

1100–1230
Appendicular trauma – back to basics

1100 Invited review: Elbow trauma

Ostlere, S.
Nuffield Orthopaedic Centre, Oxford, UK

This lecture covers the classical fractures and dislocations of the elbow joint. The injuries in children are distinct from those in adults on account of the unfused growth plates. In both age groups recognizing the presence of an effusion is important. In the context of trauma the presence of an effusion is a reasonably reliable sign of an intra-articular fracture and the absence of an effusion excludes intra-articular fracture. An effusion is diagnosed by observing the configuration and position of the anterior and posterior intra-articular fat pads on the lateral radiograph. The anterior pad is displaced anteriorly giving the sail sign and the posterior fat pad, which is normally hidden in the olecranon fossa, becomes visible. In the child the most common fractures are the supracondylar and the lateral condyle fractures. It is particularly important to recognize the latter as the abnormality may be subtle and mismanagement may result in long term disability. Valgus injury or elbow dislocation may result in avulsion of the medial epicondyle. Occasionally the epicondyle ends up lodged in the joint. Osteochondritis dissecans of the capitellum is an overuse injury seen in gymnasts. Salter-Harris I fracture through the humeral growth plate is typically a birth injury. In the adult the most common injury, which is often subtle, is the radial head fracture. Olecranon, capitellum and humeral condylar fractures are the other common injuries. Radial head

and elbow dislocations occur in both adults and children. Radial head dislocations may be associated with a proximal ulnar shaft fracture (Monteggia's fracture).

1120 Invited review: Wrist trauma

Elias, D.
King's College Hospital, London, UK

The scaphoid is the most commonly fractured bone in the carpus, usually following a fall on the outstretched hand. Scaphoid fractures are commonly complicated by malunion with humpback deformity, avascular necrosis, delayed union or non-union resulting in chronic pain and eventual osteoarthritis. Some scaphoid fractures may be occult on initial conventional radiographs, and different approaches have been utilised to identify these injuries including delayed radiographs, bone scans, CT and MRI. A number of factors have variously been reported to correlate with failed conservative or surgical management including proximal fracture location, malalignment, fracture instability and proximal fragment avascularity. Carpal dislocations may follow hyperextension injury of the wrist. Such trauma produces a sequential pattern of intercarpal instability, which, as the hyperextension force increases, may progress from scapholunate dissociation through perilunate dislocation to lunate dislocation. "Lesser arc" injuries are purely ligamentous, whilst "greater arc" injuries are fracture dislocations. Dissociative carpal instability, most commonly scapholunate instability may follow a variety of injury mechanisms. Scapholunate instability may result in widening of the scapholunate space and a dorsal intercalated segment instability pattern on conventional radiographs. Carpal instability may eventually progress to osteoarthritis and collapse (scapholunate advanced collapse).

1140 Invited review: Knee trauma

Allen, G.
The Royal Orthopaedic Hospital, Birmingham, UK

This presentation will cover all the imaging techniques used in assessing knee trauma, namely conventional radiography, CT, MRI and ultrasound. Cases will be used to illustrate the strength and weaknesses of each techniques and where they can be useful in the management of trauma. The initial assessment of knee trauma is still with conventional radiographs. CT is important for the assessment of complex fractures. MRI is used to assess not only the fracturing, but also soft tissue injury particularly ligaments and tendons. Ultrasound to be used to define precisely an area of damage, for example a collateral ligament rupture, patellar tendon rupture or quadriceps tendon rupture. Its dynamic capability enhances the diagnostic potential.

1200 Invited review: Foot and ankle trauma

Seymour, R.
Torbay NHS Trust, Torquay, UK

PURPOSE: The aim of this session is to enable the audience to learn key lessons in the interpretation of radiographs of difficult or important foot and ankle trauma. The target audience is all staff who undertake reporting of A&E radiographs. MATERIALS/METHODS: This is an interactive session. Several cases will be presented and the audience asked to submit their opinions electronically. Each case will be followed by discussion around the key learning points. RESULTS: Increased skills in interpreting difficult or subtle cases of foot and ankle trauma. CONCLUSION: A useful interactive session for most general radiologists and reporting radiographers.

1115–1230
DH Imaging Forum: Surviving the targets

1115 Invited review: Delivering 18/52 by transforming imaging

Maxwell, A.
Royal Bolton Hospital, Bolton, UK

Imaging plays a crucial role in the pathway of many patients from GP referral to treatment. In order for healthcare providers to achieve the 18 week target the imaging component needs to be compressed into a third or less of this time. This requires a huge change from the traditional NHS culture of long waiting times for many examinations. Strategies for success include ensuring an effective management and financial structure, staff engagement, the setting of ambitious but achievable targets (maximum 2 weeks from receipt of request to issuing of report) and process mapping and redesign. Lean methodology provides a framework to examine entire process pathways in order to identify and reduce the non-value-added parts, improve capacity and quality and reduce waits. This should be embedded into the organisation as part of a culture of continuous improvement.

1135 Invited review: South Tees experience of delivering 18/52

Wilson, C.
South Tees Hospitals NHS Trust, Middlesborough, UK

PURPOSE: South Tees Hospitals NHS Trust is the largest trust in the Tees Valley providing services from two sites. The Friarage Hospital, serves the population of the Yorkshire Dales and James Cook University Hospital, the population of South Teesside. The trust provides a District Hospital function to a combined population of 400 000 and tertiary services to 1.5 million. The Division of Radiology has a high demand for imaging/intervention performing 320 000 procedures per annum with resultant pressures on waiting times. The Divisional staffing structure supports ownership of service performance and role development; both have increased capacity to help meet demand. However, 18/52 has increased the need to reduce diagnostic imaging pathways to a minimum both by time and processes. In response the Division has worked with clinical colleagues to implement an Indirect Booking Service for out patient referrals thus removing many of the "bottlenecks". Using this experience and through collaboration with the National Choose and Book team, partner PCTs and local GPs we have implemented C&B for GP direct access referrals. We have also developed many one-stop and fast track clinics eliminating the need for patient follow up. Lean thinking principles have been applied to pathway redesign. In response to 18/52 target the Division set the objective of a maximum "2 week wait" for patients by the end of March 2008. This presentation is about the processes we employed and the results of these on our waiting time targets.

1155 Invited review: Commissioning the pathway and the role of diagnostics

Laitner, S.
Department of Health, London, UK

Diagnostics form a crucial part of the 18 week pathway and waits for diagnostics can constitute a major part of the patient's journey. The Department of Health 18 week Team have developed 50 commissioning pathways for common conditions and high volume procedures which detail, at a high level, the clinical assessments, diagnostic tests and treatments which need to be commissioned. The pathways describe these elements of care across primary care, specialist care (e.g. "Secondary Care") and supraspecialist care (e.g. "Tertiary Care"). In the development of the imaging sections of the pathways MBUR6 and Right Test, Right Time, Right Place guidance was used, together with close liaison with the Royal College of Radiologists and the Imaging Board. The 18 week Commissioning pathways have facilitated discussions locally and nationally regarding the appropriate use of imaging at various stages of the patient's journey and within different settings for common conditions and common planned procedures.

1300–1400
RCR Tesla Lecture

1300 Invited review: Multimodality molecular imaging: recent advances and future prospects

Gambhir, S.
University of Stanford, Stanford, California, USA

Molecular imaging of living subjects is rapidly expanding and allowing for unprecedented opportunities to characterize biology and disease at earlier times and at the most fundamental level. Imaging of molecular/cellular targets that are fundamental to molecular medicine are now possible. Technologies for small animal imaging are rapidly evolving and include small animal positron emission tomography, small animal CT, small animal single photon emission computed tomography (SPECT), small animal high resolution ultrasound, cooled charge coupled device (CCD) based optical cameras for imaging very low levels of light, Raman spectroscopy, and Photoacoustic imaging. I will review how these technologies are being utilized to study fundamental biological processes in small living animals and what additional needs for new technologies are. Applications in oncology will be highlighted. Specific strategies using reporter genes that report on events taking place deep within the living subject will be discussed. New generation molecular imaging agents and clinical technologies that may play a role in the future of molecular imaging will also be highlighted.

1415–1515
Contrast strategies for liver imaging

1415 Invited review: Contrast strategies for liver imaging

Huppertz, A.[1] Blakeborough, T.[2] Olliff, S.[3]
[1]Facharzt für Diagnostische Radiologie Geschäftsführer, Berlin, Germany, [2]Royal Hallamshire Hospital, Sheffield, UK, [3]Queen Elizabeth Hospital, Birmingham, UK

Primovist®, the innovative MRI agent has opened up new possibilities in the diagnosis of liver disease. The programme will examine the potential benefits and limitations of currently available agents through case study presentation of specific diagnostic challenges in the characterisation and detection of focal liver lesions. Novel research on meeting the requirements of surgery and the potential for replacing histopathological examination will be introduced during the discussion. The profile of the ideal agent for comprehensive imaging of the liver, looking at both dynamic and liver specific MRI imaging will be discussed.

1430–1800
Trauma imaging – Current concepts

1430 Invited review: The chest X-ray in trauma interactive case based topic

Fotheringham, T.
The Royal London Hospital, London, UK

No abstract supplied.

1455 Invited review: The pelvic X-ray in trauma

Hughes, P.
Derriford Hospital NHS Trust, Plymouth, UK

Using a case-based format, pelvic ring injuries will be considered including avulsion and ring disruptions. The combined importance of the osteo-ligamentous construct will be emphasised as this is fundamental to the implied assessment of pelvic stability which is the major determinant for the need and mode of surgical fixation. Recognition of the pattern of stability and its severity will also allow for an early assessment on the likelihood of associated bladder and pelvic vascular injury. Acetabular injuries are sustained through high energy impact and whilst many are clinically and radiologically obvious, methodical assessment of important anatomical landmarks is essential to avoid oversights. CT scanning is required in most acetabular fractures and has reduced the need for Judet views which are both time consuming and painful for the patient. With attention to several basic anatomical details it is possible to accurately classify these injuries and guide intervention. The investigation of radiologically occult injuries with also be illustrated with several important example emphasizing the early use of MRI.

1520 Invited review: Sonography scanning: when to do? Who to do?

Poletti, P.
University Hospital Geneva, Geneva, Switzerland

The term "FAST" (Focused Assessment with Sonography for Trauma) was introduced as an attempt to define and standardize the current role of ultrasound in the management of trauma victims. This technique has been defined as real-time ultrasound scanning of four regions: pericardial, perihepatic, perisplenic, and pelvis. This method of examination does not include direct visualization of parenchymal injuries. The adequate training schedule of FAST operators (radiologist or non-radiologists) is still subject to controversy; there is no consensus with regard to the number of proctored examinations necessary before an operator can be considered capable to perform a FAST examination. This number varies from 10 to 200 according to the different radiological, medical and surgical societies. FAST is a useful tool in haemodynamically unstable patients: depiction of a haemoperitoneum mandates urgent exploratory laparotomy, while a negative FAST directs a search toward extra-abdominal sources of haemorrhage. The value of FAST in haemodynamically stable patients is more controversial. Free intra- (or retro-) peritoneal fluid is not always found in patients with blunt abdominal organ injuries, including potentially life-threatening injuries: up to 34% of blunt trauma patients with CT proven organ injury do not have associated free fluid at admission CT. Beside, ultrasound achieves a poor sensitivity (40–55%) for the direct depiction of parenchymal injuries. Nevertheless, the combination of a FAST examination along with clinical, radiological (non-CT), and laboratory parameters has been shown helpful for selecting patients with suspected blunt abdominal trauma who do not require subsequent abdominal investigation (CT or clinical follow-up).

1615 Invited review: Total body CT: is it justified?

Sampson, M.
Southampton General Hospital, Southampton, UK

No abstract supplied.

1640 Invited review: Optimizing CT trauma protocols

Power, N
Bart's and the London NHS Trust, London, UK

Despite advances in emergency care and preventative measures, trauma remains a significant cause of morbidity and mortality. Multidetector CT is the mainstay of trauma imaging due to its rapid capability to provide high quality imaging of the entire body. Optimization of multidetector CT protocols in the assessment of the polytrauma patient is vital to ensure detection and appropriate management of all injuries. This case based interactive discussion will focus on current issues in trauma multidetector CT imaging including the timing of scans following contrast, the slice thickness and pitch to be used and the benefits and pitfalls of post processing imaging that can be obtained including multiplanar reconstructions, maximum intensity projections and 3D volume rendered images.

1705 Invited review: Abdominal trauma – splenic, hepatic

Barron, D.
Leeds General Infirmary, Leeds, UK

These are the two most commonly injury solid organs after blunt abdominal trauma. These often occur in combination with other injuries and there is a growing understanding that they should not be imaged in isolation. Current investigation options available to clinicians include deep peritoneal lavage, ultrasound, computed tomography and angiography. DPL used to be the investigation of choice, but is steadily declining in its use (although still recommended in the ATLS guidelines). The current trend is towards initial ATLS assessment with the FAST (Focused Assessment with Sonography for Trauma). This is then followed by CT examination as part of a polytrauma work-up. Where appropriate and where available patients with hepatic and splenic injuries should be considered for embolisation rather than laparotomy. To facilitate decision making in these difficult patient the AAST (American Association for Surgeons in Trauma) grading systems have been traditionally used. Recent work from R

Adams Cowley Trauma Centre has come up with an improved scoring system for splenic injuries which better aids patient selection for operative/non-operative treatment. This lecture will be an interactive style presentation where the above pathway, CT protocols, grading systems and imaging findings will be expanded.

1730 Invited review: A role for intervention?

Nicholson, T.
Leeds General Infirmary, Leeds, UK

Why am I giving a talk with a title like this and a question mark? Instead by this stage I should be teaching others how to carry out trauma intervention and the rest of the session should be about CT. In the last 20 years the mortality from trauma has not altered in the UK and is amongst the highest rates in the developed world. ATLS and UK anaesthetists have failed to recognize the two biggest advances in trauma management since – well since ATLS: namely CT and endovascular intervention. Radiologists have encouraged this by failing to train in intervention, failing to provide a service and building departments for radiologists rather than patients. Why are the sickest patients managed by the thickest doctors – discuss!

1430–1720
Uroradiology keynote lecture and scientific session

1430 Invited review: New horizons in MRI of renal parenchymal diseases

Grenier, N.
Service D'Imagerie Medicale, Bordeaux , France

Renal tissue charaterization for diagnosis of renal diseases is an optimal expectation for imaging in nephrology. The actual possibilities for specific diagnosis of parenchymal kidney diseases remains limited, and are based on two types of approaches: a functional approach using intrinsic or extrinsic contrast agents and a morphological approach using specific contrast agents. Diffusion-weighted MR imaging can show changes in cortical and medullary ADC values but no correlation has been demonstrated to now with specific parenchymal changes. Acute tubular dysfunction can be diagnosed early in rodents, using dendrimer-based contrast agents, and characterized, according to the site and the type of dynamic signal changes. Localization of proteinuria is also possible using an albumin-bound blood pool contrast agent. Many renal diseases present with an inflammatory reaction within interstitium and/or glomeruli. Iron oxide particles have been shown to be phagocytized by macrophages within the kidney when present. This method allows to differentiate inflammatory and non-inflammatory renal diseases, which has an impact on treatment, and to identify some causes of dysfunction, as acute tubular necrosis or rejection. Cell and gene therapy will perhaps play a role in the future for treatment of renal diseases; labelling of stem cells with iron oxide could make possible to implement a MR guidance for this therapies.

1500 Can the CT scout film replace plain KUB radiograph as a baseline investigation to follow patients with acute ureteric colic?

Bhatnagar, P.·Kennish, S.·Wah, T.·Irving, H.
St James University Hospital, Leeds, UK

PURPOSE: To determine the sensitivity of CT scout films for detecting acute ureteric calculi and whether the scout films can replace plain KUB radiographs as a baseline study for follow up purposes. MATERIALS/METHODS: Retrospective review of 100 CT scout films of patients who had a positive CT scan for acute ureteric colic. Scout films were reviewed in conjunction with the CT images to identify the symptomatic stone. Consensus interpretation by two observers, noting the size, location and Hounsfield Units on CT was made. RESULTS: 42% of calculi were visible on the scout films. The sensitivity improved to 59% when calculated for stones larger than 3 mm but was only 13% for stones less than or equal to 3 mm. The sensitivity was also related to the Hounsfield units (HU) of the stones. Stones with HU less than 600 had a sensitivity of 20% while those greater than or equal to 600 had a sensitivity of 75%. CONCLUSION: The sensitivity of CT scout films (42%) is similar/slightly lower than that reported in the literature. However, the sensitivity equals the plain KUB radiograph sensitivity (59%) for calculi greater than 3 mm, which are more likely to be symptomatic or require intervention. Although the scout films can replace some KUB films, we recommend a study to assess whether changing the imaging parameters of the scout film (kVp and mAs) can increase the pick up rate for calculi without a significant patient dose penalty. The baseline KUB radiograph could then be eliminated altogether.

1510 CT investigation of renal colic: dose reduction techniques at the Ulster Hospital Dundonald

Gibson, E. R.·Hanley, P. D.·Faulkner, P.
Ulster Hospital Dundonald, Belfast, UK

Renal colic is a benign condition. As Radiologists we should consider carefully how best to investigate these patients whilst bearing in mind the significant radiation dose that CT examination confers. The Ulster Hospital has employed CT as a first line investigation instead of IVU for a number of years. CT of the renal tracts has proved a quick and reliable modality. An effective dose of 4.7 mSv for a 70 kg patient should be achievable without undue image degradation when imaging the renal tracts. The Ulster Hospital uses a 16 Slice Philips MX8000IDT. The radiation dose of 100 CT renal tracts were retrospectively calculated. Settings used were 120 kV, 150–345 mAs (89/100 patients received an mAs of 200 or more), pitch 0.9, collimation 24 mm (16 mm x 1.5 mm). Average dose was 14.3 mSv (range 7–22 mSv). Such a high dose is unacceptable. Dose reduction techniques were trialled including Automatic Current Selection (ACS), Dose Modulation (DOM) and Manual Alterations. Scan range was limited from top of the kidneys to symphysis pubis. A re-audit was undertaken. Average dose is now 6.5 mSv for 70 kg patient (55% dose reduction). ACS proved the most popular technique for dose reduction and noise levels. A new 40 slice Philips Brilliance has recently been installed and confers further dose reduction to average 3.6 mSv. This audit highlights the importance of auditing and re-auditing radiation dose levels and provides evidence that employing dose reduction techniques can provide a significant reduction on the radiation burden to our patient population.

1520 Apparent diffusion coefficient as a prognostic biomarker in early stage prostate cancer

deSouza, N. M.·Morgan, V. A.·Riches, S. F.·Parker, C.·van As, N. J.
Institute of Cancer Research, Sutton, UK

PURPOSE: To investigate apparent diffusion coefficient (ADC) obtained on diffusion-weighted imaging as a prognostic biomarker in prostate cancer patients managed by active surveillance. MATERIALS/METHODS: 86 consecutive patients with localized prostate cancer eligible for active surveillance (Stage 1/2a, Gleason 3+3, PSA <10 ng ml-1, <2 cores positive) were studied using a 1.5 T Philips Intera and endorectal coil. Intramuscular hyoscine butylbromide 20 mg reduced peristalsis. T2 weighted images in 3 orthogonal planes (TSE 2000/90 ms [TR/effective TE], echo train length 16, 2 signal averages, 256×512 matrix, 3 mm slice thickness, 14 cm FOV) and echo-planar DW images (2500/69 ms [TR/TE]), b values 0, 100, 300, 500 and 800 s mm-2 were obtained transverse to the prostate. Regions of interest were drawn on ADC maps by visual matching with T2 weighted images. Tumour regions were identified as low signal-intensity lesions on T2 weighted images in a sextant biopsy positive for tumour. RESULTS: Mean follow-up was 29 months, repeat biopsy data was available in 78 months. 34 (40%) patients had adverse repeat biopsy findings, and 39 (45%) had deferred radical treatment (initiated if PSA velocity >1 ng ml-1 year-1 or repeat biopsy showed primary Gleason grade >4, or % positive biopsy cores >50%). On univariate analysis tumour ADC was a significant predictor of adverse repeat biopsy findings ($p<0.0001$, HR 1.3 CI 1.1–1.6) and time to radical treatment ($p<0.0001$, HR 1.5

CI 1.2–1.8). ADC performed better than baseline PSA, Gleason score, stage, number of positive cores, % tumour in cores. CONCLUSION: Functional information provided by DW-MRI at presentation is potentially useful for identifying patients with localized prostate cancer at risk of disease progression.

1530 Northern regional experience of staging of prostate cancer by MRI

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PURPOSE: MRI evaluation of prostate cancer (CaP) prior to prostatectomy remains controversial. The aim of our study was to correlate pre-operative MRI staging with histological staging following radical retropubic prostatectomy (RRP) in our unit. MATERIALS/METHODS: All patients who had MRI prior to RRP between January 2001 and February 2006 were included. MRI was performed with a surface coil at 1.5 Tesla and reported by a dedicated uroradiologist. MRI findings were corroborated with histological staging of the RRP specimens. RESULTS: In total, 86 patients had MRI prior to RRP. MRI findings correlated well with histological stage in 61/86 patients (70.9%). Discrepancy between the MRI and histological stage was noted in 25 cases (29.1%). This included 21 cases where MRI suggested organ confined CaP (T2) whereas the histological staging confirmed extraprostatic spread (T3 or T4). This included microscopic extracapsular extension (n=9), macroscopic extracapsular extension (n=6), bladder neck invasion (n=3) and seminal vesicle invasion (n=3). On the other hand, in four cases MRI showed possible T3 disease whereas histological staging confirmed organ confined disease. CONCLUSION: Staging MRI correlated well with histological staging in the majority of our patients, however, detection of early extracapsular extension is difficult with MRI. With this knowledge we are re-interpreting these MRI scans to improve our evaluation of pre-operative MRI.

1540 Testicular microlithiasis and macrocalcification: prevalence of tumours and follow-up in a single centre over 10 years

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PURPOSE: Testicular microlithiasis (TM) and macrocalcification (TC) are associated with an increased prevalence of primary testicular tumours. We report our experience of ultrasound follow-up and suggest a strategy for management. MATERIALS/METHODS: A retrospective review of patients identified with TM or TC subject to follow-up ultrasound over a 10-year period. Ultrasound images were reviewed to classify calcification into TM or TC; TM was sub-divided into limited (LTM<5 microliths field-1), classical (CTM>5 microliths field-1) and florid (FTM, too numerous to count). Presenting symptoms, tumour-risk factors, ultrasound abnormality, age and follow-up period were recorded. Tumour development with pre-existing calcification was noted. RESULTS: 12 426 ultrasound examinations were performed, testicular calcification was identified in 326/12 426 (2.6%) patients and 464/24 852 (1.7%) testes; mean age 38.1 years (range 8–82 years). TM was present in 398/464 (85.8%) testes; CTM in 103/464 (22.2%), LTM in 279/464 (60.1%) and FTM in 16/464 (3.4%). TC was present in 66/464 (14.2%) testes. Co-existent testicular abnormalities were identified in 6/67 (8.0%) with CTM, 13/226 (5.8%) with LTM, 1/8 (12.5%) with FTM and 1/54 (1.9%) with TC. Co-existent testicular tumour was present in 8/67 (11.9%) with CTM, 6/226 (2.7%) with LTM and 5/54 (9.3%) with TC; mean age 36.4 years (range 21–55 years). Mean follow-up was 12.0 months (range 0–123 months). Two non-primary tumours developed. CONCLUSION: There is a high prevalence of primary testicular malignancy with CTM and TC, lower with LTM. No primary tumours developed. The opportunity for detecting tumours may be missed; follow up should be undertaken in a younger age group.

1550 Using MR diffusion imaging to assess the accuracy of transrectal ultrasound guided (TRUS) biopsy of the prostate gland as a localization technique for tumour involvement

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MATERIALS AND METHODS: The MR diffusion images of the prostate was divided into 5 volumes for analysis (right and left far laterals, right and left laterals, and central region, respectively) according to volumes defined by TRUS biopsy performed by the urologists. A single experienced radiologist read 30 prospective cases to score whether the defined volume was involved with tumour on MR. He was blinded to the routine MR prostate images and histology results. RESULTS: Twelve cases (40%) show perfect matches between diffusion and histology of all 5 volumes. Eleven cases (36.7%) show near perfect matches (4 out of 5 volumes). There are 7 cases of mis-matches (23.3%). CONCLUSION: A sizeable discrepancy (23.3%) exists between the two modalities which raises questions about the accuracy of TRUS biopsy as a localization method.

1630 How accurate is anatomical imaging in diagnosing obstructive uropathy when compared with diuretic radionuclide renography?

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PURPOSE: In suspected obstructive uropathy (OU), to what extent do morphological appearances of the renal collecting system correlate with genuine obstruction? MATERIALS/METHODS: 104 adult patients with a radiological diagnosis of probable OU underwent diuretic renography. For each kidney a pure parenchymal renal region of interest (ROI) was drawn and a parenchymal time activity curve generated, in addition to the whole kidney ROI and curve. The curves were graded as obstructive, normal, equivocal or uninterpretable. A progressive increase in tracer uptake over 40 min, with no output after frusemide, was deemed "obstructive"; an output significantly exceeding 50% of the activity within the kidney at peak was classed as "normal". RESULTS: 39/104 patients (37%) with probable OU on anatomical imaging showed no obstruction on diuretic renography when the whole kidney curves of the renogram were considered. When parenchymal curves were analysed, an additional 7 patients with presumed OU were shown to be unobstructed. Within the total patient population, 26/73 patients (36%) with probable OU on ultrasound, 9/17 (53%) on CT and 11/14 (79%) on IVU were found not to be obstructed on analysis of the parenchymal curves. Diuretic renography was equivocal or uninterpretable in 23 patients (22%). CONCLUSION: The diagnosis of urinary tract obstruction based on morphological appearances alone can be incorrect. Diuretic radionuclide renography is more specific in diagnosing obstruction. Analysis of the parenchymal curves of the renogram in addition to the whole kidney curves adds further specificity.

1640 Evaluation of residual seminoma masses following chemotherapy with FDG PET/CT

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BACKGROUND: Seminomas are germ cell tumours which are chemo-sensitive and highly FDG avid. However, despite adequate chemotherapy some viable tumour may remain in the residual mass necessitating surgical resection which can be difficult. A non-invasive way of assessing residual disease will help in planning further management options. PURPOSE: To evaluate the role of FDG-PET/CT in the investigation of residual seminoma masses in patients following chemotherapy. MATERIALS/METHODS: Eight patients (mean age

40 years) with seminoma and residual soft-tissue masses following treatment with chemotherapy were investigated with FDG-PET/CT. Images were reviewed by two blinded observers who identified and localized lesions recording the dimensions, standardized uptake value (SUV) and whether overall features were positive or negative on PET/CT. The presence or absence of active disease at these sites was subsequently independently evaluated based on follow-up imaging and/or biopsy results. These were correlated with the PET/CT findings. RESULTS: The mean long and short axis diameter of the residual mass was 3.6 cm and 2.2 cm, respectively. The median SUV was 1.8 (range 0.02–4.1). Residual masses in all eight patients were subsequently shown to contain no active disease. The PET/CT was read as positive in 2/8 and negative in 6/8 patients giving a false positive rate of 25%. CONCLUSION: A significant proportion of residual seminoma masses following chemotherapy may give rise to false positive FDG-PET/CT. The decision to proceed to surgery should therefore not be planned based on the finding of a solitary FDG-PET/CT result.

1650 Accuracy of MRI in staging endometrial cancer – Sheffield experience

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PURPOSE: To evaluate the accuracy of pre-operative MRI in predicting myometrial invasion, cervical involvement and advanced disease in patients with endometrial cancer. METHOD: A retrospective study of 60 cases with primary endometrial cancer referred to Sheffield Teaching Hospitals between January 2003 to December 2006. All patients in the study had histologically confirmed endometrial malignancy with a median age of 56 years. The pre-operative MRI staging was compared with post-operative histological FIGO staging which was considered as the gold standard. The outcome was measured as specificity, sensitivity, positive predictive value, negative predictive value and overall accuracy of MRI in staging endometrial cancer. RESULTS: Of the 60 cases analysed there were 30 patients with superficial myometrial involvement and sensitivity and specificity of MRI in predicting this stage were 77% and 73%, respectively. The sensitivity for deep myometrial involvement was 44% and specificity was 88%. For staging cervical involvement the specificity was 89% and sensitivity was 42%. The accuracy was better for advanced disease at 92%. The overall accuracy of MRI for staging endometrial carcinoma was 83%. CONCLUSION: MRI is better in predicting superficial myometrial involvement and advanced disease compared to deep myometrial involvement and cervical involvement.

1700 Diffusion weighted MRI in the uterus – zonal variation and comparison with cervical cancer

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PURPOSE: To compare apparent diffusion coefficients (ADCs) of normal uterine regions with cervical cancer and determine the effect of oral contraceptive pill (OCP) usage. MATERIALS/METHODS: 18 women with cervical intraepithelial neoplasia (CIN) (16 pre-menopausal, 12 taking OCP, 1 post menopausal, 1 status unknown) and 18 patients with stage 1b2 cervical tumours were studied. Absence and presence of malignancy, respectively, was confirmed histologically in both groups. MRI was performed on a 1.5 T Philips Intera using a 37 mm endovaginal coil. T2 weighted fast spin-echo 4500 ms/80 ms [TR/TE] images in 3 orthogonal planes to the cervix (256 acquisition matrix, 11 cm FOV, 3 mm slice thickness) and diffusion-weighted echo-planar images 2500 ms/69 ms [TR/TE] (b-values 0, 300, 500 and 800 s mm-2, 96 matrix, 20 cm FOV, 4 mm slice thickness) were obtained. Isotropic ADC maps were generated. Regions of interest (ROIs) were drawn over cervical epithelium, cervical stroma, endometrium, junctional zone and outer myometrium in CIN patients by visual correlation of ADC maps with anatomy on corresponding T2 weighted images. In cancer patients, ROIs encompassing the entire tumour gave ADCs that reflected tumour heterogeneity. RESULTS: Mean ADC values (x10-6 mm2 s-1 ±standard deviation) were: cervical epithelium 1432±183; endometrium 1297±136; junctional zone 826±109; outer myometrium 1392±181; cervical stroma 1073±218; cervical tumour 847±218. Tumour ADCs were significantly different to those from cervical epithelium and cervical stroma ($p<0.05$). CONCLUSION: ADCs of cervical tumour are significantly lower than for cervical stroma and epithelium and may be useful in detecting stromal invasion in small lesions. Endometrial ADCs did not change with OCP usage although junctional zone ADCs did increase.

1710 Magnetic resonance imaging and the preoperative evaluation for live donor nephrectomy: a three year experience

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PURPOSE: To evaluate our experience with MRI, assessing its diagnostic accuracy in visualizing the anatomy of the vascular and collecting systems of live donor kidneys. MATERIALS/METHODS: In our centre, 135 patients underwent donor nephrectomy over a 3 year period. We retrospectively studied the hospital notes of 98 patients who were preoperatively assessed with MRI. We looked at the anatomy of the renal arteries, renal veins and collecting system in the MRI radiology reports and compared them with the intra-operative findings. The other 37 patients were either assessed using a different imaging modality or their notes were incomplete or missing. RESULTS: The MRI demonstrated that out of 98 donor kidneys, 16 had an accessory renal artery and 5 had early branching arteries. Out of 93 reported venous systems, 2 had 2 renal veins. Out of 97 kidneys (inability to comment on one collecting system), one had a duplex ureter. With regard to the operative findings, 25 harvested kidneys had 2 renal arteries, one had 3 arteries, 10 had early branching arteries, one had 2 renal veins and in one there was a duplex collecting system. The accuracy of MRA and MRU was 87.8% and 100%, respectively. The MRA had a sensitivity of 57.7% and a specificity of 98.6% in detecting accessory renal arteries. CONCLUSION: This study shows that the MRI has got an acceptable accuracy in visualizing the renal anatomy; however, it has a low sensitivity in identifying accessory renal arteries which is a cause of concern.

1430–1550
Interventional keynote lecture and scientific session

1430 Invited review: Interventional radiology – *veni*, *vidi*, vanished

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Interventional radiology has changed the practice of modern medicine. Interventional radiological procedures are now an essential part of modern medical care and have replaced many traditional surgical techniques. The success of this discipline has generated interest from other specialties. As a result, some areas of interventional radiology are now practiced largely by non-radiologists. There are also "off limits" areas, which involve procedures that radiologists can perform well, but are prevented from doing so by others, who are not more skilled, but have access to the relevant patients. There are four factors that determine who does what in the case of practical disciplines. In ascending importance, these are research activity, skills and training, the numbers of practitioners and, most important of all, clinical control of patients. Interventional radiologists are very skilled, but they lack behind competitors in all other areas. For interventional radiology to flourish, it is necessary to improve training, to encourage more research but, above all, to enable interventional radiologists to assume primary clinical responsibility for patients under their care. There are three possible future directions for interventional radiology: (a) the status quo, (b) to become a stand-alone clinical discipline based on advanced technology, distinct from diagnostic radiology and (c) partnership and collaboration with other clinical specialties. There are risks in all these options but collaboration with other disciplines is the most likely to benefit patients.

1500 Radiologically inserted gastrostomy: changes in technique affecting outcome over an 11 year period

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PURPOSE: The impression in our trust is that the major morbidity and mortality of radiologically inserted gastrostomy (RIG) has reduced over time. This retrospective review was designed to assess the technical success and complication rates of RIG over the study period and to determine what factors have been responsible for the noticeable reduction in major complications. MATERIALS/METHODS: All RIGs performed between March 1996 and September 2007 were retrospectively reviewed. Information about techniques, complications and success rates was gathered and analysed from the case notes. Changes in technique were assessed and the results compared with the largest meta-analysis in the medical literature. RESULTS: The total number of RIGs performed over the study period was 91. In the first 4 years there was a higher major complication rate of 13% with a mortality rate of 3%. The technical success rate was 90%. These results were suboptimal when compared with the largest meta-analysis in the literature. Changes in technique over the following 7 years such as the use of gastropexy and limiting the procedures to performance by a few specialists has significantly reduced the major complication rate to 6% and the mortality to 0% whilst increasing the technical success rate to 97%. CONCLUSION: Changes in procedural techniques and protocols at our trust over the last 11 years have led to a significant reduction in the major complication rate.

1510 Operator hand scrubbing has no influence on the frequency of infection following tunnelled central line insertion

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PURPOSE: To determine whether or not operator hand scrubbing has any effect on post-insertion infection rates for tunnelled central venous catheters. MATERIALS/METHODS: For this retrospective study the positive microbiology samples obtained from patients for 10 days following tunnelled CVC insertion by one of two operators were compared. The 2-year study period preceded the adoption of a hospital-wide policy requiring operator hand scrubbing prior to CVC insertions. Operator A (71 procedures) performed conventional "surgical" scrubbing prior to donning sterile gloves. Operator B (100 procedures) maintained "clean hands" between patient contacts. For all patients, computerized microbiological records were examined, identifying episodes of positive bloodstream infection or "skin infection". RESULTS: In the 10 day period following line insertion the frequency of microbiologically-proven bloodstream infection for Operator A was 6% (4/71) and for Operator B 7% (7/100, p for difference 0.72). During the same period the frequency of skin infection for Operator A was 7% (5/71) and for Operator B was 6% (6/100, p for difference 0.78). The overall frequency of positive microbiological sampling for Operator A was 13% (9/71) and for Operator B 13% (13/100, p for difference 0.95). CONCLUSION: The results suggest that "surgical" hand scrubbing prior to donning sterile impermeable gloves for tunnelled CVC insertion does not confer a substantial reduction in post-procedural infection rates. These data suggest that the likelihood of a type II error (i.e. there is a real infection reducing effect attributable to hand scrubbing but the sample size is too small to detect it) is only 5%.

1520 Percutaneous vertebroplasty: feasibility of a new "bare to the bones" approach

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PURPOSE: We assessed the feasibility of performing vertebroplasty on an outpatient basis, without general anaesthesia or an anaesthetist present. We present the method and outcome of performing vertebroplasty in this manner. MATERIALS/METHODS: We performed this procedure on 36 patients at our institution between September 2005 and November 2007, using "conscious sedation" and on an outpatient basis. We examined outcomes, the need for anaesthetic help or hospital admission, and patient tolerance of the procedure. RESULTS: 35 patients tolerated radiologist led conscious sedation during the procedure. 1 patient was converted to general anaesthesia in theatre. 28 patients (78%) were discharged on the same day after the recovery period (ranging from 5 h to 8 h). 8 patients (22%) stayed overnight. We will discuss the overall results of cost savings, pain relief and complications from this series. CONCLUSION: Percutaneous vertebroplasty is a safe and cost-effective procedure when undertaken using simple protocols, day-case surgery pathways and radiologist led conscious sedation.

1530 Serial scanning for deep venous thrombosis: the value of D Dimer testing

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PURPOSE: Ultrasound is highly sensitive for above knee deep venous thrombosis (DVT) but significantly less so for calf thrombi. Given the potential risk for calf thrombi to propagate, it has been suggested that ALL patients with an initial negative scan be rescanned after 7 days. However, this would entail significant time and cost outlays. Using D-Dimers to select patients requiring a repeat scan has been suggested as an effective method to reduce the number of repeat scans required. A negative D-Dimer is accepted as excluding DVT. Our objective was to determine the number and actual yield of repeat scans for above knee DVT performed on patients with negative initial scans and positive D-Dimers. METHODS: All patients who underwent ultrasound for DVT were identified retrospectively over a 12 month period. All patients with negative initial scans but positive D-Dimers were rescanned after 7 days. RESULTS: A total of 688 scans were performed in the 12 month period. Of these, 137 (20%) were positive and 551 (80%) negative for DVT. Of the patients with negative scans, 86 (12.5%) had positive D-Dimers and therefore were re-scanned after 7 days. Of these, 6 (7%) were positive for DVT. CONCLUSION: By using D-Dimers to select patients requiring repeat scans, only 12.5% of our patients were rescanned as opposed to a potential 80%. A significant 7% of these patients had a positive second scan. We suggest that D-Dimers are potentially an effective means to reduce the number of repeat scans. Further comparative studies would be of value.

1540 "Trauma – who cares?" Implications for radiology

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PURPOSE: The publication of the NCEPOD study "Trauma who cares" in November 2007 does not provide any surprises as to the state of trauma care in the UK. However, it does have implications for Radiology departments everywhere. MATERIALS/METHODS: The NCEPOD study examined the management of 795 trauma patients with ISS scores of 16+ admitted to 180 UK hospitals in a 3 month period. Organizational and patient data was submitted by questionnaire and case notes and analysed by a multidisciplinary group of experts. After analysis organizational details and case management were graded: Good practice, Room for improvement, Less than satisfactory. RESULTS: Almost 60% of the patients in this study received a standard of care that was less than good practice. Deficiencies in both organizational and clinical aspects of care occurred frequently. In many cases the cause of these deficiencies was related to the provision of radiology services such as CT and the inappropriate use of imaging. Only one patient in 495 who were haemodynamically unstable went for embolisation. 110 patients went to surgery for haemorrhage control. CONCLUSION: There has been no improvement in mortality from major trauma in the UK since 1990. The UK has the highest death rate for trauma victims in the developed world. Timely appropriate radiology is essential in trauma management. It is not provided in the majority of UK hospitals.

1430–1530
DH Imaging Forum: Service improvement and lean. What's the difference?

1430 Invited review: Service improvement vs. lean in radiology

Hoadley, G.
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Traditional service improvement has the ethos of "the patient at the heart of all processes". Building on this foundation it uses data to inform the approach to improving patient experience through the main workstreams of process redesign, workforce optimization, technology solutions, and transformation change by totally new ways of working. The standard data for this is demand and capacity, supported by knowledge of waiting times, DNA rates, percentage of patients being offered booked appointments (i.e. choice). Periodic review of these factors leads to incremental improvements in service quality and delivery. There are parallels between LEAN and traditional service improvement, but LEAN is a longer term management philosophy with a wider scope, based on beliefs that the right process will give the right result, that the workforce are a vital source of ideas and solutions, and commitment to continuous problem solving through root cause analysis. It should be a continuous daily process, supported by rapid improvement events (Kaizen) when required. Traditional service improvement uses capacity and demand data which can be onerous to collect, especially if it has to be done manually. LEAN works on a different principle of Takt time, which is initially hard to grasp but thereafter is easier to use on a daily basis. Value stream mapping replaces process mapping and can give a broader view of the entire service, while statistical process control charts offer a new insight into variations in the service which contribute to the total inefficiency. LEAN introduces the concept of "pull", where work is not done until the next step in the process is ready for the product – a concept normally alien to healthcare which relies upon creating waiting lists, however short, to manage flow. This approach becomes increasingly untenable however as waiting times fall lower and is impossible to contemplate if we ever wish to achieve a real "no waits" service. One of the very useful LEAN tools is visual management, making the waiting times, defect rate, and other key indicators highly visible for all to see. This enables individual workers to feel involved in progress toward targets but also identifies areas for further improvement. Used carefully it can also aid efficiency of working in many areas. Finally LEAN is fundamentally a quality initiative, aiming to drive out defects in the pursuit of perfection in our processes. It should offer a major boost to patient safety by encouraging standard working patterns (as in the airline industry) along with improved turnaround times, experience for patients and clinicians, and by eliminating waste lead to a more cost effective service.

1450 Invited review: Lean thinking and 6 sigma

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GE Healthcare, Cardiff, UK

From its roots in the automotive industry in the 1950s to the refined tools used by the worlds leading businesses today, Lean has been successful in driving out waste and increasing process speed, quality and efficiency. At the heart of this approach is the customer's definition of Value – Lean thinking seeks to remove any activities which do not add Value for our customers. While Lean delivers process speed, Six Sigma aims to reduce variation and eliminate defects. A systematic and analytical approach, Six Sigma uses statistical tools and data analysis to identify the root causes of variation. Combined with techniques to accelerate change, Lean and Six Sigma are proving to be the antidote for many of the challenges facing modern healthcare organisations today. With examples from CT, MRI, X-ray and nuclear medicine, this presentation will show how GE Healthcare Performance Solutions have helped their clients drive out waste and improve the service provided to patients across radiology.

1510 Invited review: Lean imaging – an overview from a clinician

Birnie, D.
Queen Alexandra Hospital, Portsmouth, UK

PURPOSE: Understanding implementation of lean in an imaging department and need for operational management. MATERIALS/METHODS: Data capture, rapid process improvement week, A3 plans and 30 day reviews. RESULTS: Results of implementation in imaging and other modalities will be reported including successes and problems. Key success factors for lean implementation will be highlighted and the difference between traditional service improvement approaches. CONCLUSION: Benefits of implementation will be reported under headings of quality, safety, delivery time, cost and morale.

1430–1725
Service Delivery Scientific Session I

1430 Achieving the 4 week wait. Our experience as an early implementer site

Wilson, P. R.
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PURPOSE: To show how 4 week waits for all modalities can be achieved if one aggressively manages waiting lists and maximizes productivity. MATERIALS/METHODS: As an early implementer site we had to bring our waiting times down to 4 weeks by December 2007 with very little extra resource. Building on the Service Redesign and LEAN work we have already done we have looked again at all our pathways within the Radiology department. We have explored electronic referral and reporting, implemented daily, weekly and monthly waiting list management, changed rotas and working practises. RESULTS: The 4 week target has been achieved due to a whole system approach which allows some flexibility in order to achieve maximum productivity. CONCLUSION: It is possible to achieve (and go beyond) the 4 week target.

1440 Ultrasound waiting list reduction to meet the 18 week target from referral to treatment

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PURPOSE: A case study of an ultrasound wait reduction from 25 weeks to 5 weeks in a Department performing 25 000 non obstetric ultrasounds annually. METHODS: In 2006 routine ultrasounds waited 25 weeks. A business case for new resources was not funded. There was little perceived chance of achieving a 13 week wait by April 2007. However a Team was formed to implement measures including reducing radiologist scan slots from 15 min to 10 min, and reducing sonographer time slots from 20 min to 15 min. Helpers were assigned to every list. Radiologist job plans included evening lists where 2 machines were available to speed throughput, the helper preparing the next patient while the radiologist was scanning. Radiologist Sessions were increased by extending radiographer skills e.g. for bariums. Radiologist rotas gave priority to ultrasound at the expense of shorter wait modalities. Intensive waiting list validation was performed and a "DNA" policy enforced. Interventional Ultrasound was transferred to the Interventional Suite. RESULTS: The April 2007 13 week target was easily met and our current wait is 5 weeks, on target to meet 4 weeks by April 2008. We are moving to direct booking ultrasound appointments. The waiting list reduction has been accompanied by an 11% to 4% reduction in "DNAs". CONCLUSION: This waiting list reduction has meant improved efficiency, fewer interruptions and reduced complaints from patients/referrers. However, ultrasound lists are now harder work due to shorter slots and reduced DNAs, and waiting list validation is very time consuming, although this reduces with shorter waits.

1450 Testicular ultrasound in primary care

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PURPOSE: The NHS Care Closer to Home initiative seeks to improve local access to diagnostics. We conducted a Primary Care based scrotal ultrasound pilot study to see if it overcame lengthy diagnostic delays to patient pathways in Secondary Care. MATERIALS/METHODS:

During the 6 month pilot, GPs referred directly into a community ultrasound clinic run by two trained sonographers supported by a urologist and a radiologist. The ultrasonographers used a clinical decision making protocol to arrange appropriate follow-up by the GP, a urologist or a radiologist. The results were audited against patients referred in the traditional way to the main DGH urology OPD to compare pathway steps, speed, safety and cost. RESULTS: 70 patients with suspected non-malignant scrotal lumps were scanned. Using the protocol, with occasional support from the urologist, the ultrasonographer reassured 44 (62.8%) patients who were discharged to their GP. Twenty (28.6%) were referred to a urologist complete with diagnosis and six (8.6%) to a radiologist; this included an unsuspected 1 cm testicular tumour. Comparison of the pilot with the traditional secondary care pathway showed a reduction in mean pathway time from GP referral to treatment decision from 112 days to 29.5 days, respectively. CONCLUSION: This ultrasonographer-led, consultant-backed Primary Care service provides a user-friendly and accessible pathway, resulting in certainty of diagnosis from the outset. This shorter patient pathway is faster than referral to a hospital urology clinic for the vast majority of non-target scrotal/testicular referrals. The avoidance of unnecessary outpatient appointments for 94% of patients saved £12 378.

1500 Remote reporting. Co-operation or competition?

Crotty, M.[1]·Craven, R.[2]·Eiffert, A.[3]·Elphinstone, D.[4]·French, P.[5]·Griffiths, S.[6]·McKay, L.[7]·Mills, P.[7]·Jones, R.[5]
[1]SEC SHA/NHS CfH, Maidstone, UK, [2]SEC SHA, Maidstone, UK, [3]Queen Victoria Hospital NHS Foundation Trust, East Grinstead, UK, [4]Dartford & Gravesham NHS Trust, Dartford, UK, [5]East Kent Hospitals NHS Trust, Ashford, UK, [6]Medway Maritime Hospitals NHS Trust, Gillingham, UK, [7]Maidstone & Tunbridge Wells NHS Trust, Maidstone, UK

PURPOSE: To establish and evaluate the sharing of examination reporting between NHS Trusts. MATERIALS/METHODS: New technologies are allowing reporting to take place remotely from the point of acquisition. In recent years several companies have entered the market place providing a modular service of image acquisition, reporting, and transcription. This has been variously seen as a useful additional option or a threat to established ways of working. Flexibility of service, and provision of additional capacity have proved useful, but concerns have been voiced about quality, and the adverse effect of distance on clinician relationships and patient care. In 2007 a Pilot Radiology Network was established in Kent & Medway, formed of 5 Acute Trusts, the SEC SHA and NHS CfH. Within this project we examined the opportunities for new reporting models provided by the newly deployed NHS CfH RIS and PACS technologies. By developing remote reporting in other NHS Trusts, it was hoped to reap some of the undoubted benefits whilst avoiding some of the pitfalls. RESULTS: Work started by identifying and addressing both technical and "soft system" challenges e.g. access to request information, liability issues, payments, clinical governance. We then proceeded to a "proof of concept" involving the reporting of a small number of examinations from each Trust by staff at one of the other participating Trusts. Work is in progress expected to complete March 2008. CONCLUSION: Shared reporting can be a useful option in service delivery, increasing flexibility and providing staff development opportunities.

1510 Radiology networks. A new model for service provision? Experience from Kent & Medway

Crotty, M.[1]·Craven, R.[2]·Eiffert, A.[3]·Elphinstone, D.[4]·French, P.[5]·Griffiths, S.[6]·McKay, L.[7]·Jones, R.[5]
[1]SEC SHA/NHS CfH, Maidstone, UK, [2]SEC SHA, Maidstone, UK, [3]Queen Victoria Hospital NHS Foundation Trust, East Grinstead, UK, [4]Dartford & Gravesham NHS Trust, Dartford, UK, [5]East Kent Hospitals NHS Trust, Ashford, UK, [6]Medway Maritime Hospitals NHS Trust, Rochester, UK, [7]Maidstone & Tunbridge Wells NHS Trust, Maidstone, UK

PURPOSE: In March 2007 a pilot project was established in Kent & Medway to investigate the possibilities and practicalities of a radiology network. MATERIALS/METHODS: 5 acute Trusts came together in co-operation with the SEC SHA and NHS CfH to establish and run the pilot scheme over 12 months. The approach taken involved the detailed examination of 6 areas previously identified as possibly benefiting from a network approach – the creation of a cross-organizational staff bank; sharing procurement of imaging equipment and consumables; the standardization of management information reporting; the transfer of examination reporting between organizations, and the creation of a joint Best Practice Forum. In addition to the specific benefits of each of these workstreams, it was intended that they should also be used to develop models of governance and shared working. RESULTS: At the time of writing work is still in progress, (expected to complete March 2008). However, cost savings have been achieved and new ways of working developed with early lessons have emerged around information gathering and standardization and consensus building as well as the more prosaic such as the importance of terminology, and factors for maximizing meeting attendance. CONCLUSION: In a rapidly changing environment, Radiology Networks provide new options for service delivery.

1520 Community staff bank – useful resource or failed experiment?

Crotty, M.[1]·Craven, R.[2]·Cotter, M.[3]·Eiffert, A.[4]·Harvey, G.[5]·Martin, A.[6]·Roberts, K.[7]·Woolmington, H.[7]·Trodd, F.[6]
[1]SEC SHA/NHS CfH, Maidstone, UK, [2]SEC SHA, Maidstone, UK, [3]Medway Maritime Hospitals NHS Trust, Gillingham, UK, [4]Queen Victoria Hospitals NHS Trust, East Grinstead, UK, [5]East Kent Hospitals NHS Trust, Ashford, UK, [6]Dartford & Gravesham NHS Trust, Dartford, UK, [7]Maidstone & Tunbridge Wells NHS Trust, Maidstone, UK

PURPOSE: Creation of a cross-organization Staff Bank allowing staff to work additional hours at another organization, as well as their own. MATERIALS/METHODS: The concept of a staff bank as a mechanism for providing additional capacity within radiology departments is well established. Popular with staff seeking additional earnings, and ranging from cover for out of hours shifts, cover for staff leave or in staffing of additional sessions in support of waiting list initiatives. In 2007 the Kent & Medway Pilot Radiology Network was formed of 5 acute Trusts, the SHA and NHS CfH. As a part of the pilot project we sought to extend this concept to allow staff to work additional hours at other organizations, as well as their own. This was done with the twin aims of reducing Trust dependency on agency staff and allowing the utilization of staff already familiar with the technology and systems of work and thereby providing a higher quality, more efficient service. RESULTS: The work carried out identified potential legal and procedural issues which were addressed during the course of the pilot. The approach to resolving these issues will be discussed. Agreements were reached on standard shifts and payment rates. Management arrangements were also established. At the time of writing the work is not yet complete, so the degree of success achieved is unknown, but the results will be shared during this presentation.

1530 Taking it to the patient; radiology in a GP surgery

Harcus, J. W.
The Grange Medical Centre, Hemsworth, Pontefract, UK

KEY LEARNING OBEJECTIVES: The Department of Health has outlined its strategy to bring healthcare closer to home and improve the services offered within the community. Access to imaging plays a key role in this, allowing patients a more convenient and timely means of undergoing diagnostic examinations. The Grange Medical Centre is an example of how this may work in practice. This is an overview of the services we offer and the logistics of our operation.

DESCRIPTION: The Grange Medical Centre is situated in the town of Hemsworth in West Yorkshire. In addition to the normal services a GP practice would provide, we also can offer our patients other facilities such as physiotherapy and consultant outpatient clinics, as well as diagnostic imaging. We have an ultrasound machine for weekly clinics, as well as a fully functional X-ray room. The X-ray room, complete with CR processing, can accommodate patients referred for plain films on a daily basis. Employing a full-time radiographer and enlisting the services of a consultant radiologist allows us to provide a timely and effective turnaround from initial consultation to report. In the course of setting up and delivering the service, many problems have been encountered, but we feel that we provide a worthwhile and patient-friendly approach to the service provision. CONCLUSION: The Grange Medical Centre defies the norm for a general practice. However, we as an example would expect other similar facilities to become more and more common in line with the Department of Health's vision for community-based healthcare.

1540 Radiology reporting: a general practitioner perspective

Grieve, F. M.·Plumb, A. A.·Khan, S. H.
Royal Blackburn Hospital, Blackburn, UK

PURPOSE: Radiology reports are usually the sole method of communication from Radiologists to General Practitioners (GPs) due to a lack of direct contact between the two parties. The aims of this study are to determine the level of GP satisfaction with Radiology reports, their perception of the optimum report content and preferences regarding level of detail and format. MATERIALS/METHODS: A questionnaire was sent to 100 GPs referring to East Lancashire Hospitals NHS Trust for Radiology services. Statistical analysis was performed using the Friedman test and Fisher's multiple comparisons test. RESULTS: 60 replies were received. GPs were generally satisfied with content and clarity of the reports they receive, though suggestions for improvement were made. Radiologist's recommendations for further treatment, referral and non-radiological investigation are valued, with 88%, 90% and 97%, respectively, of GPs stating they should be included in a report. 83% of respondents felt that suggested further imaging should automatically be arranged by the Radiology department. The majority of GPs are unfamiliar with the normal size ranges of anatomical structures frequently measured in Radiology reports. GPs were asked to rank preferences for ultrasound reports for the same hypothetical patient with differing formats and levels of detail. They favoured detailed reports in a tabulated format (statistically significant, $p<0.05$). CONCLUSION: GPs value the Radiologist's opinion outside the remit of imaging when suggesting further patient management and prefer a high level of detail in a report. Reporting the size of an organ or structure without explanation of its significance can potentially cause confusion.

1615 Pelvic projection radiography: increasing the source image distance provides diagnostic images at a reduced dose

Farrell, K. R.·Abbott, C.·Round, K.·Willis, S. J.·Yalden, R.·Knapp, K. M.
University of Exeter, Exeter, UK

PURPOSE: To investigate the potential for reducing patient doses for pelvis projection-radiography by increasing the source–image distance (SID). METHODS: A tissue equivalent PIXY phantom was used to obtain anteroposterior (AP) projection radiographs of the pelvis at SIDs ranging from 90 cm to 130 cm using the same collimation size and exposure factors of 79 kVp and 12.5 mAs. The exposures for each SID were repeated 10 times to account for precision errors. A barracuda (MPD) solid-state detector probe was used to measure the entrance dose. The measurements were made using Siemens multix-TOP X-ray equipment and the images acquired using Konica CR. Image quality was measured (blinded) by three separate readers using an 18-point subjective scale. A Mann-Whitney U test was used to calculate the statistical differences between the entrance doses at the various SIDs. RESULTS: The entrance doses for SIDs at 90 cm, 115 cm and 130 cm were 1.63 mGy, 0.84 mGy and 0.61 mGy, respectively. These were statistically significantly reduced with increasing SID, with a p-value of <0.001. Using the 18-point subjective scale there were no significant differences between the diagnostic quality of the images at any of the SIDs. CONCLUSION: Increasing the SID for AP pelvis radiographs significantly reduces the entrance dose, while still providing diagnostic images within the range used in this study. The dose reductions are attributable to the inverse square law resulting in a lower entrance dose. Further research is required into whether reduced exposure factors may yield the same effect whilst maintaining diagnostic images.

1625 Dose reduction in diagnostic radiology: has it gone too far?

Egbe, N. O.·Sharp, P. F.·Heaton, B.
University of Aberdeen, Aberdeen, UK

PURPOSE: Doses in diagnostic radiology are continually under review. Over the last decade, a reduction of over 42% has been achieved for most examinations in the UK. This study is aimed at assessing whether doses have been reduced too far or if there is room for further reduction. METHOD: Current diagnostic radiology doses for chest and abdominal radiography were monitored at the Aberdeen Royal Infirmary (ARI) using lithium fluoride (LiF) thermoluminescent dosemeter (TLD – 100). Phantoms images of simulated objects obtained under clinical conditions were reviewed by four observers and the film contrast was also assessed. RESULTS: Results for chest phantom studies indicate a 16% difference between UK 2005 national dose reference level and doses measured in the study. A 10% reduction in dose lowers contrast by 6.4% and 3.1% for objects in the lung and sternal areas, respectively. A contrast reduction of 28.6% and 30.8% was obtained for a 32.3% dose reduction for the same objects. Mean observer detectability showed a less prominent decline, but inter reader differences are wide and unpredictable. Results for the abdomen are being reviewed. CONCLUSION: This ongoing study shows that observer performance and image contrast are adversely affected by extending dose reduction below 0.10 mGy for chest radiography. The effect of this on expected patient outcomes may point to the need for an appraisal of current position on dose reduction, and a review of the techniques applied in film/screen chest radiography.

1635 Abbreviations used on radiology requests: are we compromising communication and safety?

Grieve, F. M.·Vummidi, D.·Khan, S. H.
Royal Blackburn Hospital, Blackburn, UK

PURPOSE: The clinical details given on a Radiology request are vital in order to safely justify exposures of ionising radiation, correctly interpret the images and generate the most accurate report. The purpose of this study is to determine what abbreviations are used by referring clinicians on Radiology request cards and whether they are recognized by Radiological staff. MATERIALS/METHODS: Abbreviations were recorded from requests for plain radiography, CT, ultrasound and fluoroscopy studies. Radiologists and Radiographers were asked whether they were familiar with the abbreviations and whether they felt they were appropriate. RESULTS: 108 different abbreviations were found on 242 request cards. Some requests contained up to five different abbreviations. The most frequently used abbreviations were recognised by over 90% of Radiologists. However, over a fifth of different abbreviations used were not recognised by 70% of Radiologists. Examples include UDGC on a CT neck request, CIBH on a Barium enema request and FSD for a cervical spine request. An internet medical abbreviation database was searched to try to uncover their meanings (www.medilexicon.com). Some abbreviations had multiple possible meanings and were given varying interpretations. CONCLUSION: A significant number of clinicians referring patients to the Radiology department are using non-standard abbreviations which are not recognized by the majority of Radiologists and Radiographers. This study shows that clinical information is being lost or misinterpreted, potentially causing inappropriate exposures of radiation and suboptimal report quality. Although standard abbreviations can save time, ink and paper, obscure abbreviations can waste time, cause confusion, and should be avoided.

1645 Pure gold or just silver recovery: the fate of the plastic film library

Ridley, N. T.·Michell, C.·Stanley, C.·Flandorfer, M.
Great Western Hospital, Swindon, UK

PURPOSE: Radiology departments throughout the UK are rapidly becoming digital. Our own department has been digital for 5 years. A digital film file has been accumulated in this time. It has recently been proposed that all the plastic films in the library be destroyed and sent for silver recovery. This prompted an audit of the films to see which could be thrown away because the digital library had examples and those that should be preserved in some form as they had unusual or historical findings. MATERIALS/METHODS: Each case in the film library was reviewed and classified into "destroy" (as examples now existed in the PACS library) and "save". This second group were subdivided into "save for unusual pathology" and "save for historical reasons". The historical section contained examples of procedures that are no longer performed such as direct carotid angiography and fetal radiographs. RESULTS: The library contained a total of 1427 cases. 925 were designated for destruction and 502 to be "saved". The save group was further divided into those that contained unusual pathology (354) and those that had historical value (148). CONCLUSION: The majority of plastic films can be culled from the film library as a digital library is soon acquired. There are, however, a number of films that should be preserved and digitized. A significant number of films have historical value and a few of these may warrant preservation in plastic form.

1655 Impact of teleradiology on clinical practice and workflow: benefits of a Singapore India teleradiology link

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PURPOSE: Prior to teleradiology implementation, outpatient radiographs performed at primary healthcare facilities managed by the National Healthcare Group, Singapore had a mean report turnaround time of 3 days. Following the implementation of teleradiology, this workflow was modified to transmit radiographic and CT images to a reading facility in Bangalore, India for interpretation. The purpose of this study was to evaluate the benefits of this teleradiology model. MATERIALS/METHODS: Outpatient radiographs performed at five primary health care facilities in Singapore over a 9 month period and CT scans performed at an inpatient facility administered by the National Healthcare Group, Singapore over a 3 month period were transmitted via teleradiology to a reading facility in Bangalore, India, for interpretation. We evaluated report turnaround times and physician satisfaction with the teleradiology workflow. RESULTS: 43 034 radiographic and 54 CT examinations were reviewed via teleradiology over the study period. Report turnaround time was under 1 h in 93% of radiographs and under 30 min in 69% studies. Increased physician satisfaction, indicated by increased referral volumes, was noted. Patients were given the report of the radiograph at the initial visit and thereby saved a repeat visit to the polyclinic. CT reports were also provided in a timely manner, with a turnaround time of 1 h in 77% and under 2 h in 23% of studies reviewed. CONCLUSION: Utilization of international teleradiology by healthcare facilities in Singapore has resulted in improved report turnaround time and enhanced physician satisfaction.

1705 Sharing data-brick walls or fluid networks?

Gatley, S.
Sybermedica Ltd, Cambridge, UK

With the nationwide adoption of PACS, the ability to share data across organizational boundaries becomes the next Holy Grail for UK clinicians and business managers alike. The principle of informed/implied consent paves the way for sharing data in the interest of patient care and there is no major legal impediment to the transfer of data between organizations. The free flow of information across clinical networks is, however, somewhat limited by a mind-set that still thinks in terms of brick walls rather than fluid communities, and because organizations are in essence, risk averse, information is sometimes slow to arrive in the hands of those that need it. Compare this to the meteoric rise of social networking sites such as FaceBook, Bebo and MySpace. True, these sites are not places for sharing highly confidential information but new clinical networking sites such as PACSMail do allow secure clinical data sharing between network users. These provide the basis for a more fluid world of data sharing which is well suited to today's multi-organizational, multidisciplinary patient care. Linking these networks to traditional record systems through DICOM and HL7 gateways squares the circle and supports the activities of clinical activities such as sports medicine and cancer care. Central databanks will always have a place in medicine, especially in large hospital settings. This paper will explore the emergence of more fluid networks in which clinicians and patients are increasingly making their own decisions about how and when their data is shared.

1715 Transforming the radiology reporting process in a filmless environment

Dugar, N.
Doncaster and Bassetlaw Hospitals NHS Trust, Doncaster, UK

Radiology examination and PACS images are incomplete without a report. Hence, it is vitally important that radiology reports are produced in a timely manner. Every department should aim to produce reports on images prior to the patients being seen by the referring clinicians, for review of the radiology examination. This can be achieved by developing robust workflows. Ability to deliver this goal is dependent on Radiology Information System (RIS) – which is the crux of the radiology department, and its tight integration to PACS and Digital Dictation. We have been able to deliver a report turnaround times of 24 h for all examinations (urgent or routine), and with almost instantaneous reports for A&E and Inpatients (between 9 and 5 Monday to Friday). This achievement has been possible due to multiple factors. Provision of adequate number of reporting workstations for radiologists. Use of RIS worklists for reporting. Priority marking on RIS for reporting and typing. Worklist flexibility in identification of work for general reporting/specialist reporting. Integrated digital dictation. Scanned request cards. Tight desktop integration with PACS. Automatic display of relevant prior images by PACS. Partial digitization of previous images on films (packetless department) with a RIS workflow to support. Shared reporting worklists with cross-site reporting by radiologists. Shared typing worklist with introduction of cross-site typing. Minimizing mouse click/key-board use for reporting process (a large volume of work is reported by no use of keyboard or mouse-driven by 4 microphone button clicks).

1445–1715
Optimizing the digital image

1445 Invited review: Optimization in CR and DR

Mackenzie, A.
KCARE, London, UK

This talk will focus on the optimizing exposures using computed radiography (CR) and digital radiography (DR) in general radiography, though much of the talk can be applied to other modalities. Optimization is a requirement of IRMER regulations and is viewed as a collaborative process including radiographers, radiologists, medical physicists and company representatives. The main consideration of optimization is generally considered to be the choice of factors such as kV, receptor dose, use of grids and extra filters. The first step before optimization of radiographic factors is to ensure that the whole procedure is optimized; areas such as and the collimation, examination justification and minimising rejects etc. should be considered. The presentation will discuss the various methodologies employed for optimization. There are two broad methodologies that have been used (1) technical measurements: contrast to noise, threshold contrast detail detectability and (2) using anthropomorphic phantoms.

1510 Invited review: Artefacts in CR and DR

Emerton, D.
KCARE, London, UK

Users of film screen systems will be familiar with the artefacts associated with them, but the world of digital imaging offer a whole range of new artefacts. These new artefacts may lead to rejects, repeats and increased dose to the patients. This talk is aimed to inform and help all users of digital systems to recognise their appearance, by presenting a wide range of artefacts. This talk will discus the reasons for artefacts in CR and DDR and what steps can be taken to avoid many of these artefacts in future. It must be remembered that many patient related artefacts will still occur, so patient preparation is still important.

1535 Invited review: A regional network approach to radiographer QA in digital radiography

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

PURPOSE: The philosophy and design of a regional service supporting radiographer QA of digital radiology will be presented. MATERIALS/METHODS: The Regional Medical Physics Department (RMPD) operates a QA service to X-ray departments in the North of England. Using the growing network of inter-hospital image communications combined with expertise in quantitative digital image analysis, a centralized QA service is being developed. This receives digital test images from around the region at a central RMPD server, where they are automatically analysed and the results posted back to the users by means of a results database on the NHS network. The test images are produced by radiographs (or other image capture e.g. digital fluorography) of an inexpensive test object. Current guidance suggests that a test frequency of only one image sequence per month could meet a large number of the QA requirements using this approach. The system would operate on a "send and forget" basis, with prompts for performance failures being sent out from the RMPD server where appropriate. In cases of serious failure, the QA teams from RMPD would be automatically alerted to make more detailed tests if appropriate. The centralization of QA records will allow comparison of equipment performance across the region. RESULTS: The design of the phantom and analysis system will be discussed, with particular focus on retrieving the maximum QA information from the least number of images. CONCLUSION: The advent of regional image communications networks brings new possibilities for supporting radiographer QA of digital imaging modalities.

1600 Invited review: What the future holds?

Bosmans, H.
University Hospitals of the KU Leuven, Leuven, Belgium

In the near future, there will be a continued effort towards radiological systems with an always better performance. This improvement can be obtained in several ways and at several stages, defined by the different components in the imaging chain: X-rays, detection, automatic exposure control, image reconstruction, image processing, viewing and retrieving the clinical or technical information. We will illustrate a few of these items. (1) The X-ray beam can be tuned towards an optimal, possibly monoenergetic X-rays; next to X-ray attenuation, other properties of the X-ray beam could be used, such as phase contrast; (2) New detectors will emerge, eventually set up as a small detector that scans across a part of the patient. An example is the series of arrays of photon counters that is introduced for low dose breast imaging; (3) 3D information may be reconstructed from 2D projective data. Tomosynthesis and cone beam CT represent emerging examples of this; (4) Exposure settings will be further adjusted to the patient or pathology to be examined, to achieve a good balance between dose and quality. New schemes are being proposed for digital imaging; CT scanners include today tube modulation, in plane and along the z-axis; (5) Image viewing is a next stage in full evolution, towards always better LCD monitors and dedicated viewing software. (6) Image processing enhances the diagnostic info of the image; CAD tries to detect suspicious regions; (7) Quality Assurance and Quality Control will benefit from the digital nature of the information. Pixel values of an unprocessed digital image have a known relationship with dose. Digital images can be readily input for further data processing. Linked to this are the numerous advantages from networking, PACS, HIS, RIS. An impressive amount of information will become available on the website, as a tool, for teaching or as an aid in daily practice. What the future really holds and which modality will provide the best performance in terms of price or dose remains unclear today.

1635 The effect of calibration on diagnostic performance, physical and psychophysical image quality

Lowe, J.·Brennan, P. C.·Mc Entee, M. F.
University College Dublin, Dublin, Ireland

PURPOSE: To determine the effect of calibration on psychophysical image quality and diagnostic performance. METHODS: Seventeen HP LCD displays were evaluated before calibration. Psychophysical tests on contrast, luminance, distortion, display resolution and veiling glare were performed in accordance with the AAPM TG18 document. Monitors were then calibrated to the GSDF part 14 standard using VeriLumTM software. Two displays (one with low and one with high acceptance levels) were chosen and calibrated. To perform JAFROC evaluation using experienced Radiologists and Radiographers will now be performed to evaluate observers' performance in identifying distal radial fractures in the wrist program and lung nodules within the chest program before and after calibration. RESULTS: Variances in all factors were large pre-calibration and were dramatically reduced after calibration. Observer performance results were obtained by using JAFROC analysis. Statistical significance for the differences was calculated by comparing the JAFROC figure of merit. CONCLUSION: Following calibration percentage variations in maximum luminance, luminance ratios and display resolution were minimized. Variations in minimum luminance were increased by 24.4%. Maximum luminance variations were reduced by 20.53% after calibration. Luminance ratios were increased by 26% for the bottom of the range display and reduced by 48% for the top of the range display after calibration. Display resolution percentage differences were reduced by 0.53% for the bottom of the range display and by 0.4% for the top of the range display after calibration. JAFROC analysis will be performed to determine the effect on diagnostic performance.

1645 Radiographic speed optimization of digital X-ray imaging systems using computer simulation

Johnston, G.·Doyle, P.·Workman, A.
Forster Green Hospital, Belfast, UK

PURPOSE: Digital X-ray systems pose unique challenges to optimizing radiographic speed. The wider dynamic range and ability to adjust image brightness and contrast requires a fresh approach to optimization, relative to screen–film radiography. Digital image quality is determined primarily by the level of noise in the image. Image receptor properties such as detective quantum efficiency, modulation transfer function (MTF) and energy response determine the characteristics and level of noise at a given exposure. Modelling the system noise should allow simulation of image quality at various radiographic speeds and prove a useful tool for optimizing exposure levels. MATERIALS/METHODS: A linear systems model developed around a computed radiography system has been modified to incorporate an indirect digital radiography (IDR) system. The signal transfer function, noise power spectrum (NPS) and MTF of the system have been measured. Using these fundamental imaging properties a noise model was constructed. The model was applied to images acquired at normal exposure levels to simulate dose reduction. The computer simulations were compared with physical measurements of contrast to noise ratio (CNR) and NPS from phantoms. RESULTS: Images were simulated at a range of radiographic speeds. Comparison of simulated images to the corresponding real images acquired at equivalent dose levels showed similar CNR and NPS characteristics

for the IDR system. CONCLUSION: The noise model employed in this study enables dose reduction simulations to be performed for an IDR system. The application of this technique to clinical images should provide a practical means optimizing radiographic speed for digital X-ray examinations.

1655 Investigating exposure class of a computed radiography system as a means to optimize chest radiography

Moore, C. S.
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PURPOSE: To investigate whether the exposure class (EC) of an Agfa 75.0 Computed Radiography (CR) system could be used to optimize chest radiography. METHODS: The Normalized Noise Power Spectra (NNPS(f)) was determined for EC setting 400 (standard), and three others (600, 800 and 1200) for a given receptor dose of 4 μGy. Subsequently, the signal to noise ratio (SNR) was measured with processed images in the lung, heart/spine and diaphragm areas of a validated phantom with ECs 400 and 600 at four tube voltages (60 kVp, 75 kVp, 90 kVp and 125 kVp). As anatomical background can be a factor in observers' detection of lung nodules, a tissue to rib ratio (TRR) was also measured to assess the suppression of rib contrast, at ECs 400 and 600. RESULTS: The NNPS(f) at EC 600 was found to be approximately 5% lower at all frequencies than EC 400. Settings 800 and 1200 offered no extra advantages in terms of lowering frequency dependent noise. EC setting 600 offered improvements in SNR of between 8% and 20% in the chest compared with setting 400. Although processing algorithms affect the signal and noise in a way that is hard to predict, we found that for a given set of processing acquisition parameters, the SNR was related to the effective dose in a logarithmic manner (all $R2 > 0.93$). Setting 600 increased the TRR slightly, thereby helping to suppress rib contrast. CONCLUSION: An exposure class setting of 600 is therefore indicated by this work, but clinical verification is required.

1705 Personal digital assistants are comparable with standard LCD monitors for the detection of intracranial bleeds and wrist fractures

Toomey, R.[1]·Mc Entee, M. F.[1]·Ryan, J.[1]·Curran, K.[1]·Chakraborty, D.[2]·Evanoff, M.[3]·Manning, D.[4]·Brennan, P. C.[1]
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PURPOSE: This study compares the performance of a PDA with a standard LCD monitor for the detection of intracranial bleeds on CT images and distal radial fractures. METHODS: This study used a multi-reader, multi-choice design combined with Jack-knife free-response Receiver Operating Characteristic (JAFROC) analysis to compare the performance of a Dell x50v PDA and Viewsonic VG810b LCD during two diagnostic performance tasks. Thirty cranial CT images were selected, of which 15 had clinical findings of intracranial bleed and 15 did not. Likewise, 30 wrist images were chosen, 15 with and 15 without fractures of the distal radius. Fifteen neuroradiologists and 9 radiologists assessed the CT images on LCD and PDA, marking the location of the intracranial bleed and their confidence in their decision, while 13 musculoskeletal radiologists and 14 radiologists assessed the wrist images for fractures in the same way. A software programme "Lesionnaire" was developed to display images randomly, generate false positive, negative and JAFROC results. Radiologists were also asked to comment on eye strain for LCD and PDA. RESULTS: The PDA and the monitor demonstrated no significant difference in assessing wrist fractures or locating intracranial bleeds at the 95% confidence interval. Radiologists were broadly satisfied with the performance the PDA in comparison with the LCD. CONCLUSIONS: The PDA and LCD have been shown to perform equally for the detection of intracranial bleeds and wrist fracture when compared under the above conditions and radiologists are positive in relation to their use.

1600–1745
DH Imaging Forum: Models of service

1600 Invited review: Working across hospitals

Parsa, A.
Circle, London, UK

No abstract supplied.

1620 Invited review: Experience linking the IS and the NHS

Webster, P.
Department of Health, London, UK

The introduction and evolution of the Independent Sector Diagnostic Programme into the existing matrix of imaging delivery has been controversial. Now 3 years into the programme, which has it self been through considerable refinement, several themes are emerging. It is proving to be a catalyst for enhancing service delivery, and providing a background for many new approaches to service infrastructure development across all imaging sectors. The identification of the strategy for integration and combined future developments of the Independent and State sectors will be explored with examples from initial developments, the gathering of evidence for best practice and translating this into wider imaging applications.

1640 Invited review: Partnership working

Thind, R.
Whiston Hospital, Prescot, UK

Partnership working is increasingly acknowledged as generating solutions to problems that single agencies cannot solve, improving services for users and enhancing co-ordination of services across boundaries. Acute Trusts are expected to deliver effective care in the most appropriate setting, responding to the choice agenda, the 18 week target and achieve financial balance through increased productivity and efficiency. There is increasing pressure to provide 24/7 cover. Increasing sub-specialization within radiology requires a range of skills which may be difficult to achieve within a small group. To this, is the added need to develop skills in new technologies. Partnership arrangements can allow sharing of skills between trusts, facilitate development of skills in new technology, support trusts to deliver an enhanced service to patients and provide the building blocks for future expansion. There are established models of service using partnership arrangements between NHS organizations. The provision of care through the independent sector as a purely private production does not usually satisfy the total needs of the patient. There is, however, a link between sustainable development and an effective partnership between the public and the private sector. The principles of partnership working and successes and challenges of such partnerships are discussed.

1700 Invited review: Feedback from the balcony

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

No abstract supplied.

1720 Invited review: Where are we now and where are we going?

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

I will review progress of national imaging performance against Department of Health and the English government's waiting times targets and policy objectives. I will give an overview of the national position with respect to maintaining low or no-waits for imaging services. I will also discuss the future aims for diagnostic imaging from a Department of Health perspective.

Notes

Scientific programme abstracts Tuesday 3 June

0830–0915
Imaging of non accidental injury
0830 Invited review: Practical aspects of imaging in NAI

Johnson, K. J.
Birmingham Children's Hospital, Birmingham, UK

An important part of paediatric radiological practice is the investigation of children who have suspected inflicted non-accidental injury. The principal role of any radiology department is to perform a skeletal survey, which should be then be reported timely and appropriately. The purpose of a skeletal survey is to identify any to detect occult, old or healed fractures and determine if there are any .inherent metabolic abnormalities or genetic disorders of the bone which may predispose the child to fracturing or injury. Any radiology department in a hospital which has acute paediatric admissions needs to have proper procedures and policies in place for the performing and reporting of skeletal surveys. Whilst the reporting of paediatric radiographs is often done by specialized individuals in the department and the formal reporting of skeletal surveys for the courts is done by a further sub-section of paediatric radiologists, it is inherent that any radiologist should be able to supervise an adequately performed skeletal survey and give a preliminary opinion. The purpose of this presentation is to describe the appropriate interaction between the radiology department and requesting paediatrician in cases of suspected non-accidental injury. The presentation will highlight the importance of communication at a senior level regarding the appropriate timing of the skeletal survey, the clinical concerns relating to the child and any areas which may need further radiological investigation, such as a tender limb or a child's reluctance to move a particular limb. The views of a full skeletal survey will be shown. Once the skeletal survey has been performed, it is important that the images are reviewed by the supervising radiologist and additional views undertaken, if required, such as coned views of the metaphyses or further views of a limb. This presentation will discuss the appropriate level and quality of the report that needs to be issued to the paediatricians and the various needs of second and third opinions for skeletal surveys. The role of head CT examinations in children with suspected of NAI will be discussed. AP and lateral skull views (+ Townes); Lateral C-Spine; Lateral Thoraco-lumbar spine; Chest X-ray and Oblique ribs (2 views); Abdominal X-ray; AP Humeri; AP Forearms; AP Hands; AP Femora; AP Tibia/fibula; DP Feet; TOTAL = 20 standard views.

0845 Invited review: Imaging of non accidental injury

Offiah, A. C.
Great Ormond Street Hospital for Children, London, UK

TITLE: Digital imaging in physical abuse: practical & legal issues. AIM: To highlight practical and legal issues surrounding digital imaging in suspected physical abuse. OUTCOMES: By the end of the talk attendees will be able to discuss safety and legal issues related to: (1) Obtaining the images: (a) Who? (b) When and where? (c) What projections are required? (d) What information should be displayed? (e) Assessing image quality. (2) Viewing the images: (a) Post processing; (b) Hard (printed film) versus soft (monitor) copy interpretation. (3) Interpreting the images: (a) Who?

0830–0930
Controversies in interventional radiology – provision of an interventional radiology on call service
0830 Invited review: Counsel of perfection versus pragmatic solution

Maskell, G.
Royal Cornwall Hospital, Truro, UK

THE PROBLEM: Interventional radiology techniques are ready to replace the traditional surgical approach in a range of emergency conditions. The techniques likely to be required in an emergency situation (trauma, major haemorrhage) require "high-end" skills and are not readily maintained in a group of part-time interventionists. In most acute hospitals, the out of hours interventional radiology service is currently provided on an ad hoc basis, relying on goodwill and availability. A sustainable emergency rota requires a minimum of six participants. There is insufficient elective IR work in most acute hospitals to sustain six interventional radiologists. THE SOLUTION: Network models of IR cover extending over multiple acute hospitals. The problems with the solution: Technical; Contractual; Cultural. FINAL THOUGHTS: To what extent does this mean a schism between IR and diagnostic radiology? Is there still a place for the "part-time interventionist"? Does all of radiology need to be organised in larger units than at present?

0850 Invited review: Interventional on call: all or nothing!

Kessel, D.
Leeds Teaching Hospitals, Leeds, UK

PURPOSE: To provoke discussion regarding provision of 24 h interventional radiology services. Emergency interventional radiology (IR) procedures can be lifesaving particularly for patients with severe trauma and haemorrhage. IR is a small specialty; there is not enough interventional work at every hospital to justify employing enough radiologists to sustain a full time IR service. Hence it is impossible for every hospital single handedly to provide 24/7 interventional radiology. Therefore every Trust should to have formal alternative arrangements to secure provision of IR services. Currently this is not happening. Failure to provide interventional radiology services will not only be a disservice to our patients but will also sound the death knell for interventional radiology as other specialties will fill the vacuum, but will only pick up those elements of service they see fit. The only rational answer is that service provision needs to be considered on a regional basis. There is no one size fits all solution to this problem, what works in one region may not work in another. Options including cross cover and hub and spoke service provision will be proposed and discussed. Following this session delegates will realise that Trusts and doctors have a professional responsibility to their patients to co-operate in order to establish cohesive and sustainable IR services. Finding a workable solution may not be easy but recognize that solutions do exist and that there is no excuse for ignoring the situation.

0830–0930
From exposure to image series – basics of DR
0830 Invited review: Physics of 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 response of the screen–film receptors they replace, especially as regards the optimum beam energy. This may mean that years of experience with screen–film may have to be ignored when optimizing for DR, and also that optimization for DR and computed radiography (CR) may well involve different approaches. RESULTS: The results of 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 Invited review: Radiography practice with DR

Cosson, P.
School of Health & Social Care, Middlesbrough, UK

No abstract supplied.

0830–0930
Picture to proton LIVE! Session 2

0830 Invited review: Spaced out: spatial encoding

McRobbie, D.
The Hammersmith Hospitals NHS Trust, London, UK

In this presentation we will examine how the scanner produces images from MR signals. An understanding of the image-formation process is particularly helpful for obtaining the optimum diagnostic information from an examination, modifying or creating new protocols, recognizing common image artefacts and taking measures to overcome or avoid them. It will also help as a basis for understanding the diverse data-acquisition strategies used in more advanced pulse sequences. The following topics are explored in greater detail: Magnetic field gradients form the basis of MR signal localization; 2D slices are produced by the combination of an excitation RF pulse and simultaneous slice-select gradient; the in-plane MR signal is encoded in terms of the spatial frequencies of the object using phase-encoding and frequency-encoding gradients; we collect or sample every spatial frequency that can exist within the image before we Fourier transform these data (known as "k-space") to produce the image directly; inadequate or erroneous k-space sampling leads to certain image artefacts.

0900 Invited review: The parallel universe: parallel imaging

McRobbie, D.
The Hammersmith Hospitals NHS Trust, London, UK

The presentation looks at using parallel imaging and reconstruction techniques in MRI. The two classic formulations of parallel imaging are SMASH and SENSE, working in k-space and image space, respectively. This presentation will explain the various types of parallel imaging, how they work, what advantages they provide and the image quality trade-offs involved. In particular it will be shown that parallel imaging: makes MR acquisitions faster by a factor known as the reduction factor R, can be applied to any existing MR sequence, including EPI, is enabled by phased array technology and may be performed in k-space or in image space, reduces the number of phase-encode steps you need to actually acquire an image, involves an image quality trade-off. Additionally: commercial implementations will be explained; Acronyms will be unravelled.

0900–1000
Dynamic Volume CT: Only More Slices or a New Future?

0900 Invited review: Basics and methods of the dynamic volume CT: Aquilion ONE

Blobel, J.
CT Systems Division, Toshiba Medical Systems Corporation, Tokyo, Japan

A CT with an advanced cone beam reconstruction algorithm "ConeXact" for 320 mm × 0.5 mm detector rows has been developed for dynamic volume scans with an axial detector collimation of 16 cm. High and low contrast resolution was determined by varying the phantom dose and compared with 64 MD-CT results. The ConeXact reconstruction algorithim with 320 slices achieves the same homogeneous voxel resolution of less than 0.4 mm in the entire scan volume and the same low contrast resolution compared with 64 slice application protocols, Rotation times of at least 0.35 s allow functional examinations such as brain perfusion and cardiac studies. An advanced Multisegment Reconstruction is used for cardiac applications, as this method improves temporal resolution with increasing heart rates down to 35 ms for extreme high heart rates. within one heart beat the entire heart is frozen within 175 ms with 2–3 mSv patient exposure in case of low heart rates. Mis-registrations as stepping and banding artefacts in the z-axis are impossible. The image will reconstruct automatically with the most motionless cardiac phase. A real time ECG control reduces the negative effects of arrhythmias. A retrospective ECG editor tool optimizes the R-R interval selection for the Multisegment Reconstruction. A quantum denoising filter algorithm halves the patient dose. For brain perfusion and other dynamic organ studies the detector collimation varies between 40 mm and 160 mm with a region adapted dose length product.

0930 Invited review: New clinical applications with dynamic volume CT

Rogalla, P.
Institut für Radiologie, Berlin, Germany

The presentation will discuss the merits of dynamic volume CT and early clinical experiences.

0945–1200
Current issues in radiation protection and scientific session

0945 Invited review: Personal monitoring – who needs it!

Rawlings, D.
Regional Medical Physics Department, Newcastle-upon-Tyne, UK

PURPOSE: This paper aims to validate whole body personal monitoring practice in the medical sector. In the UK, there are roughly 30 000 medical radiation workers. Almost all undergo personal monitoring but very few are classified. The employer must demonstrate that doses to all radiation workers are controlled and personal monitoring serves this function. METHODS: Previous monitoring data have been analysed. RESULTS: Within radiotherapy and diagnostic X-ray specialties, 99% or all occupational doses are typically below 1 mSv per year. Results over a 5 year period indicate that this distribution of doses remains constant over time. Furthermore, around 80–90% of whole body badges returned are typically less than 100 μSv. Cardiology X-ray, barium studies, vascular X-ray work and most nuclear medicine procedures contribute most to staff doses whereas radiography, dental X-ray work and mammography contribute least. CONCLUSIONS: Results, at or close to the limit of measurement for many passive detectors, represent a significant cost overhead for the employer and may add little to the knowledge base. Risk assessment indicates that, except where an accidental exposure has occurred, existing patterns of exposure may useful in predicting future dose. Regulation 18(3) of the Ionising Radiations Regulations (1999) allows for other methods of demonstrating dose control and it is possible that environmental monitoring, sample monitoring of individuals or task related dose assessment may represent a more appropriate alternative to personal monitoring in certain circumstances.

1010 Invited review: Governance of research exposures – latest hoops & hurdles

Rogers, A.
Nottingham University Hospitals NHS Trust, Nottingham, UK

The competitive and commercial pressures within clinical research are severe, and the need for a streamlined process for study authorization to enable first-class research is self-evident. Perceived or real conflicts between ethical approval processes and legal compliance for the use of radiation at a local level has hindered such streamlining, and led to calls for action. This review will explore the recent historical background to these problems and describe recent efforts to unblock

any radiation "bottlenecks" in approval processes. The new Integrated Research Application System (IRAS) will be described along with the philosophy behind the revised guidance notes pertaining to the use of ionizing radiation.

1035 Invited review: Deterministic effects and consent

Cousins, C.
Addenbrookes Hospital, Cambridge, UK

The number of medical procedures using ionizing radiation is increasing. The increasing range of interventionists are often unaware of the risks of radiation and the potential injuries. For many patients the benefit of the procedure will outweigh the risks from radiation but for others, particularly younger patients, the risks of deterministic effects, or even malignancy, will be increased. Some complex interventional procedures have resulted in skin doses that approach those from cancer radiotherapy fractions. The threshold dose for deterministic effects is approximately 2 Gy. Patients likely to receive such doses should be adequately counselled with regard to the radiation risks as for any other possible complication of the procedure. Advice should include the fact that radiation effects may be delayed and that the effects of multiple procedures are additive, being more severe if procedures are performed close together. ICRP recommends that records of exposure should be kept if the estimated maximum cumulative dose to the skin is 3 Gy or above (1 Gy if procedures are likely to be repeated). These patients should be counselled after the procedure and followed up 10–14 days later. They should also be advised of action to be taken should symptoms or signs of a radiation injury develop. Many interventional radiologists, and others, do not believe they could cause deterministic effects in their practice and may not see a radiation injury during their working lifetime. Convincing them of the seriousness of the issue and encouraging frank and open informed consent with patients is vitally important.

1055 Invited review: Effective dose and risk

Martin, C.
Gartnavel Royal Hospital, Glasgow, UK

PURPOSE: Effective dose has been adopted as a useful quantity for comparing doses for medical procedures. It incorporates an assessment of the risk to health from an exposure and so has found a role in the process of justification for medical exposures. Effective dose was introduced originally as a quantity relating to risk for use in radiation protection planning, so little consideration was given to the uncertainties. The tissue weighting factors are grossly simplified in order to facilitate the application and the uncertainties in conversion factors used to derive organ doses may be significant. METHODS: Assessments have been made of the uncertainties in effective dose as an indicator of relative risk. RESULTS: Uncertainties have been found to be of the order of ±40% for different medical exposures. This presentation will review the data on risk to health on which effective dose is based and highlight the inherent uncertainties. In addition, the effect of changes in the weighting factors following the most recent review by ICRP will be considered. CONCLUSIONS: A realistic approach to the application of effective dose in patient dosimetry is proposed. If an assessment of risk is required, doses should be evaluated for individual organs and age-related risk coefficients applied. For justification of exposures and for low dose procedures, a generic assessment of effective dose should suffice, with general terms such as negligible, minimal, very low and low to describe the level of risk.

1120 Trends in paediatric computed tomography parameter settings in the UK hospitals

Kim, K.[1]•Pearce, M.[2]•Salotti, J.[2]•McHugh, K.[3]•Parker, L.[4]•Brenner, D.[5]•Lubin, J.[1]•Ron, E.[1]
[1]National Cancer Institute, Bethesda, MD, [2]Newcastle University, Newcastle upon Tyne, UK, [3]Great Ormond Street Hospital, London, UK, [4]Dalhousie University, Halifax, NS, Canada, [5]Columbia University, New York, NY, USA

PURPOSE: In conjunction with an epidemiologic study of paediatric CT use, we evaluate use patterns in CT parameter settings at several hospitals. MATERIALS/METHODS: We abstracted data on patient age, type of examination, scanner, and machine settings from CT films at four hospitals in the UK from 1988 to 2005, and analysed exposure setting (in milliamp-seconds, mAs), which are proportional to patient radiation exposure, by age, examination, hospital, and time period. RESULTS: During the same time period at each hospital, there was wide variation in mAs used for the same CT scanner, exam, and age. Radiation exposures from head CT exams were about 100 mAs higher than exposures from examinations for other body regions. There was evidence that the lowest mAs has decreased from about 100 during the early study period (1988–~2002) to about 20 during the recent period (~2002–2004). There was no significant difference in mAs for CT examinations of the abdomen, chest, and limb in the early period. In the recent period, we observed lower mAs for chest scans. Machine settings for abdominal CT increased with age during early and recent time periods, whereas head CT settings increased only with age recently. CONCLUSION: Different mAs at the same hospital presumably result in substantial variation in patient radiation exposures. Understanding this variation might highlight ways to reduce radiation exposure. Lower mAs and use of age adjustments in the recent time period suggest more awareness and a reduction in radiation exposure per examination, however, high machine settings are still frequently employed.

1130 Investigation into localized doses received by interventional radiology staff and cardiologists using fluoroscopic equipment

Jenkins, L.•Rawson, M.
The Royal Wolverhampton Hospitals NHS Trust, Wolverhampton, UK

PURPOSE: The aim of this study was to investigate localized doses received by interventional radiology staff and cardiologists using fluoroscopic equipment. The purpose of the study was to ensure dose limits were not being exceeded and to reduce staff doses to as low as reasonably practicable (ALARP). MATERIALS/METHODS: Dose measurements were performed for staff working in interventional radiology (two radiologists, three scrub-nurses and two radiographers) and cardiac catheter labs (six cardiologists). TLDs were positioned at several locations on the body to evaluate eye, thyroid (under lead collar), torso (under lead apron), shin, feet and hand doses. TLDs were worn for 1–9 weeks and results were extrapolated to give an annual dose. RESULTS: For all staff, extrapolated annual doses for the eyes, thyroid and torso were well below their respective dose constraint values of 50 mGy, 150 mGy and 6 mGy. In general, extremity doses for the hand, shin and foot were also well below the annual dose constraint (150 mGy). Three exceptions to this were an interventional radiologist's left and right hand (330 mGy year-1, 125 mGy year-1) and a cardiologist's left foot (214 mGy year-1). Interventional radiologists had higher left and right hand doses (mean 202 mGy year-1 and 97 mGy year-1) than cardiologists (median 30 mGy year-1 and 6 mGy year-1). Limiting shin/foot doses were similar for both groups (40 mGy year-1 and 45 mGy year-1). CONCLUSION: Although dose limits were not exceeded, the measurements show that hand doses for interventional radiologists can exceed dose constraints. Furthermore, although shin/foot doses are generally well below dose constraints, they can also be exceeded. Results and dose reduction techniques were discussed with relevant staff to keep doses ALARP.

1140 Effect of patient cross-sectional area on dose in CT. Study using the GE Lightspeed 16

Meeson, S.•Alvey, C. M.•Golding, S. J.
University of Oxford, Oxford, UK

PURPOSE: It is accepted that patient dose in CT is related to patient mass or body mass index. However, these parameters are not ideal estimates of patient size since they ignore differences in build and physical changes such as abdominal distension. Patient cross-sectional area may be more closely related to patient dose, particularly with the

development of scanners that utilize automatic tube modulation to create noise controlled images. MATERIALS/METHODS: During a year long study of 16 slice scans of patients presenting with symptoms of abdominal sepsis, patient cross-sectional areas were estimated using customised ellipses at the level of the middle of vertebra L3. The relationship between cross-sectional area and dose–length product (DLP) was explored. Water filled test objects, with a range of cross-sectional areas, were also scanned using the CT abdomen protocol and over the same scan length. RESULTS: 94 patients were included in the study. Area and DLP data were subdivided by CT protocol and for CT abdomen and pelvis by gender also. Test object data and patient data followed similar trends, although there was a greater variability in the patient data. DLP increased with increasing cross-sectional area. The relationship was logarithmic not linear. CONCLUSION: Patient cross-sectional area is a simple measure of patient size, specific to the area of the body to be exposed during CT examinations. DLP increases with cross-sectional area and for larger patients cumulative doses from repeated scans will grow rapidly making this another radiation protection issue facing national populations with increasing obesity levels.

1150 A survey to establish some DRLs for paediatric radiography in Ireland

Matthews, K.•Brennan, P.
University College Dublin, Dublin, Ireland

PURPOSE: Paediatric radiography is an identified priority field for optimization research, in which diagnostic reference levels (DRLs) provide an essential benchmark. This study set out to establish DRLs for eight paediatric radiographic examinations in Ireland. MATERIALS/METHODS: Calibrated DAP meters were used to measure radiation dose in mSv cm2 for each of: SCBU chest, chest, abdomen, lumbar spine, full spine, pelvis, skull, and contrast urography. From 2002 to 2004, dose, technique and patient data were gathered from 677 examinations performed across 25% of those hospitals undertaking paediatric radiography nationwide. Dose distributions were analysed to establish an age-specific DRL for each examination at the widely accepted third quartile value, and also as a graphical plot of DAP against age. RESULTS: Age-specific, Irish DRLs are proposed for seven paediatric X-ray examinations. Age-specific doses are comparable to published data. Dose variations are apparent within and between hospitals: these correlate with lack of standardization in both equipment and radiographic techniques. Although differences between minimum and maximum values were substantial (up to a factor of 36), differences between the first and third quartile values were rarely greater than a factor of four. DISCUSSION/CONCLUSION: Paediatric DRL data for a range of examinations appear sparse internationally: to an extent this is influenced by the poor availability of patient size information. Since 90% of children at any age fall within 10% of average weight and height, DRLs stated as a function of age represent a pragmatic approach to establishing preliminary DRL values in order to objectively benchmark optimization campaigns.

1000–1130
Surviving as a business: Is the independent sector a friend or foe?

1000 Invited review: Experience of the IS working for the NHS

Pierce, K.
The Clementine Churchill Hospital, Harrow, UK

No abstract supplied.

1020 Invited review: Setting up a company to undertake NHS reporting

Collie, D.
Expert Eye Ltd., Edinburgh, UK

Changes in patient expectation, political agenda, and improvements in digital image acquisition have provided an opportunity to explore new ways of providing radiology support for the NHS. In addition, the requirement for shorter waiting times, the relentless increase in images to review, and roll-out of increased access to cross-sectional imaging to primary care clinicians is forcing a rapid change in relationship between radiologist, radiology reporting and referring clinicians. In this presentation the impetus, challenges, and some solutions to providing off-site radiology image interpretation and reporting outside conventional systems will be discussed. Advantages of working as an independent sector provider include a rapid flexibility in embracing new technology, and an ability to adopt new methods of service delivery which may be difficult to implement quickly through existing resources. Through collaboration between the IS and NHS, integrated solutions for best clinical practice are evolving. Having set up a teleradiology service from scratch, the speaker will describe some of the challenges of working in this rapidly evolving environment, and working with the changing attitudes of clinicians.

1040 Invited review: Experience of closing an independent ultrasound service

Rowlands, P.
The Royal Liverpool University Hospital, Liverpool, UK

No abstract supplied.

1100 Invited review: Impact of IS on the local Acute Trust

Smethurst, A.
Aintree University Hospitals NHS Foundation Trust, Liverpool, UK

Aintree Hospitals agreed to accept early implementation of the local Independent Sector provider's Ultrasound service. It became clear early on that there were significant problems at multiple levels in the delivery of this service, and a local audit of performance was undertaken by our hospital. This raised significant clerical, organizational and clinical concerns which were brought to the attention of the provider, and the Department of Health. As a result of this, we rescanned all of our patients over a 4 week period, and as a result of our audit and concerns expressed elsewhere, further evaluation of the local Independent Sector provider's performance occurred, with their consequent removal from the local provider contract.

1000–1130
MR imaging and measurement of tissue function

1000 Invited review: Mapping white matter anatomy in neurological disease: the clinical value of tractography

Clark, C.
UCL Institute of Child Health, London, UK

Diffusion tensor imaging (DTI) and tractography have emerged as important techniques for the quantitative study of brain structure and organization. As such they are playing an increasingly important role in the study of neurological disease. This lecture addresses the question: do DTI and tractography provide information that is clinically useful? The potential of tractography for mapping the descending motor pathways for the purposes of neurosurgical planning was clear from the early development of the technique. For example, tractography can be used to display the trajectory of the motor pathway which can be visualized in relation to the lesion to be resected. Comparisons of tractography with motor evoked potentials (MEPs) in patients with space occupying lesions have indicated favourable results. The spinal cord is a clinically eloquent site in the central nervous system and an excellent location for studying structure-function relationships with DTI and tractography. Tractography based analysis of spinal cord structure in multiple sclerosis patients that had recently suffered a cervical cord relapse indicated that the radial diffusivity in the lateral corticospinal tracts reconstructed with tractography was positively correlated the measures of clinical disability. Further clinical applications of tractography in a wide range of neurological disease will be discussed along with some of the issues and confounds that

must be considered when applying tractography in clinical studies. However, developments over the past 5 years clearly show that tractography has emerged as a clinically useful tool.

1020 Invited review: Micro magnetic particles

Lythgoe, M.
UCL Centre for Advanced Biomedical Imaging, London, UK

PURPOSE: One of the current challenges in the biomedical sciences is the localization of stem cells to the sites of tissue damage. Labelling of cells with iron oxide MRI contrast agents is becoming an established method of tracking cells. It may also be possible to exploit the magnetic properties of these particles to target them to specific sites using an external magnetic force. In this study we aimed to monitor the retention of endothelial progenitor cells (EPCs) using MRI and target them to the site of injury using an externally applied magnetic field, thus enhancing re-endothelialization. MATERIALS/METHODS: Human CD133+ cells were cultured for 10 days and labelled with Endorem (Guerbet, 500 μgFe ml-1). Balloon angioplasty was performed to the left common carotid artery in rats. This was followed by administration of iron-labelled d10-CD133s in the absence of flow with and without an external magnetic field (total n=12). RESULTS: In vitro: At 24 h following magnetic actuation of labelled d10-CD133s there is no increase in cell apoptosis. Furthermore, the iron oxide labelling itself did not cause an increase apoptosis (not shown). Preliminary in vivo data indicate increased EPC adhesion to the injured artery by approximately 100%. CONCLUSION: Using a multidisciplinary approach we have provided in vitro evidence for cell viability following labelling and magnetic actuation, as well as MR visualization at low cell concentrations. Our results indicate that in vivo targeting using an externally applied magnetic field is a promising approach to increase engraftment of stem cells to a site of vascular injury.

1050 Invited review: Measuring tumour response

Cuenod, C.
Laboratoire de Recherche en Imagerie, Paris, France

The RECIST criteria (Recist Evaluation Criteria In Solids Tumours) are based on morphological changes, and are commonly used to evaluate the tumour response to treatments. These criteria, however, are poorly performing with the new-targeted treatments, since those treatments often do not induce noticeable volume changes. Thanks to dynamic contrast enhanced MRI (DCE-MRI) and CT (DCE-CT) it is possible to access non-invasively to the tumour micro-vascularization. The signal of the tissues is driven by the concentration of contrast agent into the arteries (arterial input function: AIF) and by the functional behaviour of the capillary network. By using dedicated mathematical models it is possible to measure the micro-vascular parameters in each pixel of the images. This allows analysing of the tumour angiogenesis and to study the changes induced by the treatments. From a practical point of view, a tumour lesion is chosen as a "functional target" by the radiologist, and a dynamic series is acquired after injection of a bolus of contrast agent. The dynamic series is analysed with a dedicated software to extract several micro-vascular parameters such as the tissue blood perfusion and blood volume, the vascular permeability, the interstitial volume and Ktrans. DCE-imaging has the potential to predict which patients are more likely to respond to the treatment, to monitor the treatments and to detect the nodules which are recurring under therapy. It is necessary, however, to optimize and to homogenise the acquisition protocols as well as the analysing procedures. It will also be necessary to characterize the specific parameters and responses for each specific situation, since they depend greatly on the types of tumour and on the treatments.

1115 Imaging pH *in vivo* using dynamic nuclear polarization

Gallagher, F. A.[1,2]•Kettunen, M. I.[1]•Day, S. E.[1]•Hu, D.[1]•in 't Zandt, R.[3]•Jensen, P. R.[3]•Karlsson, M.[3]•Golman, K.[3]•Lerche, M. H.[3]•Brindle, K. M.[1]
[1]University of Cambridge, Cambridge, UK [2]Addenbrooke's Hospital, Cambridge, UK [3]Imagnia, Malmö, Sweden

PURPOSE: Alterations in pH underlie many pathological processes and therefore there is a need for a technique to measure tissue pH in the clinic. Dynamic nuclear polarization (DNP) has emerged recently as a method for radically increasing the sensitivity of 13C-magnetic resonance spectroscopy (MRS). We show here that H13CO3 can be hyperpolarized using this method and can then be used to image tissue pH in vivo in mice. MATERIALS/METHODS: 13C-labelled bicarbonate was hyperpolarized using DNP. For the in vitro experiments, this was injected into a phantom containing samples buffered at different pHs. The in vivo studies involved injecting it into mice bearing murine lymphoma tumours with 13C images acquired using a surface coil. The in vivo pH was validated using a 31P-MRS probe (3-APP). RESULTS: Injecting hyperpolarized H13CO3 into buffers of different pHs confirmed that this technique could be used to measure pHs in the physiological range. The pH of the lymphoma tumours in vivo was 6.72 ± 0.13 (n = 12) and this was confirmed with 3-APP. Finally, the spatial distribution of pH within the animal confirmed a low pH within the tumour. CONCLUSION: We have demonstrated that pH can be imaged in vitro and in vivo using hyperpolarized bicarbonate. The technique has two major advantages. First, this measurement of pH is independent of the probe concentration. Second, because bicarbonate is endogenous it is unlikely to be toxic. We have termed this new method to measure pH: Carbonic Anhydrase Mediated Bicarbonate Ratiometric Imaging using DNP-Generated Enhancement (CAMBRIDGE).

1015–1135
Musculoskeletal Scientific Session I

1015 An investigation of the facet joint anatomy in unilateral spondylolysis

Rankine, J. J.•Dickson, R. A.
Leeds Teaching Hospitals, Leeds, UK

PURPOSE: Spondylolysis is a fatigue fracture of the pars interarticularis which occurs most commonly at L5 and can be unilateral or bilateral. The demonstration of a unilateral spondylolysis is important as there is the potential for full healing if the athletic activity is modified, whereas bilateral spondylolysis frequently lead to established non union. Coronally orientated facet joints are known to predispose to spondylolysis by increasing the point loading of the pars interarticularis. To date there has been no investigation into the facet joint anatomy in unilateral spondylolysis. MATERIALS/METHODS: A review of patients with low back pain and a possible diagnosis of spondylolysis who were investigated with multi-slice CT was performed. The coronal orientation of the facet joints at L4/5 and L5/S1 was recorded. The mean angle of coronal orientation was compared between those with and without a spondylolysis. RESULTS: The coronal angle of 140 facet joints in 35 patients was recorded. 23/35 patients had a spondylolysis which was unilateral in 12 patients. The facet joint angle was significantly more coronally orientated in the presence of a lysis when compared with an intact pars (means 53° and 43°, respectively). In the presence of a unilateral spondylolysis, the facet joint was more coronally orientated on the side of the spondylolysis (means 52° and 45°, respectively). CONCLUSION: Asymmetric facet joints are likely to increase forces through one side of the spine, with a unilateral spondylolysis occurring on the side of the more coronally orientated facet joint.

1025 Radiation exposure to the patient from fluoroscopy during fixation of hip fracture and fracture of ankle – effect of surgical experience

Rajesh, B.[1]•Kassetti, R.[2]
[1]Norwich Radiology Academy, Norwich, UK, [2]Maidstone Hospital, Maidstone, UK

PURPOSE: To assess the influence of experience of the operating surgeon on the radiation exposure to the patient and surgeon.

TUESDAY

MATERIALS/METHODS: Three different groups of surgeons based upon their years of operative experience were considered. Group I fewer than 3 years; Group II 3–10 years; Group III >10 years. 60 patients with hip fracture and ankle fracture were studied retrospectively. They were subdivided into 3 groups of 20 patients each. Age and sex of the patients and fracture pattern were comparable in each group. (Closed Weber B ankle fractures and Tronzo 2 fractures.) RESULTS: Fixation of fracture of neck of femur. The radiation dose (DAP) and screening time during fixation of a hip fracture is almost three times more in Group I when compared with Group III (p-value 0.0005). Fixation of fracture of ankle. The radiation dose and screening time during fixation of ankle is almost comparable in all the three groups (p-value 0.1015). CONCLUSION: Experience and training of the operating surgeon are important factors determining the radiation exposure to patients in fixation of hip fracture. Involvement of senior surgeons in hip fracture fixation is likely to reduce the radiation dose to patients and surgeons. We endorse the practice of using snap shot pulsed fluoroscopy, last image hold and good set up geometry, as a means of dose optimization. The practice of continuous screening during fixation of fractures of neck of femur and ankle must be discouraged.

1035 The functional anatomy of supraspinatus; an ultrasound analysis

Dickson, M. R.•Rankine, J. J.
Chapel Allerton Hospital, Leeds, UK

PURPOSE: Tears of the rotator cuff are the most common cause of shoulder disability. Although there has been much radiological investigation of the painful shoulder very little has been performed on healthy shoulders with particular reference to measurement of normal tendon and muscle size. A functional morphological examination of the normal supraspinatus tendon muscle was therefore carried out by ultrasound examination MATERIALS/METHODS: 25 healthy adults volunteered. The width of the supraspinatus tendon and the width and cross-sectional area of the supraspinatus muscle were measured at standardized anatomical points three times in both shoulders. The width of the biceps muscle, as a reference was also measured similarly. These measurements were analysed, with error calculated, and then related to age, gender, dominance, body weight and body mass index. RESULTS: Mean tendon widths were less than 5 mm while mean supraspinatus muscle widths and areas were 20 mm and 8 cm2, respectively. Muscle measurements in males were significantly higher than in females but only the supraspinatus muscle width was bigger on the dominant side. Body weight and body mass index correlated significantly with all muscle measures. Supraspinatus tendon width correlated significantly with the size of its parent muscle belly on both sides. Interobserver error was low, indicating satisfactory repeatability. CONCLUSION: These relationships are novel having not been previously described. This investigation has quantified important aspects of functional supraspinatus morphology and therefore could prove a useful reference for patients with rotator cuff pathology before and after surgical treatment and rehabilitation.

1045 Pigmented villonodular synovitis of the knee – imaging appearances and a review of management experience in the UK

Kamalasekharan, S.[1]•Haleem, S.[1]•Yeung, E.[2]•El-Zebdeh, M.[2]
[1]Royal Sussex County Hospital, Brighton, UK, [2]Newham General Hospital, London, UK

PURPOSE: Pigmented villonodular synovitis (PVNS) is an uncommon presentation characterized by hyperplastic synovium, bloody effusions and bone erosions. Incompletely resected localized and diffuse lesions have a high recurrence rate. The management of recurrent lesions depends on the expertise of the surgeon and severity of the lesion. The imaging characteristics of PVNS and experience of British knee surgeons in managing these lesions is presented in our study. MATERIALS/METHODS: A postal questionnaire was sent to 100 knee surgeons of the British Association of Surgeons of the Knee (BASK) with questions related to their experience in managing localized and recurrent PVNS. RESULTS: 74 responses were included in the study. 98.6% (n = 73) of the surgeons had seen fewer than 5 presentations. Localized lesions were treated primarily by closed (arthroscopic) or open synovectomy (94.5%) with radiotherapy being utilized in 4 lesions (5.4%). For local recurrence management was arthroscopic (33.7%) and open (25.6%) synovectomy. Radiotherapy was used in 24.3% of patients with recurrence and 9.4% were referred to specialist units. Infiltrating lesions were treated with open synovectomy and radiotherapy (28.4%) and 24 cases (32.4%) were referred to specialist units. CONCLUSION: The role of imaging is invaluable in early diagnosis and treatment due to limited experience. Routine radiography and CT often demonstrate non-marginal pressure erosions with sclerotic margins as well as nodular soft tissue masses. Ultrasound shows non-specific focal or nodular synovial thickening with increased flow on colour Doppler. MRI characteristics of PVNS are nodular, synovial masses which are low signal on T1 weighted and T2 weighted imaging.

1055 Volume rendered CT. In the assessment of bone viability in surface hip replacements

Tayar, R.
St Helier Hospital, Carshalton, UK

PURPOSE: To demonstrate the viability of the underlying bone stem in surface hip replacements. MATERIALS/METHODS: 10 patients with surface hip replacements were scanned with a GE 64 slice CT. Scanner using 0.625 mm slices with 3D and volume rendering adapting a GE algorithm. Specimens were retrieved after revision surgery and these were sectioned and photographed. RESULTS: the surgical nemesis remains post procedural avascular necrosis and particle disease. These two features were studied and validated with no false positive results. CONCLUSION: The orthopaedic surgeon has for the first time, a reliable method of imaging the bone stem and cement mantle and some of the otherwise occult complications that may arise in a surface hip replacement.

1105 MRI for the diagnosis of illiopsoas tendinosis

Chicklore, S.
St Thomas Hospital, London, UK

PURPOSE: To study the incidence of iliopsoas tendinosis as a cause of groin pain in the general population. MATERIALS/METHODS: We retrospectively reviewed all MRIs between 1 November 2006 and 31 October 2007 performed for the diagnosis of hip pain. These images were then further reviewed to ascertain the pathology and look for other causes of hip pain. Where iliopsoas tendinosis was the diagnosis or the differential, case notes were reviewed to look for clinical diagnosis, management and outcome. RESULTS: In all cases, MRI allowed clear visualization of the hip joint and its surrounding structures. Iliopsoas tendinosis was diagnosed in 9 cases (5 male, 4 female; average age 42 years). A primary diagnosis of illiopsoas tendinosis was noted in 3 of these cases (3.5%). 2 of these patients got better with analgesics and physiotherapy while 1 patient who was recently diagnosed contiues to be under follow up after conservative management. In 6 cases (7.1%) with more than one possible pathology on MRI, iliopsoas tendinosis was noted to be a diagnosis. CONCLUSION: The aetiology of hip pain is multifactorial and includes muscle strains, arthritis, labral tears, femoro-acetabular impingement, bursitis and tendinosis. Iliopsoas tendinopathy is one of the less known causes of hip pain. The diagnosis of iliopsoas tendinosis as a cause for hip pain can be challenging and imaging is often necessary for final diagnosis. Ultrasound is a reliable and cheap diagnostic modality but MRI is more specific. The latter also helps to rule out the other aforementioned causes of hip pain.

1115 Incidence of iliopsoas tendinosis on MRI in general population as a cause of groin pain

Chicklore, S.•Vijayanathan, S.
St. Thomas' Hospital, London, UK

PURPOSE: The aetiology of hip pain is multifactorial and includes muscle strains, arthritis, labral tears, femoro-acetabular

impingement, bursitis and tendinosis. Iliopsoas tendinopathy is one of the less known causes of hip pain. Our aim was to look into the incidence of iliopsoas tendinosis as a cause of groin pain in general population. MATERIALS/METHODS: The diagnosis of iliopsoas tendinosis as a cause for hip pain can be challenging and imaging is often necessary for final diagnosis. Ultrasound is a reliable and cheap diagnostic modality but MRI is more specific. The latter also helps to rule out the other aforementioned causes of hip pain. We reviewed all MRIs undertaken in the last 12 months in our diagnostic imaging department to note the incidence of this entity as a cause of hip pain. 85 MRIs were reviewed. In all cases, MRI allowed clear visualization of the hip joint and its surrounding structures. Case notes for the 9 patients with iliopsoas tendinosis were reviewed. RESULTS: A primary diagnosis of iliopsoas tendinosis was made in 3 of these cases (3.5%). In 6 cases (7.1%) with more than one possible pathology on MRI, iliopsoas tendinosis was noted to be a diagnosis. CONCLUSION: iliopsoas tendinosis as a cause of hip pain may be currently underdiagnosed. MRI helps in visualization of the anatomy of the hip joint and its surrounding structures and can reliably establish a diagnosis.

1125 Efficacy of magnetic resonance myelography in lumbar spine magnetic resonance imaging

Gadvi, R. R.•Hackling, K.•Reeves, D.•Udeshi, U. L.
Cheltenham Imaging Centre, Cheltenham, UK

PURPOSE/MATERIALS: The purpose of this audit was to determine the efficacy of the magnetic resonance (MR) myelogram sequence as a routine component of lumbar spine MRI. METHODS: Over a 10 week period data was prospectively collected on all lumbar spine MRI studies reported by one of the authors. The cross sectional images were first reported blind of the myelogram sequence, followed by the myelogram independently and the final conclusion took account of both. RESULTS: The results were categorised into full agreement, conclusion altered by myelogram and false negative myelogram. 152 examinations were analysed, with full agreement reached in 91%. The conclusion was altered by the myelogram findings in 5%; upstaging the diagnosis in 4% and downstaging it in 1%. 3% of myelograms were false negative with a 1% technical failure rate. CONCLUSION: In 5% MR lumbar spine examinations the addition of MR myelography will alter the conclusion. It may therefore be helpful to obtain an MR myelogram sequence, if there is clinical suspicion of radicular compression but the standard sequences do not demonstrate this.

1030–1200
Medicolegal session – Doctors in the dock

1030 Invited review: The role of the radiologist in the expert witness situation

Armstrong, P.
Cancer Imaging, St Bartholomew's Hospital, London, UK

The talk will explain the medicolegal process as it pertains to diagnostic radiological errors and will, hopefully, be of relevance to radiologists acting as experts for the courts as well as to radiologists who find themselves subject to medicolegal claim.

1055 Invited review: The high court judge's perspective regarding doctors and the law

Kelly, P.
The High Court, Dublin, Ireland

No abstract supplied.

1120 Invited review: High profile medicolegal cases a college perspective

Craft, A.
Royal Victoria Infirmary, Newcastle upon Tyne, UK

See attached.

1045–1200
Imaging the acute abdomen – case based approach

1045 Invited review: Small bowel obstruction

Malone, D.
St Vincent's University Hospital, Dublin, Ireland

No abstract supplied.

1110 Invited review: Inflammatory and related conditions

Guest, P.
Queen Elizabeth Hospital, Birmingham, UK

1135 Invited review: The acute paediatric abdomen

Foster, K.
Birmingham Children's Hospital NHS Trust, Birmingham, UK

The "acute abdomen" is a very common cause of children attending hospital. It is often difficult to obtain a clear history, particularly in young children, so clinical examination, laboratory tests, and radiological investigations are all important to reach a diagnosis. Obstruction in neonates, may be due to bowel atresia, meconium ileus, or Hirshrung disease. Bile stained vomiting should always be taken seriously, as this may be due to mid gut volvulus. Common causes of abdominal pain in infants include intussusception, and mesenteric adentitis. Other causes of abdominal pain that are more frequently seen in older children include appendicitis, inflammatory bowel disease, and ovarian pathology. This session will discuss 5 common clinical case scenarios, to illustrate these conditions.

1045–1215
Future PACS

1045 Invited review: PACS outside radiology: the inclusion of other images

Somers, J.
Nottingham City Hospital, Nottingham, UK

'This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning.' Winston Churchill 1942

PACS deployment in England is complete. This is the first step to the use of PACS as a major tool to deliver imaging services in new ways across the NHS. The next steps include secure data sharing and teleradiology. But PACS can also be developed as secure digital imaging system for all forms of medical imaging and to support many other "ologies". These will include other radiological "ologies", such as Radiotherapy, Cardiology and Mammography screening; but also other non-radiological imaging, such as endoscopy, medical photography, retinopathy, dermatology, physiological images and histopathology. Each area provides unique challenges in terms of image size and network requirements and most lack traditional RIS functionality. The National PACS Programme has set up the CHIMERA (Cardiology Histopathology Endoscopy Radiotherapy project to evaluate how PACS might deliver in these areas. This talk will explore the possibilities, opportunities and obstacles to implementing PACS as the de facto medical imaging system for the NHS.

1110 Invited review: Improving clinical practice through PACS

Bak, P.
Vantage Business Management Services Inc., Toronto, Ontario, Canada

KEY LEARNING OBJECTIVES: This paper presents new developments in radiology workflow that are being considered in Canada. These developments are spawned by the availability of a national infrastructure for sharing imaging related data, pressures on current imaging capacity and the need for continual improvements in clinical care. DISCUSSION: Imaging volume is increasing; resource capacity cannot keep pace! There is a need to manage capacity more

effectively. Taking Canada as an example nation, adding modalities did not address a capacity problem nor reduce wait times for patients. The problem lies with the number of procedures performed per patient and the availability of staff to deliver service. Leveraging the national EHR infrastructure, Canada is implementing load balancing workflow to optimize radiologists, technologists and modalities. Similarly, Canada is eliminating unnecessary repeat procedures and looking to reduce inappropriate procedures, all with the aim of managing capacity! With continual demand for excellence in patient care, there is a growing emphasis on providing enhanced decision support and more reliable communication of critical findings. With a national EHR infrastructure in place, Canada is looking to implement solutions that improve the collaboration and communication among physicians, as well as provide access to pertinent information. CONCLUSION: With regional and nationals image enabled EHR initiatives underway, emphasis is shifting from "going filmless" to leveraging infrastructure and data for improved decision support and capacity planning.

1135 Invited review: How do we manage large image volumes? The trend in 2008

Koff, D.
McMaster University, Hamilton, Ontario, Canada

With the new imaging modalities, mainly 64 slices CT scanners, we generate more and more images, easily up to 5000 images for a cardiac CT, including 3D reconstructions. What to do with those images, can we store them on our PACS, can we move those heavy studies on our networks, how do the radiologists read them and how does it impact the workflow and productivity in the medical imaging department? Advanced processing and 3D reconstructions which required dedicated workstations can now be treated on a client software on the radiologist PACS workstation; all images are not sent to PACS and may be stored on a separate server for a limited period of time; the radiologist has to adjust to new ways to display his examinations and manage not be overwhelmed by the massive volume of information. Use of image compression may be a way to solve the storage issue. Streaming speeds up the transfer of heavy studies. The radiologist does not look at images one by one anymore, but is provided with a wealth of multimedia information which gives a faster and better understanding of the area he is interested in.

1100–1200
Image quality perception in digital radiography (a function of dose reductions)

1100 Invited review: Image quality perception in digital radiography (a function of dose reductions)

Lehnert, T, Mack, M.G., Vog, T.J.l
Klinikum der Johann Wolfgang Goethe-Universität, Frankfurt/Ma, Germany

Diagnostic acceptability is subjective and can be based on professional experience, image processing and image display. In this study, image quality was based on the required clinical criteria, in order to investigate the degree to which patient entrance doses in digital radiography have a measurable effect on diagnostic confidence levels. Images from a cadaver were acquired and subsequently scored according to diagnostic acceptability with a standard 9-point rating system. Extremity and spine images formed the basis of the image database. Benchmarking was conducted using the standard techniques currently used in daily practice with a Kodak DirectView DR7500 for the specific body part and projection being imaged. Records were kept of kV, mAs, DAP (dose–area product), and skin entrance dose readings. Radiographic techniques were stepwise decreased corresponding to decreases in patient skin entrance dose of 75%, 50% and 25% from the benchmarked value for each series of images. 100% corresponded to the benchmarked value for the specific body part and projection. Expert readers were blinded to the dose level and read from properly calibrated diagnostic workstations. Readers could vary the window width and level of each image, and had no time limits imposed. It was possible to reduce the entrance skin dose to 25% in the case of extremities without compromising the image quality required for diagnosis. It was also determined that when readers were presented the 4 dose level images belonging to a set, more than half of the time the 75% image was rated as the best image.

1230–1330
BIR AGFA Mayneord lecture

1230 Magnetic resonance, direct imaging of short T_2 relaxation components in tissue

Bydder, G.M.
University of California, San Diego, California, USA

KEY LEARNING OBJECTIVES: To explain the MR properties of tissues with a majority or a minority of short T2 relaxation components and to illustrate the use of techniques to visualize these previously MR invisible tissues. DESCRIPTION: Many tissues in the musculoskeletal system are "MR invisible" and show little or no detectable signal with conventional pulse sequences. This includes tendons, ligaments, menisci and cortical bone. Many other tissues contain a minority of short T2 components which also do not contribute to the MR signal. By using ultrashort echo time (UTE) pulse sequences with TEs 100–1000 times shorter than those used with conventional pulse sequences it is possible to detect signal from these tissues, measure their T1s and T2s and use pulse sequences to develop contrast between different short T2 tissues. This has been of value in demonstrating entheses, the red and white zones of the menisci, periosteum and cortical bone. Brain, muscle and red bone marrow are examples of tissues with a minority of short T2 components which may be affected by disease. The technique can be used in conjunction with magic angle imaging to selectively increase the T2s of tissues containing highly ordered collagen as well as off resonance fat (and other) saturation pulses. CONCLUSION: The range of MR visible tissues can be considerably extended by use of UTE sequences, magic angle imaging and other techniques.

1400–1730
Infection imaging – current concepts

1400 Invited review: Sepsis in the adult chest

Franquet, T.
Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

Pulmonary infection is a major cause of morbidity and mortality in patients with both normal or impaired immune function. Community acquired pneumonia is a major healthcare and economic problem because of their high morbidity and mortality rate, and because of its direct and indirect costs of management. Hospital admission rates of pneumonia episodes vary from 22% to 51% of patients with CAP. In CAP, diagnosis and disease management most frequently involve chest radiography and generally do not require the use of other imaging modalities. Nosocomial pneumonia is the leading cause of death from hospital acquired infections and an important public health problem. It occurs most commonly among ICU patients. The diagnosis of nosocomial pneumonia is difficult, and the criteria used for surveillance have been based on clinical findings of fever, cough, and the development of purulent sputum in combination with a new or progressive infiltrate on chest radiograph. Patients with impaired immune function are susceptible to infections by a wide range of organisms. In the last several decades, AIDS epidemic, advances in the treatment of cancer, organ transplantation, and immunosuppresive therapy has resulted in large numbers of patients who develop abnormalities in their immune system. High-resolution CT can be helpful in the detection, differential diagnosis, and management of immunocompromised patients with pulmonary complications. The most common patterns seen at HRCT in acute pulmonary infections in these patients include nodules, tree-in-bud appearance, ground-glass attenuation, consolidation and airway disease.

1430 Invited review: Abdominal sepsis

Peck, R.

Royal Hallamshire Hospital, Sheffield, UK

An interactive session looking at cases of sepsis or sepsis in the upper abdomen, with diagnostic dilemmas and debate on management/intervention.

1500 Invited review: Lower abdominal/pelvic sepsis

Page, A.
Queen Elizabeth Hospital, Birmingham, UK

No abstract supplied.

1600 Invited review: Paediatric chest

Owens, C.
Great Ormond Street Hospital, London, UK

SUMMARY: Respiratory tract infection is the most common cause of illness in children carrying significant morbidity and mortality. Host immunity is important in helping to understand and classify the different end organ responses to a particular organism and indeed whether various pathogens are virulent, as well as their degree of virulence. It is therefore prudent to consider separately the immunocompetent from the immunocompromised child when considering the radiological profiles of acute chest infection. The chest radiograph is the primary imaging modality for acute lung disease as it is easy to obtain, inexpensive, and readily available with a low radiation burden. There are a number of scenarios where CT is playing an increasing role in evaluating acute lung disease in a more sensitive manner than the CXR at a price of higher delivered radiation dose. If CT is to be used it is vital that the attending radiologist is aware of the various tips and tricks to reduce CT radiation burden. When dealing with children, the issue of performing a low-dose examination is crucial and of outmost importance. We will present a cased base discussion on important aspects of respiratory infection in children including: The immunocompetent child. Cases with an infectious aetiology will be discussed and presented to highlight the general principles important in diagnosing these conditions in childhood. The immunocompromised child: The immunodeficiency states in children may be sub-divided into two major groups; congenital (primary) and acquired (secondary). The spectrum of illness and imaging appearances are similar; regardless of the underlying cause of immunodeficiency. All immunodeficiency states are associated with an increased susceptibility to infection and neoplasia with the lymphoproliferative disorders being the most frequent. Important examples will be presented and discussed. Certain complications, however, particularly the infectious complications, are common to all immunodeficiency states and extensive overlap in imaging findings is observed. CONCLUSION: Pulmonary complications are common in immunocompetent and immunodeficient children and the CXR is the first port of call. CT has a role to play to aid characterization of diseases and to guide broncheoloalvealar lavage and/or biopsy. (1) Paediatric Chest Imaging: Lucaya and Strife. Springer Verlag 2002; (2) Respiratory Infections following Haemopoetic Stem Cell Transplantation.

1630 Invited review: Cerebral sepsis – pearls and pitfalls

Gawne-Cain, M.
Southampton General Hospital, Hampshire, UK

In this interactive session the audience will be guided through the investigation of up to 5 cases of cerebral sepsis, including common and less common presentations and radiological signs.

1700 Invited review: Musculoskeletal sepsis

Wilson, D.
Nuffield Orthopaedic Centre, Oxford, UK

Bone, joint and soft tissue infections remain causes of potentially life threatening and disabling disease that is very amenable to treatment. The incidence diminished in the early 20th century with the advent of improved public health. It is less certain whether antibiotics assisted in this change even though one of the first cases treated at the Radcliffe Infirmary in Oxford with penicillin was a policeman with an infected finger. Despite this early progress these diseases remain prevalent and active. Immunosuppression and debilitation due to aggressive cancer therapy are major risk factors. Musculoskeletal infections are difficult to detect in the early stages and the diagnostician must be vigilant. Radiologists have a major role to play as the early signs on radiographs may be subtle. Osteopaenia and joint effusion are not the easiest signs and are often overlooked by clinical observers. Ultrasound examination will show occult joint effusion but rarely gives a clue as to its cause. MRI is the definitive means of showing the extent and spread but still does not provide a specific diagnosis and there will be confusion with some tumours and traumatic or degenerative changes. Aspiration and biopsy are important techniques and are best achieved by image guidance. This lecture will show the variety of radiological features and discuss the important issues of how imaging helps the clinical team to determine the response to antibiotics and the need for surgery.

1400–1520
MRI of the foetus and Paediatric Scientific Session

1400 Invited review: Post mortem imaging, virtual autopsy

Taylor, A.
UCL Institute of Child Health & Great Ormond Street Hospital for Children, London, UK

No abstract supplied.

1420 Invited review: Neuro imaging in the foetus

Whitby, E. H.
University of Sheffield, Sheffield, UK

AIMS: To give an introduction and overview of the development of fetal MRI and its current place in clinical practice and research. OUTCOMES: (1) Understand the appropriate use of fetal MRI alongside ultrasound in clinical practise and the need for the MDT approach. (2) Understand the basic technique and how to do it. (3) Understand the limitations of the technique and the problems in interpretation.

1430 Invited review: Post natal outcomes of antenatal diagnosed formations – what do they really mean and do they matter?

Garel, L.
CHU Sainte-Justine, Montréal, Quebec, Canada

PURPOSE: To correlate the post-natal imaging features of various abnormalities seen in utero. MATERIALS/METHODS: Ste Justine Hospital (Montréal, Canada) is a mother–child institution. Most obstetrical sonograms are performed in the radiology department (22 000 year-1). A limited number of fetal MRI (150 year-1) are also performed, always based upon an initial ultrasound. Examples of congenital lung lesions (CLL), congenital diaphragmatic hernia (CDH), hydronephtosis (HN), and abdominopelvic cysts will be shown, both in utero and after birth, to emphasise their prevalence, patterns of presentation, significance and management. RESULTS: (1) CLL are visible early in pregnancy, either as a cystic mass and/or an hyperechoic parenchyma. Hyperechoic lung results often from the secondary retention of pulmonary alveolar fluid in relation to the causative lesion. The natural history of CLL shows that most cases are self-limited. Conversely poor pronostic predictors can be inferred from prenatal findings (e.g. the remaining lung in CDH). (2) Fetal HN is the most frequent anomaly reported at obstetrical ultrasound. Post-natal investigations are not needed when the 3rd trimester a-p renal pelvis diameter is less than 8–10 mm. (3) The differential diagnosis of abdomino-pelvic cysts takes into account the fetal gender, the location of the lesion and the timing in pregnancy. CONCLUSION: (1) Fetal imaging has resulted in an increased prevalence of prenatally diagnosed lesions whereas most newborns are clinically asymptomatic.

(2) The management of these asymptomatic newborns and infants is often controversial (postnatal investigations, treatment) but should be decided in the light of the natural history of the anomalies.

1500 The effectiveness of ultrasound at diagnosing acute appendicitis in children

Summerfield, R.•Hume, S.•Bakalinova, D.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

PURPOSE: Appendicitis is the most common surgical emergency in children. Consequences of delayed diagnosis can be severe. Graded compression ultrasound (US) is the gold standard radiological test. We assessed its effectiveness at diagnosing acute appendicitis in our trust. MATERIALS/METHODS: Children who had an ultrasound for suspected appendicitis from 1 May 2004 to 31 October 2007 were identified from the imaging RIS system. Histology results and, where relevant, medical notes, were obtained. The histology department supplied a list of appendix specimens received. The diagnosis of appendicitis was determined either by histology or clinical history. The outcome was correlated with the ultrasound report. RESULTS: 315 children had an appendectomy, 231 had appendicitis on histology. 169 children had an ultrasound. 53 of these had surgery: 31 were positive on histology for appendicitis. 68.8% of appendicitis cases who had an ultrasound were female. 42.5% of cases diagnosed without ultrasound were female. 116 children had an ultrasound but were not operated on. 3 had gynaecological pathology; 1 was diagnosed with an appendix abscess and treated conservatively; 1 had a positive appendectomy on a repeat admission. Ultrasound had a sensitivity of 82.3% (95% CI 64.8–92.6) and a specificity of 88.6% (CI 84.7–93.3). CONCLUSION: Sensitivity and specificity of ultrasound in our trust is comparable with published studies. A review of the false positives cases revealed appendicitis can be mimicked by pinworm infestation or the presence of a faecolith without acute inflammation. Distension of the tip of the appendix only can also lead to a false positive scan.

1510 Providing support to radiologists when diagnosing suspected physical abuse: a role for teleradiology

Offiah, A. C.[1]•Fairhurst, J.[2]•Johnson, K.[3]•Landes, C.[4]•Moon, L.[5]•Sprigg, A.[6]
[1]Great Ormond Street Hospital for Children, London, UK, [2]Southampton General Hospital, Southampton, UK [3]Birmingham Children's Hospital, Birmingham, UK, [4]Royal Liverpool Hospital, Liverpool, UK, [5]Royal London Hospital, London, UK, [6]Sheffield Children's Hospital, Sheffield, UK

PURPOSE: A recent survey of UK radiologists showed that over half wanted improved support when it came to the diagnosis of suspected physical abuse. Currently CDs and film are mailed to a handful of paediatric radiologists perceived to be "experts" in this field. Teleradiology should allow a group of radiologists to look at images together or individually with a more rapid turnover of reports and perhaps a more satisfying teaching and learning process for all involved. This work in progress will begin to test the hypothesis. MATERIALS & METHODS: 6 paediatric radiologists have each contributed images from 9 patients (radiographs, ultrasound, CT and MRI) with subtle abnormalities not necessarily linked to physical abuse. Images have been uploaded and archived via a secure server using the CIMAR Cranium Teleradiology Network. Following the on-going independent reporting of images, a group teleconference will be held during which all images will be reviewed. Images on CD will subsequently be mailed to the lead investigator. Contrast and spatial resolution of original, uploaded and CD images will be compared. Time for image transfer and arrival of posted CDs as well as cost of each method of transfer are being recorded. RESULTS: Will confirm (1) the ability of CIMAR Cranium software to provide a secure server/archiving solution with 100% lossless compression of images; (2) summarize the cost effectiveness of the technology. CONCLUSION: The study will demonstrate whether teleradiology can potentially make the task a less lonely one for the radiologist attempting to diagnose physical abuse.

1400–1720
Chest keynote lecture and scientific session

1400 Invited review: Diffuse lung diseases: a survival guide for the non-thoracic radiologist

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

No abstract submitted.

1430 Can the chest X-ray predict pulmonary tuberculosis?

Westerhout, C. J.•Jayaprasagam, K. J.•Kumar, G.•Wastie, M. L.•Tan, L. H.•Liam, C. K.•Poosparajah, S.
Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia

PURPOSE: To evaluate the ability of the chest X-ray (CXR) to predict active tuberculosis in comparison with low dose high resolution computed tomography (HRCT). MATERIALS/METHODS: Seventeen patients who were diagnosed and subsequently treated for pulmonary tuberculosis were imaged with a CXR and HRCT. On a 16 slice CT scanner, a low dose HRCT of the thorax was performed at 80 kV with exposures varying from 60 mAs to 80 mAs and slice thickness of 0.75 mm with multiplanar reformatting and post processing as maximum intensity projection (MIP). The effective dose approximated to 1.3 mSv. Three blinded radiologists reviewed CXR and HRCT images independently for features of tuberculosis such as consolidation, cavitation, acinar opacities, ground glass appearance and mediastinal lymphadenopathy. Findings were subsequently correlated with sputum smear and culture and with the patients' immune status. RESULTS: Six patients had a normal CXR: HRCT diagnosed six of them with active pulmonary tuberculosis, of whom four patients had positive sputum smear. The other two patients with negative sputum smear were treated with anti-tuberculous therapy based on the HRCT and clinical findings. Four of the patients in this group were immunocompromised. All 11 patients with abnormal CXR had HRCT features which showed active pulmonary tuberculosis, one patient had a superadded lung mycetoma. Four patients in this group were immunocompromised. CONCLUSION: A CXR alone is unreliable for diagnosing tuberculosis as 6/17 (35%) patients with tuberculosis had a normal X-ray. HRCT should be performed in those patients with a normal CXR and a strong clinical suspicion of tuberculosis.

1440 Incremental maximal intensity projection CT in the detection of pulmonary nodules

Lee, C. M.•Batra, A.
University Hospital North Tees, Stockton, UK

PURPOSE: Accurate and early diagnosis of pulmonary metastases is vital in planning therapy and predicting prognosis in patients with malignant disease. Spiral CT is the preferred modality in pulmonary nodule detection. However, not all nodules are easily detected on axial images. The aim of this study was to assess the advantages of employing an incremental maximal intensity projection (MIP) technique over routine axial images in the detection of pulmonary nodules in patients with known primary malignancy undergoing staging CT studies. MATERIALS/METHODS: We retrospectively identified 49 patients with known primary malignancy; with or without metastatic disease who underwent staging CT on a four-slice scanner. Three reviewers independently interpreted all images on a workstation. The observers first reviewed the axial images (2.5 collimation, 5 mm reconstruction) and the number and location of each nodule was recorded. MIP images were then reconstructed (25 mm slab, 5 mm interval) from the initial axial images using a standard protocol, and the nodules detected was once again recorded. The final nodule count was established by consensus. RESULTS: A total of 109 nodules were detected in the 49 patients. The use of MIP technique significantly enhanced nodule detection by all three reviewers with the overall sensitivity of 88.1% for the MIP technique versus 71.3% for axial images ($p<0.05$). CONCLUSION: MIP processing enhances the detection rate for

pulmonary nodules; hence can potentially improve the accuracy of staging studies. As this technique is quick and easy to perform, it can be routinely used in the assessment of metastatic lung disease.

1450 Investigating suspected acute pulmonary embolism: what are hospital clinicians thinking?

McQueen, A. S.·Worthy, S.·Keir, M. J.
Royal Victoria Infirmary, Newcastle upon Tyne, UK

PURPOSE: The appropriate investigation of suspected acute pulmonary embolism (PE) remains a challenge for clinicians and radiologists. The 2003 British Thoracic Society (BTS) guidelines contains specific recommendations for clinicians investigating this group of patients. Our objective was to assess local clinical knowledge and compare with the national recommendations. METHODS: A clinical questionnaire was produced based on the BTS guidelines. 186 subjects completed the questionnaires at educational sessions for clinicians of all grades, within a single NHS Trust. The level of experience amongst our subjects ranged from final year medical student to consultant physician. RESULTS: The clinicians were divided into 4 groups based on seniority; Preregistration, Junior, Middle and Senior. 46.8% of all the clinicians correctly identified 3 major risk factors for PE and 25.8% recognized the definition of the recommended clinical probability score from 2 alternatives. Statements regarding the sensitivity of isotope lung scanning and CTPA received correct responses from 41.4% and 43% of subjects, respectively, whilst 81.2% recognized that an indeterminate V/Q scan requires further imaging. The majority of clinicians correctly answered 3 clinical scenario questions regarding use of D-dimers and imaging (78%, 85%, 57.5%). There was no statistically significant difference between the 4 groups for any of the 8 questions. CONCLUSIONS: The results indicate that various aspects of the national guidelines on suspected acute PE are unfamiliar to UK hospital clinicians. Further research is needed to identify methods to improve this situation, as both clinicians and radiologists have a duty to ensure that patients are appropriately investigated.

1500 Incidental pulmonary emboli in routine thoracic CT scans of oncology patients

Vinayagam R.[1]·Woolfall, P.[2]
[1]Newcastle Deanery, Stockton-on-Tees, UK, [2]University Hospital North Tees, Stockton-on-Tees, UK

PURPOSE: To evaluate the incidence of unsuspected pulmonary emboli in oncology patients. To check how many were reported by the radiologists. MATERIALS/METHODS: Retrospective analysis of post-contrast multislice (4 slice) CT thorax of oncology patients over 33 months period in a busy district general hospital. Review of patient case notes and oncology database performed to obtain details on diagnoses and treatments. 118 scans (of 133) were studied. All images were double read by two radiologists. Careful analysis for adequacy of contrast enhancement in the pulmonary arteries were performed before looking for the presence of emboli. The incidence of pulmonary emboli in various cancer types were also studied. The radiologists reports of all scans were reviewed. RESULTS: Nine out of 118 were positive for pulmonary emboli (7.6%) after carefully ruling out multiple artefactual mimics of pulmonary emboli. All of them were segmental or sub-segmental in location. Highest incidence noted in certain specific cancer patients. Only a very small number of these incidental PE were reported by the radiologists. No significant limitation in the interpretation due to technical factors. CONCLUSION: There is a significant incidence of pulmonary embolism (7.6% in our study) in oncology patients. Radiologists should be aware of this and a careful assessment of the pulmonary arteries while reporting these scans is therefore vital.

1510 Computed tomography evaluation of pulmonary artery morphology in pulmonary hypertension – a comparison of measurement methods

Devaraj, A.·Meister, M.·Wells, A. U.·Hansell, D. M.
Royal Brompton Hospital, London, UK

PURPOSE: To evaluate how various methods of assessing pulmonary arterial tree morphology by multidetector CT impacted on the detection of pulmonary hypertension (PH). MATERIALS/METHODS: 82 patients (41 males, mean age 56 years) who had undergone thoracic multidetector CT and right heart catheterization were studied. Absolute measurements were made of the axial and sagittal diameters of the main pulmonary artery (PA) and the PA cross-sectional area using multiplanar reformats. To account for variations in PA morphology according to patient habitus, ratios were obtained of PA dimensions with respect to ascending aorta (AA), descending aorta (DA) and vertebral body (VB) size. Peripheral pulmonary arteries were semi-quantitatively compared to the size of the corresponding bronchus. All parameters were correlated with mean PA pressure (mPAP). RESULTS: The axial and sagittal diameters of the main PA correlated equally well with mPAP ($r=0.59$, $p<0.0001$ and $r=0.60$, $p<0.0001$). The PA cross-sectional area correlated more strongly with mPAP ($r=0.64$, $p<0.0001$). Obtaining ratios of PA size with DA and VB size did not alter correlations. However, a ratio of PA axial diameter and cross-sectional area with AA diameter further strengthened correlations ($r=0.67$, $p<0.0001$ and $r=0.74$, $p<0.0001$). The segmental and sub-segmental artery–bronchus ratio scores correlated well with mPAP ($r=0.58$, $p<0.0001$ and $r=0.51$, $p<0.0001$, respectively). CONCLUSION: The ratio of the cross-sectional area of the main PA to AA diameter provides the best correlation with mPAP. The less well known sign of increased artery–bronchus ratios is also a satisfactory indicator of PH.

1520 Cardiac Rb PET CT angiography. Initial European experience

Groves, A. M.[1]·Kayani, I.[1]·Menezes, L.[1]·Prvulovich, E.[1]·Habib, S.[1]·Abraham, R.[2]·Endozo, R.[1]·Walker, M.[3]·Speechly-Dick, M.[3]·Bomanji, J. B.[1]·Ell, P. J.[1]
[1]Institute Nuclear Medicine, UCL, London, UK, [2]London Diabetes Medical, London, UK, [3]Cardiology, UCLH, London, UK

PURPOSE: We describe our initial clinical experience of cardiac combined 82-Rubidium PET/CT angiography. METHODS: We analysed our first 40 patients (12 female, 28 male; mean age 58.5 years, range 26–75 years, mean BMI 28, range 20–42) that had undergone combined cardiac 82Rubidium-PET/64-detector CT angiography for clinical indications. Acquisitions were made on a GE-Discovery-VCT-PET/CT machine. Patients underwent PET imaging during adenosine infusion and at rest. Images were acquired over 7 min following 2200 MBq of 82Rubidium. CT attenuation-correction scans were performed. CT angiographic images were obtained (140 kV 600–800 mAs 64x0.05 mm detectors, pitch 0.2–0.3) using 80 ml of intravenous contrast medium in suspended respiration. PET images were reported by two experienced Nuclear Physicians. CT images were reported by two experienced Radiologists using the 82Rubidium-PET data. A further two experienced Radiologists' performed a CT segmental analysis without access to the PET data. RESULTS: 19/40 had normal 82Rubidium-PET perfusion and 21/40 patients had perfusion defects. When the CT images were interpreted with the PET data, 23/40 patients had no significant coronary artery stenoses reported on CT, whilst 17/40 patients had significant lesions. When the CT images were reported blind to the PET images no significant coronary artery lesions were reported in 15/40 patients and significant lesions were seen in 25/40. Thus when the CT reporter was blind to the PET findings, an additional 8/40 patients were diagnosed with significant coronary artery stenoses compared to when the images were read with the PET data. CONCLUSIONS: Combining coronary CT angiography with 82Rubidium-PET is clinically feasible. PET frequently alters CT angiogram interpretation.

1600 Reducing variability and improving opacification. How to improve your CTPA technique

MacDuff, R.·Poon, F.·Roditi, G.
Glasgow Royal Infirmary, Glasgow, UK

PURPOSE: To improve objective and subjective pulmonary artery opacification in CT pulmonary angiographic examinations. MATERIALS/METHODS: 30 CTPA examinations performed under existing departmental contrast injection protocols were prospectively assessed, examinations were performed on either a 4 detector row (Siemens Sensation – 18 patients) or a 64 detector-row scanners (Toshiba Aquilion – 12 patients). A literature review was performed and contrast injection protocols were revised, the main change being an increase in contrast medium strength and a change to fixed scan delays in place of bolus tracking. A further 30 examinations were then assessed (13 performed on the 64-row MDCT and 17 on the 4-row MDCT). For image evaluation two experienced consultant radiologists subjectively assessed overall pulmonary artery opacification on a four point grading system while for objective evaluation attenuation in regions of interest were measured at 4 points in the pulmonary arterial tree for each scan. RESULTS: Overall pulmonary artery attenuation was significantly improved following intervention (mean 285 HU, SD 92 vs mean 371 HU, SD131) p=0.005. Attenuation was also significantly better at each region of interest. Subjective assessment was also significantly improved (combined mean score 2.96 vs 3.20) p=0.03. Observer agreement was graded as "fair" in both patient groups (kappa 0.292 vs 0.343). CONCLUSION: Alteration and simplification of CTPA contrast injection protocol resulted in both objective and subjective improvement in pulmonary artery opacification.

1610 Frequency and significance of solitary pulmonary nodules on CT in patients with extrapulmonary malignancy

Ganeshalingam, S.•Summerfield, O.•Dennett, R.•Rottenberg, G.•Menezes, L.
Guys and St Thomas' NHS Trust, London, UK

PURPOSE: To review the frequency and significance of solitary pulmonary nodules detected on CT in patients with extrapulmonary malignancy. MATERIALS/METHODS: We retrospectively evaluated all the CT scans performed on patients with an extrapulmonary malignancy and a solitary pulmonary nodule, in the calendar year 2006. The CTs were evaluated by two radiologists for the size and location of the solitary pulmonary nodule. Nodules were considered malignant based on their growth, PET scan results, or on biopsy results, and were considered benign either on histology or if their appearance remained stable 1 year after the initial examination. RESULTS: 137 patients with an extrapulmonary primary had a solitary pulmonary nodule. Of these, 85 patients had nodules that met the criteria of a benign nodule (62%) and 52 (38%) met the criteria for malignant nodules. Nodules smaller than 8 mm were more likely to be benign (n=78/85, 92% of cases), whereas 8 mm or greater nodules were more likely to be malignant (n=45/52, 87% of cases). Most nodules within 10 mm of the pleura were benign, whereas approximately half of nodules 10 mm away from the pleura were malignant. Patients with head and neck cancers, melanoma and testicular tumours were more likely to have malignant nodules. On analysis, nodule size and distance from the nearest pleural surface were predictive of malignancy. CONCLUSION: Nodule detection rate on CT in patients with extrapulmonary malignancy is high. Most of the nodules smaller than 8 mm or within 10 mm of pleura were benign.

1620 Impact of a local thoracic oncology positron emission tomography-computerised tomography service

Karthik, S.[1]•Scarsbrook, A. F.[2]
[1]Leeds General Infirmary, Leeds, UK, [2]St. James' University Hospital, Leeds, UK

PURPOSE: To evaluate the impact of a local PET-CT service for thoracic oncology patients. MATERIALS/METHODS: 127 consecutive patients were referred for PET-CT from thoracic oncology multi-disciplinary meetings (MDMs) in the 3 months (March–May 2007) after introduction of a regional PET-CT service. Data was collected retrospectively from the institutional radiology information system, pathology database and MDM server. TNM staging at PET-CT was compared with staging on conventional imaging and final histology when available. RESULTS: 78 men and 49 women (mean age 67.1 years, range 31–88 years) were evaluated. 47 patients were referred for characterization of a solitary pulmonary nodule. 33 were FDG positive and 14 were negative. 19 patients with positive nodules underwent surgery, malignancy was confirmed in 18 (95%). PET-CT was performed for staging of non small cell lung cancer in 74 patients. PET-CT changed T stage in 29 patients (39%) (19 upstaged (26%), 10 downstaged (13%)). Nearly a quarter of patients had a higher N stage on PET (22.1%) compared with conventional imaging. 10 patients had low grade mediastinal nodal activity and underwent nodal sampling prior to treatment, 9 (90%) had negative histology, 1 had follicular lymphoma. PET-CT demonstrated occult metastases in 9 patients (12%). Significant co-incidental findings were demonstrated in 16 patients. CONCLUSION: The introduction of a local PET-CT service has had a significant impact on management of thoracic oncology patients. TNM staging was frequently altered and significant co-incidental pathology was demonstrated in several patients.

1630 CT pulmonary angiography – which measurement most accurately predicts death?

Deva, D. P.[1]•Britton, I.[1]•Morley-Davies, A. J.[1]•Charran, A. K.[1]•Chidambaram, V.[1]•Ling, L.[1]•Mahlaba, H.[1]•Nayeemuddin, M.[1]•Tony, G.[1]•Deva, A.[2]•Watson, N. A.
[1]University Hospital of North Staffordshire, Stoke-on-Trent, UK, [2]Bachelor of Actuarial and Financial Studies, Stoke-on-Trent, UK

PURPOSE: To determine the most significantly predictive CT measurement of 30-day hospital mortality, by comparing axial measurements with those obtained from 3D reconstructed four chamber views. METHODS: The Radiology RIS database was interrogated for all CTPAs performed over a 6-month period. 49 examinations were reviewed with 4 deaths in the first 30 days. All positive scans were reviewed blinded to the outcome, and the RV, LV and their ratio calculated by both methods. RESULTS: Both the Axial RV/LV ratio (p=0.0037) and the RV/LV ratio measured by 4-chamber method were significantly associated with death (p<0.0001). A cut off 1.4 on the ROC (receiver operator characteristic) curves was significant for predicting 30 day in hospital death (75% sensitivity and 91% specificity) with both methods. CONCLUSION: An RV/LV ratio of 1.4 or greater on either axial or 4 chamber view should direct aggressive intervention.

1640 The pulmonary artery ascending aorta ratio: accuracy in predicting pulmonary hypertension in lung fibrosis

Devaraj, A.•Wells, A. U.•Meister, M.•Hansell, D. M.
Royal Brompton Hospital, London, UK

PURPOSE: To study the value of the pulmonary artery (PA)/ascending aorta (AA) ratio as a sign of pulmonary hypertension (PH) in patients with fibrotic lung disease (FLD). MATERIALS/METHODS: 82 patients (41 males, mean age 56 years, 33 with FLD and 49 without FLD) were categorised into those with a mean PA pressure (mPAP) > 30 mmHg and those with a mPAP ≤ 30 mmHg. Dimensions of the main PA and AA were measured on CT at predetermined levels. Correlations between the PA diameter and the PA/AA ratio with mPAP were analysed in patients with and without FLD. RESULTS: The PA/AA ratio and PA diameter correlated equally well with mPAP in patients without FLD (r=0.72, p<0.0001 and r=0.69, p<0.0001). In contrast, the PA/AA ratio markedly strengthened the correlation with mPAP in patients with FLD compared with the PA diameter alone (r=0.57, p<0.001 and r=0.23, p=0.18, respectively). In patients with a mPAP ≤ 30 mmHg the PA and AA were larger in those with FLD compared with those without FLD (31.0 mm vs 26.0 mm, p<0.001 and 34.1 mm vs 30.9 mm, p=0.12). CONCLUSION: In patients with FLD, dilatation of the PA and AA occurs in the absence of PH. The PA/AA ratio is a better indicator of mPAP in patients with FLD than the absolute PA dimension.

1650 Computational error in intrathoracic airway dimensions due to oblique orientation on computed tomography is correctable

Gupta, S.[1]•Siddiqui, S.[1]•Mawby, D.[2]•Entwisle, J.[2]•Brightling, C.[1]
[1]Institute for Lung Health, Glenfield Hospital, Leicester, UK, [2]Glenfield Hospital, Leicester, UK

PURPOSE: Multidetector computed tomography (CT) has been used increasingly as a research tool to non-invasively measure intrathoracic airway dimensions. Oblique orientation of airways can cause considerable error in airway wall area (WA) and lumen area (LA) estimation. We sought to identify correction methods for the airway measurements. MATERIALS/METHODS: A phantom model was constructed consisting of a polystyrene block embedded with 9 plastic tubes of varying dimensions. Gold standard measurements were made to the nearest micron at both faces of each tube with a steromicroscope. CT scan was performed at 16×0.75 mm collimation, 120 kV and 50 mAs with reconstruction at 0.75 mm slices. The leading face was reconstructed at angular increments of 10°, up to 60°. Cross-sectional measurements were made at the leading face using full-width at half maximum (FWHM) principle. RESULTS: The gold standard measurements for the tubes ranged from: WA (2.42–47.02 mm2) and LA (0.95–20.42 mm2). Increasing oblique tube orientation demonstrated a stepwise increase in wall area (WA) and luminal area (LA). Using true WA (LA), measured WA (LA) and maximum to minimum diameter ratio as variables plotted in three different planes, correction equations were derived using LeoStatic© software, based on best parabolic-planar fit to the plotted points. Airway dimensions for a cohort of 60 asthmatic patients revealed significant correlation with lung functions after correction, using derived equations. CONCLUSION: Parabolic approximation equations for WA and LA obtained can be used for correction of error due to oblique orientation of airways.

1700 Thin-section CT findings in the ageing lung: a comparative study between >75 and <55 year old individual controls

Copley, S.[1]•Hawtin, K.[1]•Gibson, D.[1]•Hodson, J.[1]•Wenaden, A.[1]•Wells, A. U.[2]•Hansell, D. M.[2]
[1]Hammersmith Hospital, London, UNITED KINGDOM, [2]Royal Brompton Hospital, London, UK

PURPOSE: To document the thin-section CT findings in the lung parenchyma of older individuals and compare the prevalence of these observations with a younger age group. MATERIALS/METHODS: The CT requests of ambulatory outpatients referred for a clinically indicated CT of the abdomen or head were reviewed. Individuals over 75 years and controls under the age of 55 years were identified. Exclusion criteria included current smokers, known pulmonary disease, asbestos exposure, neoplastic disease and previous chemotherapy or radiotherapy. 53 consecutive asymptomatic individuals (38 elderly and 15 controls) were prospectively identified. Prone thin-section CT of the thorax was performed. Two blinded observers independently scored images for the presence and extent of a subpleural reticular pattern, ground glass opacity, cysts, bronchial dilatation and bronchial wall thickening. RESULTS: The observer agreement was good for subpleural reticular pattern (Kw 0.63), acceptable for ground glass opacity, cysts and bronchial dilatation (Kw 0.43–0.51) but poor for bronchial wall thickness (Kw 0.17). A subpleural reticular pattern was strikingly more prevalent in the elderly (80% observations) than in the younger group (10% observations) ($p<0.0005$). Cysts were seen in 29% of the older group compared with none of the younger group ($p<0.0001$). Ground glass opacity was seen in 38% of the older group comapred with 7% of younger controls ($p<0.001$). Bronchial dilatation and wall thickening was also significantly more frequent in the older group ($p<0.0005$, $p<0.015$, respectively). CONCLUSION: Several parenchymal findings on thin-section CT are significantly more frequent in asymptomatic elderly compared with younger individuals.

1710 Retrospective study to evaluate the clinicopathological significance of matched V/Q abnormalities when compared with CT

Mubashar, M.•Liong, S.
University Hospital South Manchester, Manchester, UK

PURPOSE: To find out the clinicopathological significance of matched V/Q abnormalities. MATERIALS/METHODS: Retrospective analysis of 419 patients' V/Q scans with normal looking chest X-rays over a period of 2 years from 1 October 2005. The V/Q abnormalities were compared with CT scan findings performed within 2 weeks of V/Q scans. RESULTS: The study showed a wide spectrum of conditions on CT scanning from PE, emphysema, bronchiectasis, bronchitis/bronchiolitis, fibrosis, atelectasis, mucous plugging/air trapping, interstitial lung disease to no significant abnormalities. CONCLUSION: This study highlights the value of V/Q scanning in hinting toward different lung pathologies which may not have been clinically evaluated. Second, it emphasises the need for rigorous clinical assessment in order to avoid an intermediate probability/ indeterminate probability for PE.

1400–1600

Radiology accreditation programme – accreditation: spotlight on safety and quality in diagnostic imaging services

1400 Invited review: Accreditation in diagnostic imaging services. The principles, aims and aspirations of the accreditation project

Adam, A.
The Royal College of Radiologists, London, UK

No abstract supplied.

1405 Invited review: Patients and professionals working in partnership to drive up quality and ensure safety: challenges and risks

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

No abstract supplied.

1425 Invited review: Learning from piloting and evaluation: how the RAP model will work in reality

Whitley, S.
UK Radiology Advisory Services, Lancashire, UK

No abstract supplied.

1450 Policy context: How the service accreditation model will fit within emerging framework for healthcare quality

Moore, J.
Department of Health, London, UK

Quality and Safety are at the heart of the vision of creating a world-class health service. It is important that we use the different levers available to maximize effect to improve quality. The changes in the regulatory system for health and social care will mean that the new regulator – the Care Quality Commission – will focus on registration, ensuring organizations are fit for purpose, and on performance assessment. Therefore we need to look to other levers to improve quality above these essential levels. This talk will focus on how accreditation can be used to support professionals, the public and commissioners in improving the quality of care. It will consider the importance of professionally laid approaches to improving the quality of care and how this will fit with the developments in clinical audit, clinical governance and standards.

1505 Invited review: Patients' expectations: can the accreditation programme deliver?

Wiltsher, C.
Royal College of Radiologists, London, UK

The Radiology Accreditation Programme is intended to be patient focused, and one of its aims is to improve the quality of care for

patients using radiology services. This presentation will explore from the perspective of a patient what "patient focused" might mean for radiology services, and assess the extent to which the accreditation scheme as now presented can deliver these aspirations. Attention will be paid to the involvement of patients in the development of the accreditation standards and the piloting of the programme, and the possible roles of lay people in accreditation visits. Consideration will be given to ways in which patients can help radiology services develop to meet and exceed the accreditation standards.

1520 Invited review: Developing and piloting the programme: impact on service delivery

Heath, A.
Alliance Medical, Warwick, UK

No abstract supplied.

1540 Invited review: Panel discussion

Adam, A.[1] Garvey, C.[4] Glean, E.[1] Moore, J.[5] Paterson, A.[2] Whitley, S.[3] Wiltsher, C.[1]
[1]The Royal College of Radiologists, London, UK, [2]College of Radiographers, London, UK, [3]UK Radiology Advisory Services, Preston, UK, [4]Royal Liverpool & Broadgreen University Hospital, Liverpool, UK, [5]Department of Health, London, UK

This contribution will consider the role that the radiological accreditation programme will play in supporting the improvement of quality in health services. It will address how accreditation can give valuable feedback to professionals in improving the quality of care. It will also look at the role of the programme in providing a framework for the public and commissioners to assess the quality of services. The panel discussion will allow the different uses of accreditation to be debated.

TUESDAY

1400–1730
PACS and Teleradiology Group meeting. Is PACS achieving its objective?

1400 Invited review: Introduction

Dugar, N.
Doncaster Royal Infirmary, UK

No abstract supplied.

1410 Invited review: The Canada Health Infoway project – the opportunity to share images and how

Bak, P.
Vantage Business Management Services Inc., Toronto, Ontario, Canada

KEY LEARNING OBJECTIVES: This paper presents the Canadian experience in successfully deploying an image enabled Electronic Health Record solution. Focus is on the Diagnostic Imaging Repository architecture, IHE XDS-I interoperability standard and benefits realized. DISCUSSION: Canada is currently implementing a national, interoperable Electronic Health Record (EHR) solution which supports seamless sharing of diagnostic imaging results to authorized health providers anywhere, anytime and with sub 5 s performance over broadband networks. The Canadian approach is to consolidate imaging results in a number of repositories that serve the EHR. These repositories are highly available, fully redundant and provide immediate access to images and reports. Recognizing the need to leverage existing PACS and RIS infrastructure, Canada has made compliance to standards a mandatory requirement for successful deployment of the EHR. For diagnostic imaging, Canada has endorsed the use of IHE XDS-I as the means to publish and discover data, and DICOM as the means to transport images. Compression and streaming standards are under evaluation to further simplify interoperability between vendor systems. CONCLUSION: Through commitment to interoperability standards, economies of scale, and aggressive negotiations with vendors, Canada will have 95% of its exam volume accessible through the EHR by 2010 and will realise significant quality of care and financial benefits.

1440 Invited review: Canadian PACS – cost effective and safe – the adoption of image compression for diagnostic purposes

Koff, D.
McMaster University, Hamilton, Ontario, Canada

PURPOSE: The Canadian Association of Radiologists PACS/Teleradiology committee has accepted the principle of irreversible (lossy) compression for use in primary diagnosis using DICOM JPEG or JPEG 2000 at specific compression ratios set by image type, but required further evaluation before making a final decision. With the assistance of Canada Health Infoway, we have conducted a large scale clinical study to assess the most appropriate compression ratios. MATERIALS/METHODS: Images from 7 anatomical regions and 5 modalities have been compressed at 3 different levels in lossy JPEG and JPEG 2000 at ratios based on average values determined by previous published studies; 80 board certified radiologists evaluated the images using a dedicated application that allowed results to be reported in real-time to a central database via the Internet. We used an association of two recognized evaluation methods: diagnostic accuracy with ROC analysis and original revealed forced choice. 70 different images or stack of images were presented to each reader with 1 normal case for 4 identified pathologies. RESULTS: We have demonstrated that at values between 8 and 15:1 for small images (ultrasound, CT, MR, NM) and between 20 and 30:1 for large images (CR/DR), there is no significant loss of information. Unexpected differences have been found between lossy JPEG and JPEG 2000 with lossy JPEG performing better on some CT areas, linked to frequency content. CONCLUSION: We conclude that at the conservative range of ratios that we recommend, we can use lossy compression for medical images with no visible loss of clinical information.

1600 Invited review: PACS update England. Where are we now and where do we want to go?

Barber, M.•Fletcher, S.
NHS Connecting for Health, Leeds, UK

PURPOSE: To update the UK Radiology community on the progress of deployment and systems development of PACS by NHS Connecting for Health in England. MATERIALS/METHODS: Presentation with Slides. RESULTS: PACS is now deployed in all trusts in England, CFH is now concentrating on leveraging these solutions to enable: (1) the sharing of reports and associated images between trusts; (2) ditto between trusts and independent sector providers to improve capacity; (3) interoperability between the different PACS solutions deployed, and between these systems and other core deliverables from CFH; (4) other trust imaging departments to store and retrieve data on PACS

1620 Invited review: National implementation in Scotland

Downie, A.
Victoria Infirmary, Glasgow, UK

PACS implementation in Scotland is well under way. The approach used differs in some key aspects from the CfH model used in England, and these differences will be discussed. In particular, a national PACS archive was implemented from the start, allowing data-sharing of images and reports between sites, using a national patient identifier. This approach has its problems, but brings major clinical advantages. Implementing PACS in a rural environment over large distances is difficult, and some of the problems and potential solutions will be discussed.

1635 Invited review: The Welsh approach

Tucker, K.
Diagnostic Services Strategy, Cardiff, UK

PURPOSE: The presentation will detail the approach to, and progress towards, the integration of clinical radiology systems in Wales. The work is being undertaken as part of the diagnostic imaging modernisation project and in partnership with Informing Healthcare. The strategy for healthcare delivery in Wales is via collaborative working between Trusts to facilitate improvements to patient care. It is recognized that integrated clinical radiology systems will be essential to underpin both collaborative working and regional reconfiguration.

1650 Invited review: The Northern Ireland PACS Project (NIPACS): the story so far...

Devlin, B.
Altnagelvin Hospital, Derry, UK

KEY LEARNING OBJECTIVES: To identify and consider the key factors driving and supporting the move to an integrated RIS/PACS project for Northern Ireland, the problems encountered along the way and the expected benefits of such an integrated system. DESCRIPTION: NIPACS is the first National fully integrated RIS/PACS procurement in the UK and is approaching the implementation phase. A number of particular characteristics of the health computing environment in Northern Ireland have contributed to the feasibility of such a project. The progress to date will be discussed with focus on the vision of the full project, the lessons learned and messages for other regions contemplating similar deployments.

1400–1600
Multi-modality imaging and image fusion

1400 Invited review: Developments in PET/CT applications

Hulse, P.
Christie Hospital NHS Trust, Manchester, UK

The developments affecting current and future clinical practice in PET CT in the UK will be discussed. These include: Use of Intravenous Contrast. PET CT in radiotherapy planning. New Radiotracers. Optimizing radiotracer supply. Service provision including patient selection, management and data collection. Training and accreditation. The developments affecting current and future clinical practice in PET CT in the UK will be discussed. These include: Use of Intravenous Contrast. PET CT in radiotherapy planning. New Radiotracers. Optimizing radiotracer supply. Service provision including patient selection, management and data collection. Training and accreditation.

1430 Invited review: PET/MR a new benchmark?

Marsden, P.
Guy's, King's and St Thomas' School of Medicine, London, UK

Following the rapid and dramatic adoption of PET-CT into clinical practice, an obvious question is: What about PET-MR? The combination of PET and MRI, however, presents more significant technical challenges than does PET-CT, the main one being that all currently available commercial clinical PET systems use photomultiplier tubes which will not work in even a very small magnetics field. Over the last 5–10 years several prototype pre-clinical PET-MR systems have been demonstrated, and more recently a human brain imaging system, using a variety of different approaches but all capable, in principle, of simultaneous PET and MR image acquisition. Of equal importance to the technical challenges of PET-MRI is the issue of exactly what applications it might be used for, the developments to date having being essentially technology driven. Potential applications include simple image co-registration, which might be achieved with a relatively straightforward "in-line", non-simultaneous, arrangement analogous to current PET-CT systems. At the other extreme are configurations that permit fully simultaneous PET and MR imaging, and which may have applications in correcting for motion, or in following complementary functional changes with both modalities in response to an intervention such as drug administration.

1500 Invited review: Image fusion and robotics

Yang, G.
Imperial College of Science, Technology and Medicine, London, UK

The field of surgery is entering a time of great change, driven by recent advances in surgical technology/imaging, and the quest for minimizing invasiveness and patient trauma during surgical procedures. Medical robotics and computer assisted surgery are new and promising fields of study, which aim to augment the capabilities of surgeons by taking the best from robots and humans. In robotic surgery, dexterity is enhanced by microprocessor controlled mechanical wrists, which allow motion scaling for reducing gross hand movements and improved performance of micro-scale tasks. The continuing evolution of the technology, including force feedback and virtual immobilization through real-time motion adaptation, will permit more complex procedures such as beating heart surgery to be carried out under a static frame-of-reference. The purpose of this talk is to introduce the latest developments in surgical imaging for bringing cellular and molecular imaging modalities to an in vivo – in situ setting to permit real-time tissue characterisation, functional assessment, and intraoperative guidance. It also outlines the medical image computing challenges in multimodality image fusion under large tissue deformation and the role of medical robotics in transforming the future minimally invasive intervention and therapy.

1530 Invited review: Multiscale imaging – using information at the cellular level

Todd-Pokropek, A.
University College London, London, UK

No abstract supplied.

1400–1500
COR Stanley Melville Memorial lecture

1400 Invited review: Diagnostic imaging modernisation in Wales

Tucker, K.
Diagnostic Service Strategy, Cardiff, UK

PURPOSE: The presentation will give details of the 3-year diagnostic imaging modernization project in Wales. This is a National Assembly initiative to improve Diagnostic Imaging services in the Principality. METHODS: It was recognized that health services were overburdened with demand and fundamental changes were needed to meet the challenges of the 21st century. The Welsh Assembly embarked on a major programme of reform and improvement. The Diagnostic Services Strategy was published in 2004 and the main thrust of the Strategy was to propose: That future planning and modernization of diagnostic services including deployment of major equipment and new technology should be within a national or regional framework; A firmer grip on standards and on managing demand and capacity; Development of services unconstrained by traditional organizational, departmental or professional boundaries; Development of an ICT infrastructure to support collaborative working between Trusts. The aim of the diagnostic imaging modernization project is to translate the Diagnostic Services Strategy vision into reality and deliver short, medium and long term improvements in quality, equity, sustainability, cost, efficiency and morale. To achieve this, a number of work streams were identified and the implementation of the diagnostic imaging modernization project commenced in June 2005. RESULTS: The project was complex and details of the successes and failures within each work stream will be outlined in the presentation. CONCLUSION: The presentation will conclude with an assessment of the benefits achieved against the cost of the project.

1400–1500
Breast Scientific Session

1400 Are intradutal breast papillomas entirely benign?

Tuano-donnelly, R.•Jain, A.•Howe, M.

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PURPOSE: To review the clinical, imaging and pathological findings in patients suspected to have intraductal breast papillomas. MATERIALS/METHODS: It is a retrospective study of 35 patients (age range 40–78 years) diagnosed either at core biopsy or post surgically with intraductal breast papillomas between the years 1995 to 2007. The study has been performed at a large Specialist Breast Unit providing screening and symptomatic services. The clinical, mammographic and ultrasound findings have been reviewed by 2 radiologists. Thirty three (94%) of 35 lesions were surgically excised and correlation has been made between pre- and post-operative histology. RESULTS: 13 patients presented with nipple discharge, 8 with a palpable lump and 14 as screening patients. Mammographically 25 (71%) lesions were well defined opacities. Ultrasound showed 10 hypoechoic lesions, 8 cystic lesions with intracystic solid component and 4 patients with dilated ducts with intraductal solid lesions. 27 patients (77%) were found to have benign intraductal papilloma and 8 (23%) intraductal papillary carcinoma. There were no specific differentiating features on mammography or ultrasound between a benign or malignant lesion. Out of the 23 patients who had core biopsies performed 97% showed correlation between the pre- and post-surgical histology. CONCLUSION: Our results support that patients with suspected intraductal papilloma should have surgical resection since a significant majority will turn out to be malignant (23%). This is despite 97% correlation between pre-operative core biopsy and post operative histology in our study.

1410 Utilizing existing NHS computer systems in a large scale trial in the UK Breast Screening Programme

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The UK is currently in the process of developing the capability of NHS IT systems to support healthcare research provided both technical and data security challenges can be overcome. Utilization of information in existing NHS databases would facilitate many of the labour intensive activities in multicentre clinical trials required for participant identification and recruitment, data collection, data management and archiving. CADET II was a multicentre randomized trial evaluating computer aided detection (CAD) in the UK NHS Breast Screening Programme (NHSBSP). Primary outcome measures were the cancer detection rate and recall rate of two film reading regimens. The target was to recruit 30 000 participants from women attending routine mammography at three UK screening centres. Existing NHSBSP administrative systems facilitated distribution of trial information sheets to women when the invitations to attend routine mammography were sent out from the screening offices. The recently upgraded NBSS computer system permits direct data entry at the time of reporting, minimizing data entry errors and facilitating recording of the outcomes of breast screening episodes. For the trial, collaboration with the software company responsible for the upgrade was required to modify the functionality of the NBSS database to allow direct data entry for reporting of mammograms read using CAD and to facilitate extraction of trial outcome data. Challenges to this approach for trial data management included the need to obtain both national and local approval for data access, security and confidentiality, and technical issues in the modification of the computer system to permit input of trial data.

1420 Accessing prior mammograms in the transition to digital breast screening

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PURPOSE: To investigate how the change to digital breast screening in the NHS will affect mammography readers level of use of prior mammograms from the last screening round, and whether digitizing these prior mammograms encourages mammography readers to use them more. Previous studies have shown that use of prior mammograms improves reader performance. METHODS: Six mammography readers, (two radiologists and four advanced practitioners), were videotaped at each of three workstations carrying out their routine reading for two 45 min sessions. Three workstations were investigated: A film workstation with film current and prior mammograms displayed on roller viewer; a hybrid workstation with current digital mammograms displayed on LCD screen, and prior film mammograms displayed on adjacent roller viewer; and a digital workstation with digital current and digitized prior mammograms displayed together on LCD screen. RESULTS: Analysis of the video showed that the average number of times the readers looked at the prior mammograms per case was 3.3, 1.1, and 2.4 at the film, hybrid and digital workstations, respectively. The difference between the film and hybrid workstations was significant ($p<0.05$). Time taken per case was lower at the digital versus the hybrid workstation ($p<0.05$). Five out of the six mammography readers reported preferring the digital to both the hybrid and film workstations. CONCLUSION: The transition to digital breast screening may produce an unwanted side-effect of reducing the amount that readers use the prior mammograms, if displayed in film format. Digitizing the prior mammograms may reduce such an effect.

1430 Development of combined X-ray and optical mammography to increase specificity

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PURPOSE: We propose a combined X-ray/optical mammography system intended to provide enhanced specificity over X-ray mammography alone. Over 2000 women have been imaged using optical mammography with specificities claimed as high as 93%. Optical contrast, dependent upon haemodynamics and thus providing physiological information, is complementary to radiographic contrast. Preliminary work by other groups suggests that a combined system provides improved specificity over either system alone. METHOD: A clinically acceptable combined system would not compromise the radiographic image quality. We have therefore modified a clinical mammography system to acquire a standard radiograph before compression is reduced and optical acquisition begins. We use an existing optical tomography system with two parallel plates of optical fibre arrays held above and below the breast. Reducing compression holds the breast in position whilst allowing the longer acquisition, of approximately 1 min, required for optical imaging. The two images will be registered by modelling the effects of breast compression. RESULTS: We have demonstrated that optical tomography can differentiate between benign and malignant lesions in the uncompressed breast. We have further shown that using prior anatomical information improves resolution, contrast and image accuracy. Initial results suggest the optical plates could remain in place during radiographic acquisition without reducing image quality, their presence in the image being removed later through digital subtraction. This provides a faster, simpler and more clinically acceptable system than moving the optical plates in and out of the field of view. Preliminary results from dual-modality imaging of developed compressible phantoms will be presented.

1440 Diagnostic quality of 50 and 100 micron computed radiography compared with analogue mammograms

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PURPOSE: To compare the diagnostic quality of a 50 and a 100 micron computed radiography (CR) system with screen analogue films. MATERIALS/METHODS: Mammograms were taken of fresh operative breast specimens from patients operated on between August and December 2006. Exposures were made without changing position or compression with three systems (FUJI CR 100, CR 50 and analogue). 57 specimens from 49 patients were prospectively evaluated by 10 readers. Images were anonymised and readers blinded to the particular CR system used for each image. A five point scoring system (-2 to +2) was used to assess quality criteria and overall diagnostic value. RESULTS: For all calcification features there was a significant preference for CR 50 over CR 100 and for both over analogue. Skin edges were better visualised on CR. Mass conspicuity was equivalent or worse on CR, but mass detail equivalent or better on CR 50. Overall diagnostic value was significantly better on CR than analogue ($p<0.05$, two tailed t-test). CONCLUSION: For most quality criteria, both CR systems were rated as at least equivalent to analogue. Fine detail was significantly better on CR 50 compared with CR 100 and analogue images.

1450 Image quality assessment in the NHSBSP

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PURPOSE: All mammographic X-ray units employed in the UK Breast Screening Programme (NHSBSP) are subject to regular quality assurance (QA) testing by both radiographers and medical physicists. QA guidelines for radiographers recommend that image quality (IQ) testing be performed on a weekly basis. With the expansion to the screening service there is increasing pressure to ensure that QA testing is performed to the required frequency. This paper presents the evidence for reducing the frequency of radiographer IQ testing from weekly to monthly. MATERIALS/METHODS: Weekly image quality QA results recorded during 2006/7 for 23 mammography X-ray units have been reviewed and analysed for variation in image quality scores for 4 parameters (high contrast resolution, 6 mm detail, 0.5 mm detail and 0.25 mm detail). Image quality measurements were made using Leeds TORMAS test objects. RESULTS: Image quality scores show that all 23 mammography units achieved the minimum standard required by the NHSBSP for both high contrast resolution and for minimum detectable contrast when the scores were averaged over a 12 month period. Interoperator variability contributes the largest source of variation in the results of image quality assessment. However, this variation does not affect the ability of screening units to achieve IQ targets. CONCLUSION: There is scope for revisiting the requirement for weekly Image Quality testing within the NHSBSP. Particularly with the possible introduction of automated methods of assessing image quality being of benefit in eliminating the errors in scoring test images. This is especially true with the expected move to full field digital mammography.

1400–1500
Dual energy CT

1400 Invited review: Dual energy CT

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Dual-source CT was primarily developed to achieve a higher temporal resolution, which is essential for cardiac imaging. The technology is not only beneficial for coronary CT angiography examinations at high or arrhythmic heart rates but also improves the assessment of heart valves and wall motion. For dual-energy CT, the two X-ray sources are run at different tube potentials of 140 kVp and 80 kVp, and the tube currents are adjusted to obtain a similar photon output. The patient dose equals that of a normal CT scan, and average images similar to 120 kVp-images are immediately available for diagnostic evaluation, so that the Dual Energy protocol can be acquired instead of the routine examination. Additionally, a variety of post-processing algorithms can be applied to exploit the spectral information. One algorithm removes the bones from angiography data sets. Another option is to colour-code iodine uptake in parenchymatous organs or to subtract the iodine-related density to obtain virtual unenhanced images. In pulmonary angiography data sets, perfusion of the lung parenchyma can be mapped by its iodine content. Different types of renal calculi can also be differentiated by their spectral properties and tendons and ligaments can be differentiated from other structures. Initial studies show the clinical value of these applications.

1530–1720
Service Delivery Scientific Session II

1530 How Clean Are We? Hygiene In Radiology

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PURPOSE: Assessment of hand hygiene in 5 areas within the Radiology departments of 2 large teaching hospitals. MATERIALS/METHODS: 5 areas were assessed: Ultrasound, MRI, CT, Fluoroscopy and Vascular. 5 assessors were placed in each area. An observational tool modified from the University College London Hand Hygiene observational tool is used to assess each area. The content of the tools include; choice of hand washing technique; frequency of staff cleaning hands before and after contact with patients; cannulation; and usage of gloves. Cleaning of equipment and couches was also noted after each patient contact. A review of the environment in each area was undertaken to evaluate if sinks, soap dispensers and alcohol hand rubs dispensers are appropriately placed to encourage utilization. Staff were interviewed regarding awareness of hand hygiene guidelines and whether a local trust e-learning module on this subject had been completed. RESULTS: A total of 30 h of observation time was achieved. Frequency of hand washing was calculated in proportion to the number of interactions and a comparison is made between the compliance of various grades of personnel in the 5 different areas. Availability and location of hand hygiene products are also presented and correlated with compliance rates. CONCLUSION: Radiology departments play an increasing role in patient care pathways and inpatient interactions carry the highest risk of transferring hospital acquired infection. In a busy department it is therefore vital that infection control policy is strictly adhered to. Re-audit and constant prioritization are imperative to ensure compliance and prevent complacency.

1540 A national evaluation of the role of the diagnostic radiography assistant practitioner

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PURPOSE: To undertake a national evaluation of the role of the radiography assistant practitioner in diagnostic imaging MATERIALS/METHODS: Structured postal questionnaires were distributed to managers and assistant practitioners (APs) at 308 major diagnostic imaging centres in England, Scotland and Wales. RESULTS: Responses were received from 120 diagnostic imaging managers, giving a 39% response rate. Responses were also received from 184 diagnostic radiography APs at those sites. There were reported to be 244 qualified APs and 105 trainees across the sites surveyed. Regional variations in numbers of APs in post were observed, being highest in the North West region and lowest in London. Slowdown in the perceived need for APs was apparent in some regions. Work-based training was the preferred method of AP education. 69% of managers regarded APs as

cost effective and 47% intended to recruit more APs. 61% felt that APs had benefited radiographers. APs undertook a wide variety of roles, including non-ambulant trauma, paediatric imaging and MRI/CT. 94% of APs were still employed at their training site and 40% were willing to move out of their geographical area in order to progress. Many APs felt that they contributed by "freeing up" radiographers for other duties. CONCLUSION: Wide variations exist within the remit and role of APs. APs appear to provide a positive contribution to the service. There was no correlation between AP recruitment and reported shortages of radiographers. The AP workforce is relatively non-mobile, but seeks appropriate career progression in line with age and experience.

1550 A survey imaging services for children in Scotland

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PURPOSE: Children are major users of healthcare. As there are only three children's hospitals in Scotland the majority of children are imaged in facilities primarily designed for adults. The main aims of this study were to (i) investigate the number and type of imaging procedures undertaken; (ii) determine the protocols and policies in place for children; (iii) investigate radiographer training; and (iv) establish children's involvement. METHODS: A questionnaire was developed and distributed to superintendent radiographers in all Scottish hospitals with imaging facilities. Quantitative data were entered into SPSS-PC. RESULTS: A 76% (78/103) response rate was achieved (all three children's hospitals and 65 acute and general hospitals). Responses indicated that of approximately 180 000 children imaged in Scotland, half were in hospitals for adults, which predominantly provided plain film imaging and ultrasound. By contrast children's hospitals provided multiple imaging modalities including fluoroscopy and CT scanning. There was no provision for children in 45% of adult departments (n=45), and 90% (59/65) had no separate amenities such as child friendly toilets or changing facilities. Two of the three children's hospitals and 81% (n=53) of the others had no protocols for children with learning special needs. Almost 75% of adult hospital radiographers reported no training in imaging children had been received. Children's views on hospital services were seldom sought. CONCLUSIONS: Children's hospitals are well placed to share good practice with colleagues in adult hospitals. Educational establishments need to address radiographer paediatric training requirements. Survey was funded by College of Radiographers (UK) Research Grant.

1600 Habitual weight-bearing exercise is related to increased calcaneal quantitative ultrasound parameters young females

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PURPOSE: To investigate the influence of habitual weight-bearing exercise on bone density at the calcaneus in a young female population. METHODS: 50 female undergraduate students (age 18–29 years) were recruited and had calcaneal QUS (Lunar Achilles) of both heels. All subjects had no history of drugs or diseases know to effect bone metabolism. A record of their habitual exercise type, duration and quantity was taken. They were divided into two groups: (1) No exercise or non-weight-bearing exercise (i.e. swimming) (n=15). (2) Moderate to high impact exercise (i.e. racquet sports) (n=35). The manufacturer's reference data were used to calculate T- and Z-scores. Differences between the two groups were compared using a student's t-test. RESULTS: Group 1: (Mean and standard deviation) BUA: 105 (9.8) dB MHz-1; SOS: 1560 (27.6) m s-1; Stiffness: 86.6 (10.5), Z-score: -0.8 (0.7). Group 2: BUA: 116.9 (13.1) dB MHz-1; SOS: 1573 (24.6) m s-1; Stiffness: 98.5 (12.6), Z-score: 0.0 (0.8). All results were statistically significant to a level of $p \leq 0.01$. CONCLUSION: Habitual weight-bearing exercise is associated with a significant positive effect on bone density parameters as measured by ultrasound at the calcaneus. The differences remain significant when Z-scores are used to account for any age-related differences. These results support that weight-bearing exercise is important in achieving maximal peak bone mass and habitual exercise such as team sports offer an ideal method to encourage such exercise. The calcaneus is a highly weight-bearing bone and therefore, the strength of these effects may be of a lesser magnitude elsewhere in the body.

1610 The skyline axial patella radiographic technique. Is it time to review our practice?

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PURPOSE: A fundamental requirement of a radiographer is to keep all exposures as low as reasonably practicable in accordance with IR(ME)R 2000. There is an established risk associated with radiation exposure and no known lower threshold. This study ascertains current practice amongst students undertaking the "skyline" patella projection and also quantifies the influence of technique and lead equivalent shielding on radiation dose received at thyroid and gonad levels. MATERIALS/METHODS: Questionnaires were sent to students in diagnostic radiography at Sheffield Hallam University. Entrance surface dose (ESD) measurements were obtained using an anthropomorphic phantom and electronic dosemeter in the University X-ray suite. RESULTS: The Laurin technique was identified as "most practiced" with 93% of respondents using it "always" or "often". Dose experiments proved revealing with an unprotected patient receiving a 50-fold increase in thyroid ESD (402.9×10^{-2} µGy) compared with 13.16×10^{-2} µGy when protection is applied to the back of the imaging plate. Alternative techniques yielded a thyroid dose of less than 14×10^{-2} µGy. Gonad dose was similar for all techniques. The percentage of students offering patient protection for the Laurin technique was shown to be very poor with only 29% consistently protecting gonad levels, 3% thyroid and 5% behind the cassette. CONCLUSION: Current practice does not appear to be based on a sound evidence base. A simple change in practice utilising lead equivalent shielding behind the imaging cassette or adopting alternative technique can reduce incident scattered radiation to negligible amounts.

1620 Adult resuscitation in radiology: are we up to date?

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PURPOSE: With increasing interventional work and referral of surgically unfit patients, the radiology department at a university hospital had been classed as medium risk area. This study was undertaken to determine the current level of resuscitation skills and knowledge amongst staff in view of the new guidelines issued by the Resuscitation Council (UK); and identify ways of improving it. MATERIALS/METHODS: Questionnaires were distributed to all radiology department staff. The questionnaires were modified according to the expected level of each subset of staff (doctors, nurses, radiographers, support staff). RESULTS: 66% of the staff responded. 75% had formal resuscitation training, but validity of the training had lapsed in 49%. Only 11% who were aware of the location of all the resuscitation equipment in the department. Only 10% were aware of the new guidelines regarding the chest compression to ventilation ratio and positioning of the hands during chest compression. Only 57% of the doctors, nurses and radiographers could manage an anaphylactic reaction. Only 35% had training to use a defibrillator, however, only 6% of these were aware of the change to the guidelines. Only one staff member was aware of the all the relevant changes in the guidelines. CONCLUSION: There is a shortfall of resuscitation skills in the department. These skills can be improved by having departmental rolling programmes to update knowledge, display of resuscitation flow charts in the department, encourage courses on par with RAD-LS (Radiology Life Support), and mandatory attendance of a recognized life support course (ILS/ALS) by medical staff.

1630 The use of NLP to reduce the need for GA in claustrophobic patients undergoing MRI

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MATERIALS/METHODS: This was a prospective study with ethics approval granted by the Barnsley ethics committee. 50 adult patients who had previously failed an MR scan due to claustrophobia were recruited to the study. These patients were invited to attend for a session of NLP with the Radiographer. The main emphasis was on a phobia cure. Patients were asked to complete state anxiety questionnaires prior to and following the session of NLP. The patients were then given the opportunity to re-attempt the MR scan. The resultant images were assessed by an appropriate Consultant Radiologist in order to establish whether or not the study was diagnostic. RESULTS: Out of the 50 patients who attended for NLP 38 (76%) completed the MR examination and all of the resultant studies were deemed to be of diagnostic quality. Of the remaining 12, two refused to attempt the MR procedure and 10 attempted but failed (no images were acquired for any of this group). The median anxiety score at the outset was 54. This was reduced to 42 following the session of NLP. CONCLUSION: The use of NLP can reduce anxiety and significantly increase the number of claustrophobic patients able to undergo MRI without having to resort to General Anaesthetic. Acknowlegements: The authors would like to acknowledge the help of the Consultant Radiologists who reviewed the images: Dr C.A.J. Romanowki; Dr T.J. Hodgson; Dr S.C. Coley; Dr D.J.A. Connolly; Dr S. Gowlett; Dr A. Highland; Dr R. Cooper; Dr R.A. Nakielny.

1640 Introduction of a clinical report quality assurance programme for magnetic resonance imaging. A multi-centre experience

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PURPOSE: To establish discrepancy rates in the reporting of MRI examinations across a multisite network of radiology practices in the UK. MATERIALS/METHODS: Double reading of radiological examinations to assure the quality of reports is employed in only selected areas of UK practice. In 2007 an "open second read" quality assurance programme was introduced into routine practice across a network of 20 MRI centres in England. All examinations were subject to primary reporting by UK specialist registered radiologists in the standard way. A target of 5% of examinations was selected for open second read by peer in each centre. The second read opinion was recorded on a standard data capture form using a simple 4 point scoring scale with reference to the primary report (Complete agreement, Minor discrepancy, Significant discrepancy, Serious Discrepancy). All results were collated centrally and the significant and serious discrepancies further analysed. RESULTS: During the period April to October 2007, 1275 MRI examinations were subject to this QA process. There was complete agreement between first and second read in 1136 cases (89.10%). Discrepancies were recorded as follows: Minor, 118 cases (9.25%), Significant 14 cases (1.10%), and Major 2 cases (0.16%). CONCLUSION: Our study demonstrates a high concordance rate between 2 readers for reporting of MRI examinations in routine clinical practice. Significant or major discrepancies occurred 1.26% of examinations.

1650 Providing evidence on CT colonography for the Scottish Diagnostics Collaborative

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PURPOSE: A Diagnostics Collaborative Programme was set up by the Scottish Government to improve patient care through improved access to diagnostics. This programme identified a need for information on the effectiveness of CT colonography in comparison with colonoscopy or double contrast barium enema (DCBE) for colorectal cancer diagnosis, to support planning and inform service development. NHS Quality Improvement Scotland, the national Health Technology Assessment (HTA) organization was approached, and a review of the evidence requested. MATERIALS/METHODS: Scoping literature searches identified various existing HTAs, systematic reviews, guidelines and consensus statements. A decision was taken to undertake a systematic review of this secondary literature to establish the current best evidence available. RESULTS: No identified studies considered morbidity and mortality as outcomes. The relative performance of the tests was therefore considered in terms of accuracy, adverse events, patient acceptance, incidental finding and cost effectiveness. The reviews identified varied in quality but were largely consistent in reporting uncertainty around the effectiveness of CT colonography. The sensitivities currently achievable with CT colonography are variable and further research on the technique and its standardization is required. Consensus on diagnostic thresholds is also needed. CONCLUSION: Despite the extensive literature on this topic there is insufficient evidence to inform recommendations on the routine use of CT colonography as a diagnostic tool in Scotland. The organisation of services to deliver CT colonography, in comparison with colonoscopy or DCBE, is likely to be at least as significant as diagnostic performance in making choices between techniques.

1700 Evaluating a 24 h CT KUB service for the initial imaging of suspected acute renal colic

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PURPOSE: To evaluate whether the provision of a 24 h CT KUB service changes the management of patients presenting with suspected acute renal colic MATERIALS/METHODS: Retrospective review of 400 patients with suspected renal colic who underwent emergency CT KUB at the Royal London Hospital. RESULTS: Over a 24 h period the average positive rate of urolithiasis was 46%. 13% of patients had an alternative abnormality and 41% of patients had no abnormality on CT KUB. Patients imaged during the normal working day (09:00–17:00) had a positive rate for urolithiasis of 44%. Between the hours of 17:00 and midnight this increased to 49% and overnight (00:00–09:00) this again increased to a significantly higher incidence of urolithiasis in 71% of patients. The number of scans identifying alternative pathologies remained constant at 13% throughout the three time periods. Overall, of those with urolithiasis confirmed on CT 23% went on to have urological intervention. None of the patients, irrespective of when scanned, underwent intervention out of hours. CONCLUSION: The positive rate for identification of urolithiasis on CT KUB increased significantly in those scanned overnight. Early diagnosis would appear to be beneficial in the planning of patient management and also desirable in allaying patient fears regarding diagnosis. As no interventions though were conducted overnight the necessity of a service requiring considerable resource remains controversial.

1710 CT-MR fusion based dosimetry for the evaluation of permanent prostate brachytherapy implants with comparison to standard CT-based dosimetry

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INTRODUCTION/PURPOSE: Standard CT-based evaluation of permanent prostate brachytherapy (PPB) implants is suboptimal due to difficulties in accurately outlining the prostate gland. MRI fails to distinguish individual sources satisfactorily. The purpose of this study was to describe a protocol of fusing CT and MR images to exploit the advantages of both modalities to compare derived dosimetric parameters to standard CT-based dosimetry. METHODS: 30 patients who had undergone PPB with loose seeds were imaged with transaxial CT and T2 weighted MR scans. Pelvic bone landmarks were used as common landmarks to align the CT and MR datasets using Variseed 7.1 software followed by manual registration. Prostate outlining was carried out by an experienced clinical oncologist on both sets of

images. Sources were derived from the CT information. Dosimetric parameters were then compared between the CT and CT-MR fusion datasets. RESULTS: Fusion was successful in 25 patients with a root mean square error of <1.0 mm (mean=0.6 mm). Whilst there was no significant difference (t-test, p=0.6) between volumes outlined by CT (mean 37.7 cm3; standard deviation [±13.2 cm3]) and CT-MR (40.2 cm3; [±15.4 cm3]) all the dosimetric parameters derived from the two datasets were significantly different (p<0.05) and demonstrated wide limits of agreement. CT dosimetry overestimated the D90 dose by 21 Gy as compared with CT-MR dosimetry with 95% limits of agreement of -30 Gy and +71 Gy. CONCLUSION: CT-MR fusion based dosimetry is clinically and statistically different from CT based imaging alone. Consideration should be given to adopting CT-MR fusion as the modality of choice for PPB dosimetry purposes.

1530–1730
History session

1530 Invited review: Introduction, recent developments in the history of radiology

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Our radiology historical society has come of age. We are now 21 years old! It's interesting to reflect how the study of the history of radiology has developed in the last 21 years. The British Society for the History of Radiology developed from the Radiology History and Heritage Charitable Trust. The first meeting of the Historical Working Party that was the precursor of the Radiology History and Heritage Charitable Trust took place on the 11 September 1987. So much has happened in the last 21 years and I think we can all be justifiably pleased at the progress. The history of radiology is now respected as a subject and we have all worked hard to increase the profile of radiology history. The current state of radiology history will be reviewed and possible future directions will be indicated.

1540 Invited review: The development of ultrasound

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Ultrasonics has its foundations in classical physics, as exemplified by Lord Rayleigh's Theory of Sound, published in two volumes in 1877–78. The first medical applications, in the 1930s, were in physiotherapy and surgery. Early attempts, in the 1940s, to use ultrasound for medical imaging were based on transmission, in the same fashion as X-ray imaging: the results were disappointing. The development of the pulse-echo reflection method for the detection of underwater obstacles at sea and, particularly, for flaw detection in metals and for radar training simulators, prompted the application of this approach to medical diagnosis, beginning in the 1940s, although progress was somewhat held back by the disenchantment caused by the failure of ultrasonic transmission imaging. The groups led by Rokuro Uchida in Japan, by D H Howry and by J J Wild in the USA, by Ian Donald in Scotland, by Inge Edler in Sweden and by George Kossoff in Australia were the most notable pioneers. Together with others who soon joined them, the technical progress which they made and the results which they obtained eventually overcame the scepticism and conservatism of the clinical radiological community so that, by the 1980s, ultrasonic imaging had become established as a mainstream investigative modality.

1605 Invited review: X-Ray therapy and the early years, 1902–1907

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The therapeutic use of X-rays between 1902 and 1907 was more of an art than a science. In a time before evidence based medicine, X-rays were hailed as miraculous cures for a multitude of previously incurable ailments. These claims fuelled a high demand for X-ray therapy and without the need for formal qualifications "X-ray Practitioners" soon created their own medical niche. The lack of legislation or guidelines to govern the use of X-rays encouraged their application to be very haphazard. As a result, these unqualified "practitioners" risked the health of their patients, as well as jeopardizing the implementation of X-rays for use by medical professionals. In addition, qualified medical professionals were also ignorant to the dangers and appropriate usage of X-rays, thereby creating an aura of uncertainty as to the application of X-ray therapy. The invention of X-rays coincided with the dawn of the "Laboratory Medicine" era. By discussing the therapeutic uses of X-rays between 1902 and 1907, I serve to exemplify an important issue of the time; the introduction of new (and often not understood) medical technology. Current secondary literature brushes over or fails to mention X-ray therapeutics during this time period – instead it focuses more on the visual/diagnostic element of X-rays. This dissertation investigates the reasons behind the lack of secondary literature and aims to highlight the evolution of X-ray therapeutics from 1902 to 1907.

1630 Invited review: Argentinean contributions to radiology

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Certain people and cultures have contributed more than their contemporaries to the advance of the science. In the beginnings of civilization they were the Mesopotamians, the Egyptians, the Hindustanians and the Chinese. Later, the Greeks and Romans. In the Middle Ages, the Arabs, the Byzantines and some Kingdoms of Europe. In modern times was Western Europe (UK, France, Germany). Later, the USA, Canada, and Japan joined. The history of science teaches us that humankind owes to a score of cultures the major contributions to universal knowledge. This statement is also true for medicine. The Hispanic cultures – and particularly Latinamericans – have been not very fertile in this matter. Nevertheless in the filed of medicine they have offered some novelties that have been taken as advantages by the whole humankind. The purpose of this lecture is to describe some of the innovations of Argentinean physicians in the field of radiology that deserved (or would deserved) a universal repercussion. To achieve this objective we acknowledge that original contributions are those that meant a real clinical or technical progress in that particular moment. Their importance is measured in connection with the level of the knowledge of the time, although sometimes the ulterior medical progress has invalidated or relegated its conclusions. We exclude the proposals that involve emergency solutions, of smaller technical or scientific quality that other already well-known, implanted by cultural, economic or political reasons and not for reasons of scientific rigor. The originality is based on the primacy of publication, a important requirement for the Latin American scientists, who in a first moment and in more than a case, published their work in local press.

1655 Invited review: Becquerel, reflections on the centenary of his death

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

2008 marks the centenary of the death of Antoine Henri Becquerel. Antoine Henri Becquerel was born in Paris on 15 December 1852 and died at Le Croisic on 25 August 1908. He was a member of a distinguished French scientific family. Becquerel was appointed to the Chair of Applied Physics at the Conservatoire des Arts et Metiers taking over from his father Alexander Edmond Becquerel. In 1892 he was appointed as Professor of Applied Physics at the Paris Museum and became a Professor at the Polytechnic in 1895. Becquerel was interested in phosphorescence throughout his career and in 1896 he discovered the phenomenon of natural radioactivity. This was subsequently investigated by Marie and Pierre Curie. For his discovery Becquerel was awarded half of the Nobel Prize for Physics in 1903, sharing it with the Curies. In spite of the many contributions of Antoine Henri Becquerel he remains less well known compared with Wilhelm Conrad Röntgen or Marie and Pierre Curie. As yet no

full length biography has been written of him in English. In this review the life and lasting contributions of Antoine Henri Becquerel will be surveyed and celebrated in this centenary year.

1600–1640
Musculoskeletal Scientific Session II

1600 Improving magnetic resonance imaging (MRI) of the wrist for longitudinal research and clinical trials

Hughes, E. J.
Imperial College, Hammersmith Hospital, London, UK

PURPOSE: Longitudinal imaging of the wrist for research and clinical trials using MRI requires the wrist to be placed in a comfortable position, close to the isocentre with high reproducibility. We developed a Perspex bridge to support the wrist inside a dedicated wrist coil, suspended above the abdomen and have tested it on volunteers. MATERIALS/METHODS: Using a Philips 3 T Achieva system, we imaged 8 volunteers, in 3 different positions on separate occasions: (1) wrist in bridge. (2) supine, wrist at side and (3) swimmer position (prone, hand above head). Each subject completed a comfort evaluation score: 1 (worst) – 10 (best). The image signal-to-noise ratio (SNR); contrast-to-noise ratio (CNR) and the offset of the field-of-view from isocentre were calculated. To assess the bridge reproducibility, a further 5 volunteers had 3 separate repeated scans and rigid body image registration of three bones in the wrist was performed to quantify relative changes in position. RESULTS: The bridge scored highest for comfort (mean 7.8±0.7, range 5–10), followed by the hand by side (mean 7.6±1.2, range 5–10) and the swimmers position (mean 6.2±1.6, range 2–10). The average offsets from the isocentre were 127 mm, 153 mm and 44 mm, respectively which corresponded with SNR/CNR values of, 6.4/3.1, 5.3/2.6 and 8.0/4.0 . The average change in relative position of three bones was 0.4 mm and 1.23° rotation. CONCLUSION: This study shows that the newly devised bridge allows improved patient comfort, with highly reproducible imaging, while maintaining image quality. It is currently being tested in a longitudinal Rheumatoid Arthritis study.

1610 Magnetic resonance arthrography of the glenohumeral joint comparing T_1 weighted 2D and volumetric interpolated breathold examinations

Stockley, H. M.•Hutchinson, C. E.
Salford Royal NHS Foundation Trust, Manchester, UK

PURPOSE: To ascertain if there is any difference in the identification of anatomical structures and pathological features when comparing separately acquired T1 weighted (T1W), two dimensional (2D) sequences and a volumetric interpolated breath-hold examination (VIBE) sequence in magnetic resonance (MR) arthrography of the glenohumeral joint. Also to investigate if patient movement is reduced when using separately acquired T1W 2D sequences compared to VIBE sequences. By incorporating VIBE sequences into MR arthrography protocols, total scanning time could be reduced to approximately half its current value. MATERIALS/METHODS: 32 patients underwent 1.5 T MRI following injection of the glenohumeral joint with diluted gadolinium, under fluoroscopic guidance. The sequences included T1W imaging with fat-saturation in the axial, sagittal oblique and coronal oblique planes and T1W VIBE imaging with water excitation in the coronal oblique plane. The two data sets were compared qualitatively for ease of identification of anatomical structures and pathological features and the presence of patient movement. RESULTS: Ligaments ($p<0.01$), tendons ($p<0.05$) and pathological features ($p<0.01$) were more easily identified on separately acquired T1W 2D sequences compared to VIBE sequences. Cartilage ($p<0.01$) was more easily recognized on VIBE imaging during which there was less patient movement ($p<0.01$) compared to T1W 2D imaging. CONCLUSION: The differences found when comparing anatomical structures and pathological features on separately acquired T1W 2D sequences with the images generated using VIBE sequences appear to be statistically significant. Nevertheless, there are limitations to this study which could potentially alter the results if these problems were to be resolved.

1620 Polytrauma imaging within tertiary care hospital of a developing country

Bhaya, A.
Apollo Hospital, Dhaka, Bangladesh

PURPOSE: To assess the diversity of the clinical presentation and role of imaging modalities in the detection and management of poly-trauma patients. MATERIALS/METHODS: Between 1 January 2006 and 30 June 2007, all patients presenting to the Emergency Department (ED) with trauma involving more than two body systems are included in this study. We, then evaluated the pattern and nature of the trauma diagnosed by the imaging modalities like X-ray, Ultrasound and CT. These patients were observed up to their full clinical outcome. We also compared the initial imaging findings with the ultimate final diagnosis RESULTS: Over the last, one and half year period 330 poly-trauma cases were recorded. Of them (57%) patients were initially evaluated by ultrasound, 207 (63%) by CT studies and 297 (91%) by plain X-ray. Among the cases there were 149 (45%) head injuries; 34 (11.2%) cervical spine fractures; 85 (26%) pelvic fractures; 46 (14%) thoracic or lumbar spine fractures; pneumothoraces 99 (30%); mediastinal injuries 26 (8%) and 62 (19%) patients with intra-abdominal injuries including 23 (7%) with liver and splenic trauma. There were three major bullet and stab injuries recorded as well. CONCLUSION: A wide range of significant injuries was demonstrated rapidly and accurately by the currently available imaging modalities. Intuitive development of fast USG and limited CT protocols has gone a long way in quick and cost effective evaluation of polytrauma patients.

1630 Outcomes of hotline and rapid MRI of patients with known malignancy and suspected malignant spinal cord compression

Houston, G.[1]•Erng, W.[1]•Chandramohan, S.[2]•Mcleay, T.[1]•Levack, P.[1]
[1]Ninewells Hospital, Dundee, UK, [2]Gartnavel General Hospital, Glasgow, UK

PURPOSE: Scottish National Audit (CRAG) of malignant spinal cord compression (MSCC) previously showed prolonged time to diagnosis and poor mobility for patients with known malignancy with suspected (MSCC). Our aim is to investigate the effects of rapid hotline referral and MRI in this group. MATERIALS/METHODS: The CRAG data was used as pre-intervention baseline. The service change was prospectively assessed to determine time to diagnosis, patient mobility at diagnosis, rate of referral and rate of positive findings. RESULTS: The time from reporting of pain to diagnosis of MSCC was reduced from median of 66 days to 1 day. The time from onset of symptoms to diagnosis of MSCC was reduced from median 90 days to 74 days. At time of diagnosis, the patient mobility was improved. The inability to walk was reduced from 48% to 14% ($p=0.006$) in patients with MSCC. The ability to walk unaided was increased from 18% to 45% ($p=0.001$). The mortality rate were not significantly different at 18 months (10% versus 14%, $p=0.64$). The monthly rate of referrals was 3.1 compared with CRAG of 2.2. Rate of MSCC is 22.5% (CRAG-16.35%) and vertebral metastasis is 25% (CRAG–17.31%). CONCLUSION: Introduction of a rapid MRI referral pathway for patients with suspected MSCC resulted in shortened time from patient reporting symptoms to diagnosis. There is improvement in mobility at time of MRI. Rapid delivery of MRI was not associated with a significant rise in referrals and revealed slightly higher rate of positive findings compared to CRAG.

1600–1700
Digital imaging in the breast screening environment

1600 Invited review: A practical perspective of CR on a mobile

Young, B
Breast Unit, Derby City General Hospital, Derby, UK

Direct digital mammography will be the thing for the future in Breast Screening. How far into the future, we do not know, and costs will be

high. In Derby we already had 1 full field digital machine, and were buying an additional set to move into our new department. Prohibitive costs of implementing direct digital throughout our screening unit directed us towards the interim solution of CR. An agreement was set up between ourselves and Fuji to pilot the use of CR on a mobile screening van. This presentation will outline the practical aspects of installation, training, working practices and most important of all, image quality, as experienced by the Derby team.

1630 FujiFilm's New Flat Panel Detector for Mammography; A Technical Review

Cahalane, R
FujiFilm, UK

Fujifilm has enjoyed worldwide success with its Computed Radiography System for mammography (FCR Profect Series). Following inclusion in the American DMIST trial it was the only CR system evaluated for screening mammography in the US. The FCR Profect subsequently gained FDA approval and is currently the only CR accepted for Screening in the UK by the NHSBSP. With a requirement to reduce manual handling in Mammography, there has been a move towards Cassetteless FFDM systems. To meet this requirements, and to expand its Mammography solutions protfolio, FujiFilm has released its new FFDM system. Utilising Fuji's clinically proven and accepted post processing algorithms, the new unit continues Fujifilm's commitment to high Image quality, in conjunction with a Solid state detector. This presentation will outline the new technology employed in FujiFilm's detector and its introduction to the UK Market.

1630–1750
Optimization in diagnostic imaging Scientific Session

1630 Balancing diagnostic image quality with entrance dose and filtration in digital projection radiography

Lehnert, T.•Korkusuz, H.•Khan, F.•Kissner, M.•Vogl, T. J.•Mack, M. G.
Department of Diagnostic and Interventional Radiology, Hospital of Johann W. Goethe-University, Frankfurt/Main, Germany

PURPOSE: In this study, image quality was based on required clinical criteria, in order to investigate to what degree entrance dose could be lowered and what kind of added filtration can be used without impinging on radiologist confidence levels in diagnosing. MATERIALS/METHODS: Images were taken of extremities from a cadaver using stepwise decreasing dose levels and variation of added filtration (no filtration, aluminium, aluminium/copper) under digital projection radiography (Kodak DirectView DR7500). The starting point dose level for all body parts imaged was the current X-ray technique. Four radiologists were presented the images in a blinded fashion and rated each with an image quality score from 1 to 9. Dose levels (DL) considered were 100%, 75%, 50% and 25% of the normal and customary X-ray techniques used for the particular body part and projection. RESULTS: Without added filtration image quality mean score was rated with 6.3 (DL 100%), 6.2 (DL 75%), 5.3 (DL 50%) and with 4.4 (DL 25%). An added aluminium filtration induced an image quality mean score of 6.3 (DL 100%), 6.0 (DL 75%), 5.1 (DL 50%) and of 4.2 (DL 25%). Using aluminium/copper filtration image quality mean score was rated with 6.0 (DL 100%), 6.1 (DL 75%), 5.0 (DL 50%) and with 3.8 (DL 25%). CONCLUSION: It is possible, in the case of extremities, to lower entrance doses up to 75% of the normal value, a reduction of 25% in dose, under simultaneous use of added aluminium or aluminium/copper filtration, without comprising the diagnostic value required.

1640 Image quality and dose optimization for paediatric CT examinations

Blobel, J.[1]•Mews RT, J.[1]•Rogalla, P.[2]
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PURPOSE: The smaller anatomical sizes of neonates in comparison with infants requires higher image resolution and improved contrast to dose relation. The standard deviation (SD) of the Houndsfield Units is the suitable control parameter for image quality. A new scan simulator displays image quality and noise effect together with the expected exposure dose for the CT protocols. METHODS AND MATERIALS: A permanently set level for image noise requires 3D adaptive CT tube current modulation and must consider the spatial density of the patient's structures as well as the scanning, reconstruction and CT-system-specific parameters. Taking these factors into account a mathematical model was developed which computes in advance the expected SD value and dose values. RESULTS: The influence of slice thickness, slice number and exposure control was simulated for different paediatric ages and scan protocols and evaluated with a mathematical regression function. Using an age-adapted model by Charité Berlin for abdomen CT, the SD is reduced by 33% for better image quality and CTDIvol is reduced by 93% from adult to neonate. Variances of slice thickness with 1 mm or 5 mm compared with 3 mm standard leads to 170% higher or 45% less CTDIvol values. With age-specific SD for thorax CT the dose reduction for neonates is 90% compared with adults. The exposure control function offers an additional dose reduction of 30%. CONCLUSION: The expected dose values are computed prognostically and can thus be assessed together with the image quality before the helical scan for verification of the user experiences.

1650 Multipurpose archiving and e-health platforms

Pohjonen, H.
Rosalieco Oy, Espoo, Finland

PURPOSE/MATERIALS: The first generation PACS archives were dedicated solutions aimed at long-term preservation of DICOM information only. However, consolidation of all patient data into a common archiving solution is a growing trend in the healthcare IT market. The new storage solutions allow any type of fixed content data including images, EPR summary records, laboratory results and video files to be stored in one system. The purpose of this study was to compare the traditional archiving approach to holistic archiving of any patient data. METHODS: In this study a generic storage architecture following the IHE XDS framework for document sharing was introduced and the benefits were compared with the traditional archiving approach in several clinical projects throughout Europe. RESULTS: The new generation storage solutions deliver faster access to any patient information – especially in big regional and national projects – comprehensive security and service continuity as well as simplified storage management and disaster recovery – with lower storage costs. It is also possible to combine research and production storage platforms into one data management system consisting of the actual data and the metadata registry. CONCLUSION: The image archiving solution will be a part of a wider generic e-health platform consisting of all medical data as well as data privacy and security services, patient's informed consent layer, coding services and messaging services.

1700 Effective detective quantum efficiency: a new metric for image quality for the whole radiography system

Mackenzie, A.[1]•Ranger, N. T.[2]•Honey, I. D.[1]•Dobbins III, J. T.[2]•Ravin, C. E.[2]•Samei, E.[2]
[1]KCARE, London, UK, [2]Duke Advanced Imaging Labs, Durham, NC, USA

PURPOSE: This work extends the methodology of the current gold standard of detective quantum efficiency (DQE) to an effective DQE (eDQE). This metric applies to the whole system and includes factors such as grid, scattered radiation, magnification and focal spot size. MATERIALS/METHODS: The study employed a phantom designed by the Food and Drug Administration, it was designed to emulate the

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attenuation and scatter properties of human thorax. Seven different systems covering a range of technologies were tested. The modulation transfer function, noise power spectra and scatter fraction were measured with the phantom in the beam. The eDQE was then calculated. One system was tested multiple times and by two international groups to test repeatability and reproducibility. RESULTS: The results varied significantly between previously measured DQE and eDQE by up to an order of magnitude. For the seven systems at 120 kV the results varied from 13% to 48% and 3% to 11% for peak DQE and Peak DQE, respectively, under automatic exposure control. The repeatability was less than 2.1% at all spatial frequencies. The comparison between two institutions showed less than 3% difference. CONCLUSION: The ranking of the systems changed, in particular a slot scan system results were more in line with clinical evaluation than with DQE. The results were reproducible on a single system and transferable between sites. The new metric of eDQE provides a more meaningful reflection of system performance as it quantifies image quality in a more clinically-relevant context.

1710 A comparison of semiconductor and ionisation chamber detectors for diagnostic X-ray dosimetry

Martin, C. J.
Gartnavel Royal Hospital, Glasgow, UK

PURPOSE: A range of instruments based on semiconductor detectors have recently become available for performance testing for X-ray equipment. These detectors incorporate several elements to provide compensation for variation in response with photon energy and are mounted on lead backing plates to minimize backscatter contributions. Semiconductor dosemeters have different properties from the ionisation chambers that have been the standard for diagnostic radiology physicists in the past. METHODS: Measurements of air kerma with the two types of detector have been compared in experimental arrangements similar to those in which they are used in equipment performance testing. RESULTS: Results recorded with the two types of dosemeter are similar when they are used in free air, but measurements near to image receptors from which X-rays are scattered, can be significantly different. Results vary because of differences in angular responses between the instruments, which make ionization chambers more sensitive to scattered radiation. Attenuation by the lead backing plate in semiconductor detectors will influence the automatic exposure rate control adjustment for fluoroscopic units. CONCLUSION: Semiconductor detectors are often more appropriate for measurements of air kerma at image receptors in digital radiography, and measurements made with ionization chambers should be multiplied by 0.75 to obtain comparable results. Ionization chambers may be more suitable for measurement of patient entrance surface dose-rate during fluoroscopy including backscatter. It is important for users to understand the characteristics of different instruments in order to ensure consistent results.

1720 Impact of varying X-ray source detector distance on X-ray examination of the arthritic cervical spine

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University College Dublin, Dublin, Ireland

PURPOSE: The unavoidable distance between the cervical spine and the image receptor presents measurable levels of geometric unsharpness, which hinders arthritic scoring. The current work explores the impact on the visualization of important arthritic indicators by increasing the distance between the X-ray source and image detector (SID) from the commonly employed 150 cm. MATERIALS/METHODS: Lateral cervical spine images were acquired using a cadaver with evidence of osteoarthritic change. All exposures were taken with a GE MAXIRay 100 tube assembly at 65 kVp using AEC and various SID distances from 150 cm to 210 cm. Five images were produced at each distance and acquired with a direct digital, amorphous silicon flat-panel design image receptor. An evaluation panel of four experienced clinicians assessed the images under normal viewing conditions by means of visual grading analysis, using objective criteria based on normal anatomic features and arthritic indicators. Radiation dose was monitored using a DAP meter and lithium fluoride TLDs. RESULTS: Results show a significantly statistical improvement of 18% in image quality with images acquired at 210 cm compared with 180 cm ($p<0.05$). The total image score for 210 cm was above 90% of the maximum achievable score. Additionally, all images with a SID of 210 cm scored higher for visually sharp reproduction of the spinous processes, facet joints, intervertebral disc spaces and trabecular bone pattern compared with 150 cm. CONCLUSION: The results indicate that total image quality and visualization of specific anatomical features is improved in cervical spine radiographs for arthritic patients when traditionally employed SID distances are increased.

1730 Initial optimization of CT cardiac angiography. How low can you go?

Willis, J. A.[1]•O'Neil, K.[2]•Higham, D.[3]•Tennant, D.[2]
[1]Regional Medical Physics Department, Newcastle Upon Tyne, UK, [2]North Tyneside General Hospital, North Tyneside, UK, [3]Wansbeck General Hospital, Ashington, UK

PURPOSE: To optimize the image quality and patient radiation dose for CTCA in a local hospital by evaluating clinical image quality at a reduced patient radiation dose. MATERIALS/METHODS: CT cardiac angiography (CTCA) was initiated at a local hospital after the installation of a large multislice CT scanner. Using an anthropomorphic phantom and TLD the organ doses for the procedure were measured and the total effective dose calculated. This was thought to be excessive and that the procedure should be optimized. The evaluation of clinical images was thought to be necessary to ensure that reducing the patient radiation dose did not compromise any diagnosis. The approach of using reconstructed images from patients already undergoing CT pulmonary angiography avoided the lengthy process of gaining ethical approval and the potential for additional patient exposure. Using assembled anatomical criteria, a number of sets of images were assessed at different dose levels by experienced observers. RESULTS: Work in progress: preliminary results indicate that the necessary anatomical criteria can be fulfilled at a much lower radiation dose to the patient than the default manufacturers' settings. CONCLUSION: In comparison with conventional cardiac angiography CTCA has the advantage of being non-invasive but has the disadvantage of a larger radiation dose. Because of our initial evaluation of clinical image quality at such a low dose, this has enabled the CTCA examination parameters to be changed progressively with confidence to reduce the radiation dose. This has been achieved without compromising the diagnostic criteria.

1740 A comparison of image quality and dose for chest radiography using 400 & 800 speed direct acquisition

McEntee, M. F.•O Regan, C.
University College Dublin, Dublin, Ireland

PURPOSE: To compare image quality and effective dose at 400 and 800 speed acquisition on the GE Revolution XQ/direct radiography system. METHOD: Images were acquired with a flat-panel detector (CsI/a-Si). Thirty patients, 18–70 years and between the BMI of 17–28 kg m^{-2}, were imaged at either speed. Doses were recorded for each patient using an inherent and calibrated dose–area product (DAP) meter. Two radiographers and one radiologist evaluated the images using the CEC Image Quality Criteria for the posterioanterior (PA) chest. RESULTS: A statistically significant difference in image quality was evident between images at 400 and 800 speed ($p\leq0.001$) with 400 speed images having a 25% higher mean score. Statistically significant differences were found in the depiction of all criteria between 400 and 800 speed images. Radiographs produced at 800 speed for patients of average body mass index (BMI) (17–24.9 kg m^{-2}) were diagnostically acceptable as all criteria had a mean score of greater than one. Statistically significant differences in effective dose ($p\leq0.009$) for both speeds were found, with 800 speed having a 55%

lower mean dose. CONCLUSIONS: Image quality of radiographs obtained at 400 speed are of higher image quality than those obtained at 800 speed. Radiographs produced at 800 speed are unacceptable for patients with BMI above 25 kg m-². Patients radiographed at 400 speed receive 55% more radiation dose than patients radiographed at 800 speed. In summary, digital chest radiographs produced at 800 speed are acceptable for certain patients with a significant 55% reduction in radiation dose to the patient.

Scientific programme abstracts Wednesday 4 June

0830–0930
Radiological management of the unconscious patient
0830 Invited review: Radiological management of the unconscious patient

Gawne-Cain, M.
Southampton General Hospital, Southampton, UK

Coma is a state of unresponsiveness characterized by a lack of self or environmental awareness, and is defined as GCS less than 8. Radiologists are regularly asked to image patients to determine why they are unconscious. Radiology is only one part of the work up. Clinical history and examination are important. The patient will need to be stabilized before coming to the radiology department: the airway secured, and other potential problems (e.g. cervical spine injury) considered. CT is usually the first examination of choice as it is generally available, the patient is accessible while in the scanner, and it may not be possible to establish whether MRI is contra-indicated. The information obtained from CT can be maximized with the routine use of reformatted images and judicious use of contrast and angiographic studies. MRI can usually be deferred to the next day, but may be needed urgently in some cases such as posterior fossa lesions, vertebral artery dissection, early infarct, and encephalitis. When reporting a study the radiologist should listen carefully to any clinical information offered. He/she should look carefully for evidence of the expected differential diagnosis. A search should also be made for other abnormalities, which may be unexpected. If a diagnosis can be made, a further search should be made for complications. If the study seems to be normal, then the radiologist should use a checklist of areas for further review: Possibilities to consider include extra-axial collections, subarachnoid haemorrhage, subtle parenchymal lesions, the dural venous sinuses and the ventricular system.

0830–0915
Imaging of the chest in the intensive care unit
0830 Invited review: Imaging of the chest in the intensive care unit

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

No abstract supplied.

0830–0915
From exposure to image series – in digital mammography
0830 Invited review: Physics of digital mammography: digital diagnostic quality

Young, K. C.
Royal Surrey County Hospital, Guildford, UK

No abstract supplied.

0855 Invited review: Radiography practice with digital mammography

Garnett, S.
University Hospital, Coventry, UK

KEY LEARNING OBJECTIVES: Commencing radiography practice with a new digital mammography system – Coventry's approach: Manipulating and moving the images from acquisition to viewing workstations; Performing mammographic, stereographic and mammotome procedures; The interim period of combining soft-copy and hard-copy image interpretation; Setting up image acquisition, quality assurance and housekeeping procedures. DESCRIPTION: Commencing radiographic practice with a new digital mammographic system involves initial training and gaining valuable experience. It also involves designing and writing new working practices and procedures to ensure the equipment is used to its full potential and tailored to the department's requirements. Experience is drawn from the move to a new filmless mammography unit in Coventry with one digital screening mobile and combining two digital systems. Using the expertise of application specialists and engineers have helped develop the efficiency of the departments workload management. Image-interpretation has involved a transition period of combining soft and hard copy reading and becoming familiar with computer manipulation of the work lists, image tools and then recording decisions made. Housekeeping procedures had to be implemented to ensure the smooth day-to-day running of the systems. CONCLUSION: The basic system functions are initially learnt, then built upon to become experienced with all function and system tools, which ensures the equipment is used to its full potential, and skills are quickly acquired to enable women to be assessed effectively.

0830–0930
Picture to proton LIVE! Session 3
0830 Invited review: Let's talk technical: MR equipment

Graves, M. J.
Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK

PURPOSE: Part 3 of a 3 part teaching session aimed at radiographers, radiologists and physicists who have a very basic knowledge of MR physics OUTCOMES: To understand the basic hardware of a modern MRI scanner, including magnets, gradients and radiofrequency (RF) systems and to be aware of developing trends in MR equipment. Based on the best selling textbook "MRI from Picture to Proton" by McRobbie, Moore, Graves & Prince (Cambridge University Press 2007 ISBN 0 521 68384 X).

0900 Invited review: Go with the Flow: MR Angiography

Graves, M. J.
Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK

PURPOSE: Part 3 of a 3 part teaching session aimed at radiographers, radiologists and physicists who have a very basic knowledge of MR physics OUTCOMES: To understand the basic principles of MR angiography including time-of-flight (TOF), phase contrast (PC) and contrast enhanced (CE) techniques. Based on the best selling textbook "MRI from Picture to Proton" by McRobbie, Moore, Graves & Prince (Cambridge University Press 2007 ISBN 0 521 68384 X).

0845–1135
Cardiac Scientific Session
0845 Heart-rate adaptive multi-segment image reconstruction in diagnostic cardiac computed tomography with 64- and 320-detector row CT

Blobel, J.
Toshiba Medical Systems, Germany

PURPOSE: For motion-free cardiac imaging, one basic requirement in CT image reconstruction is high temporal resolution. The developed enhanced algorithm for multi-segment image reconstruction aims at maintaining consistent relative temporal resolution with 64 MSCT and consistent absolute temporal resolution with 320 MSCT. METHODS AND MATERIALS: A theoretical model describes the general inter-relationships between the heart rate, the number of data segments, the number of X-ray sources, the rotation time and how the segments are

placed in the 180° projections depending on the rotation. An automated phase selection algorithm was developed to identify the phase with the least motion automatically in raw data space. RESULTS: With 64 MSCT the relative temporal resolution, as a measure of heart rate-specific motion, is almost constant over a range of 50–140 bpm, down to 10% of the R–R interval and depends on the pitch. The normally employed pitch of 0.19–0.21 is set uniformly and does not depend on the patient's heart rate. The 320 detector row CT covers the full heart range of 16 cm within one rotation. This offers a significant improvement in absolute temporal resolution, reconstruction robustness, particularly in cardiac patients with pathological arrhythmias and changes in heart rate. CONCLUSION: The adaptive multi-segment reconstruction method with 64- and 320-MSCT was designed to improve coronary artery image quality. When combined with automatic detection of the cardiac phases with the least amount of cardiac motion, this ensures a high degree of detail for the assessment of stenosis, plaque, and stents while minimizing motion blurring.

0855 Pitfalls of coronary artery calcium scoring in multidetector computed tomography

Laugharne, M. J.[1]·Morgan, S.[1]·Jones, M.[2]·McCoubrie, P.[1]·Loveday, E.[1]
[1]North Bristol NHS Trust, Bristol, UK [2]Lifescan, Bristol, UK

KEY LEARNING OBJECTIVES: Multidetector CT (MDCT) coronary artery calcium scoring is increasingly employed in the evaluation of symptomatic and asymptomatic coronary disease. However, calcium scoring is not without pitfalls associated with acquisition technique and clinician interpretation. The authors intend to demonstrate common problems in calcium scoring of relevance to clinical practice. DESCRIPTION: Experience of some 2600 coronary artery calcium scoring studies performed for screening purposes have been acquired over a 20 month period. We use a 16-section General Electric (GE) Lightspeed MDCT, obtaining small field of view 3 mm acquisition during a single breath hold with prospective ECG gating. Acquisition problems included tachycardia and cardiac dysrhythmias with resultant motion artefacts. Calcium scoring programmes entail semiautomated calculation of the Agatston score following operator-defined regions of interest. Interpretative problems may be caused by erroneous inclusion of extracoronary calcification either within the heart (such as the valves and annulus) or within the mediastinum (predominantly in the ligamentum arteriosum, aorta, pleura or pericardium). Concurrent cardiac pathology can be identified despite the absence of intravenous contrast (such as left ventricular aneurysm, ischaemic lipomatous metaplasia, percardial effusion and valvular heart disease such as aortic stenosis). Finally, the remainder of the imaged thorax should be scrutinized for co-existent pathology. CONCLUSION: Accurate calcium scoring needs an appreciation of common pitfalls of technique and interpretation. Furthermore, the scan images provide valuable imaging information of the heart and surrounding tissues, allowing further diagnoses to be made.

0905 Accuracy of 64 detector CT coronary angiography for the detection of flow limiting stenoses

Nicol, E. D.·Schultz, C.·Rubens, M.·Padley, S. P.·Di Mario, C.·Davies, S. W.
Royal Brompton Hospital, London, UK

PURPOSE: To investigate the best severity threshold using CT coronary angiography (CTA) to identify significant stenosis as assessed by invasive coronary angiography (ICA), both with visual estimation (≥70%) or with QCA measurement of lesion severity (≥50%). MATERIALS/METHODS: 52 consecutive patients with intermediate to high likelihood of coronary artery disease referred for ICA also underwent CTA. All CTA datasets included a coronary calcium score and all coronary artery segments were reported as ≥50%, or ≥70%. ICA datasets were analysed using QCA with a threshold of ≥50% and with visual estimation ≥70%. RESULTS: Overall per-segment agreement between CTA ≥50% and QCA ≥50% was 94% (Sensitivity = 63%, Specificity= 96%, PPV= 53%, NPV= 97%), CTA ≥70% and QCA ≥ 50% was 94% (Sensitivity = 32%, Specificity= 99%, PPV= 67%, NPV= 95%). Overall per-segment agreement between CTA ≥50% and visual ≥70% stenosis on ICA was 91% (Sensitivity = 44%, Specificity= 94%, PPV= 33%, NPV= 96%) and CTA ≥70% and visual ≥70% stenosis on ICA was 94% (Sensitivity = 26%, Specificity= 98%, PPV= 48%, NPV= 95%), respectively. CONCLUSION: Applying the conventional 70% stenosis as the definition for flow limiting stenosis on CTA does not affect the high NPV when compared with standard CTA definition of 50% stenosis. Using 70% as the cut-off for referral for ICA potentially reduces the number of subsequent invasive angiograms that do not lead to percutaneous intervention. The low PPV of CTA using both 50% and 70% does not support the use of CTA in this patient cohort.

0915 Low coronary calcium score does not exclude significant stenoses on CTA in high risk patients

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PURPOSE: To investigate whether coronary calcification is a sensitive predictor for significant coronary artery disease in patients with an intermediate to high likelihood of coronary artery disease (CAD). MATERIALS/METHODS: 52 consecutive patients (18 female, mean age 66±11 years) with intermediate to high likelihood of CAD referred for ICA underwent coronary calcium scores as the preliminary part of a research CTA. Coronary artery stenoses were assessed visually for CTA and using QCA for ICA RESULTS: Using low (ASE 1–100), medium (ASE 101–400) and high (ASE>400) levels of coronary calcium to stratify this cohort into medical management without subsequent CTA, completion of full CTA protocol and immediate referral to invasive angiography, respectively, would have led to 7/52 (14%) of low ASE patients being falsely reassured (QCA ≥50%, 3/7 (45%) of these had subsequent stenoses ≥ 70% on QCA) whilst 4/52 (8%) high ASE patients would have undergone unnecessary ICA (QCA <50%). CONCLUSION: A low coronary calcium score does not accurately exclude significant stenosis in patients with intermediate to high likelihood of coronary artery disease. ICA and CTA have similar efficacy in detection of significant stenoses in patients with an intermediate ASE however this study supports the hypothesis that ICA should be used in patients with a high ASE as CTA tends to underestimate the severity of significant coronary stenoses in these patients.

0925 64MDCT *vs* myocardial perfusion scintigraphy for assessment of global and regional myocardial function and infarction

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PURPOSE: Cardiac X-ray CT has the potential to assess both coronary anatomy and ventricular function in a single study. We examined the agreement between CT and myocardial perfusion scintigraphy (MPS) for the assessment of global and regional ventricular function. MATERIALS/METHODS: 52 consecutive patients (18 male, mean age 62±7 years) with low to intermediate likelihood of coronary artery disease referred for MPS were recruited to undergo additional CT coronary angiography and ventriculography. All CT ventriculograms were analysed using a 17 segment model by 2 experienced observers independently and blinded to the MPS findings. Parameters measured were left ventricular end-diastolic volume (LVEDV), end-systolic volume (LVESV), ejection fraction (LVEF), endocardial motion, myocardial thickening and myocardial contrast attenuation. MPS images were similarly analysed for LVEDV, LVESV, LVEF, myocardial motion and thickening and tracer uptake. RESULTS: CT LVEF agreed well with MPS LVEF (mean difference 4.1%, SD difference 15.13%), but CT overestimated LVEDV compared with MPS (mean difference 46.0 ml, SD 33.34 ml) (p<0.001). There was moderate agreement for segmental motion and thickening with $\kappa = 0.57$ (95% confidence

intervals 0.51–0.63) and κ = 0.47 (95% CI 0.41–0.53), respectively. Myocardial hypoattenuation was highly specific but insensitive for myocardial infarction. CONCLUSION: There was good agreement for LVEF between CT and MPS, but myocardial volumes differed and they cannot be used interchangeably. Mild abnormalities of regional function are detected more commonly by CT than by MPS. Myocardial hypoattenuationon CT is highly specific but insensitive for myocardial infarction.

0935 Significant coronary artery disease with negative calcium scores on MDCTA coronary artery calcium scoring scans

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PURPOSE: Review incidence of significant coronary artery disease occurring in the patients with negative calcium score. The recent (2007) ACCF/AHA Expert Consensus on Coronary Artery Calcium Scoring has indicated that there is further strong evidence that CAC can be used to risk stratify in asymptomatic patients. This publication also deemed that CAC scoring is independently predictive over and above traditional methods of cardiac risk stratification. We have encountered significant luminal disease in this group of patients however, and are out to quantify this entity. MATERIALS/METHODS: Review all cardiac MDCTA at Derriford for chest pain. These patients have all be received MDCTA along departmental guidelines. No additional scans would be required. The scans would be interrogated for significant coronary disease in the Ca^{2+} negative patients. RESULTS: Work in progress. CONCLUSION: Full data analysis end of February 2008.

1015 Helical CT evaluation of pulmonary arteries and aortopulmonary collaterals in pulmonary atresia

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PURPOSE: To determine the value of helical CT in the evaluation of pulmonary artery anatomy and aortopulmonary collaterals in pulmonary atresia and correlate with conventional angiography and echocardiography. MATERIALS/METHODS: A prospective study was conducted over a period of 1.5 years on 80 children with a clinical diagnosis of pulmonary atresia. All patients had an initial echocardiogram. All patients were scanned on a GE single slice helical C.T scan (0.8 s) scanner. 28 of the 80 patients also had angiography performed for the evaluation of the aortopulmonary collaterals. Subsequently, the findings at CT were compared with angiography and ECHO. RESULTS: The pulmonary arteries were visualized in 68 of 80 patients on CT scan (85%), 55 of 80 patients on echocardiography (68%) and 17 of 28 patients on angiography (60.7%). Pulmonary artery confluence was seen in all 68 patients in whom the pulmonary arteries were visualized on CT (100%), all 17 patients in whom pulmonary arteries were visualized on angiography (100%) and 45 out of 55 patients on echocardiography (80%). Aorto-pulmonary collaterals were seen in 79 of 80 patients on CT (98%), 23 of 80 patients on echocardiography (28.7%) and in all 28 patients on angiography (100%). CONCLUSION: Helical CT is as accurate as angiography for the overall preoperative evaluation of the pulmonary vasculature in patients with pulmonary atresia. Helical CT in certain situations is superior to angiography in the evaluation of hypoplastic central pulmonary arteries and can provide an alternative imaging modality to angiography.

1025 Multislice computed tomography coronary angiography in the angioplasty era: 'projections with a meaning'

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KEY LEARNING OBJECTIVES: Multislice computed tomography coronary angiography (MSCT-CA) can provide information for clinical decision making and planning coronary angioplasty. This presentation will illustrate: (1) how to use MSCT-CA to obtain an overview of the status of the coronary arteries selecting the optimal angiographic views; (2) how to identify the ideal projections to be used as working views for angioplasty. DESCRIPTION: MSCT-CA is a three-dimensional technique and can add useful information to conventional angiography before revascularization. In addition to multiplanar and curved reconstructions of coronary vessels, MSCT-CA should provide several carefully selected views to be applied as fluoroscopic angles during intervention. This demands a full understanding of the advantages and limitations of different projections for each specific coronary segment. Anatomical variants of the origin of the right coronary artery (10–15%) should be described to facilitate the cannulation of the right coronary ostium. The left coronary artery should be displayed in steep cranial or caudal angulations. Bifurcation lesions should be classified according to widely accepted classification systems (e.g. Lefevre and Medina). In chronic total occlusions, lesion length, degree of calcification and stump morphology should be reported. Cine multi-phase imaging provides often valuable information concerning left ventricular function, regional wall motion, mitral regurgitation and aortic valve disease. CONCLUSION: MSCT-CA provides superior anatomical detail of the coronary tree before revascularization. In patients with complex lesions such as bifurcation lesions and chronic total occlusions MSCT-CA may improve the procedural success rate.

1035 Body mass index, heart rate and stent diameter as predictors of coronary in-stent lumen visibility using dual source computed tomography coronary angiography

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PURPOSE: To evaluate the influence of Body Mass Index (BMI), heart rate and stent diameter on the visibility of coronary in-stent lumen with Dual Source Computed Tomography Coronary Angiography (DSCT-CA). MATERIALS/METHODS: 74 patients with prior stent implantation underwent DSCT-CA. No premedication with -blockers was performed. Data sets were reconstructed using a dedicated convolution kernel (B46f). Two observers in a joint reading assessed the visibility of the in stent lumen as a dichotomous (yes/no) variable. We performed logistic regression analysis to explore the relationship between visibility of the in-stent lumen (dependent variable), heart rate, BMI and stent diameter (independent variables). RESULTS: Average heart rate during the scans was 66 ± 12 (mean ± SD). There were 140 stents. The in-stent lumen was not visible in 10/140 (7%) stents in 10 patients. Of these, 4/10 (40%) stents were 2.25 mm in diameter, 4/10 (40%) were 2.5 mm in diameter, 1/10 (10%) was 3 mm in diameter and 1/10 (10%) was 3.5 mm in diameter. Heart rates in these patients ranged from 48 to 96 beats min^{-1}. BMI in these patients ranged from 19 to 32. The in-stent lumen was visible in all stents with diameter >3.5 mm. In a multivariate analysis, stent diameter was a significant predictor of in-stent lumen visibility (p-value=0.009). BMI (p-value=0.09) and heart rate (p-value=0.33) were not significant predictors of in-stent lumen visibility. CONCLUSION: Stent diameter is more important than heart rate and BMI as a predictor of in-stent lumen visibility and should be considered to select patients before referral to DSCT-CA.

1045 Audit of complications of cardiac stress magnetic resonance imaging using dobutamine and adenosine

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PURPOSE: Cardiac stress MR is proven highly accurate in the detection of myocardial ischaemia in patients with coronary artery disease. The myocardium is stressed pharmacologically by an intravenous infusion of Dobutamine or Adenosine. Published complication rates using identical infusion protocols show Cardiac stress MR to be a generally safe technique; but risks of severe complication with Dobutamine

varied up to 17%, and death rates of around 0.01%. Our aim was too confirm that the safety profile during departmental stress MR was at least comparable with these rates. MATERIALS/METHODS: Data was collected on consecutive stress cases in MR patients suspected or known coronary disease over a period of 12 months. Complications were recorded and scored by severity. RESULTS: Dobutamine: Of 54 cases, minor complications occurred in 7; 2 with severe hypotension who were briefly admitted. Adenosine: of 44, reported 34 mild expected symptoms. No severe complications that needed admission. Our audit results show comparable safety profiles to the standards described above. The dobutamine induced hypotensive episodes could be seen as minor complications compared to the ventricular fibrillation arrests described in literature. CONCLUSION: Immediate life support training for all staff involved in Cardiac stress MR. Re-audit in 12 months. To increase awareness of the potential for life threatening complications of Dobutamine-induced ventricular fibrillation should be noted, in preparation for such a thankfully rare occurrence.

1055 Coronary CTA quantitative assessment of myocardial perfusion from test bolus data

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PURPOSE: To quantify myocardial perfusion during coronary CT angiography using data from a modified timing test bolus acquisition. METHODS: Institutional review board approval and informed consent was obtained for this study to assess if quantification of myocardial perfusion is feasible from a coronary CT angiography test bolus. 19 patients with suspected coronary artery disease underwent a retrospectively EKG-gated dynamic test bolus acquisition (120 kV; 35 mAs; 5 mm coverage) prior to combined coronary CT angiography and cardiac ^{82}Rubidium perfusion PET. RESULTS: In patients with normal PET myocardial perfusion, the mean resting myocardial perfusion measured by CT was 0.89 ml min^{-1} g^{-1} (0.62–1.47 ±0.27) and 0.93 ml min^{-1} g^{-1} (0.61–1.36 ±0.21) at end-systole and end-diastole, respectively. CONCLUSION: Quantification of myocardial perfusion from a routine coronary CT angiography test bolus is possible. CT derived myocardial perfusion values are consistent with published values derived from other techniques.

1105 MRI including delayed enhancement technique in the diagnosis of suspected arrhythmogenic right ventricular dysplasia

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PURPOSE: To study the significance of MRI features in diagnosing arrhythmogenic right ventricular dysplasia (ARVD), and assess its role as a comprehensive tool for the diagnosis using Task Force Criteria (TFC) as gold standard. MATERIALS/METHODS: 20 patients suspected to have ARVD underwent clinical assessment and MRI. Diagnosis of ARVD was made by TFC (excluding MRI findings). A 1.5 T MRI (Avanto, Siemens, Germany) including delayed enhancement (DE) was performed. A cardiac radiologist blinded to clinical diagnosis analysed MRI images. The wall thickness, diameter, any aneurysm/fat/wall motion abnormality (WMA)/DE and function of RV were reported. Scans were classified as positive (if diagnostic/strongly suspicious) or negative (if possible/normal) for ARVC. Continuous variables were compared with student's *t*-test and discrete variables with Mann-Whitney U test. Correlation was done with Spearman's Correlation test. RESULTS: There were 16 males (mean age 37 years (range 22–53 years)). Of nine cases with ARVD, 33% had fat, 78% had DE and 90% had structural/functional abnormalities on MRI. Compared with those without ARVD (11 patients), these patients had significantly higher incidence of DE (p=0.002, odds ratio: 35 (95% CI 3–365) for likelihood of ARVD). Patients with ARVD had higher (statistically insignificant) incidence of WMA (p=0.07), RV dysfunction (p=0.07) and aneurysms (p=0.09). Sensitivity, specificity and positive predictive value for MRI classification of ARVD were 78%, 82% and 78% (chi-square, p=0.01; correlation 0.6, p=0.006). CONCLUSION: DE is a strong marker among all MRI features for diagnosis of ARVD. A composite diagnosis on MRI is highly correlated with TFC based ARVD diagnosis.

1115 Natural history of FDG uptake in atheroma on PET/CT. Implications for imaging vulnerable plaque

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PURPOSE: Increased uptake of 18F-fluorodeoxyglucose (18F-FDG) in atherosclerotic plaque on positron emission tomography (PET), predicts vulnerability. To determine the natural history of such lesions, we performed serial 18F-FDG measurements at these atheromatous sites. MATERIALS/METHODS: Following institutional ethics committee approval, we retrospectively examined PET/CT images of patients from our Institution that had at least 4 examinations in the last 4 years. This represented 209 studies in total, from 40 patients (18 women, 22 men, age 18–75 years, mean 5.2 studies per patient). The mean follow-up was 38.7 months. The carotids and the aorta were evaluated for increased 18F-FDG uptake with a maximum standardized uptake value (SUV) >2.5, and >3.0, and calcification. Plots of SUV and Hounsfield units were made versus time. RESULTS: The initial prevalence of increased focal arterial 18F-FDG uptake was 16/30 patients and of arterial calcification 20/30. 125 sites of 18F-FDG uptake in total were observed longitudinally. 18F-FDG vascular uptake did not persist with time. There was no correlation between 18F-FDG uptake and CT number. No calcifications developed at sites of focal increased 18F-FDG uptake. CONCLUSION: Arterial lesions with increased 18F-FDG uptake represent transient phenomena. This is compatible with current theories of the pathogenesis of vulnerable plaques. In the future, 18F-FDG could be used as a biomarker for inflammation in atherosclerosis.

0945–1125
Breast keynote lecture and scientific session

0945 Invited review: From blunderbuss to magic bullet: changes in breast diagnosis

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Breast cancer management has come a long way in the last 25 years. We have left the era of the blunderbuss when cancers were diagnosed clinically, there were less than 100 mammogram machines in the UK and the standard treatment was mastectomy. Screen detected cancers now account for 30% of new diagnoses and the future will see increasing expansion of early detection and prevention strategies tailored to individual risk. At diagnosis of primary breast cancer imaging and guided biopsy enables accurate mapping of disease and non operative diagnosis. Axillary surgical procedures have transformed from clearance for all, with the attendant morbidity, to minimal procedures for most with imaging guidance. Similar progress in radiotherapy has seen the end of fields which inadvertently included (and damaged) heart and lung and steady progress towards treatments elegantly designed to deliver precise doses to selected tissue according to recurrence risk. Rapid advances in systemic treatment with endocrine therapy and monoclonal antibodies have sparked public debate on cost effectiveness. Now we are in the era of the magic bullet with management tailored to the individual designed to avoid either under or over treatment.

1015 Recall rates and outcome of MRI mammography in a symptomatic setting

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PURPOSE: Recall rates following contrast enhanced magnetic resonance (MR) mammography in a symptomatic and high risk screening setting have never been previously documented. We retrospectively evaluate our recall rates and outcomes of patients undergoing MR mammography in our institution. MATERIALS/METHODS: A total of 75 patients underwent MR mammography between October 2006 and June 2007. They included cancer patients for pre-operative work up, neo-adjuvant chemotherapy (n=30), post-operative follow up (n=25), those at high risk due to family history (n=11), radiotherapy for Hodgkin's disease (n=8) and metastasis from unknown primary (n=1). Transverse dynamic T_1 images were acquired before and after contrast administration, along with T_2 STIR and coronal FS T_1. Dynacad software was used to analyse the scans. Recall rates for further assessment using ultrasound or biopsy were assessed and outcomes compared with histological findings or follow up. RESULTS: The recall rate was 21% (16/75). Of these, 38% (6/16) were benign and did not need further intervention. 62% (10/16) underwent biopsy, of which 50% were malignant. One patient had a benign result on ultrasound biopsy and underwent MR guided biopsy which proved malignant. A total of 11 (16%) new cancers were diagnosed with a positive malignant yield of 31%. Multifocality within the same breast was found in 11% (8/75) and contralateral disease in 3% (2/75). CONCLUSION: The recall rate following MR mammography was 21%. Additional malignancy was found in 14% and altered the initial surgical management in all cases.

1025 Experience with MRI-guided vacuum breast biopsy using a dedicated interventional coil and workstation

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PURPOSE: We review our experience of vacuum guided MRI biopsy between March 2006 and November 2007. MATERIALS/METHODS: Using a dedicated workstation and coil (Invivo Dynacad workstation, BBC 7-channel coil) on a Siemens 1.5 T Avanto scanner, all patients underwent compression with sagittal and gadolinium enhanced dynamic axial sequences. Three vacuum assisted devices are used; Mammotome-MR (8g or 11g), Suros 9g or Vacora 10g. Lesion position was used to choose the biopsy device/needle. A clip was placed if lesion was though to be removed in multifocal disease. A post biopsy T_1 weighted axial sequence is always performed. RESULTS: 68 patients were referred and 62 biopsies performed on 61 patients with between 1 to 38 cores taken. 23 (37.1%) were cancers, of which 21 were diagnosed on MRI biopsy. Non-representative (4/61) or benign outcomes (34/61) were subjected to either repeat biopsy or follow-up. Two of the discordant results were subsequently diagnosed with invasive cancers. 40% of lesions with a type III curve on initial imaging had benign histology. Complications occurred in seven patients. Two patients proved difficult to biopsy due to the needle "pushing" the lesion away. CONCLUSION: MRI-guided vacuum biopsy has few limitations but with experience many problems can be overcome. Good patient positioning and angling allows access to all but the most posterior of lesions. Patient compliance is essential. Optimal timing of the diagnostic scans within the menstrual cycle will help to avoid referring cyclical enhancement for biopsy. All results require multidisciplinary discussion and discordant results require further biopsy or follow-up.

1035 Small screen detected breast cancers: a learning experience

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KEY LEARNING OBJECTIVES: (1) To determine the imaging characteristics of small (<10 mm in diameter) invasive breast carcinomas detected at screening. (2) To determine whether microcalcification is the dominant feature. DESCRIPTION: All invasive breast carcinomas with a histological size less than 10 mm, and detected by Leicestershire Breast Screening service between October 2003 and October 2005, were analysed. 110 invasive cancers were identified in 105 patients. 70% of these cancers were visible on both mammographic views. Most of the cancers were detected by both screen readers (82%). The remainder were detected by one reader and recalled for assessment through arbitration. The most common mammographic appearance was a mass lesion (55%), followed by microcalcification (24%), parenchymal deformity (15.4%), and asymmetrical density (4.5%). Most microcalcifications were associated with the smallest cancers (2–5 mm) and were mostly those tumours upgraded from DCIS to invasive tumours at final histology. The majority (60%) of cancers were of histological grade two or three. Axillary nodal spread was found in 15% of cases, 14% of which was associated with grade 1 tubular carcinomas. CONCLUSION: In this series, small invasive carcinomas detected on screening mammography were visible as common mammographic abnormalities such as a mass lesion. Microcalcification was present in only 24% of cases and in the majority of cases the invasive tumour was diagnosed after surgery in areas of DCIS.

1045 Mammographic surveillance in breast cancer follow-up: is there a need for national guidance?

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PURPOSE: The aim of this study was to determine current practice in the clinical setting nationally and regionally of the use of mammographic surveillance in the follow up of patients surgically treated for early breast cancer. MATERIALS/METHODS: A cross-sectional survey method was employed. Self-administered questionnaires were sent to a random selection of symptomatic breast imaging units representing all the cancer networks in England at national level, and all symptomatic breast imaging units in one cancer network at regional level. Questions were designed to determine frequency and duration of mammographic surveillance for patients aged <50 years and ≥50 years surgically treated by mastectomy or breast conserving surgery and the number of units with protocols based on the risk of local recurrence or development of a new primary breast cancer. RESULTS: Overall response rate was 80% (32/40); regional response rate was 86% (6/7). The protocols demonstrated a striking diversity in both the frequency and duration of mammographic surveillance. Diversity was less marked regionally; however, none of the regional protocols followed the relevant cancer network guidelines. The duration of mammography for patient's aged ≥70 years surgically treated by mastectomy, demonstrated the greatest diversity (range: 0–15 years). Four protocols had regimes tailored to risk. CONCLUSION: The survey has demonstrated that a "post-code lottery" exists for both the frequency and duration of mammographic surveillance in this patient group indicating an urgent need for evidence based national guidance.

1055 Breast cancers identified in the Welsh family history screening programme

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KEY LEARNING OBJECTIVES: Women with a family history of breast cancer may be at increased risk of developing the disease themselves. Since 2001 they have been offered annual mammographic screening in Wales if they are found to be at moderate or high risk. We looked at the breast cancers in these women since screening commenced, both screen detected and interval. We compare our results with other published data. DESCRIPTION: Women are referred into the cancer genetics service by primary or secondary care providers and are stratified according to their risk into the mammographic screening program. This runs alongside the population screening performed by Breast Test Wales (BTW) with similar NHS Breast Screening Programme standards and quality assurance. The screening history and records of the 2415 women undergoing family history screening between January 2001 and June 2007 were reviewed.

Details of all cancers identified were noted and analysed. The cancers occurring in moderate, high risk and gene carrying women were noted. 47 cancers were found in the series, 32 were screen detected with 9 interval cancers. The high risk group had twice as many screen detected and interval cancers as compared to the moderate risk group. CONCLUSION: Population screening for women at increased risk of breast cancer in Wales is now established and producing comparable results to other series. Interval cancer rates are moderate, despite the annual screening of these women.

1105 How common are chance findings of breast cancer in our symptomatic breast clinic?

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PURPOSE: The one-stop, triple assessment breast clinic has had a valuable impact in the assessment of symptomatic patients. We aimed to assess the frequency of "chance findings" of breast cancer in the symptomatic breast clinic. We defined chance cancers as histologically confirmed breast cancers which were not palpable clinically and were only identified by radiological assessment (mammogram or ultrasound) in a separate geographical site from the site of the patient's presenting symptom. MATERIALS/METHODS: All patients who were diagnosed with breast cancer in the symptomatic breast clinic in our unit over a two year period from April 2003 to April 2005 were evaluated. The patients presenting symptom was correlated to radiological (mammogram and ultrasound) findings in order to identify the proportion of chance cancers. RESULTS: In total, 23/281 (8.2%) of all breast cancers diagnosed in the symptomatic breast clinic in the study period were "chance cancers". Furthermore, 43.5% of chance cancers were identified in the ipsilateral breast to the presenting complaint and 56.5% in the contralateral breast. A further 12/281 (4.3%) patients were identified as having multifocal breast cancer which were not clinically evident. CONCLUSION: A significant proportion of patients in this study were diagnosed with chance breast cancers. A thorough evaluation of the symptomatic breast as well as the contralateral side is essential. Radiological evaluation of both breasts in the symptomatic clinic may lead to a change in the patient's management.

1115 Male breast cancer: clincal and imaging review

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KEY LEARNING OBJECTIVES: Breast cancer is an uncommon cause of breast symptoms in men. We aimed to determine the most clinically effective way of evaluating males referred to the breast clinic in Cardiff. DESCRIPTION: The clinical and imaging features of male breast cancer diagnosed in our trust over a 10 year period were reviewed. Relevant patients were identified from the histopathological database. The notes and images were retrieved. Breast cancer represented just under 2% of all male referrals to our breast clinic. In all these cases the clinical findings were consistent with the diagnosis of malignancy. All males referred to the breast service underwent mammography prior to clinical assessment due to current inability to provide mammography and clinical assessment at one visit. However, if mammography had only been performed after clinical evaluation in patients with clinically suspicious findings, none of the male breast cancers would have been missed. There would also have been a significant reduction in the overall number of male mammograms performed. All the cancers except one, manifested mammographically as masses, with either lobulated or spiculated margins. The exception was an asymmetric density in a patient with bilateral gynaecomastia. None of these patients had bilateral breast cancer. Ultrasound was used to direct the diagnostic core biopsy and for preoperative assessment of the axilla. CONCLUSION: This review has confirmed that clinical assessment, followed by mammography in those with suspicious clinical findings, would be the most effective and efficient way of evaluating males referred to the breast service.

0945–1115
The challenge of obesity in imaging

0945 Invited review: Obesity: the public health time bomb

Waine, C.
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No abstract supplied.

1005 Invited review: Obesity: understanding the physics

Dunn, M. A.
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PURPOSE: Obesity presents a range of challenges to the health professional. When imaging the obese patient an understanding of the underlying physics processes used to obtain the image can help identify, where applicable, the suitability of the technique for the patient, the effect on the diagnostic quality of the images obtained and the risk of the procedure in terms of risk benefit ratio. The presentation will give an overview of the imaging process for a range of modalities, the effect that obesity has on this process and also describe some of the techniques for mitigating the effect of patient size where possible.

1025 Invited review: Obesity: understanding the challenges

Sloane, C. S.
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Diagnostic imaging of the obese patient presents the radiographer with a series of challenges over and above the everyday problems encountered within the imaging department. Such issues include significantly increased radiation doses to patients and staff; reductions in image quality; psycho-social patient care considerations and issues related to imaging equipment. The paper will consider these aspects and present a number of practical recommendations which can be used to enhance diagnostic and patient care outcomes. Careful attention to basic radiographic technique will be stressed as one of the primary factors for maximizing image quality.

1045 Invited review: Obesity: making sense of the images

Montgomery, D.
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A review of the condition with specific reference to Pathologies and increased risks associated with obesity. Using practical examples imaging strategies will be outlined, what clinical questions can be answered and which techniques.

1000–1130
Lung cancer MDT

1000 Invited review: The surgeons perspective

Jordan, S.
Royal Brompton Hospital, London, UK

No abstract supplied.

1020 Invited review: CT staging

Entwisle, J.
Glenfield Hospital, Leicester, UK

Referral to lung cancer teams is normally started by an abnormal chest X-ray (CXR). This will need further evaluation with a CT scan and ideally this should be performed as early in the patient journey as possible. The information from this allows an informed discussion with the patient as to whether this is likely to be cancer and what the potential treatment options will be. It will also help ascertain which is the most appropriate method of obtaining a pathological diagnosis, if appropriate, and help guide further staging investigations. In most patients the scan is performed with contrast. Coverage includes the thorax in an arterial phase (at 25 s) and the upper abdomen in a portal venous phase (at 60 s) to look for liver and adrenal metastases. The

pelvis may be included, particularly if there is concern about pelvic pathology, e.g. if there is a past history of colonic cancer. If there are symptoms to suggest cerebral metastases then the head can be scanned at the end of the examination. Multidetector CT (MDCT) using the latest scanner technology allows the scan to be performed in short breath holds. Thin slices of less than 1 mm allow the images to be reconstructed in any direction. Reconstructed images may be helpful to surgeons in ascertaining whether the tumour is resectable or whether the patient is operable. It may help Oncologists in planning potential radiotherapy fields. Reconstructed images are very helpful to look for bony metastases particularly in the spine as these may be easily overlooked. With the introduction of patient archiving and communication systems (PACS) within hospitals the many hundreds of images within a CT study can be presented or projected at a lung Multidisciplinary Team (MDT) meeting or viewed in clinic by the clinician. MDCT also gives a wealth of information about associated co-morbidity. Because of the common aetiology of smoking there is a high incidence of associated cardiovascular disease and synchronous tumours. Associated lung disease is common. The distribution of emphysema is important in patients with borderline lung function as removal of the tumour may be combined with lung volume reduction surgery particularly in upper lobe tumours. The present staging system has been revised and the proposed new system is available. Further information is available from the morphological features of the tumour and enhancement pattern. It is important to look at old radiographs and CTs as there may be information to look at the doubling time of the tumour. CT has well recognized limitation. There are many pathologies that mimic lung cancer. In patients with lung cancer it gives anatomical information about the potential stage. The T stage may be overestimated due to adjacent collapse and consolidation; it may be underestimated as microscopic disease is not seen. Nodal size has poor correlation with malignant involvement. Suspected metastatic disease may need further evaluation with other imaging techniques or by biopsy. CT works well as a triaging tool but many patients, who may be suitable for radical treatment, may need PET to help stage lung cancer. NICE Guidance: Lung cancer: diagnosis and treatment (NICE), 2005. Laroche C, Fairbain I, Moss H, et al. Role of computed tomographic scanning of the thorax prior to bronchoscopy in the investigation of suspected lung cancer. Thorax 2000;55:359–63. Goldstraw P, et al. The IASLC Lung Cancer Staging Project: Proposals for the Revision of the TNM Stage Groupings in the Forthcoming (Seventh) Edition of the TNM Classification of Malignant Tumours. J Thorac Oncol 2007;2:706–14.

1040 Invited review: CT PET: added value

Coulden, R.
University Hospitals of Leicester, Leicester, UK

No abstract supplied.

1100 Invited review: The role of the respiratory physician in the lung cancer MDT

Shah, P.
Royal Brompton Hospital, London, UK

No abstract supplied.

1000–1115
Uroradiological emergencies

1000 Invited review: Uroradiological emergencies – panel discussion

Moussa, S.[1] McCafferty, I.[2] Haslam, P.[3]
[1]Western General Hospital, Edinburgh, UK, [2]Queen Elizabeth Hospital, Birmingham, UK, [3]Newcastle Freeman Hospital, Newcastle-upon-Tyne, UK

No abstract supplied.

1000–1130
Advances in CT

1000 Invited review: Dual source CT

Kalender, W
Institute of Medical Physics, Erlangen, Germany

Modern clinical CT systems with rotation times below 0.4 s and detector widths of 40–160 mm offer an amazing performance level. The development from single-slice to multi-slice systems, often viewed as the "slice war" in the media, seems to come to an end though. The introduction of dual-source CT (DSCT) systems, which host two complete measurement systems and offer effective scan times of less than 100 ms, presents an alternative to boost CT potentials with specific goals such as cardiac and dual-energy imaging. The lecture will start with a review of the state of the art and analyse the challenges posed by clinical demands which are not yet met at present. While spatial resolution seems to be near the optimum for all standard applications, increases in temporal resolution and consequently in X-ray power are still of interest. This would also allow for spectral optimization efforts which demand higher filtration and thereby higher X-ray power; these are of particular interest for paediatric CT. Just the same, efficient dual-energy approaches for differentiation of tissues and assessment of tissue composition, can be better approached by DSCT. The respective applications will be reviewed and discussed.

1030 Invited review: Multislice CT – led by clinical need or manufacturers marketing?

Halpin, S.
University Hospital of Wales, Cardiff, UK

No abstract supplied.

1100 Invited review: Realistic radiation risks to patients undergoing cardiac CT?

Huda, W.
Medical University of South Carolina, Charleston, South Carolina, USA

PURPOSE: A recent study on risk from cardiac CT (*JAMA* 2007;298:317–23) provided estimates up to 1% of radiation induced cancer, based on presumptive scan protocols. In this talk, realistic risks of radiation induced cancer will be obtained that are based on a clinical patient population undergoing cardiac CT examinations on a 64 slice CT scanner. MATERIALS/METHODS: Organ dose estimates are obtained using commercial CT dosimetry software, and corrected for the patient weight. Organ doses are converted into patient risk of developing radiation induced fatal and non-fatal cancer using the BEIR VII risk factors taking into account patient sex and age. RESULTS: Our data shows that the clinical population undergoing cardiac CT patients is predominantly male with an average of ~60. The risk of radiation induced cancer is ~0.1%, with ~90% being fatal and ~75% of the radiation risk arising from irradiation of the lung. CONCLUSION: Accounting for patient size and patient demographics permits the computation of realistic carcinogenic risks from diagnostic imaging examinations that use ionizing radiation.

1000–1115
BAMRR session

1000 Invited review: Hot Topics in MR

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

Safety in MR is a rapidly evolving subject and the lecture will attempt to deal with up-to-the minute issues and concerns. At the time of writing of this abstract these are envisioned to include: The latest on the *EU Physical Agents Directive* and its effect on the MR community. Could some of our standard practices become illegal? The latest on *Nephrogenic Systemic Fibrosis*. Is gadolinium the only culprit? Concerns that the resonant wavelength in the body may be shorter than previously supposed, increasing the possibility of heating in orthopaedic implants. Some miscellaneous new implants and how they make our lives more interesting. Latest reported MRI safety

incidents.

1025 Invited review: Fat fighters

Benbow, M.
Royal Bournemouth Hospital, Bournemouth, UK

Clinical MRI scanners image hydrogen as it is abundant in the human body. However, hydrogen exists in different molecules such as fat and water. The nature and size of these molecules cause the hydrogen within water to precess slightly faster than hydrogen in fat. During MR scanning, magnetic gradients influence the precessional frequencies of the protons so that they can be spatially encoded to the correct part of the image. However, as fat and water protons will already be precessing at slightly different frequencies, this can cause mis-mapping of their signals into the image. This is known as Chemical Shift Artefact and appears as "edgy" bright and dark margins of fat/water interfaces in the frequency encoding direction. Chemical Shift Artefact can be reduced by increasing the receive bandwidth, by increasing the frequency encodings or by reducing the field of view BUT all these are detrimental to the signal to noise ratio. Alternatively, fat can be suppressed in the image by reducing its signal using Inversion Recovery, Frequency Selective Fat Saturation or a combination of them both. Another option is to only excite water. In phase and out of phase image sets can be achieved by careful selection of TE. This is Chemical Misregistration and these image sets can compliment each other to aid diagnosis. By cleverly adding or subtracting these image sets, new sets of water only or fat only images can be achieved in a process known as the Dixon Technique.

1050 Invited review: MR imaging of the bowel

Collingwood, J.
Royal Hallamshire Hospital, Sheffield, UK

PURPOSE: The purpose of the presentation is to discuss the technique used for the acquisition of MRI small bowel and MRI defecating proctograms images used at Sheffield Teaching Hospitals. MATERIALS/METHODS: The referral criteria and reasons for these criteria will be discussed. The patient preparation and MRI images sequences used to acquire the images will be outlined. Often problems are encountered during the examinations, these will be mentioned and methods to overcome them discussed. RESULTS: Pathology images of the various pathologies demonstrated will be shown. CONCLUSION: MRI of the small bowel is a developing technique – a brief outline of the value of the examination and comparison to plain film/fluoroscopy examinations will be included.

1015–1115
Ambient experience for healthcare: from concept to new reality

1015 Invited review: Ambient experience for healthcare: from concept to new reality

Stuyfzand, J.
Global Director, Ambient Experience Design, Philips Design, Eindhoven, The Netherlands

Ambient Experience for healthcare extends far beyond the design of a product or interior architecture: it is the creation of an entire environment that is sensitive to patient experience and clinical workflow needs and personalized to their requirements. It merges technology (like dynamic lighting, video projection and smart-cards) with architectural qualities and people's senses into an ambient experience with one goal – to deliver better healthcare. Highlights: Technology: how Ambient Experience for healthcare is transforming technology from an intrusive, intimidating presence into a nearly invisible enabler. Design Process: how a patient-centric design approach involves various stakeholders directly into the design analysis process. Business case: how Ambient Experience for healthcare is enabling hospitals to create added value and differentiate themselves; whilst at the same time improve workflow efficiency, increase patient and job satisfaction levels. Background case study: Ambient Experience has been applied in many Philips Healthcare MR and CT radiology suites, with excellent results both in terms of patient satisfaction and clinical improvement. The results from the paediatric CT suite in Chicago's Lutheran General Children's hospital indicate a lowering of sedation rates for children by an astonishing 30–40%. There has also been a decrease in radiation dosage, improved patient, family and staff satisfaction rates and a 15–20% increase in radiology patient throughput. Ambient Experience Design received the 2005 Gold Award from the Industrial Design Society of America, an achievement that was given coverage in Business Week.

1145–1245
IPEM John Mallard lecture

1145 Invited review: Ultrasonic imaging: an holistic view

Wells, P.
Cardiff University, Cardiff, UK

This lecture honours Professor John Mallard for his seminal and sustained contributions to the advancement of medical imaging. Historically, medical ultrasound imaging has evolved continuously since the late 1950s, when traditional X-radiography had already been established for more than 50 years and radionuclide imaging was beginning to show its potential. Subsequently, X-ray computed tomography was invented in the late 1960s and rapidly diffused into clinical practice; MRI followed after about 10 years. Nowadays and worldwide, one in every four diagnostic imaging procedures is an ultrasound investigation: this is second only to traditional X-radiography. Despite its true clinical importance, however, ultrasound imaging seems often to be perceived to be at the fringe of radiological practice. There are several reasons for this: unlike CT and MRI, the introductions of which were dramatic and disruptive, ultrasound techniques have evolved incrementally; ultrasound scanners tend to be much less expensive than are those for CT and MRI, and so they seem to be relatively unglamorous; to the untrained eye, ultrasound images are often thought to be hard to interpret; and, perhaps most importantly, ultrasound diagnosis is almost unique in being a process in which real-time images have simultaneously to be acquired and interpreted by skilled individuals, rather than being acquired according to technical protocols and subsequently interpreted by experts. Research is currently focusing on three-dimensional and elasticity imaging, contrast agent enhancement, image fusion and device miniaturization, as well as numerous other innovative techniques. The holistic reality is that ultrasound imaging has every prospect of sustaining its position in the mainstream of modern medicine.

1245–1345
COR William Stripp Memorial lecture

1245 Invited review: Musculoskeletal ultrasound – a sonographer's perspective

Hall, A.
Mid Staffordshire General Hospitals NHS Trust, Stafford, UK

Ultrasound has a number of properties which make it particularly attractive as an imaging tool for musculoskeletal disorders. These include the lack of radiation exposure, the ability to assess soft tissues joints in a dynamic fashion and the power to measure tissue perfusion, and therefore inflammation. Despite a growing interest in this field, there remain few Radiologists with expertise in musculoskeletal ultrasound and this has led to many individuals from other professions wishing to become trained and use it as part of their clinical examination. However, the use of ultrasound remains highly operator-dependent in spite of advances in technology, and the interests of the patient are best served by the provision of an ultrasound service which offers the maximum clinical benefit and optimal use of resources, i.e. with appropriately trained personnel using equipment of appropriate quality. Whilst radiographer/sonographers carry out the majority of

ultrasound examinations in most radiology departments, relatively few have had exposure to musculoskeletal scanning for a variety of reasons. This lecture aims to explore the reasons behind this and to show that sonographers can become competent in this field. They can provide a responsive, accurate service to clinicians as well as providing a training base for other interested parties.

1400–1700
Cancer imaging – current concepts

1400 Invited review: Imaging colon cancer

Taylor, S.
University College Hospital, London, UK

No abstract supplied.

1425 Invited review: Renal tumours – getting it right

Cowan, N.
The Churchill Hospital, Oxford, UK

LEARNING OBJECTIVES: To be able to: (i) Diagnose and stage: solid renal tumours, cystic renal tumours, unusual renal tumours. (ii) Know when and when not to biopsy a renal tumour. (iii) Know how to minimize the radiation dose.

1450 Invited review: Lymphoma – imaging strategies in 2008

MacVicar, D.
Royal Marsden Hospital, Sutton, UK

AIM: The aim is to focus on imaging strategies at key stages of lymphoma management. OBJECTIVES: The learning objectives of the presentation are to identify and illustrate a variety of dilemmas which may be encountered in the investigation and follow-up of the lymphomas. This talk will focus on: the role of imaging in the investigation of lymph node enlargement and in obtaining tissue diagnosis. Staging investigations and follow-up on treatment, with reference to international criteria for response assessment. The diagnostic approach to residual masses following treatment for lymphoma. Clinical presentations and imaging strategies in suspected disease relapse.

1545 Invited review: Paediatrics – sorting out the abdominal mass

Olsen, O.
Great Ormond Street Hospital, London, UK

BACKGROUND: Recognizing a primary tumour (ultrasound, radiography) is hardly ever a problem in paediatrics; they are generally very large. Deciding on further investigations (NMed, MR, CT) is more difficult because (1) there is not a very strong academic foundation for judgements of efficacy, (2) there are huge differences between institutions in modality availability, expertise and preference. Interpretation may also differ from adult imaging in that (1) origo can be difficult to determine due to lesion size, (2) appearances, particularly MRI contrast is often different, (3) change in size during treatment is not necessarily a strong prognostic factor. KEY LEARNING POINTS. The lecture will focus on (1) Comparing CT (availability, less operator dependent) and MRI (non-radiation, better soft tissue contrast) in abdominal tumour imaging, (2) Describing key concepts for successful abdominal MRI in children (SNR *vs* contrast *vs* motion artefact), (3) Suggesting some non-conventional imaging techniques, in particular diffusion-weighted imaging.

1610 Invited review: Imaging the pelvic mass

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

In patients presenting with a pelvic mass, ultrasound is the first line of investigation. Pelvic masses occur much more commonly in women, usually being gynaecological in origin. The majority of gynaecological masses are benign, with uterine fibroids being common. On occasion, cystic degeneration within a fibroid, or a pedunculated fibroid, may mimic an adnexal mass. Adnexal cysts or masses can often be characterized with confidence on ultrasound as being benign or malignant. Physiological cysts have well recognized appearances and are common, but do not usually present with a palpable pelvic mass. Benign ovarian cysts may be very large at presentation and where there are signs of complexity, can be confidently diagnosed on ultrasound. Malignant adnexal lesions occur less frequently but may be detected with a high degree of sensitivity on ultrasound. Correlation of the ultrasound findings with the clinical findings, such as CA125 level and patient age, can also be helpful in assessing the risk of malignancy in an individual patient. However, in some cases, adnexal lesions remain indeterminate following ultrasound. MRI has been shown to differentiate benign from malignant adnexal masses with a high degree of both sensitivity and specificity. However, there are well recognized potential pitfalls. Less commonly, a palpable pelvic mass may originate from the bladder, bowel, peritoneum or retroperitoneum, in both men and women. During this interactive lecture, the characteristic features of uterine masses and benign and malignant adnexal lesions will be illustrated by a presentation of clinical cases. The indications for MRI in the characterization of adnexal masses will be discussed and the potential pitfalls in diagnosis will be reviewed. The imaging characteristics of certain non-gynaecologic pelvic masses will also be presented.

1635 Invited review: Radiotherapy planning – a role for the radiologist

Reznek, R.
St. Bartholomew's Hospital, London, UK

The relatively recent implementation of conformal radiotherapy techniques now offers the possibility of reducing radiation to normal tissues and possibly escalating the dosage to the malignant lesion. As always, the greatest challenge for radiation therapy is to attain the highest probability of cure and the least toxicity to normal tissues. Application of 3D-conformal radiotherapy and intensity-modulated radiotherapy (IMRT) requires an extremely precise delineation of the tumour. Although CT is naturally the most widely used technique for tumour delineation, MR and PET have in certain instances not only improved the ability to define tumours but also to target their functioning component. Nevertheless numerous problems persist in the application of these imaging techniques, including organ motion, patient positioning, verification. It is therefore critical that all involved in planning and delivery radiotherapy understand the anatomy, the definition of the tumour and the pitfalls that arise in tumour delineation. Central to this is the radiologist with an interest in cancer imaging who, trained in cross-sectional imaging, now needs to understand the process of the delivery of conformal radiotherapy in order for these patients to be managed effectively.

1400–1540
Neuroradiology and head & neck keynote lecture and scientific session

1400 Invited review: Imaging of stroke in the 21st Century

Halpin, S.
University Hospital of Wales, Cardiff, UK

No abstract submitted.

1430 Patterns of acute subarachnoid haemorrhage missed on presentation CT scans – a retrospective analysis of cases referred to a tertiary centre

Bradley, R.·McCrea, I.·Walker, L.·Jampana, R.
Institute of Neurological Sciences, Glasgow, UK

PURPOSE: To describe common patterns of subarachnoid haemorrhage (SAH) missed on presentation CT brain and use this data to identify brain review areas. MATERIALS/METHODS: 59 patients with a presentation CT brain that was reported as negative for SAH and had subsequent positive CSF xanthochromia, who

were referred to regional neurosurgical centre, were included. The presentation CTs were retrospectively reported by a neuroradiologist and false negative scans identified. These were further reviewed by another neuroradiologist and the anatomical locations of SAH recorded. RESULTS: 28 (47%) scans were identified as false negative. The most frequent anatomical location for missed SAH was the interhemispheric fissure 13 (46%), followed by pre-pontine cistern and cortical sulci 8 (29%) each, suprasellar cistern, Sylvian fissure and lateral ventricles 6 (21%) each; interpeduncular cistern 5 (18%), fourth ventricle, quadrigeminal cistern, ambient cistern and cisterna magna 1 (4%) each. There was evidence of hydrocephalus on 4 (13%) scans. 13 scans (46%) had SAH recorded in one location only, the most frequent site being the interhemispheric fissure (4 scans) and the pre-pontine cistern (3 scans). CONCLUSION: On half of the false negative scans in our group the SAH was confined to one anatomical location, most frequently the interhemispheric fissure and the pre-pontine cistern. Overall the interhemispheric fissure, pre-pontine cistern and cortical sulci are the anatomical locations where SAH is most frequently missed and these areas are identified as requiring robust review on CT brain. To aid this review a tick box sheet with diagrams has been developed for trainee radiologists.

1440 Correlating MRA and dynamic-enhanced MR perfusion in moyamoya arteriopathy using histogram analysis of whole arterial territories

Ederle, J.·Thornton, J. S.·Brown, M. M.·Jäger, H. R.
UCL Institute of Neurology, London, UK

PURPOSE: Purpose of the study was to investigate the correlation between MR perfusion parameters and MR angiography (MRA) findings in moyamoya arteriopathy. DCE-MR perfusion imaging has previously been investigated in moyamoya-arteriopathy using measurements from multiple regions of interest. In this study we analysed whole arterial territories using a histogram approach to correlate DCE findings with MRA. MATERIAL AND METHODS: 12 patients with moyamoya arteriopathy had DCE-MR perfusion (gradient-echo EPI, flip angle (FA) 20°, TR/TE 1200/40 ms) and 3D-TOF MRA (TR/TE 37/6.9 ms; FA 20°). Vascular involvement on MRA was scored using an 8 point scale, previous validated with conventional angiography. Histogram parameters (median, mode, standard deviation, quartiles, kurtosis, skewness, peak height) of relative cerebral blood flow (rCBV), mean transit time (MTT), and time to peak (TTM) in the right and left anterior and posterior circulation territories were calculated off-line and correlated with the MRA score (total of 36 vascular territories). RESULTS: A correlation between MRA score and all three perfusion measures was found with skewness and kurtosis. MRA correlated best with MTT where all histogram parameters, except mode, reached statistical significance (median: r=0.506, SD: r=0.651, skewness: r=-0.670, kurtosis: r=-0.613, peak height: r=.560 p<0.01). The second best correlation was obtained with TTM. CONCLUSION: Vascular compromise of arterial territories can be quantitatively assessed with histogram analysis of DCE-MR perfusion. Measurements of MTT and histogram parameters skewness and kurtosis reflected most closely the degree of proximal vessel compromise. The method may be helpful for monitoring disease progression and surgical treatment.

1450 Diffusion MRI as first neuro-imaging for in-patients with suspected stroke: a 7 year experience

Meagher, T. M.
Buckinghamshire Hospitals Trust, Aylesbury, UK

PURPOSE: To examine the results of diffusion weighted MRI as first line stroke neuroimaging for in-patients with clinically suspected acute stroke. MATERIALS/METHODS: A policy of DWI MRI for suspected acute stroke was adopted in March 2000. We retrospectively examine a cohort of 157 patients with a diagnosis of stroke from 2007 and compare with cohorts from 2000 and 2004. RESULTS: 125 (80%) of 157 patients had MRI as first neuroimaging and 27 (17%) had CT and 5 patients having no imaging and a clinical diagnosis of stroke. This compares with rates of 74% in the first year and 81% in year four. We examine re-imaging rates, time from referral to imaging and detection of pathologies mimicking stroke. CONCLUSION: It is possible to achieve rates of 80% in the context of a busy general hospital with a diffusion based MRI service.

1500 Electrical impedance tomography – a novel imaging modality for acute stroke

Romsauerova, A.[1]·McEwan, A.[1]·Horesh, L.[2]·Holder, D.[1]
[1]Department of Medical Physics and Bioengineering, UCL, London, UK, [2]Department of Mathematics and Computer Science, Emory University, Atlanta, GA, USA

Electrical Impedance Tomography (EIT) is a new medical imaging method in which tomographic impedance images are rapidly produced using arrays of electrodes placed around the body. EIT has the potential to distinguish between ischaemic and haemorrhagic stroke in a non-invasive, safe, cost effective and timely manner, in order to give an early diagnosis of ischaemic stroke and allow early thrombolysis. The purpose of this work was to assess the performance of the EIT system, the UCLH Mk2.5 developed at UCL, for imaging acute stroke. The performance of the EIT was assessed using computer simulation, animal studies and phantom studies that closely simulated acute stroke. The computer simulation of acute stroke showed that impedance changes can be detected using our EIT system. The maximal scalp impedance changes, for ischemic stroke ranged between 0.2% and 1.9%, whereas for haemorrhagic stroke they ranged from -0.7% to -6.1%. In the animal model of ischaemic stroke, 4 vessel cerebral ischaemia of 15 min caused an increase of impedance by 50–200% measured from the brain surface. Controlled phantom studies of acute stroke were coherent with the computer simulations and animal studies. These results demonstrated that a multi-frequency EIT system can detect and image changes across frequency associated with ischaemic or haemorrhagic stroke, when compared with the normal brain. Therefore, we are now continuing with patient measurements on the first pilot study of brain EIT in acute stroke at the National Hospital for Neurology and Neurosurgery and UCLH, London.

1510 The role of PETCT in identification of unknown primary in head and neck cancer

Nasoodi, A.·Fahy, C.·Defreitas , R.·Primrose, B.·Clarke, J.·Hughes, S.
Belfast Trust, Belfast, UK

PURPOSE: A primary cannot be identified in 2–5% of patients with metastatic head and neck cancer despite thorough investigation. We assessed the role of PETCT in the management of these patients. MATERIALS/METHODS: We reviewed the case notes of all 17 patients who underwent PETCT for head and neck unknown primary disease at a single tertiary university centre from January 2003 to August 2005. Data were extracted from the medical notes and cancer registry data. All PETCT scans were retrospectively reviewed by two radiologists with extensive experience in PETCT and dedicated CT. All scans were performed using a GE Discovery LS PETCT after injection of 350–400 MBq of [F^{18}]-2-fluoro-2-deoxy-D-glucose (FDG). RESULTS: A total of 17 patients (11 male and 6 female patients, mean age 60 years) underwent PETCT. A malignant nodal deposit had been established using either excisional biopsy (6 patients) or FNAC (11 patients) without a primary site. PETCT identified a primary source in 7 patients (41%). This included tonsil (3 patients), base of tongue (1 patient), supraglottic (1 patient), retromandibular (1 patient), and lung (1 patient). The primary sites were subsequently confirmed following PETCT directed biopsy in five patients (29%). CONCLUSION: PETCT is invaluable in establishing the primary source of head and neck cancers with an unknown primary. PETCT is instrumental in delineating the primary and help to determine the best line of management for the patient. It should be considered early in the management of head and neck unknown primaries.

1520 Does diffusion weighted imaging pre-treatment and 6 weeks post treatment with chemoradiation for head and neck squamous cell carcioma identify residual disease?

Bhatia, K. S.[1]·King, A. D.[1]·Zhou, H.[1]·Yu, B. K.[1]·Yeung, D. K.[1]·Mo, F.[2]·Tse, G. G.[3]·Vlantis, A. C.[4]·Ahuja, A. T.[1]
[1]Department of Diagnostic Radiology and Organ Imaging, Chinese University of Hong Kong, Shatin, Hong Kong, [2]Department of Clinical Oncology, Chinese University of Hong Kong, Shatin, Hong Kong, [3]Department of Anatomical and Cellular Pathology, Chinese University of Hong Kong, Shatin, Hong Kong, [4]Department of Otorhinolaryngology, Head and Neck Surgery, Chinese University of Hong Kong, Shatin, Hong Kong

PURPOSE: To evaluate the ability of DWI to identify residual head and neck squamous cell carcinoma (HNSCC) post chemoradiation. MATERIALS/METHODS: 16 patients with newly diagnosed HNSCC selected for chemoradiation underwent DWI on a 1.5 T whole-body MRI system. Using regions of interest drawn around the primary tumour or a metastatic cervical lymph node on the Apparent Diffusion Coefficient (ADC) map, mean ADC values were calculated for the whole lesion and for a single slice containing the largest non-necrotic area. ADC values at (1) diagnosis, (2) 6 weeks post-treatment and (3) the change in ADC in this interval were correlated with treatment response. Treatment response was determined by histology in 6 patients and by serial follow-up imaging in 10 patients (mean 27 months, range 4–39 months). RESULTS: 5 patients had residual cancer (primary n=4, node n=1) and 11 had no residual disease (primary n=3, node n=8) at the site evaluated by DWI. Mean ADC values and range (in parentheses) of the whole lesion and single slice pre-treatment were 1.12 (0.92–1.43) and 0.99 (0.75–1.38), 6 weeks post-treatment were 1.48 (0.53–1.93) and 1.41 (0.44–2.11), and change in ADC values were 0.36 (0.53–1.00) and 0.42 (0.32–1.34), respectively, ($\times 10^{-3}$ mm^2 s^{-1}). Logistic regression analyses, student t and Fisher's exact tests indicated no statistically significant relationship between ADC values or change in ADC values and the presence or absence of residual disease. CONCLUSION: ADC values increase 6 weeks after chemoradiation for HNSCC. However, in this small sample, ADC values could not be used to identify residual disease.

1530 Comparison of multislice CT angiography with carotid Doppler in assessing carotid arterial disease

Blackwell, J. R.·Asquith, J. R.·Pherwani, A. D.·Jaipersad, A. S.
University Hospital North Staffordshire, Stoke-On-Trent, UK

PURPOSE: Surgical intervention is performed for symptomatic internal carotid artery (ICA) stenosis of >70%. This requires accurate grading of the stenosis. The aim of this study is to evaluate the role of multislice CT angiography (CTA) as an additional imaging modality in the quantitative assessment of ICA stenosis when compared with carotid Doppler ultrasound (CDUS). We determined those patients in which CTA changes surgical management. MATERIALS/METHODS: All patients who had ICA stenosis investigated initially by CDUS and subsequently by CTA during a 30 month period were reviewed retrospectively. Only those patients whose imaging had been performed within 6 months of each other were included. RESULTS: 555 vessels from 283 patients were compared giving a 74.4% (95% CI 71–78%) overall agreement for degree of ICA stenosis between the two imaging modalities with a weighted kappa score of 0.65 and Pearson correlation of 0.864 (p=0.000). Presuming every ICA stenosis of 70–99% receives carotid endarterectomy, the management of 497 (89.5%) of vessels would remain unchanged following second line investigation by CTA. Notably 35 vessels (6%) were graded as non-surgical by CTA, but >70% ICA stenosis on CDUS, thus potentially preventing surgical intervention in this group. In 0.5% CDUS had shown ICA occlusion, but on CTA a surgical grade ICA stenosis. In 1.1% CDUS showed surgical grade ICA stenosis, whereas CTA showed vessel occlusion. In 2.6% CDUS showed <70% ICA stenosis, but CTA surgical grade disease. CONCLUSION: CTA is beneficial as a second line investigation into ICA disease shown on CDUS.

1400–1530
Surviving as a future workforce

1400 Invited review: US perspective on radiology workforce of the future

Boland, G.
Massachusetts General Hospital, Boston, Massachusetts, USA

US radiology stakeholders (referring physicians, administrators and patients) are expecting increased value from radiology departments, particularly radiologists. While new equipment and clinical protocols continue to benefit patients, these stakeholders are expecting, sometimes demanding, a broader range of deliverables from radiologists. These include increased patient access to major modalities, expedited report turnaround, peer review, subspecialty reads, customer service and effective business management of departments, amongst others. Those radiology groups that cannot meet these expectations are being marginalized. The catalyst for change has been the rapid and widespread implementation of off-hour teleradiology, which is now infiltrating the daytime market. Larger and more successful radiology groups are either absorbing smaller, less efficient groups, or replacing them altogether. Radiology is therefore undergoing a period of consolidation. While this may temporary benefit to radiology stakeholders, there remain significant risks. This talk will focus on the drivers for US radiology services over the next 5 years, and how the radiology workforce is being challenged to adapt to these changes. It will discuss how groups can maintain and even grow market share within this new, competitive environment, and what more exposed groups can do to prevent being marginalized. The talk will also discuss the risks and benefits of radiology consolidation and the commoditization of the industry.

1430 Invited review: Radiologists: will we need more or less?

Dixon, A.
Addenbrooke's Hospital, Cambridge, UK

The need for more and more imaging is self evident. Objective imaging findings are now considered to be more reliable than subjective clinical findings. Most diagnoses are now made or confirmed by imaging. Management decisions now hang on the radiological findings and imaging is extensively used to assess treatment response. Thus there will continue to be increasing need for those trained with good interpretative and interventional skills. Exactly who does what and where remains controversial. In the short term Radiology Departments will continue to grow. Those Departments that can provide a high quality service that is also prompt and inexpensive will continue to need more and more radiologists.

1500 Invited review: Workforce planning: whose problem?

Evans, R.
College of Radiographers, London, UK

The diagnostic imaging workforce in the UK is under unprecedented pressure. In many centres, extraordinary achievements have been demonstrated so that excellent patient services are delivered more efficiently than ever before. Challenging government targets have been responded to, often with little or no increase in resources for workforce investment. As a result, services are extremely "stretched". There is a perception that current activity levels are unsustainable and yet the prospects of increasing demand for imaging are also very real. The case for sustained increases in resources for education, training and employment of imaging staff would seem clear, particularly in the light of high numbers of expected retirements from the workforce over the next 10 years. However, the evidence is that central workforce planning, never a particularly precise science, is receiving little attention. The drive to local planning and commissioning of all aspects of service is creating new challenges with little reassurance that expertise, insight and appreciation of the issues exist where the decisions are to be made.

How do the professions involved in diagnostic imaging react to the workforce planning crisis? How can managers and leaders ensure that their departments are sustainable and equipped to meet the challenges of the future? Is the education sector a leader or a follower in assuring patient services?

1400–1700

Breast imaging: from analogue to digital

1400 Invited review: Surviving the transfer: Highs and lows

Turnbull, A.
Derby City General Hospital, Derby, UK

Derby breast unit provides a fully comprehensive screening and symptomatic service, screening >23 000 women per year for the NHSBSP and seeing >6000 patients in our combined symptomatic, family history and surveillance clinics. The aim of my talk is to give a useful, practical and interesting account of our journey from analogue to digital imaging for our entire service. We have progressed from our first small field digital biopsy unit in 1999, to our first FFDR mammography unit in 2005. Then 2 department moves in 2006 and 2007 required for our PFI new hospital build; to a main static unit with 2 FFDRs, both with biopsy facility and 2 mobiles and a small static site all to have CR equipment. Our main X-ray department introduced RIS/PACS in April 2004; this has been rolled out to our symptomatic service, beginning in 2005. We plan to go fully digital for screening and the rest of the symptomatic service in the spring of 2008, when all aspects of our planning come together. Major headaches have included conversion of whole hospital RIS/PACs to NHS number, formulating the business case, the lack of RIS functionality in the NBSS system, manufacturer specific workstations and PACs software issues, along with new workflows and clinical pathways for all. This is an ongoing journey, with many frustrations, but the entire team is really enthusiastic and excited about digital imaging. The team has remarkably quickly come "on-board". This is the future – join us – we're happy to help.

1420 Invited review: Making the technology talk

Sellars, S.
NHS Cancer Screening Programmes, Sheffield, UK

The NHS Breast Screening Programme uses a standard information system (NBSS) to call and recall women and record the outcomes of screening and assessment. It is used in all Breast Screening Programmes in England Wales and Northern Ireland. The system captures information on over 1.5 million women screened per year, provides standard statistical returns and uses a standard reporting system. The NBSS system Cache Database runs on either UNIX or Windows Server platforms. It is accessed via a Windows GUI operated by a keyboard or mouse and each breast screening programme has its own client server installation. Client information is imported from the NHAIS System using Medifact messaging. The majority of breast screening is currently performed using film systems but over the next few years these systems will be replaced by digital mammography. The Cancer Reform Strategy [1] has given this move to digital a high priority although in order to implement digital effectively the information system must link with Picture Archiving and Communication Systems, be integrated with desktop functions and synchronise with the reporting workstation. Ongoing developments to the system are organized and funded centrally and deployed within two releases per year. The next major development to the system will be to enable linkages with digital systems and Picture Archiving and Communication Systems (PACS). [1] Cancer Reform Strategy; Department of Health; page 47; December 2007.

1505 Invited review: CAD: a toy not a tool?

Khoo, L.
St George's Hospital, London, UK

Computer aided detection (CAD) has been proposed as tool to increase cancer detection rates by acting as an adjunct to single reading. CAD systems either analyse digitized film–screen mammograms or are applied directly to digital mammograms. Calcium and mass marks are displayed to indicate suspicious areas. When the information is presented there is user ability to set a threshold level for marker display thus choosing sensitivity and true to false prompt ratio, as well as to manipulate the CAD images. The evidence for approval of CAD was based on initial clinical studies, which were retrospective reviews of selected batches of films. CAD was found to be very sensitive for malignancy and it was postulated that cancer detection rates would increase, if all CAD prompts on cancers were actioned. Some prospective studies in the screening setting have also shown improvement in cancer detection rates. Other studies, however, have shown either no change or reduced accuracy of interpretation. These have lead to debate about the role of CAD in the current screening environment. Possible future applications of CAD will be considered, including new developments and the impact of the increasing use of digital mammography.

1525 Invited review: CADET II: "the answer"?

Gilbert, F.
University of Aberdeen, Aberdeen, UK

In a breast screening programme the process of reading large numbers of normal mammograms to detect a small number of cancers is a highly demanding task. Double reading of mammograms with arbitration is recognized as the "gold standard" but increases the workload. Computer aided detection (CAD) systems could potentially address staffing issues and reduce oversight errors. However, more robust evidence from large scale prospective trials is required to evaluate its performance in the context of the UK breast screening programme. A retrospective study (CADET I) indicated that the performance of a single reader using CAD was at least as good as double reading when reading large numbers of mammograms containing a low percentage of cancer cases. The CADET II trial was a prospective, multicentre, randomized comparison of single reading with CAD and double reading in the UK NHS breast screening programme. Between August 2006 and September 2007, 31 287 women (age 50–70 years), attending routine mammography at three UK breast screening centres, were recruited into the trial. Film batches from screening sessions were randomly assigned in a ratio of 28:1:1 to one of three film reading regimens: Double reading and single reading with CAD, or double reading only, or single reading with CAD only. The primary outcome measures were matched comparisons of the cancer detection rates and the number of women recalled for assessment by the two reading regimens. The results of the study will be presented at the conference.

1610 Invited review: Should we stage breast cancer with MRI?

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

Conventional triple assessment is the standard investigation algorithm for the diagnosis and pre-operative assessment of breast cancer. MRI has a proven place as an adjunctive investigation when triple assessment is inconclusive. MRI is highly sensitive in the diagnosis of breast cancer. It accurately identifies additional foci of disease compared with mammography and ultrasound and more recently has been shown to change surgical management. MRI has, however, a reputation for lower specificity and false positive results which cause anxiety to doctors and patients. There is concern that the low specificity may result in unnecessary biopsies and even unnecessary mastectomies. I will present the current evidence for the use of MRI as a staging tool in the pre operative assessment of new breast cancers. The imminent publication of the UK COMICE trial may lead to a revision of the indications for MRI in breast cancer patients. CONCLUSION: Currently, however, there is insufficient evidence to justify breast MRI for all new breast cancer patients and breast MRI should be offered only to selected patients with specific indications.

1630 Invited review: MRI-CAD: help or hindrance?

Teh, W.
Northwick Park Hospital, London, UK

MRI-CAD (Computer-Aided Detection) is a relatively new development that has progressed from the realms of research to fully

fledged main-stream applications. Much of this involve using adapted software to process DICOM information so that post-processing and hanging protocols are optimized in order to maximize the display of information. Use of colour-coded information and 3D datasets in MIP reconstructions also enable potential abnormalities to be localized quicker. CAD work-stations also have the advantage of speeding up MRI guided interventional procedures using semi-automated guidance. This presentation examines the evidence of the efficacy of CAD in MRI breast examinations and highlights some of the benefits and pitfalls in using this utility.

1400–1520
Educational Scientific Session

1400 Interprofessional learning within practice education: a study to inform curriculum change

Willis, S. J.[1]·Cobb, C.[2]
[1]University of Exeter, Exeter, UK, [2]University Campus Suffolk, Ipswich, UK

PURPOSE: To investigate final year radiography students interprofessional collaboration experiences during their practice education, to identify future curriculum strategies capable of supporting interprofessional learning (IPL) in the practice setting for programmes where student-to-student engagement of IPL activities within the clinical environment cannot readily be facilitated. BACKGROUND: Whilst the incorporation of IPL within undergraduate health and social care curricula has now been realised, few published studies have sought to investigate the clinical opportunities that radiography students are given in order to develop the collaborative clinical skills required of them post qualification. METHODS: Third year undergraduate radiography students were invited to participate in the study. A mixed method case study was used to gather data in two phases; initially questionnaires were administered to participants (n=41), subsequently three focus groups were conducted (n=19) to contextualize and explore further the results returned to the questionnaire. RESULTS: The study found that students valued their experiential interprofessional working experiences, and perceived that these had contributed towards their professional development and successful negotiation of the undergraduate curriculum. However, discussions within the focus groups also echoed many of the complexities identified in previous studies associated with facilitating IPL within practice education curricula. CONCLUSION: Participants recollections have evidenced that opportunities for integrated IPL approaches exist in the clinical environments where students currently undertake their practice education. Furthermore, that the engagement of radiography students with qualified practitioners to undertake IPL may provide meaningful learning opportunities in situations, and programmes, where student-to-student engagement for such learning cannot readily be facilitated.

1410 Interpreting lung collapse: a randomized controlled study of three dimensional animation

Ward, B. M.[1]·Charissis, V.[2]·Chanock, D.[3]·Brady, L.[2]·Anderson, P.[2]
[1]University of Edinburgh, Edinburgh, UK, [2]University of Glasgow/Glasgow School of Art, Digital Design Studio, Glasgow, UK, [3]Department of Radiology, Ayr Hospital, Ayr, UK

PURPOSE: The use of computer-generated anatomical models has become widespread in anatomy teaching. Several randomized controlled studies have shown positive learning outcomes in basic undergraduate anatomy. Recent studies have suggested Virtual Reality has a role in shortening the learning curve in postgraduate medical training. Correct interpretation of radiological images often relies upon a three dimensional (3D) internal understanding of anatomy, but little is know about the potential role of enhanced visualization in radiological training. To this end we have designed a randomized controlled study exploring trainee's radiological interpretation of lung collapse, anatomical knowledge and visual–spatial ability. MATERIALS/METHODS: We designed a 3D animation series demonstrating the range of lobar collapse. In addition we developed an integrated computer-based educational package bringing together plain film, CT data and traditional schematic diagrams. 20 current radiology trainees at a deanery study day will be randomized into two equal groups, one tutorial group given additional access to the 3D animation resource. Both arms are timed, pre-assessed for knowledge, prior experience, visual–spatial skills and then debriefed by identical MCQ and qualitative survey instruments integrated with the educational package. RESULTS/DISCUSSION: The results will be collected (Questionmark-Perception) and the mean scores compared with a 2-tailed Student's t-test (SPSS). We use similar methods for the visual–spatial data and in chi-squared tests to ensure the groups are comparable. The qualitative analysis includes a Likert questionnaire analysed for internal consistency (Cronbach's alpha) and thematic analysis of open questions. The results are explored and the scope for further work discussed.

1420 Back to the dissection room: an innovative way of teaching anatomy to radiology trainees

Nicholls, M. J.[1]·Currie, S.[2]
[1]Leeds Teaching Hospitals NHS Trust, Leeds, UK, [2]Leeds and West Yorkshire Radiology Academy, Leeds, UK

PURPOSE: The Royal College of Radiologists (2004) states that detailed anatomy knowledge of each system is one element at the core of first year specialist registrar training. At undergraduate level there has been much debate about how anatomy should be taught and some medical schools are now moving away from traditional dissection room teaching towards living anatomy and medical imaging. In contrast to this we proposed that medical imagers, i.e. radiology trainees, would benefit from a return to the dissection room to complement image-based lectures and self-directed learning. MATERIALS/METHODS: At Leeds and West Yorkshire Radiology Academy, 10 trainees attended 2 full day sessions in small groups, co-tutored by ex-anatomy demonstrators and senior radiology registrars. Pro-sected cadavers alongside laptop cross-sectional imaging presentations were used. There was formative assessment pre and post course in the form of a short MCQ paper. Structured feedback was obtained using a questionnaire which consisted of closed questions, Likert scales and open ended questions. RESULTS: All trainees demonstrated an improvement in their knowledge. The average MCQ mark rose from 54–79% after session 1 and 47–82% after session 2. The feedback was excellent. 90% of candidates strongly agreed that the teaching was relevant to their needs and all candidates agreed or strongly agreed that the laptop images complemented the pro-sections. CONCLUSION: Formative assessment and feedback show that dissection room sessions are an effective way of supplementing current anatomy teaching of first year trainee radiologists.

1430 Teaching pathology to diagnostic student radiographers – a new approach using learning technologies

Lorimer, J.·Hilliard, A.
University of Hertfordshire, Hatfield, UK

KEY LEARNING OBJECTIVES: To create a module which allows some flexibility of learning location and time; makes more effective use of face-to-face contact time; increases student engagement and interactivity; and enhances student learning and understanding of the topics taught. DESCRIPTION: The project was undertaken to investigate the impact of integrating podcasts/audio file downloads and use of an electronic voting system (EVS) to transform module delivery from a traditional mode to a blended delivery. Previously, the module had been delivered in a traditional lecture format using two 2 h sessions. The first 2 h lecture was replaced by a podcast with an accompanying PowerPoint™ presentation. The second 2 h lecture format was changed to small group work including activities, one of which was use of the EVS. Evaluation was by means of student questionnaires. 95% of students accessed the podcasts regularly, with an average length of study time being 3.75 h. 62.5% of the students accessed the podcasts between Friday and Sunday. 97% of the students accessed them without difficulty, and 50% downloaded the files to an

MP3 player or equivalent. 80% of the cohort expressed satisfaction with podcasts as a teaching resource. The EVS was extremely well received by the students. 97% stated that it was easy to use, with 93.5% perceiving that it benefited their learning. CONCLUSION: Learning technologies can be successfully integrated into undergraduate radiography teaching to enhance both student interactivity and engagement with their learning.

1440 Enhanced visualization: augmenting musculoskeletal ultrasound training

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KEY LEARNING OBJECTIVES: Specialist medical education is changing to reflect current trainee's needs. Detailed anatomy is becoming a post-graduate subject and increasingly doctors must learn anatomy as part of their early specialist training. Interpreting complex 3D subject matter often requires a strong grasp of the 3D anatomy to which it relates. This is compounded when procedural techniques and specialist anatomy are effectively taught simultaneously. However, it has been shown that anatomy learning can be augmented by the use of high resolution 3D models. To this end we developed a resource facilitating training in musculoskeletal ultrasound imaging of the foot and ankle. This application had the specific objective of integrating the teaching of specialist 3D anatomy with clinical procedure and image interpretation. DESCRIPTION: We employed a visualization methodology that allowed real time interlinking between a low latency rotational 3D anatomical model, visual descriptors of ultrasound technique (positioning, movement, field) and clinical ultrasound images. Notably the system was designed to synchronously augment current clinical training or to be self-led and asynchronous. It was designed to convey the anatomy to a multidisciplinary audience. The approach capitalizes on current educational theory and enhances the current approaches by utilizing advanced visualization with an emphasis on practical and intuitive interfaces. CONCLUSION: This paper explores the empirical evidence regarding 3D visualization and the enhancement of spatial learning and describes the integration of robust anatomical modelling techniques, intuitive human computer interface and current educational theory.

1450 Should all chest radiographs be reported by radiologists?

Mehrotra, P.·Bosemani, V.·Cox, J.
University Hospital of North Durham, Durham, UK

PURPOSE: The aim of our study was to assess the ability of clinicians of different grades and specialities to correctly evaluate a series of chest radiographs. MATERIALS/METHODS: 60 clinicians of different grades and from different specialities were randomly recruited for the study. They were asked to interpret 15 chest X-rays including normal images (n=5) and abnormal images (n=10) of common medical emergencies. Non-parametric statistical tests were performed to examine any significant difference in the ability of different groups of doctors to interpret chest X-rays. RESULTS: Senior doctors (consultants and registrars, n=32) attained significantly higher scores than junior doctors (SHOs, F2 and F1 doctors, n=28, p=0.001). For the purpose of this study, consultants and registrars in radiology as well as respiratory medicine were regarded as specialists (n=7). All other registrars and consultants from other specialities were regarded as non-specialists (n=25). Specialists achieved significantly higher scores than non-specialists (p=0.0002). In addition, senior doctors (consultants and registrars) from radiology attained significantly higher scores than senior doctors from other specialities (p=0.002). CONCLUSION: To improve patient care, we suggest that all chest X-rays should be reviewed at an early stage during a patient's hospital admission by a senior clinician and reported by a radiologist at the earliest opportunity. We also suggest that structured teaching on CXR interpretation should be made available for newly qualified doctors, especially with the introduction of shortened training.

1500 Multislice computed tomography coronary angiography: effect of experience and training on reader performance

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Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands

PURPOSE: To prospectively evaluate the effects of reader experience and increasing exposure to multislice computed tomography coronary angiography (MSCT-CA) on the capability to detect significant (≥50%) coronary artery stenoses. MATERIALS/METHODS: We evaluated the progression in diagnostic performance of 4 readers (3 radiologists, 1 cardiologist) without prior experience of MSCT-CA during a 1-year fellowship in a cardiac MSCT unit. The readers were actively involved in the acquisition and interpretation of 12–15 MSCT-CA studies per week (~600 in 1 year). To assess the improvements in diagnostic performance with increasing experience (learning curve), the readers independently interpreted 50 MSCT-CA test cases at baseline, 6 months and 1 year. We calculated sensitivity, specificity and diagnostic odd ratios (DOR) using conventional coronary angiography as reference standard. RESULTS: Baseline average sensitivity was 50% (CI: 40–58), specificity 84% (CI: 80–87) and the diagnostic odd ratio (DOR) 5.3 (CI: 3.7–7.7). After 6 months, average sensitivity was 61% (CI: 52–70), specificity 85% (CI: 82–88) and DOR 9.1 (CI: 6.2–14.2). After 1 year, average sensitivity was 69% (CI: 62–77), specificity 89% (CI: 87–92) and DOR 19.2 (CI: 13.0–30.2). The improvement between the study outset and 6 months was not statistically significant. All outcomes improved significantly between the study outset and 1 year. CONCLUSION: Although physicians without prior experience were able to improve their diagnostic performances with increasing exposures to MSCT-CA, their learning curves were not steep. It may take longer than 1 year to acquire expertise in MSCT-CA.

1510 Survey of the United Kingdom's radiology trainees opinions on hot current controversial topics in radiology

Gough, V.·Mullan, D.·Curtis, J.
University Hospital Aintree, Liverpool, UK

AIM: To determine the opinions of radiology trainees to controversial issues affecting radiology in the UK. MATERIALS AND METHODS: An e-mail linked web-based questionnaire using "surevymonkey.com" was forwarded via the head of training in each deanery onto their trainees. The response rate was 37% (297/812). RESULTS: 75% (220/296) of trainees do not think that they will get a consultancy post within their period of grace. However, only 12% (36/295) of trainees want to work abroad permanently after finishing their schemes, and only 4% (12/295) want to work solely in the private sector. Implying trainees want to work within the UK in the NHS when they finish training, but do not think that they will get jobs. Only 7% (21/293) of trainees are not in or planning to do subspecialty training. Interventional radiology is the most popular choice (22% (65/293)) of subspecialty, followed by gastrointestinal 12% (36/293), musculoskeletal 11% (33/293), and breast 10% (30/293). 90% (258/291) of trainees do not consider the "F2 programme" as adequate preparation for entrance into radiology schemes, and a further 62% (181/295) think postgraduate exams should be a prerequisite for entrance. 71% (208/295) think that the European Working Time Directive will impact negatively on their training, while 69% (204/294) would not be prepared to work in a shift system when the hours change to 48 in 2009. 71% (15/21) of the trainees who replied from academies did not think that the academy would adequately prepare them for hospital radiology, and only 9% (2/21) think that they will get consultant jobs when they qualify.

1415–1600
Imaging of the heart from birth to death

1415 Background requirements and prevalence of cardiac disease from birth to death

Deanfield, J.

Great Ormond Street Hospital for Children NHS Trust, London, UK

Although Atherosclerosis does not normally present in clinical practice until middle age or older, the pathology begins from early childhood. Increasing attention is therefore being paid to opportunities to modify the initiation and progression of disease during this long pre-clinical period. The biology of early atherosclerosis involves inflammation and endothelial dysfunction. These develop in response to classical risks factors such as cholesterol or blood pressure as well as novel influences such as infection or extrinsic inflammation. Lifetime management involves treatment of risk factors to lower levels, a multi-risk approach and early treatment initiation. This may involve life style changes and drug treatment. Evidence is accumulated that this approach has the potential to provide substantial reduction in essential cardiovascular morbidity and mortality over that achieved by following current treatment guidelines.

1445 Invited review: Role of MDCT in cardiac disease

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

KEY LEARING OBJECTIVES: To understand the process of atheroma formation and how this can be visualized on MDCT. DECRIPTION: Coronary atheroma is a major cause of morbidity and mortality in the industrialized world. Despite this the pathophysiology is often misunderstood by Radiologists. This lecture will outline the process and its clinical presentations and demonstrate by examples how this may be demonstrated at CT angiography. The management of such lesions will be explored and the potential for CT to help modify the disease process will be discussed. CONCLUSION: Coronary atheroma can be accurately visualized at cardiac CT and has the potential to alter the way the disease is diagnosed and managed.

1515 Invited review: Imaging the heart for functional studies pre and post interventional cardiological techniques

Taylor, A.
UCL Institute of Child Health & Great Ormond Street Hospital for Children, London, UK

No abstract supplied.

1545–1645
Audit Scientific Session

1545 Lumbar Spine X-ray referrals

Ahmed, M. Z.·King, D.
York District Hospital, York, UK

INTRODUCTION: In the UK, plain lumber spine radiographs contribute 15% of collective radiation dose from medical imaging. Most patients with acute lower back pain and a clinical picture suggesting a mechanical cause improve with in 6 weeks of conservative. The prevalence of possible serious conditions is very low in all age groups, which implies radiation exposure in many patients with no significant lesions. Plain films are not routinely indicated and MRI is more specific. METHOD: The objective of this clinical audit was to find out whether the introduction of a referral pathway, poster and patient information leaflet has influenced the number of referrals for lumbar spine radiography from GPs. A diagnostic imaging and referral pathway for patients presenting with back pain and/or nerve root pain was produced jointly by the radiology, orthopaedic, physiotherapy and anaesthetic departments at York Hospital and SYPCT GP representatives. Following the initial introduction of the back pain referral pathway and the patient information leaflet and poster there was a small reduction in the number of GP requests. However, this was followed by marked reduction in referral coinciding with sending of the letter regarding the guidelines when the request was incompatible with the guidelines. CONCLUSION: The number of referrals has significantly reduced since the addition of the personal letter and copy pathway to reports. The management of these patients is guided by primary care and therefore GPs have to be kept informed of the optimum management pathway.

1555 Measurement of bone density in patients with metastatic prostate cancer

Jenkins, L.[1]·Crabtree, N. J.[1]·Barton, D.[2]·James, N. D.[2]
[1]University Hospital Birmingham NHS Foundation Trust, Birmingham, UK, [2]Cancer Research UK Clinical Trials Unit, The University of Birmingham, Birmingham, UK

PURPOSE: The aim of this study was to investigate the practicalities of using dual energy X-ray absorptiometry (DXA) to measure bone density (BMD) in patients with metastatic bone disease undergoing chemotherapy. Accurate assessment of BMD can only be performed in areas free from metastatic disease. The purpose of this study was to determine the optimum site. METHODS: 37 Patients with prostate cancer participating in the TRAPEZE study (www.trapeze.bham.ac.uk) had an isotope bone scan to confirm presence of bony metastatic disease. On entering the phase 2 chemotherapy trial, patients also had BMD of their lumbar spine and proximal femur using DXA. The isotope bone images and BMD scans were qualitatively compared with locate bony metastases within the DXA images. RESULTS: Due to presence of metastatic disease, 17 patients had no vertebrae suitable for bone density assessment. 20 had at least 1 unaffected vertebrae, with 8, 5, 4 and 3 patients having 1, 2, 3, and 4 unaffected vertebrae, respectively. The upper vertebrae were more frequently assessable than lower vertebrae. In contrast, only 7 patients had no assessable regions in the proximal femur. The femoral neck region was more frequently assessable than the total hip region. CONCLUSION: Standard lumbar BMD measurements are not suitable for use in prostate cancer patients with evidence of bony metastases, due to high frequency of metastatic deposits. The femoral neck may be a potential site for assessment. However, future studies of BMD in this group should use distal forearm measurements as these are much less frequently compromised by secondary spread.

1605 Are we requesting the correct investigation? Auditing ultrasound use in evaluating acute abdominal pain

Maviki, M. S.·O'Doherty, N.
Singleton Hospital (Swansea NHS Trust), Swansea, UK

PURPOSE: A useful investigation is one in which the result (positive or negative) alters management or adds confidence to the clinician's diagnosis. We set out to investigate the use of departmental ultrasound in emergency surgical admissions presenting with acute abdominal pain. MATERIALS/METHODS: A retrospective audit of case notes covering a 3 month period (1 May 2006 to 31 July 2006 inclusive) of patients admitted to Singleton Hospital with acute abdominal pain who were subsequently investigated with abdominal ultrasound, was done. Guidelines were obtained from *Making the best use of a Department of Clinical Radiology:Guidelines for Doctors, 5th Edition – RCR publication*. RESULTS: There were 69 patients: 13 male and 56 female. The age range was 14–82 years with a mean of 35 years. The average (mode) length of stay was 3 days and 55% (38) of patients were discharged by day 3. 57% (n=39) of ultrasound were useful in dictating discharge (although non-diagnostic). 23 % (n=16) established a new diagnosis, 10% (n=7) required further investigations and 10% had inappropriate scans. 80% (n=55) of ultrasound results were acted upon by the referring clinician within 24 h. CONCLUSION: Although the majority of ultrasounds affected management, most did not add to the diagnosis. Instead clinicians were reassured by "negative" ultrasound and thus able to discharge patients more confidently. Could some of these patients be managed without ultrasound (e.g. serial clinical assessment) and are doctors over-investigating patients (afraid to miss pathology)? Further study is recommended to address these issues.

1615 A study to evaluate the accuracy of radiographer performed focused abdominal ultrasound in trauma

Bowie, R. L.
Barts and the London NHS Trust, London, UK

PURPOSE: Radiographers have successfully developed their roles in certain specialities but have not previously had the opportunity to train to perform focused abdominal ultrasound in trauma (FAST) scans. Clinicians have demonstrated they can accurately perform FAST scans following a short training course. The aim of this study was to determine whether radiographers can perform FAST scans as accurately as clinicians following a short training course. MATERIALS/METHODS: Five radiographers without any previous ultrasound experience were selected to form the cohort. They undertook theoretical and practical FAST scan training after which they were assessed for competency by a consultant radiologist. Over 3 months the radiographers and a clinician group each completed 50 FAST scans and documented their results on an audit form. The results were compared against a gold standard examination to assess their sensitivity, specificity and accuracy. RESULTS: For accurately identifying free fluid radiographers achieved a sensitivity of 67% compared with 69% by clinicians. Both groups achieved a specificity of 100% and an accuracy of 92%. When assessing for pneumothoracies the radiographers demonstrated a sensitivity of 42%, specificity of 100% and an accuracy of 90% while the clinicians achieved a sensitivity of 40%, specificity of 100% and an accuracy of 73%. CONCLUSION: The radiographers in this study demonstrated they can perform FAST scans as accurately as clinicians.

1625 Ultrasound guided percutaneous liver biopsy – the Chelsea and Westminster experience

Sriharan, M.·Paul, S.·Anderson, M. G.·Khan, N.
Chelsea & Westminster Hospital NHS Trust, London, UK

PURPOSE: Percutaneous liver biopsies (PLB) are an invasive but relatively safe procedure. We audited our performance against the 1991 national audit. METHODS: We carried out a retrospective audit of all patients having ultrasound guided (USG) PLB at our institute for 1 year. Demographic details, indications, grade of operator, needle size, sample adequacy, complications and overall helpfulness of the investigation were examined and compared with national performance. RESULTS: A total of 101 patients had USG PLB (67% male); mean age was 50.9 years and 8% were over 75 years old. 77% were performed to investigate chronic liver disease (CLD). 56% were performed by specialist registrars. We achieved a 98% sample adequacy rate for histological diagnosis, with 92.4% of samples exceeding 10 mm in length – thereby minimising the risk of sample inadequacy. However, only 31% of samples investigating CLD met the more stringent and recent recommendations for chronic viral hepatitis staging and grading. The investigation was helpful in confirming clinical diagnosis or changing management in 58% and 23% of cases, respectively. We had an 8% significant complication rate, similar to national performance. Furthermore, we saw a 1.9% and 2.7% complication rate in patients with abnormal clotting or raised serum bilirubin. 91% PLB required less than 3 passes. CONCLUSION: We exceeded RCR standards for sample adequacy, whilst maintaining similar biopsy lengths and complication rates as other UK centres. We aim to take 2 × 16 gauge cores to improve sample adequacy for the staging and grading of chronic viral hepatitis.

1635 Outpatient emergency ESWL in a regional lithotripsy centre

Dover, K. L.·Hughes, B.·Eversden, L.·Watkin, N.
Epsom and St Helier NHS Trust, London, UK

PURPOSE: The Sutton Lithotripsy Department is integral to the South-West London Stone Network, offering over 1000 treatments per year to patients from 7 referring hospitals. Since October 2006 we have provided eESWL for patients presenting to these hospitals with acute ureteric colic and audited patient outcome. The intention is to treat an appropriate emergency admission as an outpatient and discharge directly home, thus minimizing inpatient stay and need for endoscopic intervention. METHODS: Criteria for treatment included symptomatic, radiopaque ureteric stones in the absence of sepsis. We audited the first 60 referrals with the following outcome measures: length of inpatient stay pre-treatment, time from referral to treatment, stone clearance rate, tolerability, subsequent interventions and complications. RESULTS: 45 of 60 patients (75%) were seen within 24 h of referral and 43 (72%) had an inpatient stay of less than 24 h before treatment. 5 patients had passed their stones spontaneously. Mean stone size was 8 mm with 44 patients (73%) having stones in the upper/mid ureter. 80% of patients were rendered stone free with eESWL alone, 53% after 1 treatment and 20% after 2. Emergency ESWL was well tolerated in all patients with discomfort levels similar to elective patients. 9 patients (16%) required subsequent intervention after treatment. 54 of 55 patients treated were discharged home directly. CONCLUSION: Outpatient emergency ESWL can be delivered promptly and safely with excellent clearance rates. It has the potential to minimize hospital stay and the need to stent patients with ureteric colic.

1600–1700
Service Delivery Scientific Session III

1600 Dose measures for the obese patient: how standard is standard man?

Shemilt, A.·Kotre, J.
Regional Medical Physics Department, Newcastle General Hospital, UK

PURPOSE: Dosimetry for diagnostic radiology is reviewed in the light of the increasing obesity of the patient population. MATERIALS/METHODS: Heights and weights of a large population of radiology patients were analysed and compared with ICRP Standard Man. It is clear that the large majority of real patients are more obese than Standard Man, and the relevance of dose measures based on Standard Man may be becoming less relevant. An alternative view on calculating Effective Dose is suggested which may go some way to solving this problem. RESULTS: Results show that the estimation of Effective Dose in obese patients can be improved and brought more into line with Monte Carlo results studying the same problem. CONCLUSION: The patient population is changing rapidly to become more obese than Standard Man. We should optimize accordingly.

1610 Breast screening histories: variation with time and impact on 10 year survival

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PURPOSE: To allocate a screening status to every primary breast cancer diagnosed in the West Midlands between 1989 and 2005. This will enable variations in screening status categories to be examined and relative survival rates to be calculated for each category. METHODS: Every primary breast cancer diagnosed in the West Midlands since screening began until 31 March 2005, was assigned a screening status based on the woman's screening history. Eligible cases were identified from the West Midlands Cancer Intelligence Unit's cancer registration database. Screen-detected tumours were identified through regional breast screening units; remaining tumours were then allocated to one of eight screening status categories (*Journal of Medical Screening* 2005;12:179–84). 10 year relative survival was calculated for the five main categories. RESULTS: 21 778 breast cancers were classified. The number of screen-detected cancers, interval cancers and cancers in lapsed attenders increased over time, whereas the number of cancers diagnosed before invitation and in non-attenders decreased. Interval cancer rates were lower for the 25–36 month period from screen to diagnosis compared with 0–24 months. Screening Status; Proportion; 10 year relative survival rate; Screen-detected; 46%, 92.25%; Interval, 28%, 75.65%; Diagnosed Before Invitation, 11%, 68.81%; Non-attender, 10%, 68.31%; Lapsed attender, 4%, 72.15%. CONCLUSION: As expected, women with screen-detected breast cancer have by far the best survival rates. Women with interval cancers had survival rates above those of non-attenders, highlighting the benefits of screening. This information is a valuable resource when evaluating the effectiveness of the breast screening programme in the West Midlands.

1620 Our innovative duty radiologist system – an assessment of impact of change in work practice

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PURPOSE: Financial constraints within the UK National Health Service (NHS) demand maximum efficiency by reduction in in-patient bed days. Imaging is deemed as a "bottle-neck" hindering speedy patient discharge. Our unique duty radiologist system was commenced just over a year ago where a named radiologist, besides dealing with consultations and queries, also undertakes and reports all inpatient scan requests received during the session. We present an assessment of the impact of this change in work practice from the point of view of both the users and the providers of the imaging service. MATERIALS/METHODS: Two separate detailed questionnaires for the two groups were devised and disseminated. Both groups were asked to compare the new work practice with the old one highlighting advantages and disadvantages. Radiology staff, in addition, were asked specific questions related to job satisfaction, work load and stress. Both groups were asked if they wished to revert back to the old system of work. RESULTS: Nearly all clinicians (96%) declared the new system better. Increased stress and work load reported by the radiology staff (booking clerks, secretaries, radiographers and radiologists), but they felt the new system to be worthwhile. Nobody expressed a desire to revert back to the old system. CONCLUSION: Our unique innovative model of duty radiologist works well and has led to improved inpatient care with reduction in inpatient bed days.

1630 Nurses screening in theatre? Whatever next?

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PURPOSE: Amounts of trauma and elective work undertaken in theatres has increased dramatically over the past 5 years. Since 2002 our workload has increased by 32% and lists have been extended. However, the number of radiographers available to undertake screening for these lists has remained static. This has on occasion delayed patients already in theatre and led to the re-scheduling of operations. The actual screening time a radiographer undertakes is often low, however they spend a lot of time setting up and waiting around. As theatre staff are already changed and available they are able to undertake short bursts of screening in between other tasks. Our aim was to train theatre nurses to undertake a range of screening procedures on specific Image Intensifiers within the theatre setting to allow more flexibility of lists. MATERIALS/METHODS: 9 Orthopaedic sisters/charge nurses were trained to carry out specific screening procedures under the guidance of senior radiographers. Staff undertook theoretical training and an exam before moving on to the practical aspect of the training. Trust board approval was gained and the training was overseen by medical physics. RESULTS: So far 3 nurses have reached the required standard. This has enabled lists to continue through busy lunch times and after normal working hours. Orthopaedic emergencies can be easily accommodated and extra patients can be added at short notice. CONCLUSION: Theatre nurses are capable of acquiring the skills to perform a specific range of screening procedures within the theatre setting.

1640 Can non-medical staff report accurately in nuclear medicine?

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PURPOSE: In light of increasing service pressure in Nuclear Medicine it is not always possible for a radiologist to be available to report scans immediately. The aim of this research was to determine the level of accuracy achieved by radiographers and technologists reporting nuclear medicine examinations following appropriate training, in order to establish whether these practitioners could usefully contribute to service enhancement. MATERIALS/METHODS: Initially a senior 1 radiographer with 12 years experience in nuclear medicine and a consultant radiologist with 15 years nuclear medicine reporting experience independently reported 500 examinations including bone, V/Q and renal studies. The radiographer had previously completed an accredited course in "clinical nuclear medicine double reporting". All reports were compared and categorised. This second stage now aims to compare the reporting outcomes of radiographers, technologists and radiologists from across the UK. RESULTS: Following the initial study the radiologist/radiographer agreement rates with no perceivable detriment to patient management were 98.5%. CONCLUSION: Following the initial study it was concluded that it was feasible to train radiographers to provide accurate reports provided they work within their own limitations of knowledge. The work in progress will investigate whether this level of agreement is reflected nationally. It will also investigate the agreement rate between radiologists, radiographers and technologists nationally.

1650 Improving the modelling of medical imaging data for simulation

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PURPOSE: To use patient imaging as the basis for developing virtual environments (VE). BACKGROUND: Interventional radiology basic skills are still taught in an apprenticeship in patients, though these could be learnt in high fidelity simulations using VE. Ideally, imaging data sets for simulation of image-guided procedures would alter dynamically in response to deformation forces such as respiration and needle insertion. We describe a methodology for deriving such dynamic volume rendering from patient imaging data. MATERIALS/METHODS: With patient consent, selected, routine imaging (computed tomography, magnetic resonance, ultrasound) of straightforward and complex anatomy and pathology was anonymised and uploaded to a repository at Bangor University. Computer scientists used interactive segmentation processes to label target anatomy for creation of a surface (triangular) and volume (tetrahedral) mesh. Computer modelling techniques used a mass spring algorithm to map tissue deformations such as needle insertion and intrinsic motion (e.g. respiration). These methods, in conjunction with a haptic device, provide output forces in real time to mimic the "feel" of a procedure. Feedback from trainees and practitioners was obtained during preliminary demonstrations. RESULTS: Data sets were derived from 6 patients and converted into deformable VEs. Preliminary content validation studies of a framework developed for training on liver biopsy procedures, demonstrated favourable observations that are leading to further revisions, including implementation of an immersive VE. CONCLUSION: It is possible to develop dynamic volume renderings from static patient data sets and these are likely to form the basis of future simulations for IR training of procedural interventions.

Notes

Scientific Poster Exhibition

Breast Poster

p101

The possibility of 3W (whatever required, whenever, wherever) mammographic interpretation training

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PURPOSE: All UK breast screeners (radiologists and advanced practitioners) annually undertake a self-assessment scheme which identifies the mammographic features which an individual has difficulty with. From this, further training can then be targeted. Ideally, such training would be tailored to the specific needs of the individual (what they require) and on-demand ("whenever" and "wherever" an individual decides to undertake it). To this end mobile technology could be employed and these studies investigated possible factors affecting the feasibility of a PDA for delivering particular aspects of such training. MATERIALS/METHODS: 20 experienced radiologists examined single MLO breast images displayed on a PDA and indicated whether an abnormality was present, specifying its location, as well as comment on the use of a PDA as a training tool. Furthermore, ongoing research is currently investigating the performance of different user groups in making screening judgments using a PDA which displays a single view mammographic image, as well as further elaborating whether the limits of such PDA usage lies in the challenging small PDA display size or within the limits imposed by the display's pixel resolution. RESULTS: Over 70% of the experienced radiologists identified 5 out of 7 abnormal cases correctly. Eye tracking studies of how individuals examined such images elucidated the need for appropriate image interaction and manipulation techniques. CONCLUSION: The study indicates the promising potential implementation of PDAs in mammogram interpretation. However, suitable HCI techniques need to be employed appropriately so as to enable a PDA based on-demand training resource for breast screening interpretation.

p102

Breast lesions incidentally discovered at CT – a pictorial review of findings

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The breast is imaged on all thoracic CT and is therefore reported by radiologists with a variety of specialist interests. We will demonstrate a variety of cases that have presented as incidental findings at CT during our clinical practice, highlighting classical CT features as well as commonly encountered pitfalls. We will correlate the CT appearances with breast ultrasound and mammography. Particular cases demonstrate the significance of breast calcification and also the CT features suggestive of both malignant and benign breast lesions. Examples of false positive reporting due to normal asymmetry of glandular breasts, and accessory axillary tissue will also be demonstrated.

p103

The breast on multidetector computed tomography of the thorax – another review area

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PURPOSE: To determine the outcome of breast masses detected on multidetector computed tomography (MDCT) of the thorax. MATERIALS/METHODS: All breast masses detected on MDCT of the thorax were referred for further assessment in a one stop breast clinic, if no previous data was available to indicate their nature. We performed a retrospective review of all such cases which presented between August 2003 and September 2007 to determine their clinical outcome. RESULTS: A total of 17 female patients were identified. Average patient age was 66 years (range 48–92 years). The most common finding that prompted referral was a single breast mass, identified in 12 of the 17 cases (71%). One patient had multiple breast masses. In 4 patients (24%), isolated axillary lymphadenopathy was the only CT feature that triggered concern. Histology confirmed malignant breast disease in 9 patients (53%) and benign disease in 5 (29%). The malignant cases were invasive ductal carcinoma (5 of 9, 56%), invasive lobular carcinoma (2 of 9, 22%), DCIS (1 of 9, 11%) and diffuse large cell lymphoma (1 of 9, 11%). Three patients did not undergo histological evaluation:one had a normal clinical examination and did not need further investigation, while another had a simple breast cyst which was aspirated. The third patient had a normal triple assessment and was discharged. CONCLUSION: 53% of breast masses detected on MDCT were malignant. The breast is therefore an important review area when reporting MDCT of the thorax. All patients with breast masses detected on MDCT must be referred for prompt evaluation.

p104

Metastatic breast cancer: current incidence and patterns

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PURPOSE: To determine the incidence and characteristics of metastatic breast cancer in a screened population. MATERIALS/METHODS: Retrospective analysis of a 3-year period (Nov 2004 to Dec 2007) to identify all women with evidence of newly developed breast cancer metastases. The pattern of spread and latent period from diagnosis was determined. This was correlated with original histopathological findings and Nottingham Prognostic Index (NPI). Incidence of metastatic breast cancer was then calculated from local demographics. RESULTS: Newly developed metastases were identified in 30 women. Bone metastases were most common (n=14), closely followed by liver deposits (n=12). Deposits to more than one organ were uncommon. The primary tumours were predominantly grade 2 or 3. A large proportion of tumours were surprisingly small with 12 measuring between 10 mm and 29 mm. Furthermore, lymph-node positivity was also found in only 50%. However, a combination of adverse factors was common, the mean NPI measuring 5.3 and 9 out of 30 cases showing an NPI above 6. There was a considerable variation in the latent phase before the development of metastases, 8 had metastases at presentation while in 2 cases this period exceeded 14 years. The local incidence of metastatic breast cancer was estimated at 7.7/100 000 women. CONCLUSION: Bone and liver remain the most common sites for metastatic breast cancer. A combination of adverse factors prevail in these patients rather any specific feature. The latent phase before developing metastasis may be many years particularly in those with relatively good prognostic tumours.

p105

Indeterminate B3 lesions: can radiology predict the outcome and final pathology?

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PURPOSE: To review diagnostic work-up of indeterminate breast lesions which are increasingly causing difficulty in clinical management decisions. MATERIALS/METHODS: Indeterminate, probably benign, breast lesions are classified histopathologically as B3. With improved image guided sampling techniques, the impact upon final clinical outcome and management of these results has been increasingly recognized. B3 outcome data has been prospectively collected for personal audit over a 5 year period from a regional NHS screening and symptomatic population. A database was developed which includes anonymised demographics, detailed radiological findings, biopsy techniques, and

pre and post operative pathology. Full diagnostic review of all cases has been undertaken. RESULTS: Between 2000 and 2005 145 cases were identified. 95 from the NHSBSP with an average screening round of 2.43 (1–6) and mean age of 59 years (49–76 years). 50 from the symptomatic population, mean age of 57 years (33–86 years). Imaging findings were specified as calcifications, mass, distortion or density. Sampling techniques included ultrasound guided 14G (62), upright and prone 14G (2) and prone 11G (80) biopsy. Despite a preoperative B3 classification 16 cancers (9 NHSBSP, 7 symptomatic) were identified postoperatively, 14 of these were associated with histological atypia preoperatively. CONCLUSION: Management of diagnostically indeterminate breast lesions remains a problem both locally and nationally; accurate local prospective data collection and audit, in conjunction with national guidelines, is recommended.

p106

Are marker coils routinely required for breast carcinoma patients undergoing neoadjuvant chemotherapy?

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OBJECTIVE: To review the usefulness of routine insertion of tumour marker coils in breast carcinoma patients prior to commencing neo-adjuvant chemotherapy. BACKGROUND: Some breast carcinoma patients undergoing neo-adjuvant chemotherapy respond so well to chemotherapy that the tumour becomes unidentifiable for subsequent breast conserving surgery. So marker coils are inserted into tumours prior to chemotherapy to localize the tumour bed at surgery. MATERIALS AND METHODS: We retrospectively reviewed the clinical outcomes of 23 consecutive breast carcinoma patients who had tumour marker coils inserted between April 2003 and March 2007. RESULTS: 14 patients (61%) did not respond to chemotherapy and did not have breast conserving surgery. In 7 patients (30%) who responded well to chemotherapy and underwent breast conserving surgery, tumour bed would not have been identified without a marker coil. In 2 patients (9%) who also responded to chemotherapy and underwent breast conserving surgery, the initial tumour had intrinsic calcium which was still visible post chemotherapy acting as a reliable marker for the tumour bed. CONCLUSION: Significant number of patients in our group did not respond to chemotherapy and hence marker coil was not useful in their management. We propose that marker coils should only be inserted in patients who show initial good response to chemotherapy. Furthermore, in tumours with radiologically visible calcium, routine use of coils can be avoided.

p107

A retrospective study evaluating the incidence and assessment of radial scars of the breast in a NHSBSP unit

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PURPOSE: Radial scar lesions of the breast are oftern difficult to distinguish from carcinoma and require surgical excision. This study aims to: determin the incidence of these lesions within the screened population and by radiographic and pathological correlation identify any contributory factors which may influence managment. MATERIALS/METHODS: A review of 121 RSL. Cases had previously undergone radiographic and histological examination and had been excised. Cases were divided into two groups; Group, confirmed at biopsy and again at excision and Group 2, confirmed at biopsy but associated with additional disease at excision. Each case was reviewed and reported against a pre-designed proforma. RESULTS: RSL represented 38% of the benign biopsies with an incidence of 0.06 per 1000 women screened. 53% were diagnosed at the prevalent screen in the 49–52 years age group. The majority visible in both radiographic views and were assigned R3 score. 39% showed the classical mammographic features. Multi variant analysis between groups indicated no significance radiologically. 14 gauge, core biopsy, retrieving an average of 5 samples, diagnosed RSL in the majority of cases. Atypia was seen in 19/67 reviewed cases. CONCLUSION: SCNB accurately targeted to the periphery of mammographic lesions suspicious of RSL may accurately diagnose, if sufficient samples are taken. In the absence of atypia follow up VACB may be an alternative to surgery in these cases, however prospective audit is initially advised to evaluate additional SCNB sampling techniques. UCNB should not be considered as an accurate method of biopsy for lesions radiologically suspicious of being RSL.

p108

Simply the breast: radiographer led injections for sentinel lymph node scans

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KEY LEARNING OBJECTIVE: Since the introduction of the NEWSTART programme which was developed as part of the breast cancer screening programme, the demand for sentinel node imaging increased greatly. However, there proved to be a lack of available radiologist cover for injections. More junior members of the breast care team were expected to undertake this role with little experience and were found to have minimal radiation protection knowledge. This resulted in a need to improve the service which was achieved by training of senior radiographers in sentinel node injections. The aim of this project was to provide patients with a more improved standard of care whilst adhering closer to radiation protection practices. DESCRIPTION: The superintendent radiographer was trained by an experienced radiologist to perform subcutaneous injections into the affected breast. A training program was agreed and completed enabling further training of staff. CONCLUSION: Three senior radiographers have successfully been trained to a high standard in sentinel node injections. The training took place over a 3 month period and each radiographer completed 15 supervised and 5 unsupervised injections. The quality and success of the injections were reviewed by the radiologist and the consultant breast surgeon. This project allowed experienced members of staff to develop their working practices resulting in more input into service provision. The overall efficiency of the service was markedly improved permitting better management of workload also enabling radiation protection practices to be enhanced, hence providing patients with a more holistic experience and standard of care.

Breast Electronic Poster

e109

Imaging of the lactating breast

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KEY LEARNING OBJECTIVES: To illustrate the normal radiological appearances of the lactating breast using a variety of imaging modalities. To present the radiological features of a range of pathological conditions affecting the lactating breast. To discuss the special considerations involved in imaging the lactating patient. DESCRIPTION: Lactating women may present with symptomatic breast disease both related and unrelated to lactation. However, imaging evaluation is made more complex by the effect that normal physiological changes related to lactation have on the radiological appearances of the breast, and on the sensitivity of various imaging modalities. The radiologist plays a central role in the diagnosis and management of symptomatic lactating women, and must therefore be familiar with both the normal appearances of the lactating breast, and the common conditions encountered during lactation. We illustrate the normal appearances of the lactating breast, highlighting the underlying physiological changes. We then discuss a range of conditions affecting the lactating patient, and illustrate these using a variety of imaging techniques. Special considerations involved in imaging of the lactating patient are also emphasised. CONCLUSION: We review the imaging appearances of the normal and the abnormal lactating breast, and highlight the special considerations involved in imaging the lactating patient.

e110

The breast – a further "review area" on computed tomography

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KEY LEARNING OBJECTIVES: The purpose of this exhibit is to establish the breasts and axillae as another "review area" during routine CT reporting. The reader should gain experience of the appearances of normal breast tissue on CT and the detection of masses as separate from this. The features suggestive of malignancy in such masses will also be discussed and illustrated. DESCRIPTION: The breasts may be overlooked during routine CT reporting. Systematic examination of this area when reporting a CT of the chest provides an opportunity to detect clinically occult breast masses. Further evaluation of these masses can then be performed with ultrasound and mammography, with biopsy where appropriate. The detection of malignancy at a subclinical stage has been proven (in mammographic screening studies) to improve outcome. Pictorial examples of the spectrum of appearances of normal glandular breast tissue on CT will be provided. Multiple examples of cases of proven breast cancer will demonstrate the detection of masses within and separate from the normal breast disc. Features concerning for malignancy will be illustrated; namely irregular lesion shape, spiculate margins and contrast enhancement. CONCLUSION: Review of this exhibit should enable the detection of masses in the breast on CT and provide some tools for the classification of the lesion as possibly malignant. Further imaging and biopsy will, however, always be required to confirm the diagnosis.

e111

A pictorial review of chloromas

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KEY LEARNING OBJECTIVES: (1) To illustrate the range of sites affected by this condition; (2) To describe the protean imaging manifestations of this tumour; (3) To review the literature on chloromas. DESCRIPTION: Chloromas, also called granulocytic sarcomas, are rare extramedullary tumours of myeloid origin, which have been described in association with relapse of AML, CML and other leukaemias. They can occur anywhere but commonly described sites include the breast, lymph nodes, the female genital tract, orbit, CNS, musculoskeletal, the oral cavity and small intestine. The radiological appearances are varied and mimic many other, commoner conditions. We review 6 cases of chloromas and describe the imaging characteristics by means of a pictorial review. We will provide pathophysiological correlation with histology samples. CONCLUSION: The imaging characteristics are varied and the main obstacle to accurate diagnosis is awareness. In the clinical context of relapsed myeloid malignancy, chloromas may present as mass lesions that have the appearance of commoner conditions, however, they must be considered in the differential.

Chest Poster

p201

Patterns of acute pulmonary embolic disease on computerized tomograpic pulmonary angiography (CTPA)

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PURPOSE: To evaluate the patterns of pulmonary embolic disease in patients undergoing CTPA for suspected acute PE. MATERIALS/METHODS: 815 CTPA were performed in 751 patients between 1 January 2006 and 31 December 2006. Patient demographics and CTPA results were collected from the institutional radiology information system. The main site of the disease was decided by the most proximal part of the pulmonary arterial system affected. RESULTS: Acute PE was demonstrated in 152 studies (18.7%). Gender distribution was almost equal. Nearly half the patients were over 70 years. The mortality rate was 5.6% and did not differ much, irrespective of whether or not patients had PE (5.3% *vs* 5.7%). The disease was bilateral/ central in 54% and unilateral in 41%. In 20% of the cases, there was central disease (i.e. embolus in the main or both of the branch pulmonary arteries). A saddle embolus was seen in 5 cases. Lobar distribution seen in 46% of the cases. Segmental and sub-segmental distributions were each seen in 14% cases. 15 cases had signs of right ventricular (RV) strain on the CT study, 7 of which were in patients with extensive multifocal bilateral disease and the other 8 in patients with central disease. Infarction of the relevant pulmonary segment/lobe was seen in 6 cases. CONCLUSION: 18.7% of patients undergoing CTPA had an acute PE. It was central/bilateral in over half and lobar in just under half the cases. 10% patients had signs of RV strain and associated pulmonary infarction was seen in 4% cases.

p202

Pulmonary neoplastic lesions masked by cardiac pacemaker devices on chest radiographs

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We report 3 patients with neoplastic pulmonary masses, two had a permanent pacemaker (PPM) and one an implantable cardiac defibrillator (ICD). The masses were partly hidden behind the cardiac devices on their chest radiographs. Case 1, aged 67 years, with coronart artery disease (CAD) and a PPM for complete heart block had bronchoscopic biopsies confirming a squamous cell lung cancer. Case 2, aged 77 years, with an ICD for recurrent VF, was unfit for bronchoscopy due to severe COPD. His chest CT and PET suggested stage 1 lung cancer. Case 3, aged 76 years, with a PPM, presented with extensive axillary, mediastinal, right hilar and intra-abdominal adenopathy. He declined invasive investigations and a diagnosis of lymphoma was presumed. The first two patients were treated with radical radiotherapy to the lung tumour after moving the cardiac device to the contralateral subclavicular area. Review of these patients' chest radiographs taken in the preceding 2 years did reveal soft tissue densities, albeit smaller in size, virtually hidden behind their cardiac devices. These were missed at the time leading to a missed opportunity for early diagnosis. These cases highlight that a small area of lung field is obscured by the cardiac device in any chest radiograph taken after its implantation. We suggest that a second radiograph with the arm elevated on the side of the device should be taken in these patients. This manoeuvre helps lift the device off the lung field. These cases also raise concern whether the implanted cardiac devices could act as oncotactic stimuli.

p203

Chest radiography in tuberculosis screening: experience from a recent UK primary school outbreak

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PURPOSE: To assess the role of the chest radiograph (CXR) within the current NICE guidelines for TB screening (2006), based on the findings from a recent tuberculosis outbreak in an UK primary school population. MATERIALS/METHODS: CXRs from 136 children were reported independently by a Consultant Paediatrician and a Consultant Radiologist. These were grouped into normal and abnormal (suspicious for TB) reports. These groups were then further subdivided according to the final clinical diagnoses of: Active TB, Latent TB and No TB, as established by the clinical teams after consideration of clinical, epidemiological, radiological and laboratory findings, including the new immunological blood test (T-Spot®) to complement conventional skin tests. RESULTS: Normal CXRs were reported by both radiologists and the paediatrician in 114/136 patients. Of these, 28 were treated for latent TB. All 7 patients reported as abnormal by both received treatment for active TB. There was discordance in the reports in 15/136 patients. In 7 patients the paediatrician issued a normal and the radiologist an abnormal report. Of these, 3 were classified as active, 3 as latent and 1 as no TB. In 8 patients the radiologist issued a normal and the paediatrician an abnormal report, 1 of these

patients was treated for active TB, 4 for latent TB and 3 had no TB. CONCLUSION: CXR reports do affect patient management in TB outbreaks, but the abnormalities can be subtle. We discuss the effect of the CXR reports on the final management, together with suggested protocols in future outbreaks.

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Radiological manifestations of bronchopulmonary aspergillosis

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KEY LEARNING OBJECTIVES: The fungus Aspergillus Fumigatus is responsible for a wide spectrum of pulmonary manifestations. Diagnosis is often based on a combination of clinical, laboratory, and radiographic findings. The purpose of this exhibit is to review the imaging manifestations of bronchopulmonary aspergillosis on chest X-rays and CT. DESCRIPTION: We reviewed the CXR films and the CT scans of 53 patients in our database, who were diagnosed with bronchopulmonary aspergillosis over a period of 3 years and we present the spectrum of manifestations of pumonary aspergillosis. This can be divided into three entities: allergic bronchopulmonary aspergillosis (ABPA), intracavitatry aspergilloma and invasive pulmonary aspergillosis. ABPA is the most common manifestation present in 46% of our patients followed by intracavitatry aspergilloma in 35%. Invasive apergillosis can be further divided into angioinvasive disease present in 4% of patients,and acute and chronic airway invasive aspergillosis present in 10% and 5%, respectively. 20% of the patients had an overlap between these entities, in 15% both ABPA and aspergillomas co-existed and 5% had both invasive aspergillosis and aspergillomas. ABPA is most common in patients with asthma (91%). Invasive aspergillosis and aspergillomas are most common in immuncompromised patients. Aspergillomas are also an important entity in the elderly and co-exist with tuberculous infection (74%) and bronchiectasis (76%). CONCLUSION: Bronchopulmonary aspergillosis can present in a variety of entities. This exhibit increases the awareness of these entities and their imaging appearances to enable a prompt diagnosis and appropriate antifungal therapy to be commenced.

p205

Lemierre's syndrome – the comeback?

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KEY LEARNING OBJECTIVES: To identify the presenting features and instigate prompt, appropriate management, thus reducing the risk of complications as well as the length of hospital admission. DESCRIPTION: This is a pictorial review of three patients who presented, over a short space of time, with Lemierre's syndrome. This is a rare condition, starting out as an acute oropharyngeal infection, usually caused by the commensal organism *Fusobacterium necrophorum*, a Gram negative, anaerobic rod. Thrombophlebitis, often of the internal jugular vein, rapidly follows which may lead to widespread complications such as septic pulmonary emboli, deranged liver function, gastrointestinal and neurological disturbances and joint involvement. CONCLUSION: Since the original description of the syndrome, particularly with the introduction of antibiotics, it is thought that the typical disease course has changed. Jaundice and septic arthritis were previously well documented. However, this review demonstrates how the main presenting features differ from the early description and illustrates the radiological findings. The associated pathophysiology and treatment is also discussed.

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Pulmonary alveolar microlithiasis high-resolution computed tomography findings

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PURPOSE: To present the high-resolution CT findings of pulmonary alveolar microlithiasis. MATERIALS/METHODS: The HRCT scans of 10 adult patients were collected from differente diagnostic centres from Brazil. Seven female and three male patients,mean age of 38.7 years, were retrospectively analysed. The films were reviewed independently by two radiologists. RESULTS: The most common tomographic findings were ground glass attenuation and linear subpleural calcifications, which were seen in 90% of the patients. Other frequent findings were small parenchymal nodules, calcification along the interlobular septa, nodular cissures, subpleural nodules, subpleural cysts, dense consolidations, and crazy paving pattern. CONCLUSION: the diagnosis of pulmonary alveolar microlithiasis is accurately suggested by the HRCT, avoiding the lung biopsy in most of the cases.

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High resolution computed tomography findings in pulmonary talcosis

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PURPOSE: to present the high resolution computed tomography (HRCT) findings of patients with pulmonary talcosis due to a variety of causes accompanied by an educational text. MATERIALS/METHODS: the HRCT findings of six patients with talcosis collected from different diagnostic centres in Brazil are presented. RESULTS: The patients developed talcosis secondary to a variety of causes including inhalation of pure talc, associated with silica, asbestos particles or due to embolisation of macerated pills of amphetamine injected by intravenous drug users. The most common HRCT finding was the presence of bilateral dense conglomerate pulmonary masses. The high density is thought due to the presence of talc. Emphysema, parenchymal bands, thickened interlobular septa and pleural thickening were also common findings. Small pulmonary nodules and areas of ground-glass attenuation were less frequent. CONCLUSION: Pulmonary talcosis is a rare cause of interstitial lung disease. We present the key findings on HRCT.

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Variation In emphysema index measurement in 64 multidetector-row computed tomography

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PURPOSE: To retrospectively assess the minimum increase in emphysema index (EI) required for detection of real increased extent of emphysema with 95% confidence by using multidetector row CT in real setting. METHODS: We review 951 CTs of the patients with diagnosis of lung cancer. 100 multidetector row CT (240 mAs, 64 detector rows, 0.75 mm section thickness) from 50 patients that had underwent repeat multidetector row CT with the same scanner after 2 months because of an pulmonary nodule were included. Extent of emphysema was considered to remain stable in this short period. Extent of low-attenuation areas representing emphysema was computed for repeat and baseline scans as percentage of lung volume below two attenuation threshold values (-970 HU -950 HU). The measure was realised in the contralateral lung of the lesion. RESULTS: Limits of agreement for differences in emphysema index between repeat and baseline scans were 0% to +1.86% at -970 HU, -0 to +1.92% at -950 HU. The correlation between CT1 and CT2 was r^2=0,93 (p<0,0001). Scanner calibration could be excluded as a factor contributing to variation in EI. The mean of variation in total lung volume was 6.2% (SD= -5.7%). CONCLUSION: Increase in ES required to detect increased extent of smoking-related emphysema with 95% probability varies between 1.04% of total lung volume at -950 HU and 0.68% at -970 HU for 64 multidetector row CT, in a real setting.

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Thoracic neuroendocrine tumours – spectrum of cross-sectional and scintigraphic appearances

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KEY LEARNING OBJECTIVES: To describe the spectrum of neuroendocrine tumours which can involve the thorax. To illustrate the cross sectional and scintigraphic appearances of these lesions. To highlight potential diagnostic pitfalls. DESCRIPTION: Neuroendocrine tumours of the thorax include carcinoid tumours of the lung and thymus, small cell lung cancer, large cell neuroendocrine tumour, paraganglioma and metastases. These lesions have a broad spectrum of clinicoradiological features ranging from indolent low grade tumours to aggressive malignancies with a poor prognosis. Small cell lung cancer is the most aggressive of these tumours and has the most specific imaging features: mediastinal or hilar lymphadenopathy. Carcinoid tumours are typically spherical with a well defined slightly lobulated border. The other entities may be non-specific, however integration of the cross-sectional and scintigraphic imaging features are invaluable in their diagnosis. We illustrate our experience in using Octreotide, Gallium and Fluorine-18 FDG-PET in the assessment of these pathologies. CONCLUSION: Neuroendocrine tumours of the thorax have a wide range of imaging appearances. This review describes a contemporary imaging approach thus helping expedite their diagnosis and directing appropriate patient management.

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Should patients with acute deep venous thrombosis have a routine chest radiograph?

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PURPOSE: Patients presenting with acute deep venous thrombosis (DVT) have a routine chest radiograph at this district general hospital. The two main reasons sited for this practice are the identification of pulmonary embolus and the association of DVT with cancer. However, the clinical evidence for this is unclear. This retrospective study challenges the view that a routine chest radiograph is a useful diagnostic tool in the management of patients with DVT. MATERIALS/METHODS: The Patient Archive and Communication System was used to search for patients who had ultrasound proven DVT in the last 5 years, who had also received a chest radiograph at the time of DVT diagnosis. Patients with known malignancy were excluded. Variables collected for each patient included age, presenting symptoms, ultrasound findings, findings on chest radiograph, date of any previous chest radiographs and findings of any further relevant radiological investigations. RESULTS: A total of 345 patients fulfilled the criteria for inclusion. Their mean age was 61 years. Two of these patients had lung carcinoma and six had pulmonary embolism, giving a diagnostic yield of 0.6% for malignancy and 1.7% for pulmonary embolism. Among these eight patients, seven had extensive above knee DVT. In over 96% of these patients, chest radiographs did not alter their clinical management. CONCLUSION: Chest radiographs in patients with DVT have a very low diagnostic rate for pulmonary embolism and carcinoma and they do not alter management in the vast majority.

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Cancer staging CT protocol for detecting unsuspected pulmonary emboli

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INTRODUCTION: With cancer a significant risk factor for thrombo-embolic disease and pulmonary embolism (PE) not infrequently diagnosed on cancer staging thoracic scans, we assessed our own incidence rates. If non-pulmonary arteriogram CT (non-CTPA) chest scans remain equivocal for PE, additional scans or clinical uncertainty results so technique optimization was considered. METHODS: Retrospective analysis of 6 months of non-CTPA thoracic scans was done, recording pulmonary trunk and main pulmonary artery attenuation values. Confidence of PE diagnosis was measured on a simple scale of no PE, equivocal or positive. Dedicated CTPA scans (with bolus tracking) and their confidence levels over the same period formed a baseline comparison. RESULTS: 9 of the 80 cancer scans identified had (possible) PE: 5 were equivocal, all of these having pulmonary artery attenuation values <189 HU (Figure 1). 4 definitely positive scans had pulmonary artery HU values of >221 HU (Figure 2). 218 CTPA scans were done in the same period, 1 equivocal study and all with arterial HU values >251. CONCLUSION: To optimize arterial enhancement sufficient to confidently diagnose or exclude PE, bolus tracking as the primary technique change needs considering for all non-CTPA chest CT scans in cancer patients.

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Referral patterns and "hit" rates for computerized tomographic pulmonary angiography in suspected acute pulmonary embolism

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PURPOSE: We evaluated the referral patterns and "hit" rates for computerized tomographic pulmonary angiography (CTPA) for suspected acute pulmonary embolism (PE) across different specialities. MATERIALS/METHODS: 815 CTPA performed in 751 patients for suspected acute PE between 01 January 2006 and 31 December 2006 were identified. Patient demographics and other details were collected from the institutional radiology information system and the results server. RESULTS: An acute PE was demonstrated in 152 studies (18.7%). The gender distribution was almost equal. Just under half of the patients were over 70 years in age. The total mortality rate was 5.6% and did not differ much, irrespective of whether or not patients had PE (5.3% *vs* 5.7%). Geriatric, respiratory and emergency medicine departments were responsible for 20%, 19.5% and 12.7% of the referrals, respectively. These three were among the five departments

with the highest hit rates 21.3%, 22% and 18.3%. The other two being Orthopaedics (23.5%) and General Medicine (18.8%). Nine individual firms were identified as having the highest hit rates and they had 58 positive studies from 215 referrals (27%). These firms included four in respiratory medicine, two geriatric medicine and one each in general medicine, cardiology and emergency medicine. CONCLUSION: Just under a fifth of the patients had an acute PE. The specialities with more referrals including geriatric and respiratory medicine, had higher "hit" rates. Orthopaedics was an exception to this rule. Within specialities, there were widespread variations in "hit" rates. This study provides us with useful insight into variations in the practices of CTPA referral patterns.

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Should the CTPA aquisition protocol depend on patient age? An audit in a teaching hospital

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PURPOSE: The current CTPA protocol at New Royal Infirmary Edinburgh (NRIE) uses a low volume (50 ml) of intravenous contrast and is independent of patient age. Anecdotally it was felt that the rate of poor quality scans that either needed repeating or were of limited diagnostic quality was relatively high. The purpose of this study was to audit subjectively and objectively the rate of poor quality examinations and to see if this was age related. MATERIALS/METHODS: All patients undergoing CTPA examination for suspected PE over a 5 week period at NRIE were included. RESULTS: Of the 104 patients included, 11 (11%) were found to have suboptimal scans of which two were repeated. Patients were split into two groups with an age cut off at 40 years. The younger group showed a significantly higher rate of poor quality scans (38% compared with 7%). Average attenuation values of the pulmonary arterial tree were measured for all patients and on average were 100 HU less in the younger age group. CONCLUSION: This audit suggests that there is considerable difference with the quality of CTPAs based upon age with a cut off of 40 years. One aquisition protocol therefore appears not to be appropriate for all. An alteration in the scanning protocol for patients under 40 years followed by a re-audit is underway.

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Fractal dimensions of nonsmall cell lung cancer on CT predicts FDG-PET stage and uptake

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PURPOSE: Fractal dimension (FD) can be used to quantify the complexity within an image. This study investigates whether the FD of non-small cell lung cancer (NSCLC) on CT predicts tumour stage and uptake on fluorodeoxyglucose positron emission tomography (FDG-PET). METHOD: 2 mm thick CT images of primary tumour were obtained from PET-CT studies of 56 patients with NSCLC. The FD within a tumour region was determined using a box counting algorithm and compared with the nodal (N), metastatic (M) and overall stage determined from PET. FD was also correlated with the maximal (FDG_{max}) and average (FDG_{avg}) tumour uptake of FDG. RESULTS: There was a significant correlation between tumour FD and overall stage (Spearman Rank Correlation: r=0.5831, p≤0.0001). FD values were significantly higher in N+ (2.09 *vs* 2.00, p_N =0.0139) and M+ (2.12 *vs* 2. 06, p_M =0.0194). FD also correlated significantly with FDG_{avg} and FDG_{max} (r=0.3732, 0.4294 &, p≤0.005, <0.001, respectively). CONCLUSION: Higher FD in CT images of NSCLC is associated with advanced stage and greater FDG uptake on PET. Measurements of tumour FD on conventional CT examinations could potentially be used as a prognostic marker and/or to select patients for PET.

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Efficacy of ultrasound guided lymph node biopsy in the diagnosis of tuberculosis

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PURPOSE: With the rising incidence of tuberculosis in the UK, early diagnosis is imperative in facilitating prompt treatment and early contact screening. Our study looks at the efficacy of percutaneous ultrasound guided core biopsy and fine needle aspiration (FNA) of clinically enlarged peripheral lymph nodes in the diagnosis of tuberculosis. METHODS: The results of the ultrasound guided FNA and core biopsy samples of 29 patients over a 3-year period with a final diagnosis of tuberculosis were retrospectively reviewed. RESULTS: A laboratory diagnosis of tuberculosis was made in 23 of the 29 patients following either lymph node FNA only, core biopsy only or FNA plus core combined. Where FNA alone was performed (n=7), a diagnosis of TB was made on 3/7, all of which had subsequent positive cultures. For patients who had core biopsy alone (n=8) a diagnosis was made on 5/8, of which only 2 had subsequent positive cultures. Patients who had core plus FNA (n=14) a diagnosis of TB was made on 14/14 where the core was diagnostic in 14/14 and the FNA was diagnostic on 2/14. 4/13 of these patients had subsequent positive cultures. CONCLUSION: Percutaneous ultrasound guided biopsy of peripherally enlarged lymph nodes is highly effective in the diagnosis of tuberculosis. It is essential to perform core biopsy in addition to FNA to improve the accuracy. Although, the majority of the diagnoses are from histology rather than the microbiology examinations of the samples, FNA specimens proved to be better at yielding positive culture results.

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Trans-oesophageal endoscopic ultrasound guided fine needle aspiration in malignant mediastinal lymphadenopathy

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PURPOSE: Trans-oesophageal endoscopic ultrasound-guided fine needle aspiration (EUS-FNA) is increasingly used for the investigation of mediastinal lymph nodes suspected of spread from thoracic neoplasms and occasionally from elsewhere. We prospectively evaluated the role of this investigation in diagnosis and staging of the cancers. MATERIALS/METHODS: All the patients undergoing trans-oesophageal EUS-FNA of mediastinal lymph nodes for suspected cancerous involvement during 2001–2006 in our institute were included in this study. The EUS-FNA results are compared with the final results obtained by the analysis of operative specimens or clinical follow-up. RESULTS: A total of 90 patients were investigated with trans-oesophageal EUS-FNA during this period. The primary site was oesophagus (n=36), lung (n=15), bronchus (n=9) and others (n=30). The cytology smear was scanty in 1 patient and the cytology result is inconclusive in 6 patients. Of the 83 definite yields; 61 were true positives, 21 were true negatives and one was false negative. The sensitivity, specificity, positive predictive value and negative predictive value were 99%, 100%, 100% and 96%, respectively. The procedure was well tolerated and no untoward incidents were reported. CONCLUSION: Trans-oesophageal EUS-FNA is a safe and valuable investigation with high yield rate in malignant mediastinal lymphadenopathy.

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EUS-FNA: an essential component in the staging algorithm of non-small cell lung cancer

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PURPOSE: To assess the accuracy of transoesophageal endoscopic ultrasound guided fine needle aspiration (EUS-FNA) of mediastinal lymph nodes in patients with non-small cell lung cancer (NSCLC). MATERIALS/METHODS: Patients with suspicious N2 mediastinal

lymph nodes detected on CT or CT-PET underwent EUS-FNA using conscious sedation as an outpatient procedure. A 22G needle was passed through an Olympus curved linear array echoendoscope (GF-UCT240, KeyMed, Southend UK) and the sample sent for cytological analysis. The results were correlated with the patients' outcome, including pathology obtained at surgery where appropriate. RESULTS: 20 patients with known or suspected NSCLC underwent EUS-FNA between March 2006 and November 2007. 3 patients had CT guided percutaneous lung biopsy prior to EUS-FNA; 1 patient had pneumothorax that required immediate chest drain insertion. 2 of the 3 lung biopsies had insufficient samples for diagnosis. There were no procedure related EUS-FNA complications. 18 EUS-FNAs were positive on cytology. 1 patient had no malignant cells detected and surgical resection confirmed the findings. 1 FNA had insufficient sample for analysis, but follow up CT showed improvement of the lymphadenopathy. Our result showed 100% sensitivity at 95% confidence interval. CONCLUSION: EUS-FNA cytology is highly accurate in the evaluation of suspicious mediastinal lymph nodes and should be used as the primary diagnostic and staging tool in patients who have a suspicious lung lesion and mediastinal lymphadenopathy accessible with EUS. It is a safe and minimally invasive procedure. Its use in the staging algorithm should replace percutaneous lung biopsy in such cases.

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Incidental solitary pulmonary nodules on CT: an audit of their management

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PURPOSE: Lung nodules are detected very commonly on CT. Indiscriminate follow-up with serial CT for at least 2 years, is expensive and has substantial radiation exposure attached. In 2005, the Fleischner Society proposed new guidelines for the follow up and management of small pulmonary nodules detected on CT. We audited to what extent these recommendations are being followed in our trust. MATERIALS/METHODS: The radiology information system was searched for cases of solitary pulmonary nodules during 2006. Patients with a known cancer were excluded. The reports were assessed for nodule size, comparisons with old scans where available, risk assessment, and what further action was suggested. The electronic patient record was searched for results of follow-up CT or further investigations such as PET or biopsy. RESULTS: 63 patients met the inclusion criteria. Nodule size was documented in 73% of cases, with old scans used for comparison where available for 61.1%. A risk assessment was made in 21%. The Fleischner recommendations were followed in 46%. However, 46% of patients received no follow-up when it was indicated. 45.5% of those for whom PET or histology was indicated received it. 3 patients (4.8%) had lung cancer, which was diagnosed between 1 month and 8 months after the nodule was first seen on CT. CONCLUSION: Current compliance with the Fleischner guidelines is poor. Increased awareness of the guidelines by both radiologists and physicians is needed. The prevalence of cancer detected is similar to the screening trials.

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Radiological findings of postoperative complications in lung transplantation: a pictorial essay

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With the increasing number and improved survival of lung transplant recipients, radiologists should be aware of the imaging features of lung transplants and the associated complications. The recognition and early treatment of complications is important for long-term survival of lung transplant recipients. The radiologist frequently plays a central role in investigation. We demonstrate radiological appearance of pulmonary complications that are represented for Reperfusion oedema, Acute rejection, Infection, Bronchial dehiscence, pulmonary tromboembolism, Chronic rejection/bronchiolitis obliterans syndrome, Cryptogenic Organing pneumonia, Post-transplant lymphoproliferative disorder and Bronchial stenosis.

Chest Electronic Poster

e220

An analysis of completeness of portable chest radiographs in a cardiothoracic surgical intensive care unit

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PURPOSE: To analyse portable chest radiographs (PCR) for their completeness in including all the peripheral areas in the film. There are no set guidelines for completeness of PCRs. Hence the films were assessed by three different experts who commonly look at these films. MATERIALS/METHODS: 109 consecutive PCRs from a cardiothoracic intensive care unit, during a 1 month period were analysed. Analysis was done independently by an anaesthetist/intensivist, a senior radiographer and by a radiologist with experience in cardiothoracic surgery. PACS (picture archiving and communications system) workstations were used for analysis. Inclusion of six zones (both apices, bases and lateral sides) of the chest radiograph was identified as marker of completeness. RESULTS: There were subjective variations amongst the three experts in interpreting a PCR as incomplete. Apices were the most commonly missed areas (5–13%), followed by the bases (2–6%). Out of 109 PCRs, 21, 13 and 15 were labelled as incomplete by the intensivist, radiographer and radiologist, respectively. Incidence of missed zones per film was 1.5 to 2. CONCLUSION: Significant number of PCRs are incomplete. Quality control is difficult in absence of set guidelines. Clear guidelines are required for quality assessment of PCRs. Clinical impact is difficult to assess due to subjective variation in their interpretation. Reasons for incompleteness and suggestions for improvement are discussed.

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Positive trends in diagnosis of malignant pleural mesothelioma : a 6 year experience in Leicestershire

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PURPOSE: To ascertain whether diagnosis of malignant pleural mesothelioma (MPM) is becoming quicker. To determine the trend in the median survival time and possible influential factors. To review the shifting trends in the mode and number of interventions for diagnosis. MATERIALS/METHODS: 101 patients were diagnosed with MPM from 2001 to 2006. The radiology information system and MDT database were used to obtain the method and date of diagnosis and death, trigger X-ray details, coding and occupational history. RESULTS: The number of patients diagnosed in 2001 were 11 increasing to 22 in 2006. The average time of diagnosis (in months) fell from 8 in 2002 to 1.7 in 2006. 91% had pleural effusion. The median survival (in days) rose from 80 in 2001 to 300 in 2006. History of exposure documentation increased from 12% in the first 3 years and 37% in the last 3 years. The coding on the trigger X-ray rose from 9% in 2001 to 40% in 2006. The number of needling procedures in 2001 were 1.5, 1.3 in 2002 and 1.1 in 2006 with CT guided biopsy being the most common and most sensitive. CONCLUSION: In our study the time to diagnosis and increase in median survival is likely multifactorial with raised awareness of unexplained pleural effusion, better occupational history documentation and increased coding for specialist referral. The number of needling procedures for diagnosis

has marginally dropped in the last 6 years. Thoracoscopy service introduced in 2006 is likely to improve this further.

e222

16 slice multislice CT chest improves diagnostic accuracy of bronchiectasis compared with conventional HRCT chest

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PURPOSE: To determine whether there was superior diagnostic accuracy for the detection and exclusion of bronchiectasis using a 16 slice CT chest volume scan (1 mm) compared with conventional HRCT chest (1 mm slice at 10 mm intervals). MATERIALS/METHODS: A prospective study was carried out in patients that were referred by a chest physician for CT chest for investigation of bronchiectasis. The CT scans were all performed using the 16 slice CT scanner and conventional HRCT images prepared. Both scans were dual read. The CT scans were scored using 6 lobes counting lingula as a separate lobe: Grade 0 = nil, 1 = Tubular, 2 = Varicose, 3 = Cystic bronchiectasis and 1 added if central bronchiectasis. RESULTS: There were 53 patients. Their median age was 62 years (51.5–71.5 years). There were 14 males and 39 females. 10 of 53 scans had no bronchiectasis in either 10 mm or 1 mm scans. 36 patients had bronchiectasis diagnosed using both protocols. Two patients had tubular bronchiectasis on the 10 mm scans which was not confirmed on the 1 mm scans. 5 patients had confirmed tubular bronchiectasis on the 1 mm cuts which was not identified on the 10 mm cuts. The median CT scores were higher in the 1 mm 5 (2–10.5) compared with the 10 mm cuts 4 (2–7.5), $p = 0.002$. Bronchiectasis was identified in forty extra lobes on the 1 mm versus the 10 mm scans. Diagnosis of bronchiectasis was made with more certainty on the 1 mm scans. CONCLUSION: Bronchiectasis was diagnosed more extensively and with greater diagnostic certainty using volume CT compared with conventional HRCT.

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An unprecedented outbreak of Q fever pneumonia in Gloucestershire in 2007: radiographic features and lessons learnt

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PURPOSE: To analyse and classify the chest radiographic features of Q fever pneumonia in 29 consecutive cases serologically confirmed in the Cheltenham area, UK, occurring between April and June 2007. The three major series in radiological literature collected cases over periods of up to 20 years. We felt the astonishing number of clustered cases gave an opportunity for more accurate analysis. METHODS: 26 Q fever cases in Cheltenham over a 3-month period. The features on the chest radiographs of the 26 undergoing X-ray in the outbreak were reviewed. The presence and position of consolidation, interstitial shadowing, adenopathy and effusions were documented. RESULTS: 27% of radiographs showed no active lung lesion. Consolidation tended to be unilateral (9 patients showing predominantly right-sided lesion, 8 patients left-sided). Only one showed extensive bilateral consolidation. Only one effusion was recognized. In contrast to previous studies, no round pneumonia was seen. The average time to complete resolution was 53.7 days (substantially longer than standard community-acquired pneumonia). CONCLUSION: Q fever remains a very unusual diagnosis in the UK, with only 50 cases reported annually. This outbreak gave an unusual opportunity to study the features of Q fever. The infection may come from a single animal reservoir. The results suggest that the radiographic features, as suggested previously, are relatively non-specific but that, like legionella pneumonia, the changes are very slow to clear. Thus the mainstay of diagnosis remains serological testing.

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Little and large. Pictorial review of round atelectasis

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KEY LEARNING OBJECTIVES: To describe the CT imaging characteristics of round atelectasis as they evolve over time. PRINCIPAL DESCRIPTION: Round atelectasis is a benign inflammatory process which usually presents in a sub-pleural location as a round or oval mass. One of the well known associations is comet tail sign, which represents an incurving of adjacent vessels and bronchi. We aim to present a pictorial review using CT and in some cases PET imaging, with detailed descriptions of smaller and larger lesions. CONCLUSION: An accurate description of round atelectasis is imperative in view of its common association with asbestos exposure, and the consequent legal implications. This is also important in ruling out lung cancer as a differential diagnosis. PET can assist in differentiating benign from malignant lesions but it is not always specific. At our institution we have found a case of round atelectasis which was PET positive.

e225

Spot the clot. Diagnosing pulmonary emboli in poorly opacified pulmonary arteries

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PURPOSE: A pictorial review of pulmonary emboli diagnosed despite poor contrast enhancement of the pulmonary arteries. DESCRIPTION: A recent audit at our hospital of 161 CTPAs found 14 indeterminate scans (8.7%) in which a sub-segmental pulmonary embolus was not excluded. All these scans had poor contrast enhancement, but 79% of these indeterminate scans were also obscured by movement and noise artefact, and extensive consolidation. Overall 23% of CTPAs showed poor proximal contrast enhancement, but over half of these scans were diagnostic as there was adequate peripheral enhancement. Therefore poor proximal enhancement alone does not prevent diagnosis of pulmonary emboli, and it is the sole cause of an indeterminate CTPA in the minority of cases. This audit found 5 cases of pulmonary emboli diagnosed despite poor proximal enhancement, and a pictorial review of these images is presented. CONCLUSION: Pulmonary emboli can be seen in the segmental arteries despite poor contrast enhancement. The clinical significance of sub-segmental emboli is unknown and will be reviewed next year in a follow up study of the patients in this audit.

e226

Modified Miller score versus right heart strain as prognostic factors in acute pulmonary embolism

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PURPOSE: Pulmonary embolism is a common, potentially life threatening disease. Although CTPA remains an established method of confirming the diagnosis there has been considerable recent interest in also using CTPA for PE risk stratification. This could be assessed according to thrombus load, using the modified Miller score, or using signs of acute right-sided heart strain, such RV dilatation or increased RV:LV ratio. Accurate stratification potentially enables clinicians to select therapy appropriately. METHOD: We reviewed all positive CTPA diagnoses of PE over a 4 month period at a large district general hospital, evaluating modified Miller scores, RV sizes and RV:LV ratios. These were then correlated with treatments and outcomes from patient records. RESULTS: 36 of 151 CTPA scans performed had confirmed PE; 2 were discrepantly reported by the authors. 18 of 34 had modified Miller thrombus load of >9, 16 scored ≤9. Of the 16 with high thrombus scores only 5 patients needed ITU support and/or tPA therapy but all these 5 had dilated RV and an increased RV: LV ratio; 3 of the 5 died of PE despite treatment. Of the 16 with low thrombus load, none had signs of RV strain although 1 died of PE and 3 died from other causes. CONCLUSION: CTPA signs of RV strain correlate better with outcomes than thrombus load using our measurement methods. All-cause mortality was high but most of these patients had pre-existing malignancy which is a known risk factor for PE.

e227

Breast dose and the ALARA principle when considering CT pulmonary angiography and ventilation–perfusion scans

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PURPOSE: The ALARA principle requires dose to the patient to be considered in addition to the diagnostic value of a test. The breast dose of a V/Q scan is lower than a CTPA examination and women under 50 years are at higher lifetime risk of radiation induced cancer. This study aims to evaluate the proportion of women undergoing CTPA examination, at a London teaching hospital, for whom a V/Q scan would be diagnostic with a lower breast dose. MATERIALS/METHODS: Reports of CTPA scans performed over 2006 were examined for demographic data and diagnostic outcome. Imaging of women under 50 years was reviewed to determine the proportion who were eligible for a V/Q scan, i.e. no prior V/Q scan, abnormal CXR, immune suppression or referral from ITU. RESULTS: During the year 451 CTPA examinations were performed of which 18% were positive. The subgroup of women <50 years accounted for 15% of referrals, 9% of these studies were positive yet 53% were eligible for a V/Q scan as an alternative diagnostic procedure. CONCLUSION: Approximately half the women under 50 years being investigated for PE could have been diagnosed with a lower radiation dose. The relative benefits and risks of CTPA and V/Q are discussed with reference to this particular referral group.

e228

CT pulmonary angiography: brightness matters

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PURPOSE: To audit the technical factors affecting the timing of CT Pulmonary angiogram (CTPA) acquisition, and the resultant effects on pulmonary artery opacification. MATERIALS/METHODS: Pulmonary artery opacification in 100 CTPAs was retrospectively analysed. Comparisons were made of opacification at various levels when using two different scanners (4 or 64 slice). In addition on the 64 slice scanner the screensave was used to analyse the placement of the region of interest (ROI), and measure the enhancement within the ROI in Hounsfield Units (HU) at scan trigger. RESULTS: 25% of scans had an incorrectly placed ROI. Scans were triggered at vastly different HU, with around 20% being triggered at <100 HU. Opacification of the pulmonary arterial system ranged from 50–486 HU. The average opacification of the main pulmonary trunk was 306 HU in the correctly performed scans on the 64 slice scanner, 215 HU on incorrectly performed scans, and 285 HU on the 4 slice scanner. CONCLUSION: A significant proportion of CTPAs were inadequately performed resulting in suboptimal pulmonary arterial enhancement, with associated difficulty in interpretation. This study highlights the need to audit the standard of images acquired in even relatively common investigations. Following this audit radiographers were trained in the placement of the ROI and bolus tracking software was introduced. A re-audit is planned.

e229

CT lung volume measurement for lobar living donor lung transplantation

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OBJECTIVE: To describe the use of CT volume quantification assessment of candidates for lobar living donor lung transplantation (LLDLT). METHODS: Six paediatric candidates for LDLLT and their donors were investigated with helical chest CT, as part of the pre-operative assessment. The CT images were analysed as per routine and additional post-processing with CT volume quantification was performed to assess volume matching between the lower lobes of the donors and respective lungs of the receptors. CT images were segmented by density and region of interest, using post processing software. Differences <33% arbitrarily defined compatibility. RESULTS: Compatible volumes were found in three cases. The other three cases were considered incompatible. All three recipents with compatible sizes survived the procedure and are alive and well. One patient with incompatible size was submitted to the procedure and died due to complications attributed to the incompatible volumes. One patient with incompatible size has subsequently grown and new measurements are to be taken to check the current volumes. Different donors are being sought for the remaining patient whose lung volumes were considered too big for the prospective transplant donor lobes. CONCLUSION: CT volume quantification is an easy to perform, non invasive technique that uses CT images for the pre-assessment of candidates for LDLLT, to compare the volume of the lower lobes from the donors with volume of each lung in the prospective recipients.

e230

Is co-axial CT-guided thoracic biopsy more effective than CT-guided FNA and/or cutting needle?

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PURPOSE: To determine whether using a co-axial system was safer and more effective than fine needle aspiration and/or cutting needle in CT-guided thoracic biopsy. MATERIALS/METHODS: A retrospective review of all lung biopsies carried out in our department using the co-axial technique was carried out for a 12 month period. A total of 29 cases were performed with a 19/20G co-axial system. Data was only available for 25 cases. Information was gathered regarding successful diagnostic yield and complication rates. The previous method used in our department has been FNA and/or cutting needle biopsy under CT guidance. A previous audit examining the effectiveness of this technique revealed a satisfactory diagnostic yield of 70.5% and a pneumothorax rate of 34.1%. The results of both audits was then compared with determine whether a change in practice should be made. RESULTS: Of the co-axial sample group, 24 (96%) cases resulted in a diagnostic histological yield. 7 (28%) cases developed a pneumothorax of which only one required a chest drain. This data showed a marked improvement in the diagnostic yield with a co-axial system. In addition there was a statistically significant ($p<0.05$) reduction in pneumothorax rate although this was still higher than national average figure of 20% as indicated by the British Thoracic Society. CONCLUSION: This study has shown that the co-axial core needle biopsy is safer and more effective compared with FNA and/or cutting needle sampling. The results of our audits have been comparable to published data and have changed the practices in this department.

Cardiac Poster

p301

Review of implanted cardiac electrophysiological devices and plain film appearances

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KEY LEARNING OBJECTIVES: Implantable electrophysiological cardiac devices are developing constantly as technology progresses. New variants and combinations of devices such as pacemakers, defibrillators and resynchronizators are emerging, and we are now regularly seeing these on plain films for assessment. DESCRIPTION: We present an educational poster series of different plain film

appearances of implantable cardiac devices. We demonstrate the radiological features for identifying the devices, and an appproach to assessing their correct placement. We also show common complications of their implantation. CONCLUSION: As a tertiary cardiac referral centre, we have observe chest radiographs of many common, and some less common implantable devices. We feel that it is important that radiologists are familar with these increasingly common plain film findings.

p302

Imaging characteristics of common cyanotic congenital heart diseases

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Over the past few years cardiac imaging has generally been deemed as a cardiologist's domain. Congenital heart disease is often referred to cardiologists due to its apparent complexity. However, with the wide spread availability of MRI facilities at the DGH level, familiarity with the imaging features of cardiac anomalies is a useful additional skill which could be put to good use by the radiologist. We discuss the imaging characteristics of common cyanotic congenital heart diseases.

p303

"Heart size normal". Can the same thing be said at CT?

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PURPOSE: PA chest radiography is widely used to predict cardiac size, a cardiothoracic ratio (CTR) of 0.5 or less being a good indicator of "normal" heart size. The significance of CTR at CT is, however, less established, with no previous large comparison study. CT has the advantage of not being influenced by projection, magnification or paracardial structures, though the patient is supine rather than erect. This led us to compare CTR from CT and CXR, to assess correlation between the modalities. METHODS: The cardiothoracic ratio was measured, using a standardized technique, on 95 consecutive patients (age range 20–94 years, mean age 55.4 years, M:F 1.3:1), who had a good quality PA CXR and a contrast enhanced CT (CECT) scan of the thorax. The CXR was performed within 48 h of the CT. The measurements and cardiothoracic ratios were then compared. RESULTS: Of those patients with "normal heart size" at CXR, 92% (59/64) had a CTR of <0.5 at CECT. Conversely, of those patients with "normal heart size" at CT, 87% (59/68) had a CTR <0.5 at CXR. CONCLUSION: Using PA chest radiography as the gold standard, there is a 92% concordance between CT and CXR for predicting a normal heart size. The factors effecting these CTR measurements will be presented.

p304

A new classification for coronary artery anomalies demonstrated with 64 MDCT coronary angiography

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KEY LEARNING POINTS: To illustrate the complexity of coronary anatomy in congenital heart disease with 5 consecutive cases of transposition of the great arteries (TGA) and congenitally corrected TGA (ccTGA). To discuss the classifications for describing coronary anatomy in TGA. To propose a unifying method for describing coronary anatomy in complex congenital heart disease and normal anatomy. DESCRIPTION: Introduction. Morphology of TGA and ccTGA. 64-MDCT technical data. Normal coronary anatomy and nomenclature. Yacoub and Leiden classifications in TGA. Sample cases and illustrations. Limitations of current classifications. Proposed unifying method of coronary artery classification for complex congenital heart disease and normal anatomy alike. SUMMARY: The major teaching points are: To understand coronary artery variants and nomenclature in TGA and ccTGA; To introduce classifications of coronary arteries in TGA commonly used by pediatric and adult congenital cardiac clinicians; To propose a coronary artery classification for patients with other complex congenital heart disease for whom there is no current classification. To identify and correctly describe coronary anatomy in patients with complex congenital heart disease.

p305

Multiphase cardiac CTA technology in hypertropic cardiomyopathy

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Multiphase computerized tomographic angiography and novel software applications may now automatically recognize endocardial and epicardial contours. This allows for "bull's eye" displays of wall thickness and wall motion. These new representations immediately highlight the increased wall thickness and decreased wall movement associated with hypertropic cardiomyopathy. This poster highlights that important functional data can be acquired with cardiac CT with the appropriate acquisition and software. Furthermore, novel software applications allow for intuitive representations to be instantanously demostrated.

p306

Cardiac magnetic resonance imaging in hypertrophic cardiomyopathy

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KEY LEARNING OBJECTIVES: We examine the increasing role of cardiac MRI (CMR) in the diagnosis of hypertrophic cardiomyopathy (HCM) with an emphasis on the radiological appearances. DESCRIPTION: HCM is a myocardial disease characterized by asymmetric left ventricular wall thickening in the absence of dilatation. The clinical presentation varies from an asymptomatic clinical finding to sudden cardiac death. Most patients have a genetic predisposition and non-invasive cardiac imaging is crucial for diagnosis and the detection of those patients at highest risk. Risk stratification can be aided by the identification of areas of myocardial fibrosis showing hyperenhancement on delayed CMR imaging. We demonstrate the ability of CMR to reveal the presence and location of hypertrophic myocardium and other typical static and dynamic features. We illustrate mitral valve abnormalities, left ventricular outflow tract obstruction, abnormal contraction patterns of the affected myocardium and areas of delayed hyperenhancement. CONCLUSION: CMR is a powerful imaging tool, providing accurate reproducible information which is important in determining the diagnosis, management and prognosis of HCM.

p307

Fatty cardiac lesions identified using computerized tomography and cardiac magnetic resonance imaging

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KEY LEARNING OBJECTIVES: The purpose of this poster is to demonstrate the capability of cross-sectional imaging and particularly MRI to identify and characterize cardiac lesions that have a predominantly fatty constitution. MRI is an excellent imaging modality in identifying these lesions because of its advanced tissue characterizing capabilities. In cardiac MRI, this involves double inversion recovery black blood T_1 and T_2 weighted images and fat suppression techniques. The assessment with CT makes use of the typical low attenuation appearances of fat. Both CT and MRI are now able to provide detailed 3D anatomical delineation of the heart and this can make interpretation of cardiac pathology more comprehensive.

DESCRIPTION: This poster demonstrates the appearances of intracardiac lipoma, lipomatous hypertrophy of the interatrial septum, the fatty infiltration in the RV free wall seen in arrhythmogenic right ventricular cardiomyopathy and fatty replacement of myocardial infarction. Both CT and MR images are presented but with an emphasis on the MR sequences used to analyse fatty lesions. CONCLUSION: In conclusion, cardiac cross sectional imaging techniques can readily identify fatty cardiac lesions and the characteristic appearances usually enable a confident diagnosis.

p308

Extra cardiac findings on localizers in cardiac magnetic resonance imaging

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PURPOSE: To assess routine localizers in cardiac MR (CMR) through the chest to detect extra-cardiac findings. MATERIALS/METHODS: 221 patients who underwent CMR on a 1.5 T magnet system (Siemens Avanto) between March and December 2006 were retrospectively reviewed. All patient examinations included a multiple breath-hold, axial ECG-gated HASTE sequence (8 mm thick contiguous slices, 4 breath-holds) from great vessels to the inferior cardiac border. Cases were reviewed by a single cardiothoracic radiologist. Findings were categorised as significant (requiring further investigation or management) or insignificant. Simple liver, renal cysts and hiatus hernias were not included. Follow up of reported extra-cardiac findings was performed using the Radiology Information System. RESULTS: 34 extra cardiac findings were identified in 221 studies (16%): 12 diffuse pulmonary parenchymal abnormalities (5.4%), 11 pulmonary nodules/focal infiltrate (5%), 7 pleural effusions (3%), 1 focal pleural lesion (0.5%), 1 liver neoplasm (0.5%) 1 pulmonary arteriovenous malformation (AVM) (0.5%), 1 liver cirrhosis (0.5%), 1 anterior mediastinal mass (0.5%), 1 mediastinal adenopathy (0.5%), 1 pneumothorax (0.5%), and 1 aberrant right subclavian (0.5%). Some patients demonstrated more than 1 finding. On follow-up, 2 patients (1%) had malignancy (1 lung, 1 liver). 6 patients had significant findings which required follow-up (3 confirmed pulmonary nodules, 1 thymoma, 1 AVM, 1 adenopathy – 3%). 3 patients are deceased. CONCLUSION: Significant unknown extra-cardiac findings requiring further investigation of a change in management were observed in 4%. This is in keeping with extra-cardiac findings in cardiac CT.

p309

Coil embolisation of fistulae between the coronary artery and pulmonary artery

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KEY LEARNING OBJECTIVES: Symptomatic patients found to have a coronary artery to pulmonary artery fistula on coronary angiogram can be effectively treated with microcoil embolisation. DESCRIPTION: Several patients have presented to the cardiologists with symptoms of shortness of breath and/or chest pain and subsequently been found to have coronary artery to pulmonary artery fistula on coronary angiogram. Patients underwent further evaluation with echocardiography and myocardial perfusion studies to rule out other underlying causes of their symptoms. All patients were treated with Trufill microcoils (Cordis, Belgium) via a standard femoral vein approach and were found to be asymptomatic on clinical follow up. The treatment was performed jointly by the interventional radiologists and cardiologists. CONCLUSION: Coronary artery to pulmonary artery fistulae are a rare cause of shortness of breath/chest pain presenting to the cardiologists. Microcoil embolisation is an effective means of treating this condition by interventionlal radiologists or cardiologists.

p310

Effects of nonionic iodinated contrast media on heart rate: comparison of Iomeprol-400 and Iodixanol-320

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PURPOSE: To compare heart rate (HR) changes in patients undergoing liver multidetector CT (MDCT) with either iomeprol (400 mgI ml^{-1}, 726 mOsm kg^{-1}) or iodixanol (320 mgI ml^{-1}, 290 mOsm kg^{-1}). MATERIALS/METHODS: 183 patients undergoing biphasic MDCT of the liver were randomized to receive equi-iodine (40 gI) iomeprol-400 or iodixanol-320 IV at 4 ml s^{-1}. HR (bpm) was measured before and for 5 min after contrast medium (CM) administration. Mean and peak increases in HR were compared in the 2 populations by ANCOVA analysis using baseline HR as the covariate. The proportion of subjects in each group with increases in HR (>5-<10; 10-<15, 15-<20, >20 bpm) was compared using a chi square test. RESULTS: 91 subjects received iomeprol-400 while 92 received iodixanol-320. The 2 groups were comparable with regard to sex, age, weight, height, presence of hypertension, use of concomitant medications, and mean baseline HR. Following contrast administration, HR increased slightly in both groups: the mean change from baseline to postdose peak HR was 7.5±11.8 bpm after iomeprol-400 and 5.0±8.7 bpm after iodixanol-320 ($p=0.12$). Postdose peak HR ranged from 55–164 in the iomeprol group and 54–126 in the iodixanol group. None of the patients experienced a postdose HR increase >40 bpm. The proportion of subjects in each group with increases of <5, 5 to <10, 10 to <15, 15 to <20, or >20 bpm was comparable ($p=0.65$). CONCLUSION: The effects of iomeprol-400 and iodixanol-320 on HR were similar in patients undergoing MDCT liver imaging: patients experienced slight and comparable postdose increases in HR.

Cardiac Electronic Poster

e311

Making the most of the MDCT coronary angiography (MDCTA) dataset for comprehensive cardiac assessment

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LEARNING OBJECTIVES: (1) Discuss normal cardiac and coronary anatomy. (2) Demonstrate additional anatomical and functional cardiac data available from MDCTCA studies. (3) Familiarize the radiologist with common cardiac abnormalities. (4) Illustrate clinically significant abnormalities. (5) Show how non-angiographic data enables a more accurate interpretation of equivocal coronary stenoses. DESCRIPTION: 64-slice MDCTCA is well established for the assessment of coronary artery disease. It is important for the radiologist to be aware of the additional anatomical and functional information that can be derived from the coronary angiography dataset. This may, in turn, allow a more complete cardiac examination at no additional radiation burden. We review image acquisition and post processing techniques to illustrate how to maximize additional cardiac information derived from a single MDCTCA examination. We describe examples of coronary, intracardiac and great vessel pathology, abnormalities of cardiac function, myocardial pathology (including regional wall motion abnormality and lack of systolic wall thickening), valvular and pericardial disease. These cases will be presented as side-by-side comparisons of pathology and the equivalent normal anatomy and physiology. CONCLUSION: This exhibit will provide the radiologist with a comprehensive overview of the common cardiac abnormalities that can be identified on MDCTCA and which may add value when reporting CT coronary angiography.

e312

Comprehensive cardiopulmonary assessment in pulmonary arterial hypertension with MDCT – a pictorial review

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LEARNING OBJECTIVES: (1) Discuss normal cardiac and pulmonary anatomy. (2) Demonstrate pulmonary and cardiac data available from MDCT studies. (3) Familiarize the radiologist with common pulmonary vascular, parenchymal and cardiac abnormalities seen in PAH. (4) Enable the radiologist to recognize clinically significant abnormalities that allow diagnosis of both PAH aetiology and the cardio-pulmonary consequences of PAH. DESCRIPTION: CTPA is used routinely in patients with PAH to assess both lung parenchyma and the pulmonary arteries. Combining CTPA with a cardiac CT protocol allows a full cardiopulmonary assessment of PAH. We review image acquisition and post processing techniques that allow the maximum cardiopulmonary information to be derived from a single MDCT examination. We describe examples of pulmonary, intracardiac and great vessel pathology that may lead to PAH. We also describe and illustrate abnormalities of lung parenchyma, pulmonary arteries and cardiac anatomy and function that may result from raised pulmonary arterial pressures. These examples utilize axial and reformatted MDCT images and examples of clinically relevant pathology are paired with images of the equivalent normal anatomy and function to allow easy comparison. CONCLUSION: This will provide the radiologist with a comprehensive overview of common cardio-pulmonary abnormalities that can be identified on MDCT and may add value when reporting clinical studies.

e313

The role of ECG gated multidetector CT in preoperative and postoperative evaluation of orthotopic cardiac transplant patients

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PURPOSE: To depict the role of ECG gated multidetector CT in preoperative and postoperative evaluation of orthotopic cardiac transplant patients. MATERIALS/METHOD: Five consecutive patients prior to, or following orthotopic cardiac transplant were subjected to ECG gated MDCT study to assist in preoperative planning or detection of postoperative complications. The studies were performed with a 64-slice scanner (0.33 s rotation time, 32 × 0.6 mm detector collimation coupled with double z sampling). Whenever the heart rate was > 65 beats min^{-1}, beta blockers were administered. The MDCT findings were correlated with additional imaging studies, surgical and pathological findings, and clinical outcome. RESULTS: Three patients were evaluated prior to heart transplantation and two patients were evaluated 5 months and 4 years following heart transplantation. Three were males and two females with an average age of 48 years. The average heart rate was 79 bpm. MDCT correctly diagnosed complex congenital anomalies in two patients associated with significant findings such as hypertrophied coronary vessels and calcified left atrial mass. In one patient a large pseudoaneurysm of the left ventricle was identified. The two post transplantation patients showed major complications including a pseudoaneurysm of the ascending aorta and a surgically retained foreign body associated with osteomyelitis of the sternum. CONCLUSION: ECG gated cardiac MDCT is a valuable noninvasive tool in preoperative planning especially in patients with prior cardiac surgery and in complex congenital anomalies. It is also useful in postoperative assessment of complications like large vessels pathology, coronary artery vasculopathy, thoracic infections and retained surgical materials.

e314

Cardiothoracic applications of real-time MRI

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PURPOSE: Conventional cardiac MRI cine acquisitions represent the motion of the heart averaged over several heartbeats. Although this is the accepted method for the assessment of ventricular function, there are cases where it is important to visualize cardiac motion in real time. Real time imaging also has important applications in non-cardiac MRI. MATERIALS/METHODS: We present a series of clinical cases using real-time MR techniques for imaging the heart and thorax. RESULTS: A real-time triggered multislice technique is a valuable alternative to conventional cine acquisitions to assess ventricular function in patients with severe dysrhythmia and those unable to breath-hold. Small field-of-view real-time imaging (using radial k-space filling) is vital in the diagnosis of constrictive pericarditis to demonstrate abnormal interventricular septal motion during deep respiration. Valvular masses can exhibit aperiodic motion and suffer from image blurring in conventional cine imaging. Real-time imaging can demonstrate motion abnormalities and the structure of these masses more clearly. The effect of abnormal structures such as vascular rings in the oesophagus can be determined using real-time sequences as the patient swallows. Diaphragmatic motion characteristics can be determined in patients with possible phrenic nerve palsy or with tumours close to the diaphragm. CONCLUSION: Real-time imaging can be used to assess ventricular function in dysrhythmic patients and those unable to hold their breath. It is vital in the diagnosis of constrictive pericarditis and useful for the imaging of valvular disease and assessing the dynamics of swallowing and diaphragmatic motion.

e315

Cardiac calcification: what the radiologist needs to know

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KEY LEARNING OBJECTIVES: Cardiac calcification is not uncommon. Whilst it is often relatively benign, this is not always the case. We aim to illustrate the causes of cardiac calcification, emphasising those lesions which are "leave alone" from those which need intervention. DESCRIPTION: By considering the anatomical area affected, it is easier to work out a differential diagnosis for the cause of calcification in each case, and any further investigations necessary. This will be illustrated with examples from our institution. We will demonstrate the different causes of myocardial calcification, as well as differentiating it from pericardial and valvular aetiologies. Arterial calcification will also be included. We will also consider calcification not directly involving the heart itself, such as in thrombus and tumours. Emphasis will be placed on conditions requiring urgent clinical follow up. CONCLUSION: Cardiac calcification can indicate serious pathology requiring immediate clinical input. The cause can be difficult to work out for a general radiologist with limited experience of cardiac CT and MRI. This presentation will aid radiologists to discriminate worrying causes from more benign entities.

Vascular/Interventional Poster

p401

Safety of arch aortography for assessing carotid arteries in stroke disease

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PURPOSE: To investigate the procedural and stroke risks associated with catheter arch aortography in the overview imaging of carotid arteries prior to intervention (stenting or endarterectomy). MATERIALS/METHODS: We performed a retrospective review of all the non-selective arch aortograms undertaken for assessment of carotid stenosis at the Freeman hospital from 2003 to 2007. This involved review of medical, nursing and operative notes, follow-up clinic letters and radiology information services. Our adverse event rate (groin complications, contrast nephrotoxicity and anaphylaxis, transient ischaemic attack, stroke, death and cardiac events) have been

analysed and compared with literature-derived figures. RESULTS: A total of 235 patients underwent arch aortograms for stroke disease during the 4 year period. No documented stroke or deaths occurred. Total complications were 15/235 (6.4%). Major complications occurred in 2 patients (0.85%); one had an acute white leg due to inadvertent compression of an underlying graft, and the other had troponin positive cardiac event. The rest were minor complications, a large majority included groin complications and transient angina attacks, which did not extend the patient's hospital stay. CONCLUSION: In our experience, arch aortography is associated with a much lower complication rate than is commonly described for selective carotid angiography. There still remains a small but serious risk of contrast related and access site complications.

p402

New applications of intravascular contrast agents in MR angiography

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PURPOSE: Gadofosveset trisodium (Vasovist) is the first intravascular contrast agent approved for use with MR angiography (MRA) within the European Union. The purpose of this retrospective review is to illustrate new applications of MRA using this agent. MATERIALS/METHODS: Standard 3D spoiled gradient echo angiographic sequences of the arterial and venous systems were obtained following intravenous infusion of 10 ml of gadofosveset trisodium with subtraction in 16 patients referred for clinical assessment of arteriovenous disease. Scans were performed on Siemens Avanto 1.5 T with TIM surface coil arrays. RESULTS: The superior T_1 shortening provides first pass renal, mesenteric and peripheral arteriography of quality comparable with extracellular agents. Prolonged intravascular half life enables steady state delayed imaging with high resolution mapping of both arterial and venous systems, complementing duplex studies in the assessment of venous incompetence. A combination of dynamic and delayed steady state imaging can provide detailed anatomical mapping of vascular malformations, indicate whether these are high or low flow and direct percutaneous sclerotherapy at one investigation. The ability to image in the steady state provides minimally invasive imaging of thrombo-occlusive disease of large veins which may be inaccessible to duplex ultrasound and guide future intervention. The display of these data sets is discussed. CONCLUSION: The combination of first pass, dynamic and steady state angiography by an intravascular agent is providing new opportunities for anatomical and functional assessment which is minimally invasive. This is extending our ability to diagnose and plan treatment of arteriovenous disease, particularly in venous disease and vascular malformations.

p403

MR angiography with gadobenate dimeglumine (MultiHance): results of multi-institutional phase 3 programme

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PURPOSE: To assess the accuracy of contrast-enhanced MR angiography (CE-MRA) for detecting significant peripheral, renal and carotid artery occlusive disease using DSA as gold standard. MATERIALS/METHODS: Patients with peripheral (n=272), carotid (n=238) or renal (n=268) artery disease underwent CE-MRA and DSA within 30 days. CE-MRA was performed at 1.5 T using a 3D-SPGRE sequence after administration of 0.1 mmol kg^{-1} gadobenate dimeglumine (MultiHance). Three independent experienced fully blinded radiologists per study evaluated MRA images while a fourth reader evaluated DSA exams. The CE-MRA technical failure rates were calculated and compared with DSA (chi-square test). Sensitivity, specificity, accuracy, and inter-reader agreement for detection of significant disease (≥51% peripheral/renal; ≥61% carotid) were calculated and compared (McNemar's test). RESULTS: Sensitivity, specificity and accuracy values of 54–86%, 89–95% and 80–87% and good 3-reader agreement (kappa: 0.64–0.69 and % agreement: 80–85%) was demonstrated for CE-MRA across all vascular territories. Overall, 89 mild (~98%) or moderate (~2%) adverse reactions considered possibly related to MultiHance were reported for 7.5% (62/828) of subjects, the most common being injection site warmth. Other safety findings were unremarkable. CONCLUSION: CE-MRA with 0.1 mmol kg^{-1} MultiHance is safe and highly accurate for routine CE-MRA applications. Results for MultiHance compare favourably with Phase III clinical results for other recently approved MR contrast agents.

p404

Pushing the frontiers in temporal and spatial resolution: new applications in magnetic resonance angiography

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KEY LEARNING OBJECTIVES: To understand the key concepts and basic physics behind "time resolved imaging of contrast kinetics" (TRICKS) magnetic resonance angiography (MRA) and venography (MRV). To understand the advantages/disadvantages of TRICKS over conventional contrast enhanced MRA (CEMRA). To appreciate the range of potential applications of TRICKS in routine MR practice. DESCRIPTION: Traditional CEMRA suffers from significantly reduced concentration after the first pass of contrast bolus. This necessitates accurate timing of data acquisition to coincide with the bolus arrival. Many bolus tracking techniques exist but all suffer the penalty of potential timing errors, additional scan time and complexity of setup. TRICKS is a modified 3D fast Gradient echo pulse sequence that uses a phase array coil, stationary stable and single contrast injection that eliminates the need for bolus chasing. The sequence provides excellent temporal resolution without sacrificing spatial resolution, producing multiple high resolution 3D MRAs of the anatomical region separated by short time periods.This provides almost "real time" flow imaging that illustrates bolus transit, differential filling rates and direction of flow. We illustrate multiple applications of TRICKS MR angiography, in combination with the high relaxivity contrast agent gadobenate dimeglumine (MultiHance), including: subclavian steal syndrome, AV fistulae in renal patients, portal venous imaging in portal hypertension, gonadal vein incompetence (pelvic congestion syndrome/varicocoele) and vascular malformations. CONCLUSION: TRICKS represents a versatile, easy to use sequence that produces 3D angiographic images with near "real time" temporal resolution, without sacrificing spatial resolution, that has multiple applications in everyday body and extremity imaging.

p405

Pictoral review of four patients with congenital absence of inferior cava with deep vein thrombosis

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KEY LEARNING OBJECTIVES: To illustrate the CT/MRI findings in congenital absence of inferior vena cava (CAIVC) associated with deep vein thrombosis (DVT), and point out the possible misinterpretations of these images. DESCRIPTION: CAIVC is a

rare abnormality and can present with lower limb and intra pelvic deep vein thrombosis (particularly bilateral DVT) in young patients. These patients presented with varied clinical symptoms. We illustrate CT/MRI images of 4 patients (mean age 21 years) with CAIVC and DVT. Two patients presented with loin pain, and one with symptoms of spinal stenosis, all of whom were found to have lower limb DVTs. One patient presented with bilateral lower limb DVT. These scans can be frequently misinterpreted. In two patients, initial CT/MR imaging raised suspicion of retroperitoneal lymphadenopathy causing IVC obstruction. Both these were subsequently established as being dilated collateral vessels. In one case, possibility of a haemangiomatous pelvic malformation was raised which was established as being a thrombus at the confluence of both common iliac vessels. Two patients had Factor V Leiden abnormality. CONCLUSION: Lower limb DVT extending into the inferior vena cava in a young adult may have a varied clinical presentation, and when present, the possibility of a congenital abnormality of the vena cava should be suspected. A MR or CT angiogram may be required to document the underlying anomaly and demonstrate the collateral circulation. One should be aware of the possible misinterpretations of scans.

p406

Incidental abdominal aortic aneurysm detection during abdominal ultrasound scans

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PURPOSE: To evaluate current local protocol for imaging of the aorta during abdominal ultrasound scans with respect to the age of the patient. MATERIALS/METHODS: Local protocol requires all patients to have aortic evaluation during abdominal ultrasound. Patients who underwent an abdominal ultrasound from which they were diagnosed to have an abdominal aortic aneurysm (AAA), were identified using a retrospective Clinical Radiology Information System (CRIS) based search of report terms over a 12 month period. Patients with known aortic aneurysms undergoing surveillance ultrasounds were excluded. The clinical reports were analysed for patient age, clinical presentation, aneurysm description, and follow up imaging. RESULTS: Out of 5649 abdominal ultrasound scans conducted, 37 patients were diagnosed with an abdominal aortic aneurysm as a direct result of the ultrasound scan. (37/5649 = 0.7%) Age ranges of patients with aneurysms detected were 58–95 years (male) and 57–89 years (female). No aneurysms were detected in patients below the age of 50 years. The main clinical presentations included weight loss and deranged liver function tests. At the time of the audit, only 43% of patients with an incidental AAA had either undergone or were scheduled for follow up. Increased follow up was seen if the report made specific recommendations. CONCLUSION: Abdominal ultrasound can detect asymptomatic AAAs. In the absence of a dedicated screening programme, aortic evaluation during abdominal ultrasound is indicated in all patients above the age of 50 years. Adequate anatomical details are essential as well as specific recommendations for follow up in the final ultrasound report.

p407

Alternative causes for acute abdominal pain in patients with a co-existing abdominal aortic aneurysm.

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KEY LEARNING OBJECTIVES: To review the CT appearances of synchronous pathologies that mimic rupture of a known AAA. DESCRIPTION: Patients with abdominal aortic aneurysms presenting with acute abdominal or back pain have traditionally been managed with urgent laparotomy. Prompt assessment with multislice CT is now routinely used to confirm and further delineate aneurysmal leakage. We present several cases of other pathology mimicking a leaking AAA including: nephrolithiasis, vertebral body fracture, pancreatitis, cholecystitis and pelvic malignancy. In these cases CT imaging using pre-contrast, post-contrast and delayed series was crucial in identifying these pathologies and preventing high-risk surgery. CONCLUSION: These cases illustrate the vital role of cross-sectional imaging in assessment of the acute abdomen in cases where a leaking aneurysm is suspected. Where co-existing pathology is detected unnecessary surgical intervention and its attendant risks are prevented.

p408

High prevalence of renal artery stenosis and associated risk of severe acute renal failure in patients undergoing elective abdominal aortic aneurysm surgery

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PURPOSE: We undertook a two centre retrospective study over a 4 year period in order to determine the prevalence and the clinical significance of renal artery stenosis (RAS) in terms of the post-operative risk of acute renal failure (ARF) and survival in patients undergoing elective abdominal aortic aneurysm (AAA) surgery. MATERIALS/METHODS: Of the 148 patients who underwent elective AAA surgery, we identified 107 for whom CT, biochemistry and clinical information was available and therefore eligible for study. ARF was defined as a rise in serum creatinine of at least 50% from baseline and/or the need for renal replacement therapy (RRT). RESULTS: Significant RAS (>50% narrowing of one or more renal arteries) was present in 33 (30.8%). Twelve patients (36.4%) had bilateral disease. ARF was seen in 20 (18.7%) of the 107 patients and occurred in 11 of the 33 patients with RAS (33.3%) compared with 9 of 74 (12.1%) in the non-RAS group ($p<0.01$, chi sq=6.73, d.f.=1). RRT was required in 6 (18.2%) patients with RAS but none of the 74 patients without RAS ($p<0.001$, chi sq=14.25, d.f =1). Five of the 6 patients requiring RRT had bilateral RAS. There were 6 deaths overall in the group (5.6%), 3 in patients with and 3 in patients without RAS (p=N.S., chi sq=1.09, d.f.=1). CONCLUSION: There is a high prevalence of RAS in patients undergoing elective AAA surgery. This is associated with an increased post-operative risk of severe ARF, particularly in patients with bilateral RAS.

p409

Iatrogenic renal haemorrhage. Imaging and endovascular management

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KEY LEARNING OBJECTIVES: To illustrate CT and angiographic features of iatrogenic renal haemorrhage. To emphasise the need for pretreatment CT imaging. To demonstrate endovascular management of iatrogenic renal injury. DESCRIPTION: Renal haemorrhage is relatively common following percutaneous renal biopsy, resulting in gross haematuria persistent for over 12 h in 3% of patients and a palpable renal haematoma in up to 1%. CT detectable renal haematoma is identified in over 90% of patients following percutaneous biopsy, although transfusion or other clinical intervention is needed in only 1–6% of patients. The incidence of haemorrhage after partial nephrectomy is between 1% and 2% and is usually self limiting. Renal haemorrhage following renal artery stenting is uncommon. We present a series of 7 patients with clinically significant iatrogenic renal haemorrhage and discuss imaging and management features. 3 of these patients had undergone percutaneous renal biopsy, 2 renal artery stenting and 2 partial nephrectomies. All patients underwent contrast CT imaging. 6 patients required subsequent catheter angiography. 4 patients were treated successfully with endovascular techniques and the remaining 3 managed conservatively. CONCLUSION: Dual phase CT imaging is recommended as the first line investigation in patients with suspected iatrogenic renal haemorrhage to localize the site of haemorrhage and affirm ongoing arterial extravasation. Multiplanar reconstruction of multislice CT can provide precise localisation of

a bleeding point, thus aiding subsequent endovascular intervention. Endovascular management of iatrogenic renal haemorrhage is well recognized as a safe, effective technique. However, conservative management, if possible, should always be considered.

p410

Pictorial review of various radiology imaging manifestations of portovenous shunts

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KEY LEARNING OBJECTIVES: To illustrate the various imaging modalities that identify the various anatomical levels of portovenous shunts and in their varying severity. DESCRIPTION: Portovenous shunts can present at many anatomical levels in the presence of raised portal pressure. They may sometimes be the first stigmata of portal hypertension before other features of causes such as liver cirrhosis are seen. As such, it is important the radiologists knows how to identify and note the relevance of these shunts in routine imaging. Modern imaging techniques can now identify many sites of these shunts where previously they were only seen on post-mortem samples. Imaging modalities include fluoroscopic screening, ultrasound, radionuclide imaging, angiography and cross-sectional studies such as CT and MRI. Using a range of these modalities, we identify portovenous shunts that can be seen to manifest as varices at various anatomical levels such as portal triad, oesophagus, perisplenic, gastric/retrogastric, paraumbilical, omental, mesenteric, retroperitoneal, thoracic as well as abdominal wall veins. We discuss relevance of these sites and how to accurately identify them. CONCLUSION: As part of routine examination, the radiologist must be aware of the various sites that varices may present as a manifest of portovenous shunt, indicating the diagnosis of portal hypertension which may otherwise be missed. Early identification of this using the various modalities described here can initiate appropriate therapy earlier.

p411

Uterine fibroid embolisation: does the outcome vary depending on the embolic material used?

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PURPOSE: To determine the difference in outcome following uterine fibroid embolisation (UFE) according to the type of embolic material used during procedure. MATERIALS/METHODS: 39 women who underwent UFE in a single District General Hospital in the UK since 2004 were included. All completed a previously validated, disease specific instrument, the Uterine Fibroid Symptoms – Quality of Life Questionnaire (UFS-QoL). Outcome was measured in terms of the difference in questionnaire scores before the procedure and at longest follow up. Patients were classified into four groups depending on the embolic material used: clear acrylic flexible spheres (Embospheres ®), PVA microporous compressible hydrospheres (Bead Block ®, Contour SE ®), and more than one agent (any mix of the above ± coils). The choice of embolic material was made on the basis of availability. All groups were compared against each other on the basis of the average change in the UFS-QoL score before and after the procedure. RESULTS: Overall, the average change in outcome following UFE was 31 points in the symptoms and 30 points in the Health Related Quality of Life subscales of the UFS-QoL questionnaire. Average improvement in symptoms and health related quality of life was 27 and 29 points (Beadblock®), 29 and 19 points (Contour SE®), 42 and 45 points (Embospheres®) and 30 and 25 points (more than one agent). CONCLUSION: In this short series, outcome is more favourable with Embospheres® compared with the other embolic agents.

p412

A new approach to the management of recurrent malignant ascites in terminal patients

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KEY LEARNING OBJECTIVES: To raise general awareness of the availability and usefulness of this technique. The appropriate use of long term peritoneal drainage for malignant ascites in the palliative group. To demonstate the safety, efficacy and cost effectiveness of this procedure. DESCRIPTION: We describe a new approach to the problem of treatment resistant malignant ascites in the palliative patient employing tunnelled long term peritoneal catheter placement. Previously multiple interval drainage has been required to manage this patient group, however with new products satisfactory long term drainage can be achieved allowing the patient to remain in the community care setting. We detail selection of appropriate patients, insertion technique, available products, complications and long term follow up. Consideration is also given to patient tolerance and cost. CONCLUSION: In our experience we have found tunnelled paracentesis line insertion to be safe, efficacious, cost effective and acceptable to patients.

p413

Intima media thickness evaluation in patients with non-alcoholic fatty liver disease

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INTRODUCTION: Non-alcoholic fatty liver disease (NAFLD) is one of the manifestations of metabolic syndrome. There is no established increased probability of cardiovascular disease in patients with NAFLD. Early detection of atherosclerosis is of particular importance for successful treatment and prevention of deadly events. Increased thickness of the intima media (IM) is considered an early marker of diffuse atherosclerosis. PURPOSE: To evaluate the IM thickness (IMT) of the common carotid artery (CCA) in NAFLD patients as a marker of diffuse atherosclerosis. PATIENTS AND METHODS: In 66 patients (35 males and 31 females) with NAFLD and 80 controls, who were 34–75 years old (mean age, 55 years), we measured the IMT of the CCA using commercially available ultrasound equipment (Acuson, Mountain View, CA) with a 1.75–4 MHz probe. In all individuals, measurements were obtained on axial colour Doppler ultrasound images close to the bifurcation of the CCA. RESULTS: The IMT of the CCA was greater in NAFLD patients (1.14 ± 0.19 mm) compared with that of controls (0.75 ± 0.12 mm, $p<0.001$). The prevalence and severity of metabolic syndrome was higher in patients with NAFLD in comparison with that of patients with no fatty liver involvement ($p<0.01$). CONCLUSION: Our results show that IMT of the CCA is significantly increased in patients with NAFLD. The IMT of the CCA could be used as an index of diffuse atherosclerosis in patients with NAFLD, and it might be of value to monitor the effect of treatment with hypolipidaemic agents on the IMT, in these patients.

p414

A basic biological model for trainees to learn us guided renal intervention

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PURPOSE: Most interventional radiologists remember the daunting experience of first learning ultrasound guided renal intervention following the master and apprentice model. Historically most trainees performed their first ultrasound guided renal intervention on a real patient. Serious complications are rare, but if it is not performed properly, a patient could potentially suffer serious injury. Due to the steep learning curve for ultrasound guided renal procedures and with the growing number of trainees, it is not always possible for trainees to get enough practical experience to achieve the competency required. MATERIALS/METHODS: We present a simple and economic way to construct a realistic biological (porcine) model to help trainees learn and practice ultrasound guided renal intervention. The biological

model is constructed using simple and easily available ingredients (e.g. porcine kidney from local supermarket, butter, gelatine) found in any household kitchen. To assess whether the ultrasound images of the biological model simulate realistically the human kidney under ultrasound, 16 experienced ultrasonographers (including consultants, registrars and radiographers) were ask to identify 10 ultrasound images consisting of a mixture of ultrasound images of the biological model and human kidneys. RESULTS: The average accuracy is only 56%. The mean is 60%. Standard deviation is 0.23. Most ultrasonographers could not reliably differentiate the images of our biological model from the ultrasound images of a human kidney. CONCLUSION: The ultrasound image of our basic biological model is comparable to the ultrasound image of human kidney. Our model is therefore suitable for the trainee to practice renal intervention.

p415

So Doctor what are your complication rates for this procedure?

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LEARNING OBJECTIVES: To assess current practice among the South West Interventional Radiology Liaison Group (SWIRL) with regard to record keeping in interventional radiology. DESCRIPTION: Currently there are guidelines but no obligation to keep records of the outcomes of interventional procedures. Knowing the success and complications rates of procedures is important for informed consent but has many other wide reaching implications. These include personal confidence and audit with regard to changing practice, revalidation, ensuring the time taken to gather such information is reflected in job plans and putting together business plans for new equipment or facilities. We surveyed the members of SWIRL with regard to their current practise. 68 members were contacted and 40 replies (58%) received. 30/40 keep records of success and complications rates of procedures. Methods of discovering complications ranged from feedback from multidisciplinary meetings (34/40), reviewing patients' notes (8/40), visiting patients on the ward or in follow up clinics (10/40), phoning the patient (1/40), having a copy of the follow up out patient clinic letter sent to the radiologist (1/40) and yearly or 2 yearly audits (1/40). The numbers reflect that some radiologists pursue this information but keep no lasting records. Written records are kept by 10/30 and 20/40 use self designed electronic databases. None of the respondents use commercially designed software. 20/40 contribute to national databases including 3/10 who keep no personal record for themselves. CONCLUSION: At present there is no unified approach to this time consuming but essential good practice.

Vascular/Interventional Electronic Poster

e416

Tubes, lines, and changing times

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KEY LEARNING OBJECTIVES: To discuss comon errors in malposition of lines, catheters and tubes in the acute setting. To show relevant examples which highlight the need to contact the referring clinicians directly in an emergent setting. DESCRIPTION: The human body has a wide variety of orifices and organs into which a bewildering array of lines, catheters and tubes can be inserted. Complications of such procedures are well recognized. With increasing sub-specialization, role extension, and a shift system working pattern, junior clinicians have arguably less exposure to traditionally basic procedures such as chest drain insertion, NG insertion, vascular access, and catheterisation. They may have less exposure to the expected complications of these and other invasive procedures, and may not fully recognize the clinical or subtle radiological manifestations. The advent of PACS has allowed real time review and reporting of examinations which are often requested and reviewed by relatively junior clinicians. The burden of responsibility thus falls on the radiologist to inform the referring clinicians of procedure related complications in an expediant manner. We provide selected images of a variety of tubes, lines, catheters and drains in various states of malposition, which required urgent actioning. Selected cases are shown as learning tools, with discussion of complications and an emphasis on anatomic condsiderations in each instance. CONCLUSION: Procedure related complications due to insertion of lines and tubes are well recognized. Subtle radiological findings can have a disproportionate bearing on clinical outcome. Direct communication of relevant findings is essential in such cases.

e417

How to detect and evaluate carotid stenosis near occlusion by using multi-detector row CT angiography

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PURPOSE: Detection of near-occlusion is essential for proper diagnosis and therapy because the risk of stroke and the benefits of surgical approach are lower in these patients. Our objective was to evaluate diagnostic performance in diagnosing near occlusion by using MDCT axial scans and different post-processing protocols. MATERIALS/METHODS: patients that performed multidetector-row CT angiography for known or suspected carotid artery, for a total of 180 carotid artery. Contrast material was injected into antecubital vein and arterial phase images were obtained by using a 3–6 ml s^{-1} flow rate. In each patient axial scans, ANGIO MIP, MPR and 3D reconstructions were studied in order to evaluate their efficacy in defining carotid stenosis near occlusion. Each examination was independently evaluated by two observers and disagreements were resolved in consensus. RESULTS: 14 carotid stenosis near occlusion were identified by using axial images, 9 by using MIP, 7 by using MPR and 11 by using VR. With MIP and VR we found some difficulties to exclude bony structures that caused superimposition with pre-siphon carotid. CONCLUSION: Prior studies have shown that CTA has an excellent correlation with conventional angiography in diagnosis near occlusion and results of our study suggest that the optimal choice to asses this situation is to analyse the axial images. MIP, MPR show a lower efficacy because of artefacts and difficulty to isolate distal carotids from bony structures.

e418

The evaluation of stenosis degree in the atherosclerotic carotid artery

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KEY LEARNING OBJECTIVES: The purpose of this exhibit is (1) To discuss current indications for performing MDCTA in the study of atherosclerotic carotid artery, (2) To review the different measurement methods of carotid artery stenosis, as well as their rationale, strengths and weakness. (3) To learn the MDCT technical parameter to be used. (4) To show which post-processing techniques can be used and their indications. (5) To compare MDCTA potentialities with the other imaging methods. DESCRIPTION: Stenosis degree is currently the leading parameter in the choice of the therapeutic option. NASCET and ECTS investigators evaluated the degree of stenosis as the percentage reduction in the linear diameter of the artery. Using axial images for the estimation of stenosis degree (Figure 2) allows to exactly differentiate the residual lumen from pathological plaque. Sometimes, it may be difficult to adequately evaluate stenosis degree by using axial images, in particular when carotid artery acquires course anomalies: in presence of kinking or coiling, it becomes mandatory to use reformatting tools in order to assess the spatial course of the carotid and to correctly identify and measure stenosis site CONCLUSION: Stenosis degree is considered the leading parameter for the choice of therapeutic option. The correct evaluation of stenosis degree depends on several conditions as the correct intraluminal HU value, the correct measurement plane orientation and the correct windows level and window width. We analysed, by using surgical comparison, the various technique to measure the correct stenosis degree by indicating their potential pitfalls.

e419

How to evaluate re-stenosis of the carotid artery: a comparison between MDCTA, MRA and US-ECD

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KEY LEARNING OBJECTIVES: To understand the anatomy carotid artery. To learn the CT, MR and US-ECD technical parameters to be used and the imaging difference between the techniques. To analyse difference between techniques in the visualization of carotid plaque and re-stenosis. To review the current indications for performing multidetector row MDCTA in the follow-up of CEA assessing radiation exposure and diagnostic efficacy. DESCRIPTION: A patient who undergo a carotid endarterectomy (CEA) may suffer some complications that must be kept under control: re-stenosis, aneurysms and cerebral complications. Re-stenosis of carotid artery is probably due to a reactive hyperplasia of vessel wall mioblasts (neointimal hyperplasia). It occurs in the 7.6% of the cases after 3–18 months since the intervention and in the 1.9% of the cases after 18–60 months after CEA. CT examinations were performed by using a multidetector-row scanner; contrast material was injected into antecubital vein and arterial phase images were obtained by using a delay time variable from 11 to 18 and by using a 3–6 ml s^{-1} flow rate. MR imaging studies were performed with a 1.5 T superconducting magnet. US-ECD examinations were performed with an Acuson 128 XP/10 with a 7 MHz linear probe. CONCLUSIONS: The re-stenosis evaluation is a fundamental phase in the follow-up of patients who underwent CEA. Different imaging technique can adequately identify and quantify re-stenosis and in particular US-ECD and MDCTA. In asymptomatic patients the use of US-ECD represent, probably, nowadays the best technique "cost\benefit" for this type of analysis.

e420

Is leukoaraiosis correlated with carotid stenosis degree?

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PURPOSE: Recent studies have demonstrated that leukoaraiosis is clinically important, in fact patients with leukoaraiosis have a poor prognosis in terms of death, stroke and myocardial infarction. Our purpose was to evaluate whether the presence of stenosis degree is associated with leukoaraiosis. MATERIALS/METHODS: From January 2004 to March 2007, we studied 178 consecutive patients by using multidetector-row CT. A total of 356 carotid arteries and 178 brains were assessed, blind to clinical features, for the presence of leukoaraiosis and for the stenosis degree by two experienced radiologist in consensus. Stenosis degree classification was based on NASCET classification. RESULTS: The presence of presence of leukoaraiosis and stenosis degree 0–29% shows *p*-value of 0.0884 (OR = 0.6), presence of leukoaraiosis and stenosis degree 30–49% shows *p*-value of 0.16 (OR = 0.6), presence of leukoaraiosis and stenosis degree 50–69% shows *p*-value of 0.95 (OR = 0.98), presence of leukoaraiosis and stenosis degree 70–84% shows *p*-value of 0.62 (OR = 1.15), presence of leukoaraiosis and stenosis degree >85% shows *p*-value of 0.013 (OR = 1.87). By analysing double stenosis we observed a significant correlation between the presence of bilateral stenosis > 70% (*p*-value = 0.0194 and RR 2.16). CONCLUSION: The presence of leukoaraiosis is correlated with the presence of monolateral carotid stenosis degree > 85% ($p=0.0011$) or bilateral stenosis > 70% ($p=0.019$). Presence of carotid artery stenosis is associated with the presence of leukoaraiosis.

e421

Magnetic resonance imaging techniques and remodelling of complex carotid atherosclerosis

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INTRODUCTION. The principal initiating event in the pathogenesis of acute cardiovascular events is rupture or erosion of vulnerable atherosclerotic plaque. The examination of the carotid arteries of patients with recent cerebral ischaemia, provides an ideal opportunity to identify key features in plaque morphology. METHODS. 15 patients with recent symptoms and signs of an acute transient ischaemic attack, amaurosis fugax or stroke were recruited from an acute neurovascular clinic. Based around the carotid bifurcation, multicontrast weighted MR imaging (T_1, PD and T_2 weighted and 3D TOF) before and after gadolinium enhancement was performed. Modified AHA classification for atherosclerotic plaque was applied to each scan. Lipid gives a high signal on a T_1 weighted scan, whereas fibrous tissue produces an intermediate signal. It was hypothesised that a complex plaque consisting of several components (lipid, haemorrhage, fibrous tissue), would produce a range of signal intensities, and hence a wider or bimodal histogram. The occurrence of different intensity signals within the plaque was plotted as a histogram. RESULTS. A total of 15 patients were recruited. The percentage of internal carotid artery stenosis on ultrasound, ranged from 48% to 90%. Plaque area or volume made measurements were shown to be reproducible. A wider histogram was seen with more complex plaques, *i.e.* a higher modified AHA classification. CONCLUSION. MRI of the carotid bifurcation using has been used to provide statistically significant, reproducible information. MRI features have been used to grade plaque morphology, allowing correlation of plaque heterogeneity with signal intensity heterogeneity as demonstrated by plotting histograms.

e422

Inferior vena cava: embriology and anomalies

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LEARNING OBJECTIVES: (1) To describe the embryologic development and the malformative mechanism of the inferior vena cava (IVC) and the left renal vein (LRV). (2) To illustrate the CT features of the most common anomalies of the IVC and the LRV. DESCRIPTION: Congenital anomalies of IVC and the left renal vein occur with a prevalence of 0.07% to 8.7%, and are easily identified on CT. Its identification is important to avoid erroneous diagnosis of retroperitoneal and mediastinal masses or adenopathy, and to avoid complications during radiological and surgical procedures. An understanding of the embryologic development is necessary to understand the genesis of these anomalies and their accompanying anatomic variants. We describe the CT findings in 48 cases of anomalies of the IVC and the LRV: 4 anomalies of the suprarenal segment (interrupted IVC with azygos continuation), 26 anomalies of the renal segment (18 circumaortic LRV, 8 retroarotic LRV), and 18 anomalies of the infrarrenal segment (1 retrocaval ureter, 6 transposition of the IVC, and 11 duplications of the IVC). CONCLUSION: (1) Congenital anomalies of the inferior vena cava (IVC) and the left renal vein are usually readily recognized in CT scans, frequently incidentally. (2) Its identification is important to avoid erroneous diagnosis of retroperitoneal and mediastinal masses or adenopathy, and to avoid complications during radiological and surgical procedures. (3) An understanding of the embryologic development of the vena cava and its tributaries is necessary to understand the genesis of these anomalies and their accompanying anatomic variants.

e423

Three level computed tomographic venography (CTV) of lower limbs, is it good enough?

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PURPOSE: Conventional CT imaging for DVT involves contiguous slices from the level of the femoral head to the knee. Purpose of our study was to assess if a limited three level scans through the femoral

head, mid-thigh and the knee were good enough to replace this technique. MATERIALS/METHODS: Retrospective analysis of all CT venous pulmonary angiography (CTVPA) performed in our centre between Oct 2004 and 2007. Each limb was counted as one and images of all positive cases were reviewed specifically at three levels, i.e femoral head, mid thigh (adductor canal) and knee. RESULTS: Total of 110 CTVPA were performed. 18 (16.3%) were positive for thrombus. At the level of, femoral head 11 (62%) were positive, mid thigh 14 (87%) and 11 (79%) had clot behind the knee. One patient had an incidental baker's cyst. If 3 level CT scanning was performed none of the 18 clots would have been missed. CONCLUSION: Three level CTV can be done as a single comprehensive examination along with CTPA and may increase the detection of VTE (PIOPED II). Concerns have been raised about the additional radiation burden. Initial results from our pilot study shows that a three level CT scan for DVT scanning is as good as contiguous conventional scans with significant reduction in the radiation dose. An important exception would be scanning prior to IVC filter when it is important to assess the clot burden and hence contiguous imaging is essential. Review of larger CT venography trials would validate this technique.

e424

Acute aortic haematomas, dissections, leaks and lacerations. Pictorial review and technical considerations

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Imaging of suspected emergencies of the thoracic and abdominal aorta tends to be a high stakes–low yield exercise due to a low incidence of acute pathology. Experience in interpretation and reporting of these scans is difficult to accumulate and consequently not finely honed for dealing with such emergencies. We illustrate recognized features of non-traumatic aortic emergencies (intramural haematoma, classical Stanford Type A and B aortic dissections, leaking thoracic and abdominal aortic aneurysms) and acute traumatic aortic injury and discuss their clinical relevance, prognostic significance and their implications for surgical, vascular interventional and medical management. We also discuss methods of optimising technique, contrast-media selection (including low osmolar agents), scanning protocols, triggering, portal venous imaging, and artefact recognition and reduction.

e425

Endovascular treatment of false aneurysms of the thoracic aorta using coil embolisation and Amplatzer septal occluder device

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KEY LEARNING OBJECTIVES: To understand the clinical background, imaging findings and procedural details of endovascular treatment of false aneurysms of the thoracic aorta using a combination of coils and occluder device. DESCRIPTION: Endovascular treatment of thoracic aortic diseases with stent grafts is accepted as standard in many centres. However, stent graft therapy cannot always be used because of location of the aneurysms in the aorta and the presence of important branch vessels. Whilst there are many articles in the literature about stent grafting, less has been written about the use of coil embolisation and Amplatzer occluder devices in treating aneurysms of the thoracic aorta. This poster highlights the radiological anatomy and pathophysiology of thoracic false aneurysms and explains the procedure with technical details and illustrations. Interactive video clips and pictures are included to help understand the procedure CONCLUSION: Percutaneous coil embolisation, in combination with occluder device is a safe and effective procedure for the treatment of false aneurysms of the thoracic aorta and offers a valuable option especially in cases where surgical contraindications exist.

e426

Management of angiomyolipomata in the tuberous sclerosis complex: pictorial review of a single centre experience

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PURPOSE-MATERIALS: To review the imaging and management of Angiomyolipomata (AML) in the Tuberous Sclerosis Complex (TSC) based on our experience of TSC patients who have undergone embolisation. METHODS: We retrospectively reviewed all TSC patients undergoing embolisation of AML at our unit since 1987. Surveillance imaging comprised 6–12 monthly ultrasound, with MRI used to evaluate complex lesions. CT including CT angiography was usual in the emergency situation, prior to conventional angiography and selective embolisation. RESULTS: Of 12 patients, 8 underwent emergency embolisation for acute haemorrhage. Four were embolised electively, two for rapidly enlarging AML detected on surveillance ultrasound and two for pain attributed to aneurysms within large (>10 cm) AML where no active bleeding was identified. Of those with acute haemorrhage, one required further embolisation during that admission and three within 1 year for recurrent symptoms. Of the elective group, one aneurysm required re-embolisation due to recurrent symptoms, the other remained occluded and asymptomatic 18 months post embolisation. Both patients with rapidly enlarging AML were asymptomatic with evidence of tumour shrinkage on long-term follow up. CONCLUSION: Radiology plays a vital role in the management of AML in TSC patients. Regular surveillance of patients with ultrasound is advisable, with MRI useful for further characterizing complex lesions. CT and CT angiography are particularly valuable in emergency situations. Where patients are symptomatic or surveillance imaging supports intervention, selective angiography and embolisation offer a nephron-sparing therapeutic option in both emergency and elective situations and should be the intervention of choice.

e427

What Line Is It Anyway?

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KEY LEARNING OBJECTIVES: To appreciate the radiological appearance of various external devices that are employed in adult and paediatric critical care units and the role they play in patient management. DESCRIPTION: Critical care units employ a wide range of devices that are used on a regular basis to aid in both monitoring and for administration of therapy. Most of these devices are connected to the patient through various lines and tubes. In addition, certain devices like the rectal tube are more geared towards maintaining the hygiene of the patient and considerably improve daily patient care. These tubes and lines, which come in various shapes and sizes can range from simple central venous catheters to more the complex and intriguing devices like the oesophageal Doppler. Vast majority of these are connected to external monitors and are imaged along with the patient. They can prove to be a diagnostic dilemma to the novice and of considerable interest to the experts alike. The poster provides a wide range of radiographic examples of such devices used both in adult and paediatric critical care units. The clinical role of these devices will be discussed and how they can be misinterpreted in certain imaging modalities and complications associated with their use. CONCLUSION: Knowledge of medical devices used in adult and paediatric critical care units and their radiographic appearances are important in understanding both their relevance and role in patient management.

Gastrointestinal Poster

p501

Intraductal papillary mucinous tumours (IPMT) of pancreas – pictorial review of endoscopic ultrasound appearances with CT, MR and EUS guided aspiration cytology

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Intraductal papillary mucinous tumour of the pancreas has an intraductal papillomatous growth pattern, associated with excessive mucin secretion resulting in progressive ductal dilatation or cyst formation. The correct

diagnosis, once achieved only with ERCP can now be made with noninvasive imaging modalities, particularly CT, MR imaging and more recently, by endoscopic ultrasound (EUS). The key objective of the poster is to understand the imaging features of IPMTs on CT, MR imaging with an emphasis on EUS appearances. EUS provides simultaneous visual assessment of the ampulla for the characteristic bulging papilla sign. EUS guided aspiration of cyst fluid with assessment of mucin content can differentiate it from pseudocysts of the pancreas which also communicate with the ductal system. The tumour occurs in four main types: (a) segmental main duct type, (b) diffuse main duct type, (c)macrocystic branch duct type and (d) microcystic involvement of a branch duct. These tumours may be benign or malignant. In this poster, we present a review of the imaging findings of IPMTs with an emphasis on the relatively new technique of EUS, with CT, MR correlation and EUS guided aspiration cytology. Images of the different types of IPMTs are presented. Useful criteria for characterizing the lesion and assessing the grade of malignancy preoperatively are discussed. Imaging of IPMT is extremely important not only to identify the tumour but also to suggest the most appropriate therapeutic strategy in relation to the site of origin and size of the lesion.

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Differentiation of inflammatory pancreatic masses from neoplasms using endoscopic ultrasound – correlation with FNA cytology

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PURPOSE: Pancreatic masses,in the setting of previous pancreatitis can be difficult to characterize as inflammatory or neoplastic lesions on current available CT, MR and ultrasound. Endosopic ultrasound gives high resolution images of the pancreas. We are evaluating the use of specific signs on endoscopic ultrasound (EUS) to differentiate inflammatory pancreatic masses from neoplastic masses. MATERIALS/METHODS: This is an ongoing prospective study. All patients undergoing EUS scans for pancreatic masses are included. In each patient, the following features of the lesions are ascertained: (a) size, (b) clarity of margin, (c) echotexture, (d) calcification, (e) calibre of pancreatic duct within the lesion, (f) vascular invasion. Correlation with CT, MR and EUS guide FNA cytology was performed. Amylase levels, CA 19-9 levels also measured. RESULTS: 35 masses have been analysed so far. According to the available data, the following are the results: (1) Presence of undilated pancreatic duct within the lesion has a high specificity and positive predictive value for inflammatory lesions (>95%). This feature was appreciated more clearly on EUS compared with CT and MR. (2) Presence of scattered calcification, heterogeneous echotexture and poor margins have moderate specificity and positive predictive value for inflammatory lesions (70–90%). (3) Presence of clear margin, homogeneous echotexture with no calcification had a moderate specificity for neoplasms (70–90%). (4) Presence of vascular invasion, sudden occlusion of pancreatic duct had a high specificity and positive predictive value (>95%) for neoplastic masses. (5) Very high specificity when combined with amylase and CA 19-9 levels. CONCLUSION: There are features on EUS which demonstrate a high degree of specificty and postive predictive value for inflammatory and neoplastic masses in the pancreas, helping to differentiate between them. Characterization is further enhanced by tumour marker estimation.

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High resolution ultrasound in the assessment of the adult bowel: a pictorial essay

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KEY LEARNING OBJECTIVES: Ultrasound is a safe, readily available and relatively underused modality for the detection of pathology within the adult bowel with appropriate time allocation and attention to ultrasound technique. DESCRIPTION: In this review we present the use of ultrasound in the assessment of the adult bowel in the outpatient and acute clinical settings. Initially, we describe the techniques for imaging bowel using conventional grey scale and colour Doppler. We describe normal bowel appearances, and present a pictorial review of the following inflammatory pathologies on ultrasound: appendicitis, appendiceal abscess, infectious ileocaecitis, ileocaecal tuberculosis, Crohn's disease with associated complications, colitis with associated complications, epiploic appendagitis, omental infarction, and diverticular disease with its associated complications. In addition, we reveal the importance of ultrasound in diagnosing adult bowel neoplasms. The appearances of benign tumours such as polyps and lipomas, malignant small intestinal tumours such as GISTs and lymphomas, and large bowel malignant tumours are discussed with detailed ultrasound images. Finally, intussusception will be illustrated as an example of a diagnosis made with a high degree of confidence on ultrasound. CONCLUSION: Due to substantial advances in technology, wide availability and a favourable safety profile, ultrasound is an increasingly valuable imaging modality for adult bowel pathology in addition to its established role in the paediatric population.

p504

Right upper quadrant pain – not just biliary

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LEARNING OBJECTIVE: (1) To illustrate the various non-biliary causes of acute right upper quadrant pain. (2) Understand the appropriate use and role of different imaging modalities. (3) Familiarity with both the characteristic and the unusual features of a wide variety of pathologies causing right upper quadrant pain. DESCRIPTION: Acute cholecystitis is the most common cause of acute pain in the right upper quadrant (RUQ). However, more than one-third of patients with acute RUQ pain do not have acute cholecystitis. We illustrate various causes of RUQ pain such as, hepatic abscess, hepatoma with local invasion, subphrenic abscess, appendicitis, pyonephrosis, duodenal ulcer, and acute pancreatitis. Successful imaging with all modalities requires familiarity with both the characteristic and the unusual features of a wide variety of pathologies. SUMMARY: The major teaching points of this exhibit are: (1) About one third of cases with acute RUQ pain are non-biliary. (2) Ultrasound is the primary modality of choice with CT and MRI used for further evaluation. (3) Proper diagnosis is crucial for management and to avoid unnecessary surgical intervention.

p505

Not just the appendix: ultrasound and histological findings in the right iliac fossa

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KEY LEARNING OBJECTIVES: To review the ultrasound findings and associated histology of pathologies in the right iliac fossa. DESCRIPTION: Patients presenting to our institution with right iliac fossa pain frequently undergo ultrasound as an initial investigation. A review of patients revealed a number of causes seen on ultrasound other than acute appendicitis. Their ultrasound findings are presented along with the associated histopathology. Conditions seen include GI causes such as terminal ileitis, colitis and appendices epiploicae and non-GI causes such as endometriosis and pelvic inflammatory disease. CONCLUSION: Bowel ultrasound is a useful tool in the investigation of right iliac fossa pain and can be used to diagnose a variety of conditions other than acute appendicitis. As the resolution of ultrasound improves, its more routine use may make it possible to avoid ionising radiation in this group of young people.

p506

Wot, no appendicitis

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KEY LEARNING OBJECTIVES: To increase awareness of the CT appearances of more unusual right iliac fossa conditions that can clinically mimic appendicitis. DESCRIPTION: CT is increasingly used in the diagnosis of patients suspected of having appendicitis,

resulting in the preoperative detection of other unsuspected disease. We present more unusual right iliac fossa pathology demonstrated at CT. This includes ileocaecal tuberculosis, ileocaecal intussuception, an obstructed pelvic kidney, actinomycosis of the ileum, a hydrosalpinx, an obstructed abdominal wall hernia, ileocaecal lymphoma, Crohn's disease and ileocaecal ischaemia. CONCLUSION: It is essential to be aware of the full differential diagnosis of appendicitis, as early diagnosis of more unusual conditions using CT can avoid unnecessary surgery or alter the management plan.

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Retained appendicoliths – a pictorial review of clinical features and diagnosis with multislice computerized tomography

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KEY LEARNING OBJECTIVES: (1) Review the clinical features, imaging characteristics, and management of retained appendicoliths. (2) Illustrate the diagnostic appearances and associated findings of retained appendicoliths on multislice CT. DESCRIPTION: Background: Appendicoliths are calcified aggregations of faecal matter that collect and harden within the appendix. They have been shown on CT to have upwards of 84% specificity for appendicitis, and are present in 65% of cases. Appendicoliths can spill out into the peritoneal cavity during appendicectomy, or spontaneously drop out from a perforated appendix. After migrating to variety of locations, often out of site to the operating surgeon, they can remain in the abdomen post-operatively and cause late sepsis. Given that cross-sectional imaging is increasingly utilized to investigate patients with post-operative sepsis, and that an infected retained appendicolith has to be removed for resolution to occur, it is important to recognize the appearances of such "retained" appendicoliths on CT. Content organization: (1) Review of the aetiology, pathology, and typical clinical features of retained appendicoliths. (2) Imaging review demonstrating: Common locations of retained appendicoliths within the abdomen and pelvis identified with multislice CT; Common associated findings. (3) Discussion of management options for retained appendicoliths, including percutaneous image-guided retrieval. CONCLUSION: CT of the abdomen and pelvis is the investigation of choice in post appendicectomy patients presenting with signs of intra-abdominal sepsis, and a history of appendicolith-associated appendicitis or appendiceal perforation. Resolution of sepsis will only occur following removal of the appendicolith, and can be performed using common inteventional radiology techniques.

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Comparison of enhancement with Iomeprol-400 and Iodixanol-320 in patients undergoing contrast-enhanced multidetector CT of the liver

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PURPOSE: To compare contrast enhancement with iomeprol (400 mgI ml^{-1}) *vs* iodixanol (320 mgI ml^{-1}) in patients undergoing contrast-enhanced multidetector CT (MDCT) of the liver. MATERIALS/METHODS: 183 patients received equi-iodine doses (40 gI) of iomeprol-400 or iodixanol-320 IV at 4 ml s^{-1}. Liver MDCT was performed using scanners with at least 4 detector rows. Two off-site, independent, blinded readers assessed images at the abdominal aorta, inferior vena cava (IVC), portal vein, and liver parenchyma. Descriptive statistics were used to summarize the contrast density (HU) measurements for the two study groups. The mean contrast densities achieved in each of the four regions of interest were compared and 95% confidence intervals estimated. RESULTS: 91 patients received iomeprol-400 while 92 received iodixanol-320. The two study groups were comparable with regard to sex, age, weight, and race. Iomeprol-400 resulted in significantly greater arterial phase enhancement of the abdominal aorta compared with iodixanol-320 (Reader 1: 339.7 *vs* 292.6 HU, 95% CI [19.4, 65.5], $p=0.0004$ Reader 2: 327.9 *vs* 293.0 HU, 95% CI [6.6, 54.3], $p=0.01$). Iomeprol-400 also led to greater enhancement of liver parenchyma during the portal-venous phase (significantly greater for Reader 1 [$p=0.04$] and of borderline significance for Reader 2 [$p=0.05$]). No significant difference was noted between the two study groups regarding enhancement of the IVC or portal vein. CONCLUSION: Iomeprol-400 provides significantly greater enhancement in the arterial phase and improved enhancement of hepatic parenchyma in the portal-venous phase compared with iodixanol-320 at the same iodine dose in patients undergoing MDCT of the liver.

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Impact of PET and integrated PET-CT in staging and management of oesophageal cancer

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PURPOSE/MATERIALS: To evaluate the influence of PET and integrated PET-CT on the staging and management of patients with oesophageal cancer. METHODS: We have retrospectively reviewed the hospital notes of 74 patients who underwent PET/integrated PET for the staging of oesophageal cancer prior to planning surgery or radical radiotherapy over a period of 1 year. We evaluated the patient demographics, staging investigations performed and analysed the influence of PET and PET-CT on clinical decision making. RESULTS: Mean age of patients was 62 years (age range 37–82 years). Lower oesophageal tumours were most common found in 74% of patients. Gastro-oesophageal tumours were found in 15% and mid oesophageal tumours were found in 7%. Three patients had a gastric tumour. All patients had a CT at the time of referral. 55% had a staging laparoscopy for assessment of intraperitoneal disease and 43% had an endoscopic ultrasound for accurate nodal staging. PET helped upstage the tumour in 18%, and helped downstage the tumour in 19%. The staging was reinforced in 53% of patients and as there was no FDG uptake in 10%. Incorrect diagnosis of metastasis was made on PET in 3 patients. In 27% of patients, LN were missed on PET but were diagnosed by CT and endoscopic ultrasound. CONCLUSION: PET helped to alter the management in 13% of patients and confirmed operability in 36% of patients. PET confirmed inoperabilility in another 13% thus influenced management in about 53% of the patients in our study.

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Gastrointestinal tract diverticula: unusual aspects and rare locations

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LEARNING OBJECTIVES: Diverticula of the gastrointestinal tract are frequently found in imaging studies. Our objective is to show their unusual aspects and rare locations. DESCRIPTION: We reviewed double-contrast series and CT studies in which diverticular pathology were present, performed in our Department during the last 2 years. We classified them considering their location, morphology, number, size and complications, taking into account common and uncommon aspects. In the pharynx diverticula of shape, size and location not usually describe in the literature. In the oesophagus we describe intramural diverticula related to peptic disease, and gigantic diverticula, many of them with the post-surgical appearance. In the stomach we observed diverticula of variable shape and size in its roof, and an intramural diverticulum. In the small bowel we present intramural and intraluminal forms of duodenal diverticula, and diverticulosis in the

jejunum and ileum. Also, we present cases of Meckel's diverticulum. In the colon, we present invaginated forms (which simulated elevated images), gigantic diverticula and rare complications of diverticular disease. CONCLUSIONS: It is very important for the radiologist to be familiarized not only with the usual radiology features of diverticular pathology, but also to recognize infrequent aspects of the disease.

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Imaging features of neuroendocrine tumours of the gastrointestinal tract

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KEY LEARNING OBJECTIVES: The aim of this educational poster is to describe the important imaging features of neuroendocrine tumours of the gastrointestinal tract on different imaging modalities. Imaging is used to localize primary and metastatic lesions and to determine resectability or alternative palliative and curative treatment options. DISCUSSION: Neuroendocrine tumours are uncommon malignancies and constitute 0.5–1% of all human malignancies. They have a variable natural history and demonstrate indolent biological behaviour. The vast majority of these tumours fall into two nearly distinct categories: Carcinoids and pancreatic endocrine tumours (PETs). Carcinoid tumours are classified, depending on the point of origin, as foregut (lung, thymus, stomach, and duodenum) or midgut (distal ileum and proximal colon) or hindgut (distal colon and rectum). Less than 1% of carcinoid tumours originate in the pancreas. PETs can be non-secretory or secretory tumours. Secretory tumours are classified by the hormone most strongly secreted, i.e. insulinoma, glucagonoma or gastrinoma. Most neuroendocrine tumours have non-specific imaging characteristics. However, they can demonstrate peculiar radiological features, which in combination with the clinical presentation can help the radiologist infer the specific diagnosis. Although neuroendocrine tumours are uncommon, they should be considered in developing the differential diagnosis for gastrointestinal tumours in patients with a typical syndrome or when the tumours have characteristic imaging features. CONCLUSION: The imaging characteristics of neuroendocrine tumours and important pitfalls are described, which in combination with the clinical information may help radiologists in making the diagnosis.

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Gastric radiology: an illustrated history

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LEARNING OBJECTIVES: To show the development of gastric radiology. DESCRPTION: In order to achieve an overview of the historical development of gastric radiology, the works of the pioneers in this field were studied and systemized in chronological order. We describe the works of the following authors, who were pioneers and made contributions considered historical landmarks: C. Wegele & E. Lindemann, W. Becher, W. Cannon, F. Williams, H. Rieder, G. Holzchnecht, L. Cole, R. Carman, M. Haudeck, F. Eisler & R. Lenk, G. Elischer. I. Laufer, R. Miller, etc. CONCLUSIONS: We display the progress that has been made in gastric radiology.

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Does double contrast on small bowel follow through increase the diagnosis of Crohn's disease?

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PURPOSE: To determine the test characteristics of single-contrast, double-contrast and double-read barium follow-through (SBFT) examinations for the diagnosis of terminal ileum Crohn's disease against a gold-standard of ileo-colonoscopy with biopsy. MATERIAL AND METHODS: Prospective study with ethical review board permission. 120 outpatients undergoing investigation for suspected Crohn's were scheduled for SBFT with pneumocolon (for double-contrast views of the terminal ileum) and ileo-colonoscopy with biopsy within 21 days of each other. 73 patients completed both examinations. The SBFT examinations were read by two radiologists independently who then reached a consensus on double-reading. RESULTS: 37 of the 73 patients had a proven diagnosis of Crohn's disease. (Prevalence of 50.7%.) For the diagnosis of Crohn's disease against a gold standard of ileo-colonoscopy with biopsy the sensitivity/specificity of the two independent readers with only single-contrast SBFT images was 59%/95% (reader A) and 56%/90% (reader B). Adding double-contrast views had no effect on sensitivity (reader A 59–53%, reader B 56–59%) but did reduce specificity (reader A 95–83%, reader B 90–68%). Double-reading had no effect on the test characteristics for single-contrast image SBFT images (sensitivity/specificity 56%/95%). However, double-reading slightly improved test characteristics when double-contrast images were also reviewed (sensitivity/specificity 65%/90%). CONCLUSION: The sensitivity of SBFT for the diagnosis of terminal ileum Crohn's disease is poor. For single readers the addition of double-contrast views (SBFT with pneumocolon) reduces specificity without improving sensitivity and double-reading improves diagnostic performance only slightly and only with double-contrast images.

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Optimizing barium enema bowel preparation

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PURPOSE: To audit the quality of bowel preparation for barium enema examinations following the change of dose of laxative (picolax) from 2 to 3 sachets, which occurred as a result of reviewing a previous barium enema preparation audit. To audit the patient's adherence with preparation instructions. MATERIALS/METHODS: An audit proforma was completed for 100 consecutive patients attending for a barium enema examination. All patients received 3 sachets of laxative. Patients were asked to detail timing of laxative medication. Adequacy of bowel preparation was recorded as good, adequate, poor, or very poor by the attending radiologist. RESULTS: The patient population comprised 86% outpatients and 14% inpatients. 78% of patients were examined in the morning and 22% in the afternoon. 25% of patients were considered to be non-compliant with recommended preparation instructions. 28% of these patients had poor/very poor bowel preparation compared with only 8% of those whom considered as compliant. Overall bowel preparation was considered good or adequate in 87% of cases (75% in previous audit). Bowel preparation in afternoon patients was good/adequate in 81% (previously 52%) compared with 91% in morning patients (previously 82%). Inpatient bowel preparation was good/adequate in 85% (69% in previous audit) and almost as good as outpatient bowel preparation 87% (previously 75%). CONCLUSION: The change in laxative dose prior to barium enema examination has resulted in a significant improvement in quality of bowel preparation in all patient groups. Compliance with bowel preparation instructions results in improved bowel preparation.

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Multidetector computed tomography of caecal volvulus:a pictorial essay

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KEY LEARNING OBJECTIVES: Multidetector CT, using isotropic data sets, is the imaging technique of choice for the assessment of the acute abdomen. In caecal volvulus the plain radiograph may be limited by fluid filling the closed loop, or overlying of the closed loop by gas distended bowel. This pictorial essay provide's multiplanar images illustrating the CT signs of caecal volvulus including the "coffee bean", "bird's beak", "whirl" and "air-filled appendix sign". METHODS:

The post intravenous contrast CT datasets from 5 cases of surgically confirmed caecal volvulus were reviewed to provide multiplanar images of the CT signs of caecal volvulus. CONCLUSIONS: This pictorial essay aims to improve recognition and knowledge of the features of caecal volvulus These include the tapering and convergence of the 2 limbs of the looped obstruction at the site of torsion ("Birds beak" sign), the spiralling of loops of collapsed caecum with radiating enhancing engorged vessels ("The Whirl" sign), and the gas filled appendix sign.

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CT findings of the effects of acute pancreatitis on the small bowel and colon

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KEY LEARNING OBJECTIVES: The imaging of pancreatitis and its complications is widely described in radiological literature but its effects on the bowel are relatively less recognized. The aim of this pictorial review is to give a comprehensive illustration of the spectrum of pathologies affecting the bowel, secondary to acute pancreatitis, on multidetector row CT. DESCRIPTION: MDCT establishes the severity of an attack of acute pancreatitis by assessing the extent of the primary pancreatic injury and is also useful in evaluating any secondary insult to the extrapancreatic tissues. MDCT is particularly advantageous in the evaluation of acute pancreatitis as it is able to delineate the soft tissue planes and anatomical compartments by which inflammation affects bowel. Both the severity and extent of damage caused by acute pancreatitis are necessary for most severity scoring systems and hence the need for careful evaluation. Extrapancreatic extravasation of enzyme rich pancreatic juice extends the inflammatory process into adjacent tissues, i.e. infiltration between the layers of the gastrocolic ligament, small bowel mesentery or transverse mesocolon will lead to secondary effects on the stomach, small bowel and colon. In the acute phase, this infiltrate can inflame, compress, or erode into bowel leading to ischaemia, obstruction, ileus or perforation. CONCLUSION: Knowledge of the anatomic pathways involved in the spread of extrapancreatic inflammation during an episode of acute pancreatitis, is essential in order to appreciate bowel complications. Early recognition of the pattern of bowel involvement described can lead to the confirmation and management of severe underlying pancreatitis.

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A review of colorectal carcinoma missed by double contrast barium enema

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PURPOSE: The purpose of this study was to identify the factors leading to missed diagnosis of colorectal carcinoma (CRC) by double contrast barium enema (DCBE). MATERIALS/METHODS: Patients diagnosed with CRC between 1 January 2003 and 31 December 2005 were identified through MDT. Among these, patients who had DCBE within 3 years of the diagnosis were identified through RADIS. The DCBEs that missed the CRC were reviewed by two sets of Radiology Consultants and the sites confirmed by histopathology reports. RESULTS: Of the 324 patients identified, 84 patients had DCBE within 3 years of diagnosis. The cancer was demonstrated in 71 (84.5%) patients. Nine (10.7%) were equivocal studies. Seven were due to technical factors: coexistent disease (2), incomplete study (3), poor technique (1) and poor bowel preparation (1).Two were failure of interpretation. Sigmoid colon was the most common site. Of the 11 patients with missed cancer, 4 (perceptive mismatch 4.7%) were shown to have cancer on review. In seven patients, the cancer was not identified even on review (technical mismatch 8.3%). Five were due to technical factors: coexistent diseases (3), poor technique (1) and single contrast study (1). Two were simple failures. Rectum and caecum were the most common sites. CONCLUSION: The rectum and sigmoid colon were the most common sites for missed pathology with technical factor being the most common cause. A flexible sigmoidoscopy is a useful adjunct to DCBE in investigations of patients with CRC.

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Cancer or no cancer? Closing the gap between demonstration and perception at barium enema

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PURPOSE: Why is bowel cancer missed in double-contrast barium enema studies? We identify recurrent avoidable errors in the diagnosis of radiologically demonstrated colorectal cancers. MATERIALS/METHODS: The regional colorectal cancer database was cross-referenced with the local radiology database for 279 colorectal cancers from 2004 to 2005. In the year preceding their diagnosis, 100 patients had undergone complete barium enema examination. Reports were reviewed for positive tumour identification. Errors were categorised as (1) Technical: diagnosis could not be achieved because of an incomplete study, (2) Perception: tumour was missed but identified on retrospective review, (3) Interpretation: abnormality was identified but not categorised as cancer. These errors are demonstrated within the pictorial review. RESULTS: Colorectal cancer was originally diagnosed in 94/100 patients, yet retrospective review increased this value to 99%. There were 3 perception errors (1 caecum, 1 ascending colon and 1 sigmoid), 2 interpretation errors (1 "prominent ileocaecal valve" and 1 "faecal residue") and 1 technical error (inadequate double contrast). 3 of the caecal errors were due to "faecal masses" in an otherwise clear colon. CONCLUSION: Perception and interpretative errors were the most important. When "faecal residue" is present in the caecum with an otherwise clean colon, CT colonography should be performed increasing sensitivity to 97% in this cohort, approaching the 99% demonstration rate. Care should be taken in dismissing anatomical variations if they exhibit any degree of atypical morphology.

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The use of minimal preparation CT for the investigation of suspected colorectal cancer in frail, elderly patients

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PURPOSE: To evaluate the efficacy of minimal preparation computed tomography (MPCT) in detecting clinically significant colonic tumours in frail, elderly patients unable to tolerate bowel preparation for barium enema or colonoscopy. METHOD: All reports of patients who underwent MPCT at the Royal Liverpool Hospital, between 1 November 2002 and 31 October 2003, were reviewed retrospectively. The MPCT protocol consisted of 1.5 l Gastrografin 1% diluted with water administered during a 48 h period preceding the procedure in 3 divided doses, with no additional bowel preparation. Intravenous contrast was administered and single-slice spiral CT through the abdomen and pelvis was performed. The findings were categorised as definite, possible or no colonic malignancy. The results from the MPCT reports were then cross-referenced with the hospital histological database up to 31 October 2006. A definitive diagnosis of colorectal cancer was given following the appearance on the database. RESULTS: 115 MPCT studies were performed on 113 patients. Seven patients in the study group had a histologically confirmed diagnosis of colorectal cancer, giving a tumour prevalence of 6.2%. When all scans, reporting definite or possible malignancy, were considered positive the following values were calculated with 95% confidence intervals: sensitivity 0.50 (0.15, 0.85); specificity 0.74 (0.58, 0.90); PPV 0.13 (0.01, 0.24); NPV 0.95 (0.91, 1.00). CONCLUSION: MPCT is not a sensitive test, but it is a useful first-line investigation for investigating colorectal cancer in elderly patients, because it has a relatively high specificity and negative predictive value, so that it can accurately exclude malignancy.

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Magnetic resonance imaging for colovesical fistula

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KEY LEARNING OBJECTIVES: To understand the pathology and causes of colovesical fistula. To illustrate the role of MR and its potential superiority over other imaging modalities or clinical tests like CT, cystoscopy, cystography and barium enema. DESCRIPTION: Colovesical fistula is the most common type of enterovesical fistula and is commonly caused by diverticular disease. Traditionally various techniques have been used for diagnosis. CT has the advantage of looking at the surrounding organs and demonstrates the cause of fistula. However, MR scan has superior contrast and has the ability to see the bladder musculature and to delineate the fistula pathway. Over the period of past 6 years, we have been using MR for evaluation of colovesical fistula. We do post-micturation scan as micturation helps push urine into the fistula tract. This helps in locating the tract and in surgical planning. We will show a few examples of colovesical fistula demonstrated by MRI. CONCLUSION: MRI has a very important role in management of patients with colovesical fistula. Its use, in combination with other imaging modalities, facilitates better surgical planning and management.

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CT colonography. An analysis of radiological and clinician opinion

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PURPOSE: CT colonography is gaining popularity as an imaging modality in colonic disease. The aim is to assess whether or not there is consensus of opinion regarding adequacy, competency and performance of CTC. Additionally opinion is sought as to what type of patient should have this investigation in preference to endoscopy. MATERIALS/METHODS: A questionnaire, composing 5 questions was sent out to 27 radiologists with a GI interest and 57 gastroenterolgists/GI surgeons within the NW of England with a 74% response rate. RESULTS: (1) The majority of respondents (55–60%) believe CTC should be used as the first line radiological investigation of colorectal malignancy in preference to barium enema. (2) There was consensus of opinion regarding the patient who was unsuitable for CTC over endoscopy. There was a difference of opinion between radiologists and clinicians as to who was suitable for CTC in preference to endoscopy with the exception of an elderly patient with co-morbidities. (3) Some respondents to the questionnaire underestimate CTCs ability in detecting large (>9 mm) polyps and most, including 81% of clinicians, overestimate its sensitivity for small (<6 mm) polyps. CONCLUSION: It is important that those requesting and those performing colonography are aware of its limitations as well as its benefits. Greater consensus needs to be established as to which patients are suitable for CTC. This imaging tool is gaining popularity but its application in hospital practice needs further clarification. Consultants in radiology, gastroenterolgy and surgery have wide and varied opinions on the utility of CTC.

p522
CT in abdominal hernias

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Abdominal hernias are a common clinical entity. Although some are easy to diagnose clinically others need imaging for their precise diagnosis. CT not only makes a specific diagnosis but also demonstrates the contents of the hernial sac and detects complications such as obstruction, incarceration and strangulation. We describe the CT findings of some common and some not so common hernias such as obturator and internal hernias. Emphasis is placed on identifying various anatomical landmarks to provide an accurate preoperative diagnosis.

p523
The misty mesentery – five must know diagnoses

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KEY LEARNING OBJECTIVES: This exhibit will review the differential diagnoses of a "misty" mesentery. These will include uncommon conditions such as mesenteric panniculitis, segmental omental infarction and epiploic appendagitis. Illustrative examples of these conditions will be presented. Emphasis will be placed on the CT imaging features that help to differentiate between these pathological entities. DESCRIPTION: CT has an established role in the management of the acute abdomen. Occasionally, altered fat density in the mesentery (the "misty" mesentery) may provide a clue to possible underlying mesenteric or bowel pathology. These include mesenteric panniculitis, segmental omental infarction, epiploic appendagitis, mesenteric lymphoma and inflammatory processes such as diverticulitis. Specific imaging features are seen with these disease processes that aid the radiologist towards the appropriate diagnosis. Recognition of these conditions is important clinically, as it may prevent unnecessary operative intervention. CONCLUSION: Mesenteric panniculitis, segmental omental infarction, epiploic appendagitis, mesenteric lymphoma and acute diverticulitis may present with an acute abdomen and result in a "misty" appearance to the mesentery at imaging. A radiologist must be able to recognize the imaging features of these conditions and to guide further clinical management.

p524
Peritoneal carcinomatosis: pathways of intraabdominal spread and spiral CT findings

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LEARNING OBJECTIVES: (1) To recognize the pathways of spread of peritoneal carcinomatosis in the peritoneum. (2) To illustrate the CT finding of the different types of spread. DESCRIPTION: Peritoneal carcinomatosis may spread by direct invasion, lymphatic permeation, peritoneal seeding or hematogenously. The use of spiral CT in the evaluation of abdominal disease improve the detection rate of peritoneal carcinomatosis in patient with history of previous malignancy. In this exhibit we present the CT findings in our own patient to illustrate the spiral CT appearance of different types of spread in the peritoneum. Peritoneal carcinomatosis may be either primary (mesothelioma) or metastatic. The imaging patterns include fibronodular stranding, nodules, plaques, and masses. Spiral CT can identify the primary tumours and can assess the location of the metastatic process (e.g. mesentery and omentum). The various patterns of peritoneal involvement may be helpful in establishing the diagnosis. The entities involved include neoplasms of ovary, stomach, colon, pancreas, and uncommon malignant melanoma, breast or lung carcinoma. CONCLUSION: Spiral CT shows the pathways of spread of peritoneal carcinomatosis, and identify the primary neoplasm. Is the most useful modality in diagnosis and follow-up pf peritoneal tumours.

p525
Imaging of the pancreatic transplant in simultaneous pancreatic-renal transplants and their complications

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KEY LEARNING OBJECTIVES: (1) To review the surgical anatomy of simutaneous pancreatic and renal transplants. (2) To review the normal post-operative imaging appearances. (3) To discuss the

complications and relevant imaging features. OBJECTIVES: We will review the surgical anatomy detailing methods of reconstructing pancreatic vasculature and managing graft secretions. We will demonstrate post-operative imaging appearances of the normal pancreatic transplant – using ultrasound and cross-sectional imaging. An early reversible cause of graft loss is vascular thrombosis and expedient imaging with ultrasound is essential, but appearances are often difficult to interpret – hence a good understanding of the underlying surgery is essential and further imaging with MR and angiography can be helpful. Possible leakage and sepsis are best imaged directly with CT. Rejection is the most common complication and here biopsy is essential. CONCLUSION: The postoperative imaging appearances of the pancreatic transplant in simultaneous pancreatic and renal transplants are variable and difficult to interpret. These can be optimized by using the appropriate imaging modality and understanding the underlying surgical anatomy and physiology.

p526

Complications of minimally invasive retroperotoneal pancreatic necrosectomy – a pictorial review

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KEY LEARNING OBJECTIVES: There is a wide range of complications that follow necrosectomy for acute pancreatitis. Tubograms are used to assess the size of cavities and fistulae. Very little has been published about the appearances of various complications as seen on tubograms. This pictorial review provides an insight into the appearances of complications as seen on tubography following minimally invasive retroperotoneal pancreatic necrosectomy (MIRP). DESCRIPTION: Retrospective analysis of the list of patients who have under gone minimally invasive retroperitoneal pancreatic necrosectomy (MIRP) and subsequent tubography over 3 years duration (September 2002 to September 2005) has been performed. The images demonstrating the complications have been harvested from the tubogram studies performed during this period (n=48). At our hospital (Royal Liverpool University Hospital, Liverpool, UK), pancreatic necrosectomy is done using a percutaneous approach initially in the CT department and then in the theatres under fluoroscopic guidance. Patient's progress is followed up with a repeat CT scan and tubography to assess cavity size and any other complications. CONCLUSION: Tubography following MIRP is a study usually encountered in tertiary hospital practice, due to the nature of illness (necrotic pancreatitis) which requires care in a specialized pancreatic unit. We believe that this pictorial review will familiarize the radiology trainees and radiologists based in the DGH setting, to the appearances of the complications as seen on tubography.

Gastrointestinal Electronic Poster

e527

An audit to assess use of the plain abdominal film in the investigation of acute abdominal pain

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PURPOSE: To assess the percentage of patients presenting in Accident and Emergency that received a plain abdominal film, and determine if this represents over utilization of the test. MATERIALS/METHODS: A 2-month retrospective audit was conducted, which included the investigation of 55 patients with acute abdominal pain. The final diagnosis was determined on clinical, investigative, operative and pathological findings. Comparison of the results was made with published data. RESULTS: The utilization rate of the plain abdominal film in emergency patients was 52.7%. This is within the standards set from the published data, where the utilization rate was 55.8%. The conditions where the plain abominal film was most useful were bowel obstruction and urolithiasis. The plain abdominal films were diagnostic in 24.1% of cases. Using RCR guidelines for the request of films, the utilization rate would drop from 52.7% to 20% and not significantly alter the diagnostic yield. This has important implications for patient exposure, staff resource and cost. Proposals for modification of deparment protocols were made and re-audit suggested in 1 year. CONCLUSION: The utilization rate of the plain abdominal film was 52.7% in the investigation of acute abdominal pain. By following RCR guidelines, this can be reduced to 20%, with a resulting decrease in patient exposure, staff resource and cost.

e528

Radiologic signs in CT evaluation of acute abdominal emergencies – a pictorial review

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Multiple signs associated with acute abdominal imaging are described in the literature. Identifying these signs allows the radiologist to make a specific diagnosis or give a concise differential diagnosis. This pictorial review of common radiological signs seen on CT scans in acute abdominal emergencies will help radiology residents and practising radiologists to understand what these signs stand for and help to revise the characteristic radiological features of acute abdominal emergencies. 300 CT scans were evaluated for signs in acute abdominal emergencies. The following signs were noted and have been illustrated. (1) "Arrowhead sign" in acute appendicitis, (2) "Central dot and hyperattenuating rim signs" in Epiploic appendagitis. (3) "White pyramid sign" – Absence indicates tubular hydronephrosis, an early sign of urinary obstruction. (4) "Rim sign" – For differentiating ureteric calculus from phlebolith. (5) "Target, rim & crescent signs" in common bile duct stones. (6) "Small bowel feces sign" in small bowel obstruction. (7) "Whirl sign" in volvulus. (8) "Double halo and Target signs" in inflammatory bowel disease, ischemia, infection and radiation damage. (9) "Fat halo sign" in Crohn's disease and ulcerative colitis. (10) "Comb sign and Creeping fat signs" in Crohn's disease. (11) "Accordion sign" in Pseudomembranous colitis. (12) "High attenuation crescent" and "draped aorta signs" in impending rupture of aortic aneurysm. (13) "Beak sign" in aortic dissection. (14) "Fat halo sign" in mesenteric panniculitis. (15) "Straight border sign" in sectorial THAD due to portal vein thrombosis. We hope that the above pictorial review will help the viewers to better understand and diagnose the CT appearance of acute abdominal pathologies.

e529

Diagnostic accuracy of detecting causes of abdominal sepsis with multislice computed tomography

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PURPOSE: The further development of multislice detector CT (MSCT) has increased complexity of examinations and led to changes in examination technique. Diagnostic accuracy of detecting causes of abdominal sepsis with this technology was sought, since there is a need to justify the level and frequency of radiation exposure associated with MSCT and there are insufficient published data on this application with MSCT. MATERIALS/METHODS: Patients who received CT of the abdominal cavity after presenting with potential abdominal sepsis were assessed over a 12 month period. Indicators for sepsis included physical signs, patient condition and elevated inflammatory variables. Scans were performed using the GE LightSpeed 16 (GE Healthcare Medical Systems, Slough). Dose parameters recorded were the dose–length product (DLP) and volume CT dose index, as satisfactory values for dose audits. RESULTS: 94 patients were included in the study. Causes of abdominal sepsis could be detected with a sensitivity of 0.95 and specificity of 0.91. Ascites and abscesses were identified most frequently. Mean patient DLP was lower in abscesses than ascites and highest in peritonitis studies. Patients with abscesses and acute pancreatitis had the highest number of scanner visits during their stay in hospital. However, patients with diverticular disease had the lowest number of scanner visits, lowest cumulative DLP and shortest stay in hospital. CONCLUSION: Diagnostic accuracy data for MSCT scans using 16 slices confirm CT remains a suitable modality for imaging abdominal sepsis. This study relates sensitivity to exposure in this application, and represents the baseline for future potential dose constraint.

e530

CT abdominal signs – a pictorial review of our "top ten"

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KEY LEARNING OBJECTIVES: (1) To describe the characteristic imaging features of 10 signs seen on abdominal CT and to be able to identify these signs on cross sectional imaging; (2) To describe the incidence and relevance of these signs. DESCRIPTION: CT is commonly used in the investigation of acute abdominal pain in order to improve early diagnosis. In the current climate it is being increasingly used in order to avoid diagnostic delays often in conjunction with ultrasound imaging. There are many characteristic signs seen on abdominal CT that should be recognized by the reporting radiologist so as to assist in making as accurate a diagnosis as possible. Familiarity with these CT imaging signs may allow early diagnosis and therefore progression to earlier treatment and surgical intervention if required. This may help prevent progression to more serious pathological conditions and therefore avoid complications. We present the cross-sectional imaging of our "Top Ten signs" along with descriptions of the findings, incidence and significance. The signs included are the Comb sign, the Accordion sign, the String of Pearls, the Fat Halo and the Water Halo signs, the Pancreatic Duct Interruption sign, the Small Bowel Faeces sign, the Target sign, the Sandwich sign and the Whirl sign. CONCLUSION: Although many of these abdominal signs are non-specific they are associated with certain pathologies and their recognition will help lead to the correct diagnosis. We therefore present 10 abdominal signs we have encountered and describe their characteristic features and significance.

e531

Imaging in acute surgical conditions. Clinicians awareness of Royal College guidelines

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PURPOSE: Many radiological investigations performed on acute surgical patients have low yield. This is due to lack of adequate guidelines and their awareness amongst junior doctors. Aim of our study was to identify different investigations performed, review their usefulness and assess basic awareness of clinicians with regards to radiation. MATERIALS/METHODS: Review of 103 consecutive patients admitted in acute surgical unit in September 2006. Questionnaires sent to 66 clinicians in the surgical directorate. RESULTS: Abdominal X-ray was performed on 65 (63%), CXR on 55 (53%), ultrasound on 42 (40%), CT on 31 (30%) and 11 (11%) did not have any imaging. Significant abnormality was reported on 12 (18%) of the AXRs, 6 (10%) of CXR, 15 (36%) of the ultrasound and 18 (30%) of CT. There were 28 females under the age of 45, of these, 4 had no imaging, 11 had CXR, 12 had AXR, 6 had CT and 17 (61%) had ultrasound scan. 18 questionnaires were returned, 43% of responses were correct with regards to dose equivalent in background radiation and 22% of clinicians had access to RCR guidelines. CONCLUSION: AXR and CXR were most common investigation performed, but positive in less than 20% of cases. Ultrasound/CT had positive findings in more than 30%. All the CXRs, in females younger than 45 years, were normal. There is inadequate awareness amongst clinicians with regards to radiation doses and RCR guidelines. The new RCR guidelines would serve their best only if, they are incorporated in junior doctor's teaching curriculum.

e532

Abdomainal tuberculosis – the great mimicker. The spectrum of imaging findings and potential simulators

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PURPOSE/AIM: Tuberculosis (TB) is quiet common disease entity and can involve any part of the abdomen. Our aim is to highlight the varied CT or MRI characteristics of abdominal TB and to emphasise the common differentials it can imitate which can be quite confusing and hence has tremendous impact on successful treatment of patient. CONTENT ORGANIZATION: Abdominal TB is a common clinical disease in Asian countries and also in west in view recent surge in immunocompomised population. Practically it can involves any organ in the body. The imaging features are quite variable. Differentials can be from congenital entities like epidermoid cyst of spleen to hepatocellular carcinoma of liver. We present the spectrum of tuberculous involvement of both hollow and solid organs of the abdomen and emphasise on common disease entities it can simulate. SUMMARY: Abdominal TB is common disease entity expecially in asian countries which can have extremely variable appearance in modern imaging like CT or MRI and hence pose diagnostic challenges. It is of paramount importance to keep in differential diagnosis in order to have successfull outcome.

e533

***Clostridium difficile* revisited: pictorial review of an old problem with new relevance**

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KEY LEARNING OBJECTIVES: *Clostridium difficile* toxin (CDT) is the leading cause of antibiotic-related diarrhoea in the NHS and causes virtually all cases of pseudomembranous colitis (PMC). Endemic in nursing homes and hospitals, *C. difficile* poses most threat to the immunodeficient and elderly. CDT related disease is now more prevalent, with the proportion of severe cases increasing due to emergence of highly virulent strains. Estimated mortality is >10% in those over 60 years. Reliance on early imaging places the Radiologist in a key position to alert clinicians of suspected disease, direct management and limit morbidity. Our aim is to raise awareness of the key imaging features of PMC on plain film, ultrasound and CT with pathology correlates. DESCRIPTION: Plain film features range from ileus (up to 50%), haustral thickening and "thumb-printing" to polypoidal mucosal thickening, pneumatosis and toxic megacolon, suggestive of PMC. Ultrasound is often the first test in patients with vague symptoms and so aids early detection. Features include focal/diffuse mural thickening and trapping of echogenic bowel contents in haustral folds equivalent to the CT "accordian" sign. CT is of benefit in unsuspected CDT cases and can guide endoscopy. Features include mural thickening, "target sign", pericolic stranding and secondary ascites. These are less sensitive indicators compared with the "accordion" sign; mural irregularity with contrast enhancement. CONCLUSION: Familiarity with the imaging of CDT disease is essential in limiting epidemics of new strains and avoidance of surgery.

e534

Gastrointestinal manifestations of lymphoma – a demonstration of the CT appearances with FDG CT/PET correlation

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KEY LEARNING OBJECTIVES: To recognize the unusual presentation and features of Lymphoma in the gastrointestinal tract with CT and PET correlation. DESCRIPTION: A review of 3 years of a network lymphoma MDM was made with identification of cases of abdominal lymphoma with emphasis of both luminal and solid organ involvement. Cases demonstrated in this poster will include predominantly those which presented with primary abdominal disease in the absence of systemic involvement and were frequently mistaken for solid organ malignancy. The poster will aim to alert radiologists to the diagnosis of lymphoma in almost any organ and remind them to consider this imprtant diagnosis. Cases of primary oesophageal, small bowel, colonic, liver and pancreatic lymphoma will be shown. CONCLUSION: Lymphoma is an important diagnosis to consider in the abdomen and if suspected should be biopsied to prevent unecessary surgery and delay in diagnosis.

e535

Percutaneous transhepatic cholangiography: is sedoanalgesia given by radiologists safe and effective?

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PURPOSE: Conscious sedation is commonly used to facilitate uncomfortable diagnostic and therapeutic procedures. The aim of this study was to examine the safety and effectiveness of sedoanalgesia provided by radiologists during percutaneous transhepatic cholangiography (PTC). MATERIALS/METHODS: 30 consecutive patients undergoing PTC between 2003 and 2005 were included in this study. Ethical approval and written informed consent from patients was obtained. Sedoanalgesia was provided using titrated fentanyl and midazolam. Data collected included patient demographics and previous medical history, pulse oximetry and automated sphygnomanometry, degree of analgesia (Ramsay score), comfort level during and after the procedure, and adverse haemodynamic, respiratory and gastrointestinal events. Statistical analysis of the relationship between these variables was by logistic regression. RESULTS: Mean age of patients was 71 years. Mean length of procedure was 82 min (±10). The majority (73%) of patients experienced transient anxiety or agitation (Ramsay 1) and/or significant discomfort at some point during the procedure. None suffered from excessive sedation. Conditions such as transient hypotension, hypoxia and bradycardia were safely dealt with. No serious complication occurred. Statistics did not prove inadequate sedoanalgesia to be related to sedative dosage, age of patients, or duration of procedure ($p>0.05$). 83% indicated overall satisfaction with the procedure. CONCLUSION: Although there were no serious adverse events, patients experienced episodes of under-sedation when sedoanalgesia is performed by radiologist during PTC.

e536

Radiological appearances of dropped gallstones

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KEY LEARNING OBJECTIVE: Radiological appearances of dropped gallstones. DESCTIPTION: Laparoscopic cholecystectomy is the treatment of choice for gallstones. However, one of the infrequent complications of this operation is dropped gall stones. This often presents with atypical pain or complex abscess formation. CONCLUSION: Dropped gall stones are an unusual complication of laparoscopic cholecystectomy. However, these must be recognized and treated promptly. This pictorial review will highlight their common locations and appearances on a range of imaging modalities.

e537

Bouveret Syndrome: a pictorial review of imaging in three cases

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KEY LEARNING OBJECTIVES: To describe and illustrate CT and MR cholangiopancreatography (MRCP) findings in Bouveret's syndrome. DESCRIPTION: Bouveret's syndrome is a rare condition characterized by gastric outlet obstruction secondary to an impacted gallstone in the stomach or duodenal bulb. It accounts for 1–3% of gallstone ileus cases. All of the patients presented with vomiting (one bilious) and epigastric pain. They all had ultrasound scans followed by a CT scan. Two of the patients had an MRCP prior to the CT scan.The CT scans revealed the Rigler triad of pnuemobilia, dilated stomach and impacted calcified duodenal gallstone. MRCP images are rarely described in the literature and are useful in cases with isoattenuating stones or in patients unable to tolerate oral contrast. All of the patients were successfully treated with laparotomy and stone removal via enterotomy. CONCLUSION: Radiologists should become familiar with the imaging appearance of Bouveret's syndrome which is being revealed more frequently on CT scanning for abdominal pain. Early diagnosis is essential as it causes significant morbidity and has a surgical mortality of about 12%.

e538

Ultrasound evaluation in liver cirrhosis

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LEARNING OBJECTIVES: (1) To understand the different ultrasound techniques used in the diagnosis and assessment of liver cirrhosis including grey scale imaging, Doppler ultrasound, contrast enhanced ultrasound (CEUS), hepatic vein transit time (HVTT) and elastography. (2) To recognize the appearance of the cirrhotic liver with different ultrasound techniques. DESCRIPTION: Ultrasound is essential in both assessment of the potentially cirrhotic liver and surveillance of selected patients with chronic hepatitis as liver biopsy can be misleading or inaccurate in 25% of cases. Elastography and HVTT have the potential to exclude patients without significant fibrosis or cirrhosis. Other applications can demonstrate a cirrhotic liver and complications such as portal hypertension and hepatocellular carcinoma. The techniques employed in grey scale imaging, Doppler, and CEUS are described and illustrated. These include grey scale changes such as volume redistribution, capsule nodularity, parenchymal nodularity and echotexture. The Doppler findings in the hepatic veins, portal veins, hepatic artery and varices are illustrated as is the role of low mechanical index CEUS in the assessment of hepatocellular carcinoma and portal vein thrombus. CONCLUSION: Optimized ultrasound technique is essential for accurate diagnosis of the cirrhotic liver and its complications.

e539

The role of MR contrast agents in imaging of focal liver lesions

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Focal liver lesions are frequently detected on CT or ultrasound and some of these require further characterization by MRI. We present a pictorial spectrum of MRI appearances of liver lesions, demonstrating how MRI contrast agents and combinations of MRI sequences have helped differentiate between various diagnostic possibilities. The main groups of MR contrast agents currently in use for liver imaging are: the widely used extracellular gadolinium chelates, superparamagnetic iron oxide (SPIO) particles (reticuloendothelial agents), combined agents that demonstrate extracellular and hepatobiliary properties, and manganese containing hepatobiliary agents. Combining SPIO agents with gadolinium chelates increases the sensitivity and accuracy of characterization of liver lesions. Radiologists should be familiar with the application of these MR contrast agents. A wider application of these agents where appropriate, will improve the characterization accuracy, aid treatment, and often reduce the need for diagnostic biopsy.

e540

Transjugular intrahepatic portosystemic shunt (TIPSS): approaches for imaging

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KEY LEARNING OBJECTIVES: To provide a step by step approach to the TIPSS procedure and its current use as a treatment option. The role of imaging for the procedure and in follow up will be discussed with respect to complications encountered. DESCRIPTION: The TIPSS procedure will be reviewed and the short- and long-term complications analysed (both procedural and shunt related). Experience of follow-up with Duplex ultrasound and MDCT will be presented. Indications for TIPSS have evolved as the procedure has become more commonly deployed as an interventional procedure. Indications such as acute variceal bleeding, hepatorenal syndrome and hepatic hydrothorax will be discussed. Current evidence for TIPSS as a rescue treatment will also be reviewed. CONCLUSION: Improved skills and technical development has made TIPSS an important procedure for a variety

of conditions. Emerging indications for its use will require future randomized controlled trials. Imaging has defined roles in placement, shunt patency and follow-up.

e541
The angry pancreas

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LEARNING OBJECTIVES: (1) Recognize acute pancreatitis is a debilitating condition with serious complications and associated high mortality. (2) For radiologists to be familiar with the complications of acute pancreatitis enabling appropriate subsequent patient monitoring, management and intervention. BACKGROUND: Acute pancreatitis is a serious and frequently occurring condition. There are a multitude of risk factors including gall stone disease, excess alcohol consumption, steroid use and interventional procedures. It has a varied and unpredictable clinical course from mild to severe. Mild cases may have an uneventful recovery. However, acute pancreatitis can cause many complications the importance of which lie in their recognition and appropriate management or intervention. The aim of this exhibit is to demonstrate the typical complications arising from acute pancreatitis. Our exhibit uses multidetector CT with multiplanar reformats and post-processing of images to demonstrate the typical findings of acute pancreatitis including pseudocyst formation, pancreatic necrosis, abscess, splenic artery pseudoaneurysm, perforated duodenum and fistula formation. CONCLUSION: Radiologists must be familiar with acute pancreatitis and its complications in order to allow for prompt and timely intervention where required. In so doing patient morbidity and mortality can ultimately be reduced.

e542
The clinical utility of 18F-FDG PET/CT in the evaluation of oesophageal carcinoma: a pictorial review

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KEY LEARNING OBJECTIVES: After reviewing this exhibit, the delegate will be able to: Describe the current indications for PET/CT in the imaging of oesophageal carcinoma. Understand some of the limitations and pitfalls in image interpretation in PET/CT of oesophageal carcinoma. Discuss potential future uses of PET/CT in the imaging of oesophageal carcinoma. Analyse illustrative clinical cases that highlight the role of PET/CT in the management of this important group of patients. DESCRIPTION: Carcinoma of the oesophagus accounts for approximately 5% of all cancers, with 7500 incident cases in the UK annually. The overall 5-year survival is only 10%, increasing to 15–40% in patients who are eligible for resection of the primary tumour. A multimodality approach is required in the evaluation of oesophageal carcinoma, with ^{18}F-FDG PET/CT forming an integral part of the imaging pathway, as unsuspected metastatic disease is identified in an additional 5–10% of patients. Moreover, PET/CT can alter the management approach in approximately 20%, preventing inappropriate surgery in these cases. By utilising a number of interactive and illustrative clinical examples, this pictorial review will provide an overview of the clinical versatility of PET/CT in the evaluation of patients with oesophageal carcinoma. CONCLUSION: ^{18}F-FDG PET/CT has an important role in the evaluation of patients with oesophageal carcinoma, particularly by identifying unsuspected metastatic disease and preventing inappropriate surgery. With an increasing body of evidence, the role of PET/CT is set to expand to incorporate the detection of disease response and recurrent disease.

e543
Initial experience of using CT-PET to stage potentially operable oesophageal carcinoma

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PURPOSE: To demonstrate the efficacy of CT-PET in staging oesophageal cancer in potentially operative patients. To discuss potential pitfalls and difficulties with CT-PET. MATERIALS/METHODS: Radical therapy for oesophageal cancer still has a relatively low 5 year survival, with a high morbidity and mortality rate. Surgical resection offers no significant palliative benefit in those patients with advanced disease. Therefore, accurate staging is vital so that patients can receive appropriate treatment. Standard staging includes CT of chest and abdomen, and endoscopic ultrasound. CT-PET is a recent advancement which is used to detect metastatic disease not identified on CT. We have been using CT-PET for staging in patients with potentially operable oesophageal cancer since April 2007. All of these patients have had a CT which has not revealed definite inoperable disease. This poster presents our experience, with particular reference to the percentage of patients in whom distant disease was discovered on CT-PET. RESULTS: In 6 of our first 40 patients (15%), CT-PET demonstrated distal malignant disease that was not demonstrated on CT. Some positive findings were totally unexpected, and some helped confirm malignancy in equivocal cases on CT. 4 of the 6 patients would definitely have had radical therapy had it not been for having the CT-PET. A disadvantage was that CT-PET also produced equivocal findings in several patients, leading to benign biopsies. CONCLUSION: We have found CT-PET to be an invaluable modality in oesophageal staging, and it has significantly increased the sensitivity of our staging.

e544
CT evaluation of gastrointestinal stromal tumours

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Gastrointestinal stromal tumours (GIST) are smooth muscle tumours that can arise anywhere in the GI tract most commonly affecting the stomach and the small bowel. These form a heterogeneous group of tumours with a variable malignant potential. CT is the examination of choice for diagnosis and evaluation of GIST. It also provides a reproducible assessment of the tumour following treatment. We describe their imaging features, pattern of metastatic spread and the changes seen in liver metastasis following treatment with Imatinib (Glivec).

e545
Radiological – pathological correlation of gastrointestinal stromal tumours – experiences from Leeds

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KEY LEARNING OBJECTIVES: To illustrate the spectrum of imaging findings of gastrointestinal stromal tumours (GIST) throughout the gastrointestinal tract. To review the radiological and pathological features of these tumours with particular emphasis on their cross-sectional and endoluminal ultrasound appearances. DESCRIPTION: GISTs are the most common mesenchymal tumours of the gastrointestinal tract. They are defined by their expression of KIT (CD117) – a tyrosine kinase growth factor receptor. They arise within the muscularis propria or muscularis mucosa of the bowel wall from precursors of Cajal cells. Radiology plays an important role in the diagnosis and management of these tumours and an understanding of their typical and atypical imaging features is therefore essential. CT is the imaging modality of choice to assess tissue of origin, local invasion and the presence of distant metastases. Most arise from stomach or small bowel and imaging features vary depending on tumour size and aggressiveness. Small tumours typically appear as well-defined, homogeneously enhancing soft tissue masses, while larger tumours tend to show central necrosis, haemorrhage and a more heterogeneous pattern of enhancement. Larger tumours have a greater propensity to be malignant, but pathological assessment is required in all cases. CONCLUSION: It is important to be aware of

the spectrum of imaging appearances of GISTs and consider these within the differential diagnoses of the various gastrointestinal tumours. Radiological and pathological correlation is important to ensure appropriate patient management.

e546

The role of CT and MRI in the assessment of Crohn's disease and its complications

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KEY LEARNING OBJECTIVES: The aim of this exhibit is to: Provide a pictorial review of the CT and MRI appearances of Crohn's disease and the associated complications of the disease process. DESCRIPTION: (1) Overview of the pathophysiology of Crohn's disease; (2) Review of indications and contraindications of cross sectional imaging; (3) Current imaging techniques used in CT and MRI along with the associated advantages, disadvantages and pitfalls; (4) Review of the imaging findings in active inflammatory Crohn's disease of differing severity; (5) Review of the imaging findings of complications of disease including (a) enteroenteric/colic fistula, (b) perianal fistula, (c) stricture formation, (d) mesenteric abscess, (e) appendicitis, (f) extraenteric complications including sacroilitis, renal stones, cholelithiasis, primary sclerosing cholangitis and lymphoma. (6) Discussion of future advances in imaging of Crohn's disease. CONCLUSION: The main teaching points of the exhibit are: MRI has the advantage of evaluating disease activity in Crohn's disease with the absence of ionizing radiation. Cross sectional imaging allows for diagnosis and follow up of the complications associated with the disease.

e547

Radiological manifestations of Crohn's disease in the elderly: a pictorial review

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KEY LEARNING OBJECTIVE: To illustrate the radiological appearance of Crohn's disease in the elderly. DESCRIPTION: Crohn's disease typically presents at 2 peaks, commonly in the younger age group and less so in the older age group. However, with the use of cross sectional imaging, Crohn's disease has become increasingly recognized in the older age group where the radiological presentation may be difficult to distinguish from other common disorders. Imaging appearances can easily be confused with diverticulitis, ischaemia and carcinoma. This poster illustrates the difficulty and dilemmas of diagnosing Crohn's disease on imaging. CONCLUSION: This pictorial review will illustrate the radiological manifestations of Crohn's disease as a mimic of other potential differential diagnosis.

e548

Colonic thickening on computed tomography; what features predict positive lower gastrointestinal endoscopy?

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OBJECTIVE: Increased use of abdominal CT has led to greater detection of colonic wall thickening (CWT). We assessed CT features of CWT which were associated with positive findings at lower gastrointestinal endososcopy (LGIE). DESCRIPTION: We performed a retrospective study of endoscopies requested for the investigation of CWT reported at CT. CT images were reviewed for site of CWT, degree of wall thickening, length of bowel involvement, hyperaemia, presence of local lymph nodes, peri-colonic fat stranding and free fluid. Patients were excluded if endoscopic examination was incomplete and did not reach the site of CT abnormality, if there was associated diverticular disease, or a previous diagnosis of colorectal cancer or inflammatory bowel disease. RESULTS: We identified 34 (1%) patients with CWT from 3400 undergoing abdominal CT during a 1 year period, who subsequently underwent LGIE. 15/34 (44%) had positive findings, and 19/34 (56%) had negative findings at LGIE. Positive findings at LGIE were associated with CWT distal to the splenic flexure (13/15 *vs* 7/19, $p=0.005$) and peri-colonic fat stranding (11/15 *vs* 6/19, $p=0.04$). There was a non-significant trend towards greater wall thickness being associated with positive findings at LGIE (median (IQR) 10 (6–11) mm *vs* 8.5 (5–10) mm, $p=0.2$). CONCLUSION: The overall positive predictive value of CWT for abnormality at LGEI was 44%. CWT distal to the splenic flexure and the presence of peri-colonic fat stranding were predictive of abnormal findings at LGEI. The presence of these features may aid in determing the requirement for LGEI in individuals with CWT at CT.

e549

MRI accuracy in determining rectal carcinoma surgical resection margin involvement, with and without preoperative chemoradiotherapy

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PURPOSE: MRI is central in rectal carcinoma management, determining feasibility of surgical resection, most appropriate operation, and need for neoadjuvant chemoradiotherapy (CRT). A retrospective analysis of rectal MRI accuracy in identifying resection margin involvement was undertaken during a departmental audit. MATERIALS/METHODS: Cases of rectal carcinoma were identified from the 2006 hospital histopathology database. Histology and radiology MRI reports were interrogated for: radiological involvement of the circumferential resection margin (CRM); histological CRM involvement from surgical resection specimens; and the use of preoperative CRT. Radiology and histology reports were compared with determine MRI accuracy in predicting surgical CRM involvement. RESULTS: Of 100 patients with rectal carcinoma, 55 had pre-operative MRI followed by tumour resection. 20 of these had preoperative CRT. In the determination of CRM involvement, there was agreement between rectal MR and surgical resection specimen histology in 96% without CRT (negative predictive value 100%) and 73% following CRT (negative predictive value 100%). Radiological CRM involvement could not be determined in 11% of cases without CRT, and 25% cases following CRT. CONCLUSION: Rectal MRI has a high negative predictive value in determining surgical CRM involvement. Although post-CRT peri-tumoural fibrosis causes difficulties determining CRM involvement, a high degree of accuracy is still possible. Discordant cases are presented to illustrate potential pitfalls.

e550

Accuracy and pitfalls of MRI in staging rectal carcinoma, with and without preoperative chemoradiotherapy

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PURPOSE: MRI plays a central role in the management of rectal carcinoma, determining feasibility of surgical resection, most appropriate operation, and need for neoadjuvant chemoradiotherapy (CRT). A retrospective analysis of rectal MRI accuracy in identifying tumour (T) stage was undertaken during a departmental audit. MATERIALS/METHODS: Cases of rectal carcinoma were identified from the 2006 hospital histopathology database. Histology and radiology MRI reports were interrogated for: radiological tumour stage; surgical resection specimen histological tumour stage; and use of preoperative CRT. Radiology and histology reports were compared with determine the accuracy of MRI in predicting histological tumour (T) stage. RESULTS: Of 100 patients with rectal carcinoma, 55 had pre-operative MRI followed by tumour resection. 20 of these

had preoperative CRT. The agreement of rectal MRI with histology in determining T stage was 63% without CRT, and 70% following CRT. In particular, in the absence of chemoradiotherapy, there was a tendency to under-stage histological T3 disease. CONCLUSION: Rectal MRI plays an essential role in determining tumour stage prior to definitive treatment. Cases of under-staged histological T3 disease are presented to provide insight into potential pitfalls in identifying early invasion of the muscularis propria.

e551

The clinical utility of ^{18}F-FDG PET/CT in the evaluation of colorectal carcinoma: a pictorial review

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KEY LEARNING OBJECTIVES: After reviewing this exhibit, the delegate will be able to: Describe the current indications for PET/CT in the imaging of colorectal carcinoma. Understand some of the limitations and pitfalls in image interpretation in PET/CT of colorectal carcinoma. Discuss potential future uses of PET/CT in the imaging of colorectal carcinoma. DESCRIPTION: Colorectal carcinoma is the second most common cause of cancer mortality in the developed world, and there are approximately 40 000 incident cases in the UK annually. The overall 5-year survival is approximately 55%, although this is heavily dependant on staging of disease at diagnosis. A multimodality approach is required in the evaluation of colorectal carcinoma, with ^{18}F-FDG PET/CT forming an integral part of the imaging pathway. PET/CT has an established role in several settings including: (a) localizing the site of recurrence in patients with rising carcinoembryonic antigen (CEA) levels and negative conventional imaging, (b) discriminating between recurrent tumour and fibrosis in presacral soft tissue masses and (c) in the detection of extrahepatic disease when planning hepatic resection for potentially limited metastatic disease. By utilizing a number of interactive and illustrative clinical examples, this pictorial review will provide an overview of the clinical versatility of PET/CT in the evaluation of patients with colorectal carcinoma. CONCLUSION: ^{18}F-FDG PET/CT has an important role in the evaluation of patients with colorectal carcinoma. With an increasing body of evidence, the role of PET/CT is set to expand even further, particularly to incorporate the detection of disease response to established and novel therapies.

e552

An audit of CT colonography in a district general hospital setting

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KEY LEARNING OBJECTIVES: To illustrate that CT colonography (CTC) is an accurate and practical technique in a DGH setting. To demonstrate the particular benefits of CTC. To discuss the issues relating to setting up a CTC service in a DGH. DESCRIPTION: CTC is a relatively recent, but well established technique for investigating colorectal cancer. However, the issues of training, scanner time and available software/hardware place limitations on the abilities of a DGH radiology department to offer this service. This poster aims to illustrate that using CTC for selected patients is accurate and fits in well with the work of a DGH. Clinicians also find it helpful in examining the colon. Over a 12 month period we performed 82 CTCs. The scans were performed on a 16 slice CT scanner. All patients were given full bowel preparation and IV buscopan, and colonic distention with air was performed. Scanning was performed in prone and supine positions, with IV contrast administration for the supine scan. A large majority of the scans were performed for patients who could not have a barium enema or colonoscopy, or had previously failed attempts with those techniques. 7% had colon cancer and 9% had non-colonic cancers, with one false positive for colon cancer and no-false negatives on follow-up so far. CONCLUSION: CTC is a useful technique in investigating colonic cancer in a DGH, even when not offered as a first line service. Tailored to the available resources, it offers benefits to patients, clinicians and radiologists.

e553

Virtual endoscopy: a pictorial review of the appearances of upper and lower gastrointestinal pathologies

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KEY LEARNING OBJECTIVES: To illustrate the utility of virtual upper and lower GI endoscopy, and to describe the methods available to produce optimum images. DESCRIPTION: Conventional, invasive endoscopy has long been the gold standard to evaluate intraluminal pathology. However, advances in multidetector computed tomography (MDCT) coupled with powerful image manipulation software have led to the increasing usage of the virtual endoscopy, most notably as the virtual colonogram. With appropriate dedicated preparation however, this technique can also be applied to the upper gastrointestinal tract. In our department this consists of a carbex/water combination (acting as a negative oral contrast agent) to evaluate the oesophagus and stomach, with additional left lateral decubitus imaging of the duodenum. Large bowel MDCT endoscopy is undertaken using automated rectal carbon dioxide insufflation followed by supine and prone scanning. In this presentation we will correlate both the virtual and actual endoscopic images of upper and lower gastrointestinal pathologies including oesophageal carcinomas, exophytic gastric tumours, gastrointestinal stromal tumours (GISTs), malignant gastric ulcers, duodenal and ampullary tumours, as well as colonic tumours. CONCLUSION: Virtual endoscopy is a valuable technique to evaluate the morphological appearance of intraluminal gut lesions, particularly in patients who are unable to have an invasive endoscopy. It has the added benefit of simultaneously allowing evaluation of surrounding and distal structures. We present a pictorial review of a range of upper and lower GI pathologies demonstrated by multiplanar and virtual MDCT endoscopy, with direct reference to conventional endoscopic images.

e554

Barium small bowel imaging. Are we good enough?

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PURPOSE: In last few years cross sectional imaging of small bowel has gained universal acceptance. There has been consequent decrease in demand of barium imaging, for suspected small bowel pathologies. We believe this has led to decline in standards of barium imaging. This study looks at this hypothesis. MATERIALS/METHODS: Retrospective review of all barium small bowel studies in Leicester in 2006. All reports and 41 randomly selected images were analysed. RESULTS: Total of 232 studies, 75 (32%) were enema (SBE) and remainder were follow through (SBFT). 136 were referred by gastroenterologists while surgeons referred 83 cases. 29% of SBE were converted to SBFT. 22% did not have over couch films while, 63% had no spot films performed during the examination. CONCLUSION: High number of SBE cases (29%) were converted to SBFT. Majority did not match up to standards ascribed by American College of Radiology. This poor performance was attributed to scarce experience of junior radiologists, due to overall reduction in barium studies. Radiology training needs to recognize this changing trend and make appropriate changes to maintain standard of barium imaging.

Uroradiology Poster

p601

Loin pain in pregnancy: causes, imaging protocols and management

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KEY LEARNING OBJECTIVES: To review the incidence and significance of loin pain in pregnancy. To review imaging modalities available. To discuss the role of MR urography and non contrast CT in patient evaluation. To review the indications for intervention and follow up. DESCRIPTION: To describe our experience within a tertiary referral centre over the past 7 years with pictorial case review and discussion on the pros and cons of imaging using each modality; ultrasound, intravenous urography, magnetic resonance and computed tomography. The role of sedo-analgesia for percutaneous nephrostomy and the foetal risks from ionising radiation will be reviewed. CONCLUSION: An algorithm for imaging and follow up for pregnant women with loin pain will be presented.

p602

The predict study: a randomized, double-blind comparison of contrast-induced nephropathy in high-risk patients

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PURPOSE: To compare the incidence of CIN following intravenous (IV) administration of low-osmolar or iso-osmolar contrast media (CM) in patients with diabetes mellitus (DM) and chronic kidney disease (CKD) undergoing CT using a multicentre, randomized, double-blind, parallel-group study design. MATERIALS/METHODS: In the PREDICT (Patients with REnal impairment and DIabetes undergoing Computed Tomography) study, 248 patients with moderate-to-severe CKD (eGFR 20–59 ml min^{-1}) and DM were randomized to receive a minimum of 65 ml of iopamidol-370 or iodixanol-320 administered IV for their CT procedure. Serum creatinine (SCr) was measured at screening, baseline and 48–72 h post-contrast. CIN was defined as a post-contrast increase in SCr ≥25% from baseline. The incidence of CIN was compared using Fisher's exact test. RESULTS: A total of 125 patients received iopamidol-370 and 123 received iodixanol-320. The two groups were comparable in age, gender, body weight, IV hydration, CM dose, concomitant administration of nephrotoxic drugs, and baseline SCr (iopamidol-370: 1.46 mg dl^{-1}; iodixanol-320: 1.42 mg dl^{-1}; $p=0.35$). Baseline renal function was slightly worse in the group receiving iopamidol-370 (46.3 ml min^{-1} *vs* 48.6 ml min^{-1}; $p=0.05$). Increases in SCr ≥25% occurred in 7 (5.6%) patients receiving iopamidol-370 and 6 (4.9%) subjects receiving iodixanol-320 (95% CI iopamidol – iodixanol = [-4.8%, 6.3%], $p=1.0$). Mean SCr changes from baseline were 0.04 mg dl^{-1} for both groups (ANCOVA $p=0.80$). No patient required dialysis or died from acute renal failure. CONCLUSION: The incidence of CIN in patients with DM and CKD receiving IV CM is not significantly different after iopamidol-370 or iodixanol-320.

p603

Renal effects of low and isoosmolar contrast media in patients with chronic kidney disease: the active study

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PURPOSE: To compare the effects of iomeprol-400 and iodixanol-320 on kidney function in patients with chronic kidney disease (CKD). MATERIALS/METHODS: 148 patients with calculated CrCl, ≥10 ml min^{-1} and ≤60 ml min^{-1}) undergoing CE-MDCT were randomized to receive equi-iodine doses (40 gI) of the low-osmolar agent iomeprol-400 (726 mOsm kg^{-1}, $n=76$) or the isotonic agent iodixanol-320 (290 mOsm kg^{-1}, $n=72$) at 4 ml s^{-1}. SCr and CrCl were obtained at baseline and 48–72 h post-dose. Contrast-induced nephropathy (CIN) was defined as SCr increase ≥0.5 mg dl^{-1} (44.2 µmol l^{-1}) from baseline at to 48–72 h post-dose. A Renal Safety Data Monitoring Board reviewed the renal safety data, demographics, medical history, concomitant medications, and hydration status of each subject in a blinded manner. RESULTS: The two study groups were comparable with regard to age, gender distribution, concomitant nephrotoxins, hydration status, and total iodine dose. The iomeprol-400 group contained a higher proportion of patients with diabetes mellitus ($p=0.02$). Baseline SCr was 149.4±53.0 µmol l^{-1} in the iomeprol-400 group and 151.2±64.5 µmol l^{-1} in the iodixanol-320 group ($p=0.87$). The mean change in SCr from baseline was significantly higher ($p=0.017$ ANCOVA) after iodixanol (5.3±23.9 µmol l^{-1}) than after iomeprol (-3.5±16.8 µmol l^{-1}). CIN (>0.5 mg dl^{-1}) occurred significantly ($p<0.025$) more frequently in the iodixanol-320 group (5 cases, 6.9%) than in the iomeprol-400 group (no cases). No significant differences were found for the other CIN endpoints. CONCLUSION: Despite the difference in osmolality, iodixanol-320 caused more marked effects on renal function of CKD patients than iomeprol-400.

p604

Renal tuberculosis

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KEY LEARNING OBJECTIVES: To demonstrate knowledge and understanding of a specific urinary system pathology and to relate it to professional practice. To differentiate between the pathology and the urinary system during health and to describe the typical and atypical radiographic appearances. To discuss patient referral procedures, diagnosis and the radiographic contribution to patient care. DESCRIPTION: The pathology of renal tuberculosis was selected. Research into the pathology was conducted and a description presented which included the epidemiology and aetiology, signs and symptoms, differential diagnoses, radiographic appearances, patient pathway, treatment and prognosis. The role of imaging modalities including plain projection radiography, intravenous urography, contrast-enhanced CT, ultrasound, antegrade and retrograde pyelography was discussed and evaluated and typically radiographic appearances presented. CONCLUSION: Renal TB is an unusual pathology, but one which should be considered if the patient presents with sterile pyuria. The disease is best demonstrated radiographically using IVU, although ultrasound and CT have some role in the imaging of this disease. Prompt treatment and patient compliance are essential to successful resolution.

p605

Do renal cell carcinomas incidentalomas present at a lower tumour-nodes-metastases stage than those detected clinically

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PURPOSE: Renal cell carcinoma classically presents with haematuria, flank pain or abdominal mass. More recently many have been diagnosed as incidental-carcinomas on radiological imaging. Low TNM stage combined with incidental detection is a documented favourable independent prognostic indicator. We present a pictorial review of the relationship between the mode of presentation and the TNM stage at CT scan. MATERIALS/METHODS: All new diagnoses of renal cell carcinoma at our institution between October 2005 and October 2007 were included. The MDT database, radiology information system and patient case-notes were reviewed. The relationship between the mode of presentation and the CT TNM stage was analysed using the chi-square test for statistical significance. RESULTS: There were 61 new presentations. 21 presented as incidental-carcinomas, 33 clinically of which: 12 had haematuria, 8 loin pain, 4 symptoms of metastasis, 4 chest symptoms, 2

with abdominal mass, 2 male UTI and 1 anaemia. In 7 cases the mode of presentation was not clear. TNM staging distribution for incidental presentations: pT1aN0M0=8 (38%), pT1bN0M0=8 (38%), pT2N0M0=2 (10%), pT3bN0M0=2 (10%) pT3bN0M1=1 (4%) and for clinical presentations: pT1aN0M0=7 (21%), pT1bN0M0=7 (21%) pT1bN2M1=1 (3%), pT2N0M0=4 (12%), pT2N2M0=1 (3%), pT2N0M2=1 (3%), pT3aN0M0=4 (12%), pT3bN0M0=4 (13%) pT3bN2M0=2 (6%), PT3bN0M1=1 (3%). PTXNXM1=1 (3%). CONCLUSION: Incidentally detected renal cell carcinomas are significantly more likely to be staged as pT1a or PT1b compared with those detected clinically and less likely to have nodal or metastatic spread. Incidental discovery of RCC by radiology is an important mode of presentation and aids in the early management of this treatable malignancy.

p606

Locoregional staging of biopsy proven prostate cancer: how accurate is magnetic resonance imaging?

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PURPOSE: This retrospective study was performed to report accuracy of MRI pelvis in locoregional staging of cancer of prostate gland. MATERIALS/METHODS: From June 2003 to August 2007, 93 patients (mean age 63 years) were referred for MRI scans, performed using 1.5 T whole body MR imaging unit. All patients included had biopsy proven prostate cancer and a minimum of 4 weeks from biopsy to MRI. All images were read independently by a single uroradiologist. Image findings evaluated were cancer laterality, nodal involvement, extracapsular extension and seminal vesicle invasion and the results were correlated with the final histopathological reports. RESULTS: The final radical prostatectomy histopathological data has shown that a total of 19 patients had extracapsular extension, a total of 148 sides, 15 seminal vesicles and 5 lymph nodes were involved. The overall accuracy of MRI in diagnosis of laterality, extracapsular extension (ECE) seminal vesicle involvement (SVI) and lymph node involvement was 93%, 74%, 83% and 92%, respectively. For ECE, sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPP) were 16%, 89%, 27% and 80%, respectively. For seminal vesical invasion, the inability of MRIs to diagnose any histopathologically positive SVIs precluded calculation of sensitivities and PPV. Whereas the specificity and NPV for SVI was 98.7% and 84%, respectively. CONCLUSION: Our results suggest that MRI scan is not very sensitive in detecting extraprostatic (ECE and SVI) extension of carcinoma of the prostate gland. Alternatives such as endorectal coil MRI or transrectal ultrasound should be considered.

p607

Preoperative imaging evaluation of live renal donor

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PURPOSE: To review our eight years experience in pre-operative imaging evaluation of live renal donors. To assess the accuracy of intravenous digital subtraction angiogram (IVDSA), multislice computed tomography angiography (CTA) and magnetic resonance angiography (MRA) in predicting renal vascular anomalies. MATERIALS AND METHODS: Between April 1999 and March 2007, 36 live renal donors underwent radiological assessments prior to donor nephrectomy. The assessments included chest X-ray (CXR), intravenous urogram (IVU), renal ultrasound, isotope renal function, IVDSA, CTA and MRA. The imaging findings of IVDSA, CTA and MRA were compared with reference standard of operative findings. RESULTS: All CXR were reported normal. IVU identified one donor with duplex ureter, and ultrasound found two donors with simple cysts. Observational data also revealed that multiple renal arteries were seen in 11 (15%) kidneys. Major variations of renal veins included 7 accessory veins and 1 retroaortic renal vein. CTA was more accurate in identifying renal vascular anomalies with overall accuracy of 91% compared with MRA and IVDSA with accuracies of 70 and 67%, respectively. The early findings of integrated single phrase arterial CTA and IVU showed 100% accuracy in detection of renal vascular anomalies with added advantage of reduction of radiation dose. CONCLUSION: In our experience, CTA was more accurate in depicting renal arterial and venous anomalies compared with MRA and IVDSA. Integrated single arterial phrase CT angiography and IVU can be alternative technique to minimize ionizing radiation. Further research and validation of this technique are required.

Uroradiology Electronic Poster

e608

Pictorial review of congenital ureteric anomalies

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KEY LEARNING OBJECTIVES: Congenital abnormalities of the urinary tract account for 30–50% of all congenital anomalies and affect between 3% and 11% of the population. Almost one-third of urinary tract anomalies are ureteric. Timely diagnosis is required to guide appropriate treatment and to prevent potential complications that include; obstruction, infection, renal scarring, systemic hypertension and end stage renal failure. Therefore, it is important the radiologist understands the causes, consequences, associations and imaging appearances of these anomalies to ensure their detection and to guide management. DESCRIPTION: Ureteric anomalies are found when symptomatic, often young, patients are investigated. With multislice CT and MRI occult ureteric anomalies are increasingly discovered. By reviewing relevant texts and articles from peer-reviewed journals, we revise the embryology, anatomy, preferred imaging techniques and appearances of congenital ureteric anomalies. The discussed imaging techniques include ultrasound, intravenous urography, isotope studies, CT and MRI. As far as possible the anomalies are illustrated with relevant images. CONCLUSION: This pictorial review of congenital abnormalities of the ureter will help the radiologists recognize these potentially important conditions and their complications. In so doing the radiologist can play a pivotal role ensuring rapid appropriate referral to ensure best management.

e609

Low-dose unenhanced spiral CT for suspected renal colic – the expected, the unexpected and the pitfalls

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KEY LEARNING OBJECTIVES: To discuss the use of low-dose unenhanced spiral CT in the imaging evaluation of patients with suspected renal colic, with particular reference to its advantages over excretory urography. To describe an approach to image interpretation, and familiarize the reader with the typical imaging features of acute ureterolithiasis and secondary signs of obstruction. To describe common pitfalls in the evaluation of ureterolithiasis and techniques for their avoidance. To illustrate alternative causes of acute flank pain that may be identified on low-dose unenhanced spiral CT. DESCRIPTION: Renal colic is a common problem affecting up to 12% of the population during their lifetime. Low-dose unenhanced spiral CT is now considered to be the imaging technique of choice in the evaluation of suspected renal colic, with high sensitivity and specificity for the detection of ureteric calculi, and advantages over excretory urography of a rapid examination, avoidance of intravenous cannulation and contrast exposure, as well as improved diagnostic return. CT enables direct visualization of ureteric calculi as well as secondary signs of urinary obstruction. We illustrate the typical imaging features using both axial and reformatted images and review techniques used to avoid diagnostic pitfalls. This technique also affords unsuspected alternative diagnoses for acute flank pain in 6–10% of cases, and we present a range of these. CONCLUSION: We aim to increase the confidence of the radiologist in the use of low-dose unenhanced spiral CT in suspected renal colic.

e610

Complicated renal infections: a pictorial review and interactive teaching file

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KEY LEARNING OBJECTIVES: (1) To illustrate the radiological manifestations of complicated and severe renal infections on ultrasound and MDCT. (2) To demonstrate the characteristic and classical features of these diseases. (3) To test the reviewers knowledge via an interactive quiz. DESCRIPTION: We will illustrate both the most common and the severe renal infections, discuss the modality of investigation most appropriate for each and demonstrate their classical radiographic appearances. The reviewers ability to recognize these important conditions will be challenged with the aide of an interactive pictorial quiz. Cases will include acute and chronic pyelonephritis, renal and perirenal abscess, emphysematous pyelonephritis, renal tuberculosis and renal hydatid disease. CONCLUSION: This pictorial review describes and demonstrates the features of both common and severe renal infections. To recognize these radiological manifestations is important to facilitate diagnosis and essential in directing appropriate medical or surgical therapy.

e611

A pictorial review of renal manifestations of HIV

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KEY LEARNING OBJECTIVES: (1) To review the disorders affecting the kidneys in patients with HIV. (2) To illustrate the cross-sectional imaging findings associated with these conditions. DESCRIPTION: Renal complications are often seen as late manifestations of HIV infection, and are increasing in incidence owing to prolonged patient survival. The kidneys in patients with HIV are subject to a variety of infectious, neoplastic, immunological, vascular and drug-related insults. Ultrasound should be used as the initial screening study in patients with HIV and suspected renal dysfunction, but CT and MRI may be necessary to identify focal infectious, ischaemic, and neoplastic processes. This pictorial review will illustrate the spectrum of cross-sectional findings of various renal manifestations of HIV. CONCLUSION: Cross-sectional imaging can be useful in detecting and characterising the infectious and neoplastic disorders affecting the kidneys in patients with HIV. Ultrasound can often detect diffuse abnormalities of HIV-associated nephropathy, but CT and MRI may be required to demonstrate focal lesions.

e612

New concepts in the imaging evaluation of renal masses

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KEY LEARNING OBJECTIVES: The purpose of this exhibit is to present an overview of new concepts in the CT, MR and contrast-enhanced ultrasound imaging in the evaluation of renal masses. We focus on a pragmatic approach to the application of these concepts. DESCRIPTION: Some benign lesions can be diagnosed definitively based on characteristic CT and MR imaging. Most renal carcinoma will demonstrates a CT attenuation >20 HU and internal heterogeneity at unenhanced CT, and attenuation >70 HU and moderate to marked internal heterogeneity at isolated venous phase CT. Pseudoenhancement is a pitfall in CT imaging that may lead to the mischaracterization of cysts as solid tumour. MRI with quantitative contrast enhancement analysis adds confidence in distinguishing cysts from solid renal lesion. The use of contrast-enhanced ultrasound imaging provides a further "problem-solving" tool in depicting complex renal cysts and normal variants. CONCLUSION: With the application of new concepts in cross sectional and ultrasound imaging, the diagnostic approach to evaluation of renal masses has been significantly changed. Specific MR and CT protocols, complimented with contrast-enhanced ultrasound scan, allow improved accuracy in the distinction of benign cysts from solid tumour.

e613

Renal artery aneurysms: what you need to know!

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LEARNING OBJECTIVES: To familiarize the viewer with the causes of renal artery aneurysms. To describe methods of imaging. To provide examples of pathology. To outline treatment options. DESCRIPTION: Renal artery aneurysms are an uncommon but important finding. There are multiple causes including hypertension and fibromuscular hyperplasia. Less common causes include Kawasaki's disease, Ehlers Danlos Syndrome, Neurofibromatosis and Takayasu' Arteritis. We describe imaging modalities, pathology, and treatment. Multiple explanatory images are included. CONCLUSION: Renal artery aneurysms are uncommon and easily overlooked. They are important because of the risk of rupture. This poster outlines essential information regarding their diagnosis and managment.

e614

Imaging following renal transplantation

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LEARNING OBJECTIVES: (1) To illustrate normal ultrasound appearances following renal transplantation. (2) To discuss the diagnosis of early and late complications using ultrasound. (3) To understand the application of supplementary imaging modalities, e.g. nuclear medicine and MRI, to achieve a diagnosis in complex cases. BACKGROUND: Transplantation in the end stage renal failure patient greatly improves quality of life, increases longevity and can be extremely cost-effective. Ultrasound plays a key role in the follow up of such patients and can direct further imaging in complicated cases. IMAGING FINDINGS: This pictorial review will outline the role of ultrasound in imaging the post-transplant patient, including technique and normal ultrasound appearances. In the immediate post-transplant period ultrasound can assess whether there is adequate perfusion, look for significant perinephric collections, hydronephrosis or Doppler features suggesting venous occlusion. Microbubble contrast agents may further help in assessing vascular complications and, through dynamic enhancement curves, could help distinguish ATN from rejection. Ultrasound features of later complications including ureteric, venous and arterial stenoses will also be reviewed. Ultrasound can also be used to guide interventional procedures, e.g. biopsy or nephrostomy, where complications arise, or more recently local ablation techniques for malignancy. CONCLUSION: Grey-scale with colour Doppler ultrasound is the first line investigation in post-transplant imaging. In complex cases MAG-3 studies, angiography and MRI are useful adjuncts to ultrasound: the indications for when these are used will be covered.

e615

Targeted prostate biopsies in a PSA screened population is there a diagnostic benefit?

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PURPOSE: To determine the utility of targeted biopsies in a 10 core prostate needle biopsy scheme including lateral cores in a PSA screened population when interoperator variability is excluded and the pathology processing technique is optimized. MATERIALS/METHODS: The study population consisted of 267 patients enrolled in the ProtecT trial (Prostate testing for cancer and Treatment/final results have not been published yet) who underwent prostate needle biopsies. The biopsy scheme included at least 10 biopsies: standard sextant, 2 medial and 2 lateral horn biopsies with additional targeted

biopsies obtained in 46 (17.2%) of cases. Grey scale and colour Doppler ultrasound were used for the targeted biopsies. The biopsies were carried out by a single experienced radiologist. The biopsy processing protocol confirmed to the guidelines of the Pathology Committee of the European Randomized Study of Screening for Prostate Cancer. RESULTS: Prostatic cancer was found in 114 (42.7%) cases; 100 (87.7%) were detected on sextant biopsy, 111 (97.4%) on sextant + lateral horn biopsy and 113 (99.1%) on sextant + lateral + medial biopsies. The targeted biopsy was the only positive biopsy in just 1 (0.9%) of the positive cases, and increased the positivity rate by only 0.4%. CONCLUSION: Additional targeted biopsies are of limited utility even when taken by a single experienced radiologist, if a 10 core biopsy protocol including lateral horn biopsies in the setting of an optimized pathology processing technique is carried out.

e616

Locally recurrent prostate cancer following radical prostatectomy: imaging features and pattern of recurrence seen on MRI

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KEY LEARNING OBJECTIVES: To demonstrate the appearances and pattern of local recurrence on MRI in patients with recurrent prostate cancer following radical prostatectomy. To understand the pitfalls and limitations in identifying local recurrence. DESCRIPTION: Following radical prostatectomy, approximately 30–40% of patients develop biochemical relapse and 6–19% may have isolated local disease. Identifying isolated local disease is important to determine local therapy. We retrospectively reviewed pelvic MR images of 27 patients with isolated local recurrence following radical prostatectomy. The size, site and signal characteristics of the tumour recurrence were recorded. IMAGING FINDING: The pattern of recurrence seen on MRI is commonly at the anastomotic site and other sites include the resection margin of prostatectomy, e.g. residual seminal vesicle. Recurrent disease is often shown to be of intermediate to high signal relative to muscle on T_2 weighted sequences. CONCLUSION: MRI is a powerful tool for identifying patients with local recurrent disease following prostatectomy. It is important to recognize the appearance of local recurrence so that further treatment can be planned.

e617

Prostate cancer: critical MRI signs for accurate evaluation of extracapsular spread and seminal vesicle invasion

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LEARNING OBJECTIVES: (1) To recognize the importance of tumour (T) stage in the long-term outcome of prostate cancer. (2) Measurement of tumour load on T_2 weighted and contrast-enhanced MRI to assign T2 stage. (3) Critical signs to recognize extracapsular extension (ECE) and differentiation of T3a and T3b disease. BACKGROUND: MRI is used in prostate cancer to demonstrate tumour location, ECE and seminal vesicle invasion (SVI). Treatment is closely dependent on T stage. Stage 3 disease, especially stage 3b, is associated with substantially poorer outcome. In the future it may be important to assess tumour load (stage 2) for patients on active surveillance. IMAGING FINDINGS: This review will demonstrate the critical signs that distinguish between T2a/T2b/T2c disease and T3a/T3b disease. Tumour volume or load as seen on T_2 weighted and dynamic MRI. ECE is assessed by looking for asymmetry of the neurovascular bundles, assessment of the prostatic contour and capsular breech. SVI is evaluated by assessing the architecture of the seminal vesicles with regard to their signal characteristics, the presence of mass lesions and tumour extension (demonstrated by loss of the angle between the prostate and seminal vesicles or direct tumour extension from the prostate base). Examples of these, and other, signs will be shown, the use of multiple views emphasised and the potential pitfalls demonstrated. CONCLUSION: MRI in early stage prostate cancer helps prognostication and therapeutic planning. This exhibit provides examples of the critical signs that distinguish each stage of disease with a clear step-wise approach to evaluating disease extent.

e618

A pictorial review of testicular abnormalities

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LEARNING OBJECTIVES: (1) Revision of normal scrotal anatomy on US. (2) Review of the classical appearances of common testicular pathologies. (3) To appreciate the rarer manifestations of common conditions. (4) Discussion of relevant additional imaging modalities. BACKGROUND: Testicular pathology often has classical appearances on ultrasound imaging allowing an accurate diagnosis to be made at first presentation. However, some pathologies have rarer manifestations which must also be recognized. Where ultrasound does not provide a definitive diagnosis other imaging modalities can be employed. IMAGING FINDINGS: Ultrasound is the most common first-line technique employed in imaging testicular pathology. This poster will give a pictorial review of ultrasound findings in common pathologies including orchitis, granulomatous diseases, benign and malignant tumours. We will also discuss conditions such as testicular torsion, infarction and trauma. Where diagnosis is difficult, we will discuss the application of alternative imaging techniques such as nuclear medicine and MRI. CONCLUSION: Testicular pathology frequently presents to the ultrasound department. It is important for all radiologists to be aware of the typical appearances of common conditions as illustrated in this pictorial review. Where ultrasound is inconclusive further imaging can be beneficial.

e619

Assessment of anatomy and DRF With Ge CEMDCT – a reliable and time efficient method

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PURPOSE: A recent publication (Fowler et al. *British Journal of Radiology* 2006;79: 935–42), showed that differential renal function (DRF) can be derived by comparison of enhancing renal volumes obtained from contrast enhanced multidetector computed tomography (CEMDCT), using Siemens Sensation 16 and Leonardo software. AIM: To establish whether GE equipment can be utilized in a similar and time efficient way for the calculation of split renal function. MATERIALS/METHODS: Patients who had undergone both CEMDCT using a GE Lightspeed VCT64 or GE Lightspeed 16 Pro scanner with Voxtool 6.7 software and a nuclear medicine test with stable renal status between the studies were included (n=28). A volume of interest was selected for each kidney with non enhancing structures, perinephric and pelvic fat excluded by windowing. Following subtraction of unenhanced background tissue, an enhancing renal volume for each kidney was established allowing a CT derived DRF to be obtained. In a smaller control group DRF was also obtained by excluding non enhancing structures by precise placement of ROI in addition to windowing. The time to obtain the DRF by windowing was recorded. RESULTS: Comparison of DRF from NM and GE derived CEMDCT demonstrated excellent correlation with a Pearson's correlation coefficient of 0.96. There was no significant difference compared with the control group. The time required was consistently below 11 min. CONCLUSION: GE equipment can be used in a time efficient way to assess both renal anatomy and function.

Gynaecology/Obsterics Poster

p701

Sonohysterograpy: technique, indications and findings in endometrial and subendometrial lesions

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LEARNING OBJECTIVES: (1) To describe the technique to perform state-of-the-art sonohysterography. (2) To describe its indications. (3) To described the typical and atypical sonohysterographic appearances of common endometrial and subendometrial lesions. (4) To describe the characteristic appearances of less common focal and diffuse conditions. DESCRIPTION: Sonohysterography is an ultrasound technique in which the endometrial cavity is distended with saline under continuous ultrasound visualization to assess the endometrial cavity. It is useful in the evaluation of dysfunctional uterine and postmenopausal bleeding because it allows reliable differentiation between focal and diffuse endometrial and subendometrial lesions. Focal lesions are defined as lesions occupying less than 25% of the endometrial surface area such as endometrial polyps and diffuse lesions involve a larger percentage of the endometrial surface area like endometrial hyperplasia. These entities are often indistinguishable from each other. Subendometrial pathological conditions such as submucosal leiomyomas fibroids and adenomyosis may also manifest as apparent endometrial thickening. CONCLUSIONS: When a diffuse endometrial condition is present, an endometrial biopsy, without visual guidance, should be adequate for diagnosis. However, a focal lesion seen at sonohysterography should be further evaluated with visually directed biopsy, polypectomy, or myomectomy because of the high percentage of false-negative results at blind biopsy. The findings at sonohysterography determine whether a blind biopsy, hysteroscopically guided biopsy, or hysteroscopically guided dilation and curettage is the appropriate diagnostic procedure.

p702
Congenital uterine abnormalities – a pictorial guide

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KEY LEARNING OBJECTIVES: To revise the developmental embryology of the uterus. To be able to recognize and appropriately categorise congenital uterine abnormalities. To understand the clinical significance of the various congenital uterine abnormalities. DESCRIPTION: Congenital uterine abnormalities exist in approximately 1% of women of reproductive age. However, the prevalence is far higher in patients being investigated for infertility. Accurate diagnosis is crucial in the management of these patients because treatment options vary considerably depending on the nature of the abnormality. In this review, congenital uterine abnormalities are classified according to the system devised by the American Fertility Society. Examples are illustrated using several different modalities such as transvaginal ultrasound and hysterosalpingography. However, there is particular emphasis on T_2 weighted MRI because this is the imaging modality of choice for the evaluation of congenital uterine abnormalities. The key radiological diagnostic features pertaining to each group are emphasised. The clinical significance of discriminating between the various anomalies is discussed. The importance of evaluating the kidney in these patients is also demonstrated highlighting the necessity to understand the close embryogenic relationship between the uterus and kidney. CONCLUSION: This multimodality pictorial review summarizes the pertinent radiological features that allow accurate characterization of congenital uterine abnormalities. The clinical significance and associations are both described and illustrated to provide a comprehensive review. Basic embryology is also revised to help provide a more complete understanding of this condition.

p703
Unusual patterns of uterine leiomyomas: review of imaging findings with pathological correlation

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KEY LEARNING OBJECTIVES: Illustrate the unusual patterns of uterine leiomyomas outside the uterus on different imaging modalities. Highlight the role of radiologists in selecting patients for either medical or surgical treatment. DESCRIPTION: Intrauterine leiomyomas are common, benign tumours in women of reproductive age. These tumours can however, on rare occasions, demonstrate bizarre patterns of growth outside the uterus presenting as extrauterine pelvic masses, intravascular masses, widespread peritoneal dissemination and the so called "benign metastasising leiomyoma". All of these may mimic malignancy and in a female patient with a history of uterine fibroids and low level of clinical suspicion the differential diagnosis should include this entity. We have collected 15 cases of extrauterine leiomyomas with imaging and pathological correlation which we will use to illustrate the imaging features and growth patterns of these tumours in addition to demonstrating the potential role of the radiologist in governing treatment. CONCLUSION: At the end of this exhibit the reader should understand the pathology, patterns of spread and typical imaging appearances of extrauterine leiomyomas.

p704
Imaging characteristics of teratomas and their complications

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KEY LEARNING OBJECTIVES: To revise the biology of tertomas as a means of explaining their appearance on the plain radiograph, ultrasound scan, CT and MRI from head to pelvis. To identify appearances that increase the likelihood of there being immature elements within the teratoma because these behave in a clinically malignant fashion. Furthermore, to illustrate the potential complications of mass effect, torsion, rupture, infection or malignant transformation. DESCRIPTION: Teratomas are germ cell neoplasms whose embryonal differentiation confers a variable quantity of ectodermal, mesodermal and endodermal content. This frequently gives rise to lipid, calcific and soft tissue elements that are easily recognized on imaging and in combination can be quite specific findings. Teratomas are frequently gonadal but can be extragonadal and their location in part determines the nature of associated complications. CT and MRI are used in diagnosis, to identify complications and suggest when there are immature elements present that represent a malignant component. CONCLUSION: This review explains and illustrates teratomas and associated complications from head to pelvis.

Gynaecology/Obsterics Electronic Poster

e705
Hysterosalpingography revisited

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Hysterosalpingography (HSG) is a commonly performed investigation for tubal assessment in patients with primary or secondary infertility and subfertility. Anecdotal reports suggest that the numbers of HSGs performed is rising and set to rise further for various reasons including the rising rates of sexually transmitted diseases. We present a pictorial spectrum of the conditions which may be encountered at hysterosalpingography to include uterine, tubal, and peritubal abnormalities. Practitioners should be familiar with the procedure, possible complications and also with the interpretation of the images.

e706
Non gynaecological pelvic "masses" presenting to the gynaecologists – a pictorial review

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KEY LEARNING OBJECTIVES: (1) To recognize the characteristic cross-sectional imaging features of various types of non-gynaecological pelvic masses. (2) To review and understand the imaging features of pelvic masses and how to differentiate from true gynaecological masses. (3) To review the compartmental anatomy of the pelvis with relevance to localising these masses. DESCRIPTION: Non-gynaecological pathology can initially present to the gynaecologist as a pelvic mass. Imaging is essential in an attempt to identify such masses in order for the appropriate treatment to be instigated. Although in the acute setting diverticulitis and appendicitis are well recognized as non-gynaecological pathologies that often present to the gynaecologist there are a number of pelvic masses we have encountered that have been shown to be non gynaecological in origin with close scrutiny of the cross sectional imaging. We present a spectrum of pelvic masses to include mesenteric cysts, hydronephrotic kidney, lymphocoele, haematoma, neurofibroma, appendicular mucocoele and colonic carcinoma. Although these were all clinically felt to be gynaecological in origin subsequent imaging showed them not to be. CONCLUSION: It is important to understand the compartmental anatomy of the pelvis which is essential in correctly localising pelvic masses which will assist in reaching the correct clinical diagnosis. The discussion of the anatomy and recognising the examples shown is important for the cross-sectional Radiologist who may be the first person to suggest the correct diagnosis. We therefore present a pictorial review with cross sectional imaging and descriptions of the above pathologies in order to aid differentiation between them.

e707

Imaging spectrum of endometriosis a pictorial review with magnetic resonance

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KEY LEARNING OBJECTIVES: (1) To illustrate a broad spectrum of imaging findings of endometriosis. (2) To demonstrate atypical imaging findings of endometriosis with pathological correlation. (3) To classify the common and uncommon locations of endometriosis. (4) To understand the various treatment options, the potential type of surgical intervention. (5) To demonstrate strength and limitation of MRI in diagnosing endometriosis. BACKGROUND: Endometriosis is an important gynecological disorder of women in reproductive age and it is defined as presence of functional endometrial glands and stroma in location outside the uterus. The clinical manifestation of endometriosis varies from microscopic implants to large cysts. Endometriosis can be seen as peritoneal endometrial implants (solid endometrial tissues), endometriomas (endometrial cyst) or adhesion on imaging. Drugs can induce temporary quiescence of active deep lesions but in most cases surgery is the final solution. MRI studies were performed with a 1.5-T superconducting magnet (Philips Intera). Patient preparation required a moderately filled bladder in order to correct the angle of uterine antiversion, leading to better evaluation of the pelvic structures. We used SE and TSE sequences, T_1 and T_2 weighted with and without fat suppression. Each examination was completed with gadolinium. CONCLUSION: There is a broad spectrum of imaging findings of endometriosis, including typical imaging findings of endometrioma and atypical imaging findings of peritoneal implants and adhesion mimicking malignancy and MR demonstrates optimal sensitivity and specificity and accuracy in identification and in the evaluation of the extension of lesions in patients with endometriosis.

e708

Study of endometriosis by using magnetic resonance imaging: evaluation of inter-observer agreement

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PURPOSE: Endometriosis corresponds to ectopic endometrial glands and stroma outside the uterine cavity. MRI has shown high accuracies for both anterior and posterior endometriosis and enables complete lesion mapping before surgery. Posterior locations demonstrate abnormal T_2 hypointense, nodules with occasional T_1 hyperintense spots and are easier to identify when peristaltic inhibitors and intravenous contrast media are used. Anterior locations benefit from the possibility of MRI urography sequences within the same examination. Our purpose was to evaluate interobserver agreement in the evaluation of endometriosis. MATERIALS/METHODS: Two experienced radiologist retrospectively evaluated 54 women (mean age 39 years; range 19–43 years) that underwent MRI study for suspected endometriosis. We used SE and TSE sequences, T_1 and T_2 weighted with and without fat suppression. Each examination was completed with gadolinium. Radiologist independently evaluated each dataset for the presence or absence of endometriosis. Statistical analysis for kappa measurement was performed in order to calculate agreement between measurement. RESULTS: We observed an overall interobserver agreement of 76% and a kappa value of 0.504 (standard error 0.122) (95% Confidence Interval from 0.31 to 0.698). Best results of concordance were visible in the anterior localizations. CONCLUSION: We observed a moderate agreement for the identification of endometriosis. Best results are obtained in the anterior localization. The use of fat saturation sequences determines the highest concordance rates.

e709

Magnetic resonance imaging of ovarian pathology: an illustrated guide of non-neoplastic and neoplastic disease

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KEY LEARNING OBJECTIVES: (1) Illustrate various examples of non-neoplastic and neoplastic ovarian disease with MR imaging. (2) Discuss diagnostic characteristics to aid diagnosis on MR with an emphasis to distinguishing benign from malignant pathologies. DESCRIPTION: The ovaries consist of multiple cell types which vary in appearance with age and hormone levels. They demonstrate a spectrum of pathology from non-neoplastic to neoplastic, which in turn ranges from benign to malignant. MRI, in conjunction with other modalities of imaging may distinguish between pathologies in adjunct to clinical and biochemical parameters. Differentiating cystic from solid neoplasms is important, as the later tend to be malignant. The excellent soft tissue characterization and multiplanar imaging of MR is well established, further characterization of masses is therefore possible more accurately than other modalities. T_1 weighted imaging provides information about haemorrhage, fat content and nodal pathology. Fat suppression aids diagnosis of fat content. Dynamic gadolinium enhanced 3D fat suppressed T_1 spin echo imaging may evaluate focal enhancement suspicious for malignancy and assess disease outside the ovarian capsule. We include a pictorial of a variety of non-neoplastic ovarian pathologies including physiological cysts, endometriomas, tubo-ovarian inflammatory masses and polycystic ovaries. Imaging of neoplasms including benign serous and mucinous epithelial cysts, fibromas and fibrothecomas as well as the imaging of malignant tumours including primary epithelial and secondary malignant neoplasms are demonstrated. CONCLUSION: MR is the tool of choice in the characterization of complex ovarian disease. Using different sequences, weightings and post contrast dynamic sequences it is possible to differentiate malignant from benign masses.

e710

Foetal diagnosis by using prenatal magnetic resonance

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KEY LEARNING OBJECTIVES: To review and describe the most frequent foetal anomalies. To learn the MR technical parameters to be used and the ancillary procedures in order to improve quality of examinations. To understand the various treatment options. To compare differences with foetal ultrasound. BACKGROUND: Anatomic details that affect prognosis and selection for foetal therapy, such liver herniations and pulmonary hypoplasia in congenital diaphragmatic hernia (CDH) and airway patency in giant neck masses, should be accurately delineate and MR can be adequately achieve this task. For this educational exibits we retrospectively analysed 26 pregnant women and the foetuses ranged in age from 21 weeks to 38 weeks gestation (mean 28.1 weeks). MRI studies were performed with a 1.5-T superconducting magnet (Philips Intera). A variety of ultrafast imaging sequences were performed including fast gradiendt echo, half-fourier single shot turbo spin echo (Haste) and echo planar imaging yielding images with T_1 to T_2 type weighting. CONCLUSION: Prenatal MRI enhances foetal anatomic evaluation and facilitates perinatal management. MR provides a detailed description and insight into foetal anatomy, pathology and aetiology. In particular, supratentorial parenchyma and lateral ventricular volumes can be reliably measured on foetal MR.

Musculoskeletal Poster

p801

Imaging characteristics of juvenile dermatomyositis

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KEY LEARNING OBJECTIVES: To understand the clinical presentation and imaging findings of juvenile dermatomyositis. DESCRIPTION: Juvenile dermatomyositis is a chronic inflammatory illness of unknown aetiology that affects primarily muscle and skin. It usually presents with malaise, easy fatigability, muscle weakness and rash. The disease can affect other organs including the gastrointestinal tract, lungs and heart. In addition, calcinosis is seen in up to one-third of these patients. We describe the clinical presentation, complications and imaging findings of these cases presented at our tertiary referral centre. Plain films, ultrasound and MRI of the affected areas are presented and discussed with clinical correlation. CONCLUSION: This pictorial review explains the clinical spectrum of juvenile dermatomyositis along with the interesting imaging findings.

p802

Imaging of musculoskeletal infections

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KEY LEARNING OBJECTIVES: (1) Review the established uses and limitations of plain film radiography, ultrasound, CT, MRI and scintigraphy in diagnosing musculoskeletal infections. (2) To illustrate the key imaging findings in a range of musculoskeletal infections involving bone, joint and soft tissue. DESCRIPTION: Imaging has a key role to play in the evaluation of patients with musculoskeletal infections. We review the main indications, imaging findings and limitations for plain film radiography, ultrasound, CT, MRI and nuclear medicine including Tc99m-MDP bone and labelled white cell scintigraphy. We illustrate the key imaging modalities and findings for acute and chronic osteomyelitis, septic arthritis and infections involving prosthetic joints, soft tissues and the spine. Diagnostic imaging algorithms can be used to ensure the most suitable imaging pathway is selected for different types of musculoskeletal infection. New emerging techniques may have a future role to play, with the use of PET-CT, combining anatomic and functional imaging, shown be highly sensitive and specific for evaluating musculoskeletal infections. CONCLUSION: There are a range of imaging modalities available for imaging musculoskeletal infections with MRI being the principal anatomical imaging modality and white cell scintigraphy the principal functional modality. This educational exhibit highlights selecting the most appropriate imaging modality is important in order to correctly evaluate different musculoskeletal infections.

p803

Lipoma arborescens – a pictorial review of clinical features and diagnosis with magnetic resonance imaging

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KEY LEARNING OBJECTIVES: (1) Review the clinical features, imaging characteristics, and management of lipoma arborescens. (2) Illustrate the pathognomic MR features and associated findings of lipoma arborescens. (3) Discuss how to differentiate lipoma arborescens from other proliferative synovial lesions on MR. DESCRIPTION: Background. Lipoma arborescens is a debilitating synovial disease with chronic, non-specific signs and symptoms. MR demonstrates a pathognomic diffuse, villo-lipomatous proliferation of the synovium that is identical to the macroscopic appearance of lipoma arborescens. Unlike other proliferative synovial lesions, synovectomy can readily cure lipoma arborescens and can be considered following MR diagnosis alone. Content organization. (1) Review of aetiology, pathogenesis, and typical clinical features. (2) Pictorial review demonstrating: Synovial villi; Synovial fronds; Synovial pseudo-masses; Iso-intensity to fat on T_1 and T_2, and loss of signal with STIR; Common additional findings. (3) Discussion of characteristics differentiating lipoma arborescens from other proliferative synovial lesions, namely pigmented villonodular synovitis, synovial haemangioma, chronic rheumatoid arthritis, and synovial osteochondramatosis. (4) Highlighting of the pivotal role of MR in diagnosing and initiating definitive therapy for liopma arborescens. CONCLUSION: The MR appearances and characteristics of lipoma arborescens can be pathognomic, and recognition can expedite curative treatment.

p804

Arthrographic techniques – a pictorial review

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KEY LEARNING OBJECTIVES: To outline the role of athrography in the investigation and treatment of joint pathology; To provide a pictorial review of reliable, reproducible techniques for introducing contrast media into joint spaces, focusing on wrist, shoulder and hip. DISCUSSION: Arthography is a well established, minimally invasive examination, and is an accurate method of evaluating intra-articular anatomy and pathology. Through distension of the joint space, the sensitivity and specificity of conventional CT and MR can be improved. The technique is increasingly being used in the investigation of many joints, particularly in relation to labral and ligamentous injuries of the hip and shoulder. It is also an important precursor to therapeutic intra-articular steroid or ytrium injection. Many different arthrographic techniques have been described, and practice tends to vary between institutions. Accurate and miminally traumatic injections increase the diagnostic value of arthrography. This pictorial review will focus on tried and tested techniques employed in fluoroscopic-guided intra-articular injection of contrast in the wrist, shoulder and hip. The relative indications for CT and MR arthrography are covered, along with optimal contrast type, strength and volume for each examination. Pitfalls along with tips for best practice are discussed. CONCLUSION: Arthography is an important technique in the investigation and treatment of joint pathology. We present an overview of reliable methods for the introduction of contrast media into the joints of the appendicular skeleton.

p805

A review of the imaging of complex regional pain syndrome

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KEY LEARNING OBJECTIVES: The imaging of Complex regional pain syndrome (CRPS) will be discussed with illustrative examples. Emphasis will be placed on plain radiographic, radionuclide and

MR imaging features. DESCRIPTION: CRPS (also known as reflex sympathetic dystrophy) is a condition characterized by pain, swelling, trophic skin changes and vasomotor disturbance. It remains predominantly a clinical diagnosis, with three distinct stages recognized. The radiologist may play a role in the diagnosis with imaging helping to differentiate between the various stages of CRPS. A systematic review of the literature reveals a varying appearance of CRPS in time and with different modalities, with no one modality having a good positive predictive or negative predictive value. Diffuse osteoporosis and soft tissue swelling demonstrated on plain radiographs and increased uptake on dynamic isotope radionuclide studies are typical. MRI features include bone marrow oedema, soft tissue enhancement and synovial effusions. CONCLUSION: We present a pictorial review of CRPS. Clinical features, plain radiographs and radionuclide bone studies may aid the radiologist towards the diagnosis. MRI may also provide the simultaneous assessment of bone and soft tissue involvement seen in CRPS.

p806
Referral patterns for musculoskeletal ultrasound in rheumatology

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PURPOSE: To assess the referral pattern for musculoskeletal ultrasound in Rheumatological diseases with a view to form guidelines for appropriate referral. MATERIALS/METHODS: 273 consecutive patients were analysed retrospectively over a period of 1 year (1 July 2005 to 30 June 2006) in a University Hospital setting across three hospital sites. All rheumatology patients referred for ultrasound were included. Referrals that were rejected and patients aged less than 18 years were excluded from the study. The data collected was analysed for grade of the referrer, clinical details, previous imaging, haematological markers and ultrasound findings. Two computer programmes were used for data collection. RESULTS: The mean age of the patients was 52.5 years (range 18–87 years). Maximum numbers of patients were between 4th to 6th decades with female to male ratio of 3:2. Shoulder and hand ultrasound constituted 64% of total scans. Of the 186 patients who had CRP levels checked only 1 patient with CRP greater than 20 had a normal scan. 53% and 32% of the referrals did not have plain radiographs and CRP, respectively. 34% of scans were normal. 36% had inappropriate clinical requests. 45% of GP-referred ultrasound examination had normal scans. CONCLUSION: Approximately one-third of the ultrasound examinations performed were not essential. We therefore recommend that blood markers should preferably be performed prior to ultrasound examination requests. Ultrasound should be used in conjunction with clinical and haematological examination rather than as a replacement for them. Education and awareness is needed to reduce unnecessary workload on already overburdened modality.

p807
Ultrasound guided steroid injection in the treatment of painful amputation stump neuromas

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PURPOSE: To evaluate ultrasound guided injection of steroid and local anaesthetic in the treatment of painful amputation stump neuromas. MATERIALS/METHODS: Over a 4 year period, 10 patients (9M, 1F; mean age 54 years; range 23–80 years) who previously underwent limb amputation (5 transfemoral, 5 transtibial) for various conditions (6 chronic osteomyelitis; 2 trauma; 2 peripheral vascular disease) were referred for ultrasound guided steroid (methylprednisolone 20 mg or hydrocortisone suspension 25 mg) and local anesthetic (bupivacaine 0.5% 1–3 ml) injection for distal stump neuromas. All patients had chronic local stump and/or phantom pain resistant to oral painkillers and prosthetic adjustment. Treatment effect was assessed by telephone interview. RESULTS: 9/10 patients had a well defined neuroma on ultrasound examination (mean max. dimension 17 mm; range 5–30 mm). One patient had a tender ill defined hypoechoic area. Patients were contacted at 2–23 months (mean 10 months) following injection. 7/10 patients (70%) reported significant pain relief. Of these, 3 patients (30%) had complete resolution of symptoms with no recurrence. 4 (40%) had a partial response with significantly diminished symptoms at the original site of pain (improvement in pain score of ≥70%). The remaining 3 patients (30%) reported less than 2 weeks pain relief. Complete and partial responders had smaller lesions (mean 12 mm; range 21–30 mm) compared with non-responders (mean 26 mm; range 5–25 mm; $p=0.01$ Student t-test). No complications due to injection were reported. CONCLUSION: Ultrasound guided steroid injection is valuable in managing painful amputation stump neuroma particularly for lesions under 2–2.5 cm, and is recommended before resorting to surgical options.

p808
Cleidocranial dysplasia

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Cleidocranial dysplasia (also known as cleidocranial dysostosis or mutational dysostosis) is an uncommon autosomal dominant disorder primarily affecting bones formed by intramembranous ossification but also can involve the spine and appendicular skeleton. Many cases present as a coincidental finding when the patient seeks medical attention or during treatment for dental problems. Plain film imaging plays a key role in the diagnosis, surveillance and treatment of the condition. Areas affected will have unique configurations such as the "chef's hat" appearance of an elongated femoral head, widened symphysis pubis and sacroiliac joints, midface hypoplasia and frontal bossing, narrow thorax and extent of clavicular defects that range from the rudimentary to the completely absent. This poster aims to provide a pictorial review of the condition, highlighting key radiological features, whilst discussing current thoughts regarding its prevalence, genetic origin and treatment options.

p809
Changes in intervertebral discs adjacent to vertebral body fracture and their clinical significance

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KEY LEARNING OBJECTIVES: To assess the changes in intervertebral discs adjacent to vertebral body fracture and review the literature with a view to explore their long term outcome. MATERIALS AND METHODS: We retrospectively reviewed the MRI scans of 25 consecutive patients who had vertebral body fracture due to minor or major trauma from November 2005 to March 2007. All scans were performed on 1.5 T Siemens scanners. RESULTS: In 13 patients (52%) there were signal changes in the discs adjacent to vertebral body fracture. The disc signals were high on T_1 weighted in 1, T_2 weighted in 8 and both T_1 weighted and T_2 weighted in 4 patients. DISCUSSION: In our series, change in the signal characteristics of intervertebral discs adjacent to vertebral body fracture was a common phenomenon. In the context of trauma, we hypothesise that these changes, particularly on T_1 weighted sequence are likely to be due to haemorrhage within the disc. Earlier studies have shown that degenerative disc changes are common following vertebral body fracture. So, early identification of discs with signal changes adjacent to fractured vertebrae can act as a prognostic factor by predicting the future risk of developing degenerative changes. Anecdotal reports have shown that high signal changes in discs persist or develop few months from vertebral body fracture. Failure to recognize previous history of trauma in such patients can lead to a wrong diagnosis of discitis.

p810
Physiotherapy extended scope practitioner use of MRI in patients presenting with low back pain

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PURPOSE: The increasing pressure of new government targets has led to role delegation within the NHS. We evaluated the use of MRI in the assessment of patients presenting with back pain by Physiotherapy Extended Scope Practitioners (ESPs) working in a secondary care referral centre, against a standard practiced by orthopaedic surgeons in a separate secondary care referral centre. Neither centre has a dedicated operative spinal service. MATERIALS/METHODS: A two centre retrospective review of 202 lumbar MRI scans requested by ESPs and 145 scans requested by orthopaedic surgeons was performed. Presenting symptoms and signs, abnormalities detected on the MRI scans and subsequent management were recorded with rate of subsequent operative intervention used as a measure of appropriate MRI usage. RESULTS: 82% and 89%, respectively, of orthopaedic and ESP patient referrals for MRI documented neurological signs or symptoms. A higher rate of neurological signs was reported by ESPs (64% *vs* 42%). The abnormal scan rates (ESPs 87%, orthopaedics 92%) and tertiary referral rates were comparable (ESPs 45%, orthopaedics 42%). The numbers of patients that were listed for operative intervention in the tertiary referral centre were 19% and 26%, respectively, for ESPs and orthopaedic surgeons. CONCLUSION: This study shows that physiotherapy ESP use of MRI in the investigation of patients presenting with back pain is comparable with orthopaedic surgeons in a centre without a dedicated spinal service. With adequate training we support the use of MRI by physiotherapy ESPs in the assessment of patients with spine related problems.

p811
Harrington or Hartshill?

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DESCRIPTION: Spinal instability may arise as a result of trauma, destruction due to neoplastic or inflammatory process or as a result of deformity due to congenital abnormalities. Spinal fixation devices are used to achieve stability, temporary or permanent. Depending on the situation they may be employed to achieve stability by either anterior or posterior stabilization, by spinal arthroplasty, by placing spacer device and by limiting or correcting deformity. Devices can be in shape of rods, brackets, wires, spacer devices and a combination of these. As a radiologist, if we can recognize fixation device correctly then it is easier to understand their intended purpose, their biomechanics and to recognize their evolving complications earlier. They are usually divided into four categories depending upon their anatomical location into occipitocervical, lower cervical, thoracolumbar and lumbosacral devices. KEY LEARNING OBJECTIVE: Spinal fixation devices are used in variety of clinical situations and in each case they have a typical shape and appearance, conforming to particular needs of the situation. Similarly they are associated with peculiar complications. Radiologists assess images of post-operative spine. We aim to present a pictorial review of common devices, as seen on radiographs, to help us identify them with certainty in future. CONCLUSION: Spinal fixation devices are designed to address a particular situation of instability. Identifying them correctly helps us to recognize the situation for which they were used and to specifically look for any complications which may arise as a result of either device fixation or as a continuation of disease process.

p812
The value of upright positional MRI in the diagnosis and treatment of symptomatic patients referred after prior nondiagnostic conventional supine MRI scan of the lumbar spine

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PURPOSE: To determine the extent to which upright MRI examination detects clinically relevant abnormalities which are not evident on conventional supine MRI scans. MATERIALS/METHODS: 114 patients who had been referred for positional MRI studies of their lumbar spine had their scans reviewed. Three patients (all male) were excluded because of the non-availability of an accompanying clinical history. 111 patients (53 females, age range 24–77 years, and 58 males, age range 21–80 years) were included in the study. Reasons for patients' referral included nondiagnostic supine MRI scans, or scans with dubious findings, as well as assessment for spinal instability/dynamic spinal stenosis. All the examinations were performed using an "Upright" 0.6 T scanner (FONAR Corp., Melville, NY). Each MRI scan included a repeat supine examination, in addition to imaging in the standing and seated (neutral, extended and flexed) positions. The standard protocol was of 11 T_2 weighted images in the sagittal plane, as well as three axial T_2 weighted images through each of the 5 lumbar intervertebral discs. Two experienced radiologists reviewed the images, and their findings were then correlated with the patients' symptomatology. RESULTS: Of the 111 patients, 47 (42%, 27 males, 20 females) demonstrated abnormalities, in one or more of the erect or seated positions, which correlated with their symptoms and were not evident on the conventional supine scan. CONCLUSION: Patients with inconclusive conventional lumbar spine MRI scans ideally should be offered the opportunity to be scanned dynamically. This may obviate the need for more invasive diagnostic procedures.

p813
De Quervain's disease – efficacy of ultrasound guided injection

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PURPOSE: The aim of this study is to describe the technique and determine the efficacy of ultrasound guided intrasynovial injection of triamcinolone and bupivacaine in treatment of De Quervain's disease. MATERIALS & METHODS: A total of 17 patients with symptomatic De Quervain's disease from January 2005 to October 2007 were included in this study. The procedure involved confirmation of diagnosis with ultrasound followed by injection of a mixture of 20 mg of triamcinolone (40 mg ml^{-1}) and 1 ml of 0.5% bupivacaine. Ultrasound guidance with a high resolution 7–15 MHz footprint probe was used for injection into the first dorsal extensor compartment tendon sheath (E1). The patients were followed up after a minimum period of 3 weeks. RESULTS: There were 14 female and 3 male patients from 29 years to 74 years of age. Fourteen (82.4%) referrals were from hand surgeons. The mean duration of symptoms was 8.9 months. Five patients had one non-ultrasound guided injection in the past. One of 17 patients had an atypical septum in the first extensor compartment and the extensor pollicis brevis alone was involved. The mean post injection follow up was at 6.75 weeks. One patient was lost to follow up. 15 of 16 patients had significant symptomatic relief (93.75%). There were no immediate or delayed complications. Recurrence of symptoms was seen in 3 (20%) patients. CONCLUSION: Ultrasound guided injection of triamcinolone and bupivacaine is safe and effective in controlling symptoms of De Quervain's disease. Correct needle placement avoids intratendinous injection as well as local complications like fat atrophy.

p814
DISI or VISI. Which way round is it? A pictorial review of imaging appearances in carpal instability

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LEARNING POINTS: Carpal instability is not uncommon after wrist injuries and needs to be considered in differential diagnosis of chronic wrist pain. Diagnosis is based on clinical and radiological examination including dynamic views with the confirmatory test being wrist arthroscopy. Four groups of carpal instability are described: Dorsal intercalated segment instability (DISI), volar intercalated segment instability (VISI), ulnar translocation and dorsal subluxation. The instability can also be static or dynamic and dissociative or

nondissociative. DESCRIPTION: Carpal instability results from ligamentous or bony injury to the wrist, depending on the force, point of impact and position of the wrist at the time of injury. Four groups are described: DISI, VISI, ulnar translocation and dorsal subluxation. A DISI results if the lunate is dorsiflexed more than 15° than the capitate on lateral radiography and conversely a VISI results if the lunate is volar flexed more than 15°. Dynamic instability is diagnosed using dynamic radiographs or arthroscopy. Instability can also be either dissociative or nondissociative. The dissociative type indicates instability between adjacent carpal bones within a row and nondissociative type indicates instability between rows. We present a review of these patterns presenting to our institution in the last 3 years, with illustrative cases using plain radiographs and cross-sectional images. CONCLUSION: The incidence of post-traumatic carpal instability varies from 10% to 30%. The radiological diagnosis is based on plain radiographs, fluoroscopy and use of specialized techniques like arthrography, MR and CT. Treatment is complex and usually specific to the individual type of instability.

p815

Abnormalities of the long head of the biceps tendon of the shoulder: imaging findings

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LEARNING OBJECTIVES: To illustrate the normal anatomy, variants, pathological changes of the long head of the biceps brachii tendon (LHBT). DESCRIPTION: The LHBT stabilizes the anterior glenohumeral joint capsule and the humeral head. Pathology involving the LHBT is increasingly recognized as the important cause of shoulder pain and dysfunction. In this exhibit we describe the anatomy and the pathological changes involving the LHBT using various imaging modalities. IMAGING FINDINGS: Ultrasound and the MRI play a significant role in the imaging of the LHBT. The pathological alterations include congenital absence, instability, tendonosis, tenosynovitis, rupture and lesions at the origin of the tendon at the superior labrum (superior labrum anterior to posterior (SLAP) lesions). LHBT pathology is often associated with rotator cuff disease. CONCLUSION: The clinical tests to identify the various pathologies of LHBT are non-specific and equivocal. Moreover isolated lesions of LHBT are very rare. LHBT pathology often associated with rotator cuff and superior labral lesions. Imaging plays a pivotal role due to the lack of specific clinical signs and symptoms and the association of various abnormalities. Identifying these coexisting abnormalities plays a crucial role and can alter the management of the patients.

p816

Does shoulder ultrasound affect clinical management in hospital practice

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PURPOSE: Increasing waiting lists for shoulder ultrasound (ShUS) prompted a review to establish whether ShUS findings altered patient management. METHODS: Retrospective review of medical records of 100 randomly selected patients, who underwent ShUS, over a period of 24 months in 2005/6 (11 excluded – miscoded). ShUS performed by one of four radiologists (3 consultants, 1 SpR). The clinical diagnosis, in the majority of patients, was of rotator cuff tear (RCT). The clinical diagnosis, ShUS findings, further management, and where applicable, operative findings were recorded. RESULTS: 50/89 patients had ShUS diagnosis of RCT. Of these, 35 (70%) were offered surgery; 23/35 patients were listed for surgery (15 had surgery; 6 still waiting; 2 symptoms improved), 10/35 refused surgery, 2/35 unfit for anaesthetic. Of the 15 remaining; 5 improved before surgery was offered, 4 referred for surgical opinion, and 6 lost to follow up. 37/89 patients showed no evidence of RCT on ShUS – normal/degenerative/tendinopathy. Of these, 20 improved with conservative treatment. Only 7/37 proceeded to surgery (2 had arthroscopically proven RCT), 1 cervical disc pathology on MRI, 1 waiting for MR arthrogram, 1 muscle wasting and 4 lost to follow up. 1 patient non-diagnostic ShUS – "grossly abnormal" underwent shoulder replacement; 1 DNA. CONCLUSION: Clinicians only referred patients for ShUS where the clinical diagnosis of RCT was uncertain. ShUS allowed triage into surgical or conservative treatment pathways providing greater diagnostic reassurance. ShUS reduced the number of arthroscopies and diagnostic MRIs, with both patient safety and economic benefits.

p817

Identification of patients with varying severity of osteoarthritis of the hip and knee from a radiology information system (RIS)

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MATERIALS AND METHODS: A total of 60 hip and 100 knee patients with a recent radiograph were required to participate in a new osteoarthritis study. In order to identify a large pool of potential participants from which to recruit, four computerized searches were performed on the local RIS. Search criteria included aged >50 years, radiograph of pelvis, both hips or both knees, radiograph within the last 12 months. Reports of each patient's relevant investigations were then examined in order to assess suitability for the study. Exclusion criteria included surgical interventions, inflammatory arthropathies, developmental dysplasias, avascular necrosis, metabolic bone disease, and no report on RIS. The first search was of orthopaedic surgeon referrers. Following identification, letters were sent to referring clinicians requesting that study information packs be sent to their patients. RESULTS: Initial search of 4 orthopaedic referrers identified 716 patients (53 hips, 28 knees). Referrer criteria were widened to include all clinicians, and 3 further searches identified a total of 10 400 patients. 9300 records yielded 441 hip and 520 knee reports of suitable patients, 273 and 374, respectively, letters were sent to clinicians, and to date 36 and 40 patients, respectively, have been recruited. CONCLUSION: Computerized "data mining" of a RIS is an efficient method of patient identification for recruitment into clinical trials. However, additional manual searching is required for capturing specific features required for assessing patients' suitability.

p818

Medial sided knee injuries: spectrum of MRI findings seen with anterior cruciate ligament tears

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KEY LEARNING OBJECTIVES: The purpose of this exhibit is to draw attention to the medial and posteromedial structures of the knee and to describe the injury patterns associated with anterior cruciate ligament (ACL) disruption. DESCRIPTION: ACL injuries are common and often occur in association with meniscal tears or trauma to other ligamentous structures around the knee. It is important to recognize these injuries as they may influence surgical management. A pictorial review of injuries of the medial compartment of the knee in ACL deficiency will be illustrated. These will consist of specific bone contusion patterns, medial meniscal injuries including meniscocapsular separation, tears of the superficial and deep medial collateral ligaments (MCL), injuries of the posteromedial corner structures including those involving the semimembranous tendon expansion, and posteromedial capsular disruptions. The O'Donaghue triad (comprising ACL injury, MCL injury and medial meniscal tears) will also be demonstrated. CONCLUSION: MRI plays an important role in the assessment of ACL injury and its subsequent management. This review demonstrates the spectrum of MR findings that may be

encountered in the medial side of the knee. These injuries are well recognized in the orthopaedic literature but have not been well documented in the radiology literature. The imaging findings are of clinical relevance and may help contribute to the appropriate surgical management of these complicated injuries.

p819

MR appearances of the "flipped meniscus"

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KEY LEARNING OBJECTIVES: To raise awareness of the MR appearances of an unusual type of meniscal tear – the flipped meniscus. DESCRIPTION: MRI is a recognized and accurate method for assessing meniscal tears in the knee with a reported sensitivity and specificity of 96% and 97%, respectively, on modern 3.0 T machines [1]. The MR appearances of meniscal tears including bucket handle tears have been well described. The flipped meniscus is an uncommon type of meniscal tear, and is less recognized in the literature. Our aim is to present a pictorial review of the MR appearances of the flipped meniscus including examples of the "reverse double PCL sign". This will be accompanied by a brief description of the presenting clinical features for each case. CONCLUSION: The flipped meniscus is relatively uncommon type of meniscal injury and it is essential that radiologists are familiar with those findings which suggest such pathology on MRI. [1] Magee T, Williams D 3.0-T MRI of meniscal tears. AJR Am J Roentgenol 2006;187:371–5.

p820

The use of multidetector computed tomography in assessing failing total knee arthroplasty: a pictoral review

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KEY LEARNING OBJECTIVES: CT imaging is becoming an important tool in the investigation of a failing Total Knee Arthroplasty (TKA). It has been shown to be superior to plain radiographs in identifying peri-prosthetic osteolysis, fractures and malalignment. Multiplanar reconstructions with volume rendered images provide the surgeon with an important diagnostic and pre-operative planning tool for a revision TKA. DESCRIPTION: TKA is now a routine procedure for knee joint osteoarthritis. As the population is ageing, patients are commonly outliving the life of the prosthesis necessitating a second procedure. Studies have shown CT imaging to be superior to plain radiographs in identifying peri-prosthetic osteolysis, fractures and malalignment. We retrospectively studied CT scans performed in our department for failing total knee replacements over a period of 18 months. In this pictorial review we demonstrate with illustrative cases the usefulness of CT imaging as an important diagnostic and pre-operative planning tool for the surgeon. CONCLUSION: While loosening and failure of prosthesis is clinically evident, the surgical solution for this abnormality may not always be obvious from plain radiographs, necessitating the use of CT. Studies have shown the usefulness of CT imaging in the investigation of a failed TKA and in pre-operative planning for a revision procedure. With the aging population and first round of knee prosthesis coming to the end of their useful life, use of CT assessment of a failed TKA will be more common, making it important to be familiar with the imaging findings to guide further surgical management.

p821

AP and mortise ankle projections: a photographic review of radiographic technique

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The standard radiographic projections of the ankle following trauma are the AP mortise and lateral projections. The AP mortise projection is the preferred AP ankle projection following trauma as it facilitates assessment of the joint space surrounding the talus (the mortise). However, description of appropriate technique to achieve a high quality AP mortise projection of the ankle varies between text books. Although most authors advocate internal rotation of the lower limb, the degree of rotation is inconsistent, varying between 10° and 20°. The problem of identifying the best technique for the AP mortise ankle projection is further compounded in clinical practice. The clinical assessment of internal rotation is not an exact science and is "guestimated" by radiographers resulting in inconsistent techniques being adopted. Further, a survey of 30 qualified radiographers practicing within West Yorkshire indicated that approximately 50% were uncertain of the differences between the true AP and AP mortise ankle projections in terms of both the radiographic technique required to achieve each projection and radiographic appearances. This poster reports the findings of a 1st year student radiography project considering the evidence base for ankle radiography technique. It will provide a photographic review of AP and AP mortise ankle technique and radiographic appearances. It will also demonstrate how anatomical variations in the foot and ankle create inconsistency in the degree of internal rotation necessary to achieve the mortise projection. Finally, this poster will suggest an alternative description of AP technique based upon anatomical structures.

p822

CT and MR anatomy of the subtalar joint

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KEY LEARNING OBJECTIVES: To illustrate the three dimensional bone and soft tissue anatomy of the subtalar joint using CT and MR. DESCRIPTION: The subtalar joint forms an important component of the hind foot articulations, playing a pivotal role in executing the gait cycle. Two of the largest tarsal bones, the talus and the calcaneum articulate to constitute the subtalar joint. The subtalar joint is a complex, multi-axial synovial joint, divided into two parts by an intervening tunnel, the sinus tarsi. Investigating this joint has been difficult with conventional radiography because of its multiplanar orientation; however the advent of CT and MR has revolutionized its imaging. Although the imaging has been simplified, the anatomy still continues to be complex and difficult to picture. The bone and soft tissue anatomy of the subtalar joint as seen on multiplanar CT and MR has been discussed with the help of key images. We have also endeavoured to briefly explore those bits of anatomy which have important pathological significance. CONCLUSION: The subtalar joint is directly or indirectly involved in a significant number of ankle injuries. We believe that an illustrated discussion of its anatomy with the imaging modalities currently used would simplify its understanding and will have practical applications.

p823

Alignment, angles and axes of the foot: what the orthopaedic surgeon needs to know

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KEY LEARNING OBJECTIVES: This exhibit will review the alignment of the foot and the commonly measured angles and axes. The clinical relevance of these measurements in congenital and acquired foot deformities will also be emphasised with illustrative examples. DESCRIPTION: An assessment of the alignment of the forefoot, midfoot and hindfoot are of clinical importance as they allow the pre-operative evaluation of various foot deformities. Various angles and axes may be assessed. These include: metatarsus primus varus angle, 1st intermetatarsal angle, hallux valgus angle, Bohler's angle, talocalcaneal angle and the longitudinal plantar arch

angle. These angles will be demonstrated on radiographs of the feet. Congenital and acquired foot deformities, including hallux valgus, talipes equinovarus, congenital vertical talus and pes planus, will also be demonstrated. CONCLUSION: We present a pictorial review of the measurement of foot alignment, angles and axes on plain radiographs with relevant clinical examples. These are of importance to the Orthopaedic surgeon in the operative assessment of congenital and acquired foot deformities.

Musculoskeletal Electronic Poster

e824

Quality assessment of the postoperative radiographs in joint replacement surgery: a retrospective study

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PURPOSE: It is a routine practice in most orthopaedic units to obtain early post-operative radiographs before discharging the patients who underwent total hip replacement (THR) or total knee replacement (TKR). Our aim was to assess the quality of early and late post-operative radiographs. MATERIALS/METHODS: We assessed the post-operative radiographs of 87 patients who had THR (46 patients) or TKR (41 patients). The AP and the lateral views for both the early and late post-operative films were evaluated by 2 independent practitioners. Each view was scored using 4 criteria; Adequacy, exposure, position and rotation. A total score, out of 8, was given to each imaging (including the AP and lateral). RESULTS: The early post-operative films were obtained in average of 1.5 days after THR and 2.2 days after TKR. Late post-operative radiographs were performed in average of 15 weeks and 17 weeks following the THR and TKR, respectively. The mean early and late post-operative X-ray scores for THR were 4.54 and 6.87, respectively, while those for TKR were 5.84 and 6.83. The differences in the early and late post-operative X-ray scores were statistically significant for both THR and TKR ($p<0.001$, Wilcoxon-Rank test). CONCLUSION: There is a significant difference in the quality of early and late post-operative radiographs in favour of the late films. We question the necessity for obtaining routine early post-operative X-rays and recommend performing them at the first follow up visit. This would result in obtaining better quality radiographs in more comfortable patients easily positioned by the radiographer.

e825

MRI cervial spine in trauma: what every radiologists needs to know

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PURPOSE: Every Radiologist needs to be aware of indications, appropriate MRI sequences, radiological findings, its interpretation and clinical significance in cervical spinal trauma. CONTENT: Discusses the clinical findings to suspect spinal injury warranting a uregent MRI. Describes in detail the must-have sequences, their strengths and pitfalls. Furthermore it descibes clinicoradiological findings in cord oedema, intraspinal haemorrhage, cord transection, ligamentous and vertebral injury. With emphasis on what a clinican want to know to make important management decisions, reporting and essential communication is discussed. CONCLUSION: The poster explains the indications, technique, important findings, interpretations and essential communication (report) to clinician.

e826

Cervical spine imaging in trauma: does the use of grid and filter combination improve visualization of cervicothoracic junction on the lateral radiographs?

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PURPOSE: To evaluate the usefulness of filter and anti-scatter grid combination in demonstrating the cervicothoracic junction in lateral cervical spine X-rays performed for trauma patients. MATERIALS/METHODS: Following a change in departmental protocol in our hospital, anti scatter grid and filter are routinely used for lateral cervical spine X-ray in all trauma patients with immobilized cervical spine. A retrospective study was done to compare the efficacy of lateral cervical spine X-rays in demonstrating the cervicothoracic junction for a period of 3 months before and after the implementation of the change. All images were independently evaluated by two observers. RESULTS: 253 trauma patients had a lateral cervical spine X-ray done in January to March 2003 without using the anti-scatter grid and filter while 309 patients in January to March 2007, using filter and grid. Interobserver variability between the two observers was calculated using Cohen's Kappa which showed good and very good agreement for 2003 and 2007, respectively. 126 (49.8%) images adequately demonstrated the cervicothoracic junction without filter and grid while 189 (61.1%) were adequate following their use. This was statistically significant. (Fischer exact test, p-value=0.0081). CONCLUSION: The use of filter and anti scatter grids improves the visualization of cervicothoracic junction in lateral cervical spine imaging and reduces the need to repeat exposure.

e827

MRI lumbar spine in cauda equina syndrome – does urgent imaging influence management?

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KEY LEARNING OBJECTIVES: Cauda equina syndrome (CES) is a neurosurgical emergency and an indication for urgent MRI of lumbar spine. Surgical decompression within 48 h of symptom onset is considered necessary for neurological improvement. In cases of CES, assessment by MRI should be performed ideally within 12 h. This is our local departmental standard. No national guidelines exist for timing of imaging in CES. DESCRIPTION: A&E referrals over a 32 month period were included. Patients with CES were identified and the time to MRI scan and patient treatment was determined. MRI request forms were reviewed by a spinal orthopaedic surgeon and the presenting symptoms classified as urgent or non-urgent. Urgent histories were deemed to warrant a scan within 12 h. 72 patients were referred for urgent MRI lumbar spine. 28 patients were scanned <12 h, 11 within 12–24 h, and 33 >24 h.19 patients had an urgent surgical history. l4 of these were scanned <12 h, and 5 between 12–24 h. 5 cases of CES all due to lumbar disc disease were identified and transferred to an orthopaedic centre. 2 patients presented "out of hours", but were scanned within 12 h and operated on within 6 h of imaging. 3 patients were scanned within 2 h but were not operated on acutely. CONCLUSION: All cases of CES were scanned within 12 h, however timing and nature of surgical treatment varies and is quite unpredictable. The introduction of an emergency consultant led MRI service for CES is currently under consideration.

e828

CT guided percutaneous coblation nucleoplasty treatment for lumbar disc disease: initial case series

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PURPOSE: To evaluate the outcome of a group of patients with discogenic low back pain (bulging or contained herniation) who were treated with CT guided nucleoplasty. MATERIALS/METHODS: 11 patients with chronic symptoms (axial or radicular pain) who failed to improve conservatively and were not candidated for surgery, underwent percutaneous coblation nucleoplasty treatment under CT guidance. In

all patients, a lumbar MR revealed bulging disc or a contained disc herniation (2 patients: L3–L4, 8 patients: L4–L5 and 1 patient L5–S1). Under CT guidance the spine wand was introduced into the nucleus through a 17-gauge needle while ablating and reducing intradiscal pressure. Patients were followed at least for 6 months post procedure. RESULTS: Overall, 11 of 11 patients indicated a decrease in their pain at 6 months. In 6 patients (54.5%) pain was eliminated. After 6 months MR demonstrated complete resolution of disc protrusion in 6 patients. On the other, MR did not declare a sincere resolution of it, nevertheless there was clinical improvement. No post-procedural complication was observed. CONCLUSION: CT guided percutaneous coblation nucleoplasty proved to be a minimally invasive and effective method in patients with low back pain associated with bulging or contained herniated disc. CT allowed accurate localization of centrally disc tissue removal with thermal treatment. The integrity of the annulus fibrosus, also the disc deficit after nucleoplasty controlled with CT discography, were important for the success.

e829

The use of ultrasound in assessing nail related disorders

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PURPOSE: We report on 36 consecutive sonographic assessments of nail disorders presenting to hand clinics over 45 months. MATERIALS/METHODS: Retrospective review of 36 patients performed between April 2003 and January 2007. Radiology information system was searched for total number, hand/wrist study and nail related disorders. Ultrasound findings were correlated with clinical information. 13 male and 23 female. Mean age 54.2 years (range 14–80 years). RESULTS: These patients presented with Lump (27) of which 13 were painful, post trauma (6) and infection (3). The ultrasound diagnoses were Infection (4), Trauma (2) , Cyst (7), Foreign body (5), ganglion (1), GCT (4), miscellaneous (3), osteoarthrits related (3), neurogenic tumour (5), implantation dermoid (2) and normal (1). Surgery was performed on 15 (42%). The Procedures included 12 excisions of lumps, 2 explorations and debridements and 1 refashioning of the nail bed. 10 (67%) of the 15 had histological confirmation. Final histology confirmed Glomus tumour (2), GCT (4), Superficial acral fibromyxoma (1) Granuloma (2) and Ganglion (1). All of the provisional diagnosis of trauma (2), ganglion (1) and GCT (4) were confirmed by utlrasound. Discrepancy occurred in rest of the provisional diagnoses. Sonographic diagnosis of OA (1), ganglion (1), implantation dermoid (1), foreign body (1), miscellaneous (1), neurogenic tumour (1) and No abnormality detected (1) were made in a group of 7 cases with the clinical diagnosis of cyst.US detected foreign bodies in 3 cases with a clinical diagnosis of indeterminate lumps (4). CONCLUSION: Ultrasound study was performed to assess atypical lesions, local staging and obtain further information regarding location, size and relationship to anatomical structures prior to surgery. Role of ultrasound and typical findings will be illustrated.

e830

Wrist MR arthrography, essentials

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KEY LEARNING OBJECTIVES: (1) Illustrate relevant aspects of anatomy and technique. (2) Discuss common applications and their imaging findings. (3) Identify potential diagnostic pitfalls and develop strategies for avoiding them. DESCRIPTION: The complex structure of the wrist joint along with its small size make MRI of the wrist diagnostically challenging. In MR arthrography intra-articular contrast media is utilized to depict small joint abnormalities. Common indications include evaluation of TFCC tears, instability secondary to intrinsic and extrinsic ligament injury, ulnar wrist pain and ulnar impaction syndrome. CONCLUSION: MR arthrography is an excellent diagnostic tool in the evaluation of disorders of the wrist. A sound knowledge of relevant anatomy, technique and imaging findings increases diagnostic efficacy and minimizes potential error.

e831

Sternoclavicular joint disease – a retrospective review of the utility of plain radiographs

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PURPOSE: The aim of this study was to assess the utility of plain radiographs in the assessment of the symptomatic sternoclavicular joint. MATERIALS/METHODS: A retrospective review was performed of 142 patients who presented with sternoclavicular joint symptoms and had subsequent imaging between January 2002 to April 2007. The studies were reviewed and classified in to normal or abnormal, and if abnormal, the diagnosis was noted. All the patients who underwent subsequent ultrasound, CT, MRI or nuclear medicine studies were identified and results were recorded. RESULTS: Out of 142 patients, 64.5% (93) had a normal plain radiograph compared with 34.5% (49) whose radiographs were reported as abnormal. 41% (20 patients) of patients who had an abnormal radiograph had a second line investigation. 90% (18/20) of those with abnormal radiographs had the abnormal diagnosis confirmed by a second investigation. The diagnoses included osteoarthrosis, subluxation and infection. Of the 93 patients with a normal radiograph 15% (14) had a further investigation. 92.7% of these had abnormalities on the second investigation: CT 50%, MRI 28.3%, ultrasound 14.3%. The specificity of plain films was 90% but the sensitivity was only 58% for sternoclavicular joint abnormalities. CONCLUSION: These findings suggest that the sensitivity of plain radiographs for disease of the sternoclavicular joint is low and therefore it might be reasonable to consider other modalities as a first line investigation for the symptomatic sternoclavicular joint.

e832

Acromioclavicular joint stress radiographs. Do they alter patient management?

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KEY LEARNING OBJECTIVES: The classification and management of acromioclavicular joint (ACJ) injuries. To consider whether ACJ stress radiographs alter patient management and therfore whether they should be performed in the context of an acute presentation with a suspected ACJ injury. DESCRIPTION: ACJ stress radiographs are commonly performed in the context of trauma to the shoulder although serious injury is rare and the treatment is most commonly non-operative. Therefore, in most cases, radiography of the ACJ will not alter patient management. We present an audit of 50 patients over a 2 year period all of whom had ACJ stress radiographs undertaken after presentaion in Accident and Emergency. Higher grades of ACJ injury were rare and in no patient was the management altered by stress views of the ACJ and in particular, the more significant grades of injury were visible on non-stress views. There are savings to be made in radiography and reporting time, cost, and radiation exposure by not undertaking such views. CONCLUSION: ACJ stress views did not alter patient management in any of our 50 patients and are no longer performed at our insitution, unless specifically requested by a shoulder surgeon.

e833

Pictorial review of atypical findings on shoulder MR arthrography

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KEY LEARNING OBJECTIVES: (1) To illustrate the wide spectrum of atypical pathologies seen on shoulder MR arthrography. (2) To elaborate on the non rotator cuff and non labral anatomy and normal variant seen on MR arthrography. DESCRIPTION: MR arthrography

is a routine investigation for shoulder complaints. The most common indication tends to be suspected rotator cuff or labral abnormalities. On retrospective review of shoulder MR arthrography done over the last 5 years in our trust, we have come across an array of pathologies. These include occult fracture, biceps pulley tears, glenohumeral osteoarthritis, osteochondral defects and Parsonage-Turner syndrome. Concomitant findings are also seen such as lipomas in the soft tissue and benign bony lesions such as bone islands and enchondromas. CONCLUSION: Wide range of pathologies are seen in the shoulder which may all present with shoulder pain and symptoms suggestive of rotator cuff or labral pathology. Clinical assessment of shoulder can be notoriously deceptive and therefore much depends on the radiological opinion. Radiologists need to have a comprehensive strategy for evaluation of shoulder MR arthrography to enable accurate diagnosis.

e834

Imaging of rotator cuff – is ultrasound as reliable as arthroscopy

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PURPOSE: To evaluate the accuracy of high-resolution ultrasound compared with shoulder arthroscopy in the detection of rotator cuff tears. MATERIALS/METHODS: 100 patients with shoulder pain who had undergone standardized preoperative ultrasound and subsequent arthroscopy were included in the study. All the ultrasound examinations were done by a single experienced musculoskeletal radiologist using a standard protocol. The findings at ultrasound were classified into intact cuff (including tendinopathy), partial-thickness tear and full-thickness rotator cuff tears. The size of the tear was measured in centimetres. The location was designated as subscapularis, supraspinatus, infraspinatus, or a combination. All shoulder arthroscopies were done by a single surgeon. The presence or absence of a rotator cuff tear and the size and extent of the tear when present were recorded. We compared the ultrasound findings with the operative findings; the operative findings were used as the gold standard to define the accuracy of the ultrasound examination. RESULTS: Ultrasound correctly depicted rotator cuff tears with sensitivity 95%, specificity 94%, PPV 97%, NPV 91% and accuracy 95%. Full-thickness tears had a sensitivity of 100%, specificity 91%, PPV 91%, NPV 100%, and accuracy of 95% while partial-thickness tears had a sensitivity of 80%, specificity 98%, PPV 86%, NPV 96%, and accuracy 95%. CONCLUSION: Ultrasound is a highly accurate diagnostic method for detecting rotator cuff tears. Accuracy is comparable with MRI of the shoulder. Dynamic imaging and comparison with opposite shoulder is an added advantage.

e835

Pictorial review of groin strains in sports professionals, imaging techniques and pathology

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PURPOSE: Pubalgia following acute trauma or chronic overuse is a common complaint in sports professionals and has a wide differential diagnosis, including Gilmore's groin, inguinal hernia, osteitis pubis, adductor tear, enthesitis and tendonitis, trochanteric bursitis and others. We propose a tailored imaging protocol comprising MRI, CT and ultrasound that enables accurate diagnosis and guides therapy and rehabilitation in this cohort of high demand patients. MATERIALS/METHODS: We give a pictorial review of 15 cases of groin strains in sports professionals with a wide spectrum of different pathologies. These were investigated using a special MRI protocol (T_1 & T_2 axial, T_2 FS coronal, T_1 & T_2 FS sagittal and coronal oblique pre contrast and T_1 FS sagittal & coronal oblique post contrast) and other imaging modalities as appropriate. CONCLUSION: A tailored imaging protocol with special MRI sequences and judicious use of other imaging modalities is capable of detecting of the different pathologies underlying the presenting symptom of pubalgia in sports professionals. This also helps in planning and monitoring the rehabilitation of these patients.

e836

Acetabular labrum assessment with magnetic resonance arthrography and correlation with arthroscopy findings: a pictorial review

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KEY LEARNING OBJECTIVES: Acetabular labral tears are an important cause for groin pain. It is also a precursor for the development of early osteoarthritis most commonly seen with femoral acetabular impingement. Other conditions associated with development of labral tears include trauma and acetabular dysplasia. It is therefore vital to diagnose these injuries accurately. Currently, MR arthrography is considered the most accurate imaging technique for detecting and characterizing acetabular labral injury. This pictorial review is intended as an introduction into the characteristic imaging findings of labral tears and correlates the typical MR-findings with arthroscopy findings. This poster is of educational interest to every radiology trainee as it enhances understanding of acetabular labral tears by correlating MR-findings with arthroscopy findings. However, it also serves as a reminder to the general radiologist reporting MRI scans of the hip. DESCRIPTION: Characteristic MR and MR-arthography images of labral tears are demonstrated with a brief description of the typical radiological findings. Correlation with arthroscopy findings is made. CONCLUSION: MR-arthrography is an excellent tool for the detection of acetabular labral tears. We hope that this review has improved understanding of the MR findings of labral tears.

e837

A review of the technique, anatomy and pathologies of magnetic resonance arthrography of the hip

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KEY LEARNING OBJECTIVES: MR arthrography is the gold standard imaging technique for detecting and characterizing intra-articular ligamentous or fibrocartilaginous tissue injury. It is therefore an important tool to diagnose cartilaginous and labral pathologies. However, the anatomy and technique of MR-arthrography of the hip is often not well understood. This pictorial review serves as an introduction to MR-arthrography of the hip with an emphasis on anatomy, technique and various pathologies, particularly cartilaginous lesions, loose bodies, labral tears and ligamentous injuries. It is of educational interest to every radiology trainee and radiologist because it enhances understanding of the anatomy and pathology of the hip and helps to understand the technique. DESCRIPTION: The anatomy and pathology of the hip on MR-arthrography as well as the technique will be illustrated with a particular emphasis on the imaging findings of cartilaginous lesions, loose bodies, labral tears and ligamentous injuries. CONCLUSION: MR-arthrography is an excellent tool for the detection of hip pathologies because it shows exquisite anatomical detail. We hope that this review has improved understanding of the anatomy and pathology of the hip as demonstrated on MR-arthrography and has given an insight into the technique of MR-arthrography.

e838

Radiological review of hip resurfacing complications

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PURPOSE: Radiological evaluation of hip resurfacing complications seen in a large district general hospital. MATERIALS/METHODS: Retrospective review of around 300 hip resurfacing procedures done at our hospital over the last 5 years. RESULTS: The complications seen reflect those seen in other large series. The range of complications seen radiologically includes infection, aseptic loosening, cup dislocation, heterotopic ossification and fracture of femoral neck. There are other complications that are clinically or biochemically diagnosed such as sciatic nerve compression or high blood chromium, potential long term effect of which is not yet known as well as occasional metal hypersensitivity. CONCLUSION: The hip resurfacing procedure is fairly ubiquitous procedure as more and more patients, who tend to be relatively younger and fitter, are having this done.The procedure is still evolving and the follow up so far are only of short to medium term unlike the conventional hip replacement. The reporting radiologists and radiographers need to be familiar with the complications seen radiologically. The complications are similar to that seen in conventional hip replacement but with few differences such as less likelihood of hip dislocation but slightly higher risk of femoral neck fracture. Some complications are more unique to hip resurfacing such as heterotopic ossification of hip soft tissue.

e839

Osteonecrosis about the knee (part 1): spectrum of imaging abnormalities in the femoral condyles

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KEY LEARNING OBJECTIVES: In part-1 of this two-part presentation, we demonstrate the gamut of imaging findings related to osteonecrosis (ON) of the femoral condyle (FC) that are helpful in distinguishing ON from other disorders of the knee. A multimodality imaging approach is used according to the clinical stage of ON. Furthermore, we investigate any association of ON of the FC to that of the tibial plateau. DESCRIPTION: ON of the FC either spontaneous, or secondary to systemic disease processes may present with knee pain mimicking conditions such as osteochondritis dissecans, osteoarthritis, or transient osteoporosis. The imaging features of ON of the FC are variable. Initial radiographs may be unremarkable or show subtle flattening and sclerosis of the weightbearing surface of the FC. MRI and scintigraphy are both helpful in the early detection of ON and determination of the distribution of necrotic lesions. MRI allows definition of the extent of involvement in the FC. A focal lesion of low signal intensity on T_1 and of variable signal intensity on T_2 weighted images is usually seen. Additional findings include the band pattern, the double-line sign, and flattening of the articular surface of the FC or the proximal tibia. CT can optimally depict subchondral fracture and resulting articular collapse. CONCLUSION: Recognition of the imaging features of ON of the FC may allow early initiation of treatment and preservation of overall knee function. The postulated association of ON of the FC with ON of the tibial plateau has important implications for both diagnosis and treatment.

e840

Osteonecrosis about the knee (part 2): spectrum of imaging abnormalities in the tibial plateau

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KEY LEARNING OBJECTIVES: Osteonecrosis (ON) of the tibial plateau (TP) has become an important entity to recognize because it can be a source of knee pain and disability. In part-2 of this presentation, we demonstrate the imaging findings of ON occurring in this unusual site using imaging studies according to the clinical stage of disease. In addition, we explore the association of ON of the TP with meniscal pathology. DESCRIPTION: ON affecting the medial and lateral tibial condyles can cause pain close to the joint line that may suggest meniscal tear, osteoarthritis, or bursitis. Although radiography is often used for initial evaluation of knee pain, in early-stage ON of the TP findings may be normal. By contrast, bone scintigraphy reveals increased uptake in the involved TP. With progression of the disease, subchondral radiolucency with or without surrounding sclerosis or articular collapse is evident. The MRI features of ON of the TP vary according to chronicity of the disease and appear analogous to those seen in ON of the femoral condyles. Common associated lesions include meniscal tears, chondromalacia, joint effusion, and ligament abnormalities. CT depicts abnormal bone mineralization, and fracture of subchondral bone with or without collapse of the articular surface. CONCLUSION: Although ON of the TP is largely unrecognized in the imaging literature, accurate diagnosis is critical. Lesions of the TP can be associated with meniscal tears, providing a plausible explanation for the pathogenesis of ON as it relates to abnormal physical stress across the knee.

e841

Deep infrapatellar bursa: prevalence and morphology on MR imaging of the knee

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KEY LEARNING OBJECTIVES: To describe the normal anatomy of the deep infrapatellar bursa (DIB) using MRI. To evaluate the prevalence, location, size and morphology of the DIB on MRI of the knee. DESCRIPTION: The DIB is a fluid-containing structure located deep to the patellar tendon proximal to its tibial insertion. Pathological conditions of the DIB are important to include in the differential diagnosis of anterior knee pain. MRI of the DIB of 120 consecutive patients was performed on a 1.5 T MR unit. There were 85 male and 34 female patients, with an age range of 18–60 years (mean, 35 years). The MR protocol consisted of sagittal, coronal, and axial double echo in steady state (DESS), maximum intensity projection (MIP) and multiplanar reconstruction (MPR) fast spin-echo proton density and T_2 weighted images, and T_1 weighted spin-echo images. The DIB was detected in 84 (70%) patients. The mean dimensions of the DIB in the craniocaudal, mediolateral, and anteroposterior planes were, respectively, 12.5 mm, 24 mm and 4.1 mm. The DIB assumed grossly the shape of an inverted triangle located inferior to the infrapatellar fat pad. Variable size of the DIB was noted, mirroring different amounts of fluid within it. Bilateral recesses were seen with the lateral recess being larger than the medial recess. There was no communication between the DIB and the knee joint. CONCLUSION: There is variability in the presence and configuration of the DIB, and this suggests that caution should be exercised in distinguishing this structure from pathologic conditions affecting the infrapatellar fat pad.

e842

The posterolateral aspect of the knee: ultrasound findings

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LEARNING OBJECTIVES: To familiarize viewer with the possibilities of ultrasound of the posterolateral aspect of the knee. To review anatomy and pathology. To provide a technique for assessment to the posterolateral aspect ot the knee. DESCRIPTION:

This poster describes the vital structures and of the posterolateral aspect of the knee. The functional significance and ultrasound features of the iliotibial tract, the lateral collateral ligament, biceps femoris, popliteus, the cruciate ligaments, the menisci, the vessels and nerves are all described and demonstrated. Examples of pathology are included. CONCLUSION: Ultrasound is an under-used and under-rated modality for examination of the posterolateral aspect of the knee. This poster revises anatomy and pathology. Increased use of ultrasound in the posterolateral aspect of the knee is promoted.

e843

CT-scan based quantitative analysis of autogenous cancellous bone graft from proximal tibia compared with anterior iliac crest

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PURPOSE: To determine the volume of cancellous bone that can be harvested for autologous bone grafting from the proximal tibia compared with the anterior iliac crest, using a CT-scan-based 3D-geometrical-computerized-model. MATERIALS/METHODS: The CT-scan data (2 mm-thick spiral CT scan) were obtained from 15 trauma patients. The cancellous bone-graft volume was determined in the anterior (first 1/3) iliac crest from the anterior superior iliac spine to a point above the hip joint and in the proximal tibia metaphysis from a point 1.5 cm below tibia plateau. 3D-computer-imaging and quantitative analysis of the cortical and cancellous bone was semi-automatic and based on the grey values of cortical and cancellous bone within the CT-images. A CT density of 300–600 HU was regarded as the corticocancellous interface of the endosteal cavity since bone with higher density is generally not removable using conventional surgical hand tools. RESULTS: In all cases the estimated average volume of the proximal tibia cancellous bone (ranged from 16.265 cm^3 to 69.567 cm^3, mean 38.609 cm^3) was increased compared with the anterior iliac crest (ranged from 4.987 cm^3 to 33.572 cm^3, mean 17.633 cm^3). CONCLUSION: Results of the current study support the clinical findings that a sufficient amount of cancellous bone can be harvested from the proximal tibia compared with the anterior iliac crest. The presented herein CT-3D-geometrical-computerized-model, used in the past to study the morphology of bones and develop customized joint implants, can precisely determine the cancellous bone volume and play a major role in the surgical decision of the donor site. A close collaboration between orthopaedic surgeons, radiologists and biomechanical engineers could further develop a computerized mechanical bone testing before bone harvesting.

e844

Optimized radiographic projections for the detection of avulsion fractures of the ankle

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KEY LEARNING OBJECTIVES: To develop optimized radiographic projections for better assessment of the sites of attachment of the ankle medial and lateral collateral ligaments. To evaluate which radiographic projections enhance visualization of malleolar avulsion fractures. DESCRIPTION: Avulsion fractures of the ankle are clinically significant injuries as ununited fractures can result in chronic pain and instability. Clinically, avulsion fractures of the ankle can be easily misdiagnosed as ligamentous sprains, while standard radiographic projections usually fail to depict small fractures obscured by adjacent structures. The malleolar attachment sites of the tibionavicular (TN), tibiocalcaneal (TC), posterior tibiotalar (PTT), anterior talofibular (ATF), and calcaneofibular (CF) ligaments of three cadaveric ankles were dissected. Standard and new radiographic views of the ankle were obtained with the foot in different positions and various degrees of beam angulation. Simulated avulsion injuries related to these ligaments were created, and the visibility of these structures was assessed. Avulsion injuries of the TN ligament were better assessed in 45° of plantarflexion with 15° of lateral beam angulation. Standard projections were found to adequately depict avulsion fractures related to the TC and CF ligaments. Radiographs in 45° of external ankle rotation were best for evaluating injuries of the PTT ligament. Avulsion injuries related to the ATF ligament were best visualized in 45° of plantarflexion views with 15° of medial beam angulation. CONCLUSION: Modified radiographic projections of the ankle significantly improved visualization of ligamentous structures and malleolar avulsion fractures. The proposed radiographic views may well supplement standard radiographic views in questionable trauma cases.

e845

The ligaments of the ankle: how to evaluate with ultrasound

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LEARNING OBJECTIVES: To familiarize the viewer with the anatomy of the ankle ligaments. To teach a logical technique for their ultrasound assessment. To illustrate pathology of the ankle ligaments as seen on ultrasound. DESCRIPTION: The ligaments of the ankle can be divded into medial and lateral ligament complexes. These are important in stabilization of the ankle joint and are commonly injured. New high frequency ultrasound transducers can provide high resolution images of the ankle ligaments and can accurately assess pathology. Dynamic ultrasound imaging can assess function which other modalities struggle with. CONCLUSION: Ultrasound of the ankle ligaments is useful. This poster provides a review of the anatomy of the ankle ligaments and a technique for their assessment.

e846

Targeted MR imaging with modified foot positioning for evaluation of ankle tendons and ligaments in patients with chronic ankle pain

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KEY LEARNING OBJECTIVES: To demonstrate that passive positioning of the ankle influences the MRI appearances of ankle tendons and ligaments. To measure the exact angles of plantarflexion or dorsiflexion and inversion or eversion of the foot for best visualization of the aforementioned structures on MR images. DESCRIPTION: The clinical presentation of patients with chronic ankle pain may be puzzling, and a precise ligamentous injury may frequently go undiagnosed. 10 patients were imaged with a 1.5 Tesla magnet using a dedicated, nonferromagnetic calibrated device. The plantar aspect of the foot was stabilized against a plexiglass plate, and varying degrees of plantarflexion or dorsiflexion were prescribed. Ankle inversion

or eversion was achieved using rubber wedges. Axial and coronal T_1 weighted images were acquired in six positions of the ankle, and the appearance of the tendons and lateral ligaments was evaluated. A Wilcoxon matched-pairs signed-ranks analysis was used. The peroneus longus, peroneus brevis, anterior tibialis, extensor digitorum longus, and extensor hallucis longus tendons were best depicted in 20° of plantarflexion and 20° of inversion ($p<0.0001$). The anterior talofibular and calcaneofibular ligaments were best visualized in 20° of plantarflexion ($p<0.0001$). 10° of dorsiflexion was the least useful imaging plane for all of the evaluated structures. CONCLUSION: Results from this study show that a targeted approach in MRI with modified passive positioning of the foot in those patients with position-dependent pathology may enhance visualization of the periarticular elements and can significantly increase diagnostic accuracy.

e847

The footballer's foot and ankle: MRI features of injuries

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KEY LEARNING OBJECTIVES: To review the MRI findings of soft tissue and osseous injuries of the foot and ankle in professional football players. DESCRIPTION: Football is one of the most popular sports worldwide and has a high incidence of injuries. MRI offers high spatial and contrast resolution, noninvasiveness and multiplanarity for the global assessment of soft tissues and bone for persistent pain following injury. An appreciation of the range of foot and ankle injuries encountered in football players and their MRI appearances would therefore be useful. In this exhibit, we will discuss and illustrate the MRI findings of both the common and less frequent causes of foot and ankle pain following football-related injury. These include causes of pain following a specific traumatic event: fractures, ligament abnormalities, the sinus tarsi syndrome; causes of pain following repetitive trauma: stress fractures, osteochondritis dissecans, the impingement syndromes; and tendon abnormalities. CONCLUSION: MRI is an excellent technique for evaluating the soft tissues and bony structures following football-related foot and ankle injury.

e848

Radiological assessment of soft tissue masses of the ankle and foot

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KEY LEARNING OBJECTIVES: (1) To demonstrate characteristic features of commonly occurring soft tissue masses of the ankle and foot so specific diagnosis can be obtained. (2) To recognize imaging features of aggressive lesions of the ankle and foot so surgical intervention can be suggested. DESCRIPTION: Benign neoplasm and tumour like lesions comprise the most of soft tissue masses of the ankle and foot. Commonly occurring benign neoplasm and reactive processes are plantar fibromatosis, morton's neuroma, ganglion, giant cell tumour of tendon sheath, etc. Few conditions can present as mass around foot and ankle such as ruptured tendons, tenosynovitis, rheumatoid nodule, gouty tophi, accessory muscles and varicosities. While malignant soft tissue masses, constitute 10–25% of total soft tissue masses in this region, are synovial sarcoma, malignant fibrous histiocytoma and clear cell sarcoma. We have presented here typical ultrasound and MRI features with clinical and pathological findings of commonly seen benign and malignant masses of the ankle and foot. CONCLUSION: Ultrasound is initial choice of investigation to differentiate solid from cystic masses. Further tendon pathology can be easily identified on ultrasound. All solid lesions on ultrasound should have MRI scan for further characterization so specific diagnosis can be achieved. However, if features are non-specific on MRI then those lesions should be treated as aggressive lesions. Plain radiographs and CT scan have very limited role in demonstrating calcification and bone infiltration. Overall when imaging features are correlated with clinical findings, patient's age, gender and location of lesion, specific diagnosis can be suggested.

e849

Os calcis angles: Bohler And Gissane: past present and future

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KEY LEARNING OBJECTIVES: Review the history of Lorenz Bohler and William Gissane and the development of their eponymous angle measurements. Explain the nature of Bohler's and Gissane's angles in the Os Calcis. Understand the practical difficulties and limitations of measurement. Outline the current role of these angles in diagnosis and assessing post operative position. DESCRIPTION: Biographies of Bohler and Gissane including the history of the publication of angle measurement on Os Calcis radiographs. Discussion of practicalities of measuring each of the angles with emphasis on intraobserver and interobserver variation. Show examples of interesting and difficult cases. Discuss role and limitations of angle measurement and thresholds for normal range in the era of multidetector CT. CONCLUSION: Bohler and Gissane used different angle measurements in the os calcis to aid diagnosis of injury. Gissane's is less well defined than Bohler's and the limits of normal less established. Observer variation occurs in both but particularly in Gissane's. They have a role in assessing surgical reconstruction but as a diagnostic tool they are limited. Bohler's is of some value but the range of "normal" is wide and the threshold prompting CT should be low.

e850

A comparison of bone biopsies performed with and without cross-sectional imaging guidance

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PURPOSE: To compare the adequacy and accuracy of bone biopsies performed using CT or ultrasound with biopsies performed using clinical or fluoroscopic guidance. MATERIALS/METHODS: A search of the pathology database identified 54 consecutive bone biopsy samples performed in 50 patients over a 12 month period. Pathology reports were assessed to see if samples were adequate for analysis and if a specific diagnosis was acheived. Follow up, using the electronic patient record and radiology databases, identified the method used to guide the biopsies and what was the patient's outcome. RESULTS: In 43 biopsies utilizing clinical or fluoroscopic guidance there was an adequacy of 79%, accuracy in differentiating benign from malignant conditions of 94% and accuracy in achieving a specific diagnosis of 88% for benign conditions and 71% for malignant conditions. In 11 biopsies utilizing CT or ultrasound guidance there was an adequacy of 91%, accuracy in differentiating benign from malignant conditions of 100% and accuracy in acheiving a specific benign or malignant diagnosis of 100%. CONCLUSION: The use of cross-sectional imaging improves the chances of obtaining tissue samples adequate for histopathological assessment. The material obtained is also more likely to be of sufficient quantity and quality to allow the pathologist to acheive a specific tissue diagnosis and accurately grade tumours.

e851

Morelle Lavalle lesion mimicking soft tissue tumour: how to differentiate them on MRI and ultrasound appearances

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KEY LEARNING OBJECTIVES: The natural history, pathophysiology and presentation of Morelle Lavalle lesions. Know that chronic lesions can be a difficult to diagnose and can mimic soft tissue tumour. Highlight the typical MRI and ultrasound appearances. DESCRIPTION: A closed internal degloving injury which results in a tear of the subcutaneous tissues from the underlying fascia is described

in the literature as a Morelle Lavalle lesion. Although this lesion is typically considered to secondary to trauma, often an appropriate history may be absent. The site most commonly affected is in the region of the greater trochanter where the dermis contains a rich vascular plexus that pierces the fascia lata. The disrupted capillaries drain into the peri-fascial plane, filling up the virtual cavity with blood, lymph, and debris. Inflammatory reaction may create a peripheral capsule. Chronic lesions may simulate soft tissue tumours. Imaging in these cases is of value in establishing the correct diagnosis and biopsy is not always necessary with an index of suspicion and typical appearances on cross sectional imaging. CONCLUSION: Morelle Lavalle lesions can be chronic and present without an appropriate clinical history. Chronic lesions may simulate soft tissue tumours. We present the typical ultrasound and MR findings which are extremely useful in diagnosing and differentiating these lesions from soft tissue tumours and other pathology.

e852

Ultrasound imaging of abdominal wall

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LEARNING OBJECTIVES: To illustrate the normal anatomy of the abdominal wall on ultrasound and to discuss various findings of the abdominal wall lesions. DESCRIPTION: Clinically equivocal abdominal wall lesions often pose a diagnostic dilemma for the clinicians. Ultrasound is a non-ionizing, cheap and easily accessible investigation for such lesions. It is widely in use and has an added advantage of being a dynamic investigation. It offers real time evaluation of these lesions thus having an edge over CT and MR scans. However, imaging with ultrasound is operator dependant and relies on their technical skills. It is important to understand the imaging of normal anatomy and familiarize with imaging appearance of various lesions. CONCLUSION: Ultrasound is an effective screening tool for assessment of abdominal wall lesions. Neuroradiology Poster

Neuroradiology Poster

p901

Imaging of infections of the central nervous system: a pictorial review

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KEY LEARNING OBJECTIVES: Imaging plays a vital role in the diagnosis of CNS-infections. As a radiologist, it is important to be familiar with the radiological features of common CNS-infections because these are potentially curable whilst missing them can have disastrous consequences. In our review, we demonstrate the typical neuroradiological features of common bacterial, parasitic and viral infections with a particular emphasis on bacterial, tuberculous and HIV-associated CNS-infections. However, characteristic imaging of viral, rarer parasitic CNS-infections as well as neurosyphilis will also be discussed. This pictorial review is intended as an educational tool to radiology trainees because it enhances understanding of common CNS-infections. However, it also serves as a reminder to all radiologists reporting CT or MRI scans of the brain. DESCRIPTION: Characteristic imaging findings of infections of the central nervous system will be displayed and discussed with a particular emphasis on bacterial, tuberculous and HIV-associated infections. Viral, rarer parasitic CNS-infections as well as neurosyphilis will also be discussed. CONCLUSION: It is vital to be familiar with the typical features of infections of the central nervous system so patients can be diagnosed and treated accurately and quickly. We hope that this poster has facilitated the understanding of the radiological features of CNS-infections.

p902

Pictorial review of the imaging characteristics of HIV/AIDS associated central nervous system manifestations

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KEY LEARNING OBJECTIVES: The neurological manifestations of HIV/AIDS are increasingly encountered in radiological practice in the UK More than half of the patients with HIV/AIDS will develop neurological problems. The aim of this exhibit is to review the imaging features of the manifestations of HIV/AIDS in the central nervous system (CNS). DESCRIPTION: The neurological manifestations of HIV/AIDS can be divided into four categories: (1) direct consequence of the HIV infection, (2) secondary to progression of immunodeficiency, (3) HIV/AIDS associated neoplasms, and (4) Immune reconstitution syndrome. We reviewed CT/MRI studies of over 100 patients diagnosed with HIV/AIDS for these entities. Viral leukoencephealopathy was a common complication occurring as a consequence of spread of the HIV/CMV into the CNS and is presented on CT and MRI. Imaging characteristics of opportunistic infections including progressive multifocal leukoencephalopathy, cryptococcus, toxoplasmosis, cytomegalovirus and Herpes simplex virus encephalitis, mycobacterium are also discussed. The imaging features of primary CNS lymphoma, the most common neoplasm in HIV/AIDS patients, is also illustrated. Glioblastoma multiforme is an atypical neoplasom in HIV/AIDS encountered in a few of our patients. Immune reconstitution syndrome is a rare but important CNS manifestation, with variable imaging features. We also illustrate the role of diffusion-weighted MRI in the differential diagnosis of cerebral lesions in HIV/AIDS. CONCLUSION: HIV/AIDS-associated CNS manifestations are important clinical entities that the practicing radiologist must be able to recognize. The imaging characteristics discussed in this exhibit raise the awareness of the breadth of the disease spectrum and provide an aid to differential diagnosis.

p903

The appearances of neurosurgical devices on CT imaging of the head

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KEY LEARNING OBJECTIVES: Patients who have had previous neurosurgical intervention commonly have multiple CT scans of their heads. There is a wide range of neurosurgical devices in use that may be implanted and prompt, accurate identification of these devices can aid in the interpretation of the scan and rapid recognition of any complications. DESCRIPTION: The neuroradiology and neurosurgical departments have collaborated to illustrate the typical appearances of commonly used neurosurgical devices. We provide pictures of the devices and make comparison with their imaging appearances. We consider the appropriate factors to take into account when assessing the positioning of the devices and we consider their MRI compatibility. CONCLUSION: Neurosurgical patients often have implanted devices that, when appropriately identified and assessed, are key to providing an accurate and helpful report. We provide an illustrated account of how this can be achieved.

p904

Therapeutic effect of a negative CT brain scan in patients with chronic benign headache

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PURPOSE: To determine the anxiolytic effect of a negative CT scan in chronic benign headache patients referred for CT scanning. MATERIALS/METHODS: This prospective study included 50 patients with chronic headache referred for CT brain. All completed a questionnaire prior to and 3 months following CT. The questionnaire was adapted from the Hospital Anxiety and Depression Scale (HADS)

to include seven questions (scored 0–3) relating to current anxiety state, thus the maximum possible score of 21. RESULTS: 50 patients were recruited. All had negative CT scans. The mean pre and post scan HADS were 8.1 (SD 3.3) and 7.2 (SD 4.0), respectively. Thus an average reduction of 0.9 ($p=0.002$). 3 months after scanning, HADS score was improved in 54% of patients but was unchanged (20%) or deteriorated (26%) in the remainder. Over the same period, severity of headache was reduced in 22%, unchanged in 68% and increased in 10%. In 22% of patients whose headache improved, the average reduction in HADS was 2.6 ($p=0.001$). The large reduction in HADS in this small subgroup is responsible for two-thirds of the overall reduction in HADS. In the remaining 78% of patients, the average reduction was only 0.4 points ($p=0.13$). CONCLUSION: Measurable anxiolytic effect of a negative CT in patients with chronic benign headache is statistically significant but apparently small. In the 78% of patients whose headches persist or worsen at three months after scanning, anxiolytic effect is even smaller and not statistically significant.

p905
Spontaneous intracranial hypotension: a rare headache

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KEY LEARNING OBJECTIVES: The objectives of this exhibit are to show the typical imaging findings seen in Spontaneous Intracranial Hypotension (SIH) and to discuss the potential pitfalls involved in making this diagnosis. DESCRIPTION: SIH is one of the rarer causes of headaches and may not routinely be considered by radiologists in the differential diagnosis. A history of orthostatic headache should alert both clinicians and radiologists to the possibility of SIH. On cranial MRI, diffuse pachymeningeal enhancement is the most characteristic feature found in SIH and it is often associated with other features of "brain sagging", such as tonsillar descent, effacement of the basal cisterns, flattening of the pons against the clivus and bilateral subdural haemorrhage (SDH). Common pitfalls include misdiagnosis of tonsillar descent as type 1 Arnold Chiari malformation, failure to recognize bilateral, thin SDH and ascribing dural enhancement to other causes such as inflammation, infection or neoplasia. The cause for intracranial hypotension is a CSF leak. Spinal MRI may be performed to identify the leak. Occasionally contrast or isotope myelograms can also be performed. Treatments include intravenous caffeine, epidural blood patches or dural repair. CONCLUSION: By being aware of these clinical and imaging findings, radiologists can help to minimize diagnostic delays and avoid the need for additional and unnecessary investigations in patients with SIH.

p906
CT and MRI of the brain in poisoning

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LEARNING OBJECTIVES: (1) To emphasise the increasing importance of chemicals, environmental hazards and drug toxicity in causing brain disease. (2) To highlight the important role that imaging plays in the diagnosis and confirmation of suspected poisoning. DESCRIPTION: Imaging studies could be needed in patients with known poisoning who had prolonged stay in hospital due to persisting or worsening symptoms or impaired biochemistry, and/or to evaluate long term effects of poisons. Toxic manifestations of drugs and environmental hazards can cause radiological appearances that closely mimic other common disorders, so the radiologist should be aware of these possibilities and liases with clinicians to obtain an adequate history to ensure correct diagnosis and prompt treatment, including withdrawal of the agent from the patient's environment. We show and describe the imaging features of poisoning with alcoholism, carbon monoxide, lead, methanol, copper (Wilson's disease), several organic compunds (solvent, toluene) and drug abuse (cocaine, heroin, ectasy, amphetamins, etc.) in patients who had CT or MR imaging of the brain either for suspected poisoning, or cases which were diagnosed to be drug related or due to overdose. CONCLUSION: Imaging plays an important role in the diagnosis and confirmation of suspected poisoning, as well in the follow-up of these patients.

p907
Typical and atypical MRI findings in Wernicke's encephalopathy

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LEARNING OBJECTIVES: To display the typical and atypical MRI findings of Wernicke's encephalopathy. DESCRIPTION: Wernicke's encephalopathy is a neurological disorder due to nutritional deficiency or malabsorption of vitamin B1 (thiamine), described by Karl Wernicke in 1881, and characterized by a classic triad (ophtalmoplegia, ataxia and an apathetic confusional state). If untreated, Wernicke's encephalopathy may be followed by an amnesic syndrome or Korsakoff's psychosis. It occurs most often in alcoholics. However, it is also observed in non-alcoholic patients. In many cases, the clinical presentation is incomplete, and only changes in consciousness are present. In these cases MRI may be of great importance to allow diagnosis of the disease and initiate specific treatment. Typical findings in the acute stage are symmetrical hyperintense lesions on T_2 weighted imaging and FLAIR images in the paraventricular regions of the thalamus and hypothalamus, periacueductal regions of the midbrain, floor of the fourth ventricle, and midline structures of the cerebellum. These lesions may enhance with gadolinium. Atypical findings include the symmetrical bilateral hyperintense lesions along the central and paracentral sulci in the cerebral cortex. Milder changes were also seen along the superior frontal sulcus. These lesions may not enhance with gadolinium. CONCLUSION: Wernicke's encephalopathy is caused by a variety of clinical conditions and its characterized by typical and atypical MRI finding. The knowledge of these findings allow the correct diagnosis in patients without the classic clinical triad or in coma. This early diagnosis allow the early indication of the proper treatment, modifying the prognosis of this disease.

p908
Conventional MRI of cerebral glioma: interobserver reproducibility of a simple method for tumour volumetrics

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PURPOSE: To determine the interobserver reproducibility for a simple, manual method of cerebral glioma volume measurements, designed to facilitate future analysis of tumour component volumes. MATERIALS/METHODS: 28 patients with cerebral glioma (29 tumours in total) were imaged in a 3 T Philips Achieva MR scanner. T_2 and post gadolinium contrast T_1 weighted images were obtained. Measurements were carried out on each imaging set by two Radiology Registrars blinded to patient histology and outcomes. Using freely available software (MRIcro) on standard PCs with pen tablet devices, volumes of interest were manually drawn for each tumour on both T_2 and Gd-enhanced T_1 images. The enhancing fraction on T_1 contrast imaging was calculated semi-automatedly by software greyscale thresholding. Using SPSS, T_1 tumour volume (VT1C), T_2 tumour volume (VT2) and T_1-Gd tumour enhancing fraction (VE) measurements were compared between the two observers utilising the method of Altman and Bland, and the intraclass correlation coefficient (ICC). The ICC employed the two-way random model with absolute agreement and 95% confidence intervals. RESULTS: Altman and Bland analysis showed 89.7%, 92.9% and 96.4% of difference values were within 95% CI for VT1C, VE and VT2, respectively. The ICCs were 0.941, 0.957 and 0.964, respectively, with $p<0.001$. CONCLUSION: The method employed here shows acceptable interobserver reproducibility for non-expert radiologists employing simple glioma volumetrics, without the need for expensive proprietary software or equipment. Approaching 95% of interobserver differences were within the Altman and Bland limits of agreement despite the small sample size, the ICC indicating significant interobserver reproducibility.

p909

Conventional MRI of cerebral glioma interobserver agreement of qualitative and quantitative tumour edge characteristics

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PURPOSE: To evaluate the interobserver reproducibility of both quantitative measures of tumour border sharpness coefficient (TBSC) and qualitative descriptors of tumour morphology in cerebral gliomas. These techniques have shown potential in differentiating between histological and genetic subtypes of gliomas but have not previously been tested for interobserver reproducibility. METHODS: A retrospective analysis of 23 patients (24 tumours, 10 grade II and 14 grade IV). T_2 weighted and post contrast T_1 weighted imaging sequences were performed prior to surgery on a 3.0 T Philips Achieva system. Analysis was performed independently by two radiologists (GT and JRC). Measurement of TBSC consisted of measuring 4 consecutive voxel grayscales going into tumour at the anterior, posterior, medial and lateral edges and calculating the average linier regression slope. Qualitative descriptors were assessed as follows: sharp versus indistinct border, smooth versus irregular contour, and homogeneous versus heterogeneous signal. Interobserver variability of the data was assessed using a non-weighted kappa analysis, with >0.7 = acceptable agreement. RESULTS: Excellent agreement was found for both T_1 weighted and T_2 weighted TBSC and the majority of the qualitative descriptors (K>0.7, $p<0.001$). The T_1 weighted TBSC intraclass correlation coefficient (ICC) type A = 0.950 (95% CI 0.889–0.978) the T_2 weighted TBSC ICC type A = 0.895 (95% CI 0.777–0.954). Only the qualitative T_2 weighted border descriptors in grade IV tumours failed to reach an acceptable level of agreement. CONCLUSION: This study demonstrated excellent interobserver reproducibility of TBSC. Qualitative assessment of tumour border morphology is open to greater subjective interpretation than TBSC demonstrating poorer reproducibility in high grade tumours.

p910

Spectrum of posterior cranial fossa cystic malformations

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Classically, posterior fossa cystic malformations have been divided into: Dandy-Walker malformation; Dandy-Walker variant. Mega Cisterna Magna. Posterior Fossa Arachnoid Cyst. Precisely differentiating the malformations may not be possible. They represent a continuum of developmental anomalies on a *spectrum* that has been termed the Dandy-Walker complex. Dandy-Walker complex is characterized by: An enlarged posterior fossa. High position of tentorium with upward displacement of the lateral sinuses, torcular herophili. Varying degrees of vermian hypoplasia. Cystic dilatation of the fourth ventricle that nearly fills the entire posterior fossa. Since the vermis is present in posterior fossa arachnoid cyst, this is considered separately from Dandy-Walker malformation. Dandy-Walker variant consist of vermian hypoplasia and cystic dilatation of the fourth ventricle without much enlargement of the posterior fossa. 4th ventricle is smaller and better formed. It is more common than the classic DWS; accounts for 1/3 of ALL posterior fossa malformations. Mega cisterna magna: An enlarged posterior fossa, secondary to enlarged cisterna magna, but a normal cerebellar vermis and fourth ventricle. Arachnoid cyst: Retrocerebellar cysts of developmental origin are uncommon but clinically important. True retrocerebellar arachnoid cysts displace the fourth ventricle and cerebellum anteriorly and show significant mass effect. Differentiation of posterior fossa arachnoid cyst from Dandy-Walker malformation is essential as surgical therapy differs between the two entities. Posterior Cranial non-cystic fossa malformations include: Rhombencephalo Synapsis: Absent Vermis and fusion of the folia, interfoliate sulci+ dentate nuclei + cerebellar white matter across the midline.

p911

Quantitative analysis of magnetic resonance imaging for paediatric cerebellar tumours

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PURPOSE: This study presents a quantitative analysis scheme, employing conventional MRI to achieve tissue characterization and provide insights in the process of diagnosing paediatric cerebellar tumours. This work supports current practice of diagnosis, based on the combination of clinical presentation and radiological appearance. MATERIALS/METHODS: The study included 34 children, with known histopathological diagnosis of three types of cerebellar tumours: medulloblastoma (n=20), ependymoma (n=5) and pilocytic astrocytoma (n=9). The quantitative analysis scheme employed pre-treatment T_1 weighted (T1W), contrast enhanced T1W (CET1W), and T_2 weighted (T2W) axial images, on 1.5 T Siemens Symphony and GE Signa Excite. A region of interest (ROI) was selected to encompass the solid part of the tumour. The mean signal intensity within the ROI was normalized to the value in the brain stem giving the relative signal intensity (RSI), preventing inter-patient image intensity variations. The standard deviation in the ROI provided a measure of tumour heterogeneity. The discriminatory power of the quantities was evaluated by ANOVA, Receiver Operating Characteristics (ROC) curves and cross-validated Linear Discriminant Analysis (LDA). RESULTS: The RSI from T2W images shows the greatest discriminatory power, with differences between the three tumour types (F=40.25, $p<0.05$) according to ANOVA. In the ROC curve analysis, T2W RSI is an ideal test (AUC=1, 100% specificity and 100% sensitivity) for identifying astrocytomas. Based on RSI and heterogeneity quantities, LDA correctly classified 100%, 40% and 89% of the medulloblastomas, ependymomas and pilocystic astrocytomas, respectively. CONCLUSION: This scheme can be considered as a useful adjunct to conventional radiological analysis in aiding pre-surgery diagnosis.

p912

An overview of paediatric orbital pathology – a pictorial review

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The spectrum of ocular and orbital pathology in the paediatric age group is quite different from that of adults. Imaging studies serve an important role in the diagnosis and management of many of these abnormalities. Systemic approach is required to understand the classification and imaging features of orbital pathology. We have described them according to the 3 orbital compartments namely the globe/optic nerve sheath, Intraconal and extraconal lesions. This extensive pictorial review outlines the various abnormalities of the paediatric eye and orbit for which imaging studies are often required, including infection, neoplasm, inflammation and infiltration, developmental anomalies, and trauma. Imaging included in this review includes the relevant plain radiography, CT, ultrasound and MRI features of the various pathologies. Additionally, the pertinent findings are correlated with pictorial description of the relevant histopathology, fundoscopy features and relevant clinical ocular photographs. Correlation of the results of imaging studies with pertinent clinical information allows the determination of specific diagnoses in most instances of paediatric orbital pathology.

p913

Imaging the trigeminal nerve tract: a pictorial review of normal anatomy and pathology of the trigeminal nerve

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PURPOSE: Patients with trigeminal nerve pathology often present with indirect evidence of their underlying lesions. The patients may present with pain or numbness in the distribution of the branches of the trigeminal nerve. Clinical evaluation of the three main divisions of the trigeminal nerve can direct the main area of interest for cross sectional imaging. The anatomy of the trigeminal nerve with its clinical correlative is presented through a series of diagrams and corresponding CT and MR images. We present useful protocols for both CT and MRI. METHODS: 15 cases of varying pathology affecting the trigeminal nerve are presented and these are linked to the anatomical site images. The most common cause in our practice at the head and neck cancer unit is peri-neural spread of malignancy particularly through the foramen ovale specifically effecting V3. Other pathologies including sinus tumours, schwanomas of the main trigeminal nerve, metastatic spread to the meninges and trigeminal nerve tract from breast carcinoma are also presented. Finally, we discuss vascular loops in relation to the root exit zone of the main trigeminal nerve at the level of the brain stem. CONCLUSION: Imaging of the trigeminal nerve is a difficult radiological challenge which can be targeted more appropriately with good quality clinical feedback. Detailed knowledge of the normal anatomy is essential if subtle changes due to pathology are to be detected.

p914

Skull base tumours: a pictorial review

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KEY LEARNING OBJECTIVE: Skull base lesions either primary or metastatic, both pose a challenge to a surgeon because of their unique pathological composition. This is not only because of their complex anatomical location but most of the time their involvement with the bones, adjacent structures and communication through bony gaps. Key element in the success of these surgeries is efficient and effective imaging. It plays an important role in the diagnosis and further management of the patients. Surgeons can rely on these images to decide about their approach and levels of excision. DESCRIPTION: We reviewed our records to collect interesting cases of skull base tumours. In this review, the authors examine the skull base lesions that occur in the anterior, middle, and posterior cranial base, focusing on unique tumors such as Encephalocele, fibrous dysplasia, Esthesio neuroblastoma, craniopharyngioma, juvenile nasopharyngeal angiofibroma, cholesteatoma, chordoma, chondrosarcoma, and Ewing sarcoma. With a working knowledge of skull base anatomy and special considerations of the developing craniofacial skeleton, neurosurgeons can treat skull base lesions with acceptable morbidity and mortality rates. CONCLUSION: This pictorial review illustrates the complexity of these lesions and also signifies the role of imaging in their management.

p915

A pictorial review of the craniovertebral junction in health and disease

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KEY LEARNING OBJECTIVES: The normal anatomy, anatomical variants and pathology of the craniovertebral junction. DESCRIPTION: The craniovertebral junction encompasses the occiput, atlas, axis, ligaments and encloses soft tissue structures of the cervicomedullary junction (medulla, spinal cord and lower cranial nerves). It is an area of the body that invites interest from multiple disciplines, from ENT to rheumatology to neurosurgery. However, as an "in between" region, it can often be overlooked in texts addressing the skull or cervical spine. We will aim to address this by illustrating the normal anatomy and some anatomical variants, along with reference measurements useful to the radiologist. We will also include a wide range of acquired and developmental disease in children and adults. We will demonstrate a diverse range of pathologies including atlantoaxial subluxation, Mucopolysaccharidoses, Down's syndrome and Chiari malformations. Meningioma, dermoid, syringobulbia, cavernoma, lymphoma, tuberculosis, myeloma and skull base pathologies are just a few of the many other conditions that will be illustrated. CONCLUSION: The craniovertebral junction represents a convergence of multiple clinical and radiological disciplines. This pictorial review aims to facilitate an understanding of the many pathologies which may be encountered in this complex region.

p916

Radiological review of clinically suspected spinal cord and cauda equina compression with a proposed algorithm for classification by imaging findings

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PURPOSE: Patients commonly present with symptoms suspicious of spinal cord or cauda equina compression and such patients increasingly are undergoing emergency imaging. The cause of these symptoms is extremely varied and the site of pathology can lie anywhere between the brainstem and the sacrum. This presentation aims to discuss the imaging features of these lesions and to propose a simple algorithm based on imaging appearances to optimize assessment and diagnosis. Content Organization: Introduction; Anatomy; Extradural pathology; Intradural extramedullary pathology; Intramedullary spinal cord lesions; Pathology of the cauda equina; Algorithm for classifying causes of spinal cord and cauda equina compression. CONCLUSION: The major teaching points of this exhibit include: To appreciate the importance of swift imaging in suspected cases of spinal cord and cauda equina compression. To have an imaging strategy, including relevant MR sequences and alternative methods for those patients that cannot undergo MRI. To understand the anatomy of the spinal cord, cauda equina and vertebral column. To recognize the presence of compressive or intrinsic spinal or cauda equina pathology and appreciate the imaging features of each pathology discussed. To provide an algorithm to assist with the classification.

p917

A prospective audit of local lumbar puncture practice for patients with suspected subarachnoid haemorrhage

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PURPOSE: To assess our hospital's compliance with national guidelines in the investigation of suspected subarachnoid haemorrhage (SAH) after negative CT. The national standard is lumbar puncture (LP) following negative CT, with the LP performed more than 12 h after the onset of symptoms. METHODS: Patients presenting with suspected SAH and investigated with CT over a 2 month period were included. Notes and computer records were assessed for the results of CT, LP and final diagnosis. The documented clinical differential diagnoses prior to CT and the timings of CT and LP from onset of symptoms were recorded. All patients were followed up during the audit period. RESULTS: 52 patients were referred to the duty radiologist as cases of suspected SAH and had CT scans, of which 7 were positive for SAH. There were 45 patients with negative CT, of which 20 had LP with 1 case of SAH confirmed on LP. Of the remaining 25 patients, 3 had a significant alternative diagnosis made on CT and 17 improved clinically and were discharged without further investigation. On reviewing the clinical notes, SAH was not documented as a differential diagnosis in 11 patients. CONCLUSION: Local practice is below the national standard. 17 out of 25 patients with negative CT did not have LP. This information highlights a specific area requiring education. This audit was performed in a single centre with an on-site tertiary neurosciences centre. Further regional audit

involving local district hospitals would provide valuable information about regional multi-centre practice.

p918

"An elusive pelvic cyst": case report of an anterior sacral meningocoele

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KEY LEARNING OBJECTIVES: To discuss anterior sacral meningocoele (ASM) as a rare cause of pelvic cystic lesion and imaging features of cerebral hypotension. DESCRIPTION: A 37-year-old woman was admitted for laparoscopy to investigate a history of acute on chronic pelvic pain and repeated ultrasound evidence of a large (8 cm × 5 cm × 7 cm) right pelvic cyst for the previous 8 years. She had 2 previous laparoscopies and a laparotomy for the same indication. No pelvic cyst had ever been found. Tumour markers (CA 125 and CA 19-9) were normal. At laparoscopy, there was a subtle fullness on the right pelvic sidewall. Careful dissection revealed a non-pulsatile fibrotic cystic capsule which was deroofed, biopsied and marsupialized, to prevent recollection. The patient presented 14 days post operatively with a progressive worsening postural headache. Brain MRI showed meningeal enhancement and low lying cerebellar tonsils. Findings consistent with cerebral hypotension. The possibility that the pelvic cyst may have been of meningeal origin was suspected. The patient was neurologically intact with no cutaneous stigmata of occult spinal dysraphism. Pelvic CT revealed a right sided ASM originating from the S3 neural exit foramina measuring 4.5 cm × 4.5 cm × 3 cm. There was also an associated sacral deformity with hypoplasia of the coccyx. Subsequently, she underwent a sacral laminectomy and repair of the ASM. CONCLUSION: ASM is a rare anomaly that can have serious complications. Therefore, it should not be overlooked. A female presenting with a cystic pre-sacral mass requires detailed imaging and a complete diagnostic workup prior to its definitive treatment.

p919

Magnetic resonance spectroscopy – basics and its clinical applications in neuro imaging

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KEY LEARNING OBJECTIVES: MR spectroscopy and its clinical applications in neuroimaging. DESCRIPTION: MR spectroscopy is a non-invasive method of obtaining biochemical information from the internal organs including the brain, heart, kidney, prostate and extremities. The region of interest is localized in all three spatial dimensions from which the metabolic information is derived and analysed as a spectrum. The major brain metabolites detected are choline, creatinine, N-acetyl aspartate (NAA), lactate, myoinositol, glutamine and glutamate, lipids, and the amino acids leucine and alanine. Each peak of the spectrum is a measure of the metabolite concentration which varies between tissues and therefore can be used for characterization. Common clinical indications of MR spectroscopy in neuroimaging are evaluation of both primary and secondary tumours, differentiation of infectious and non-infectious lesions, demyelination, radiation, epilepsy, and other disorders such as cortical dysplasia, leukodystrophy and neurofibromatosis. In brain tumours MR spectroscopy may allow characterization of metabolic changes associated with tumour growth, degree of malignancy, grading of tumours, response to treatment and sequelae of treatment. CONCLUSION: We will outline the basic principles of MR spectroscopy and the significance of important metabolites in various abnormalities in the brain. We will also present a pictorial review of various clinical cases to illustrate its use in neuro imaging.

p920

Let's be nice. A look at the evidence behind the guidelines

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KEY LEARNING OBJECTIVES: (1) Emergency junior medical staff can struggle to justify a CT head within an appropriate time frame despite guidelines. We aim to examine the evidence behind the guidelines to demonstrate on how appropriate use can affect the clinical care of the patient. (2) Examine the evidence published as to changes in clinical care since the guidelines have been introduced. (3) Improve communication between emergency and radiology department junior medical staff through improving understanding of the evidence base for the current guidelines and resultant imaging requests generated. DESCRIPTION: A literature search of the references given on the NICE guideline website and additional publications assessing brain imaging following trauma was performed with emphasis on education of junior medical staff to relevant points which alter referral for imaging. We hope that by clarifying why particular information is needed to follow guidelines well and what relevance different variables have on outcome the emergency and radiology juniors would develop a more tangible grasp of appropriate use of resources. CONCLUSION: Aim that radiology staff can have a better understanding of the evidence base from the previously published research which is the foundation for current guidelines for brain imaging following trauma and therefore to enable them to help their clinical colleges understand the implications imaging has for impact in clinical patient care.

p921

Using eye tracking technology to provide an insight in brain magnetic resonance interpretation

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PURPOSE: MRI is a challenging interpretation task for even the expert radiologist and is the focus of the ongoing research described here, which concentrates upon brain MRI. A single MRI examination can of itself produce hundreds of images which each need to be examined thoroughly, in an efficient and timely manner. The technique permits good visualization of a large number of conditions. For instance; vascular diseases such as stroke, and degenerative diseases such as Alzheimer's, present themselves quite differently (localized or generalized) in an MRI scan and pose different accuracy and interpretation problems for the observer. Of particular interest here is what constitutes radiological expertise in the area of neuroradiology and how does it differ, if at all, from other specialties? MATERIALS/METHODS: Eye-tracking technology provides an objective/experimental insight into how radiographers and radiologists appraise a medical image and how errors might occur in complex data. Our ongoing research is exploring interpretative accuracy and decision-making using a combination of qualitative (exploration of radiologist accounts) and quantitative (eye-tracking) methodologies. Such data could then be compared with success in clinical decision-making and reported clinical errors in domains such as neurology and neurosurgery. CONCLUSION: MR images combine perfectly the investigation of complex digital imagery with the examination of the accuracy and interpretation of neuroradiological images. It is intended that the proposed research will inform practice in the field of neuroradiological imaging with subsequent benefits in terms of clinical outcomes.

p922

Intraindividual comparison of gadobenate dimeglumine and gadodiamide for contrast enhanced MR imaging of the CNS

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PURPOSE: To compare the high-relaxivity contrast agent gadobenate dimeglumine (Gd-BOPTA, Multihance) with the conventional agent gadodiamide (Gd-DTPA-BMA, Omniscan) for contrast-enhanced MRI of brain pathology. MATERIALS/METHODS: Adults (n=138) with known or suspected CNS disease underwent two 1.5 T MRI examinations separated by 3–14 days, one with 0.1 mmol kg^{-1} Gd-BOPTA, the other with equimolar Gd-DTPA-BMA. For both studies T_1wSE imaging was performed at 3–7 min postdose. Three independent neuroradiologists blinded to patient data quantitatively and qualitatively assessed matched pairs of images. Differences between groups were determined using the Wilcoxon signed rank test and inter-reader agreement was measured with kappa statistics. RESULTS: 113 subjects were enrolled: 46 (41%) with intra-axial brain tumors, 29 (26%) with metastatic tumors, 19 (17%) with extra-axial brain tumors, and 19 (17%) with other diagnoses. Readers showed a highly significant preference for Gd-BOPTA for all diagnostic information and quantitative enhancement endpoints (p<0.0001; all 3 readers). The lesion-to-brain and contrast-to-noise ratios were significantly higher after gadobenate dimeglumine (p<0.0001). Qualitatively, a significant global diagnostic preference for gadobenate dimeglumine was indicated by all 3 readers in 63 (56%), 77 (68%), and 73 (65%) patients, respectively, *vs* 3, 2, and 3 patients for gadodiamide (p<0.0001). Inter-reader agreement was good among all 3 readers (kappa= 0.47–0.69). CONCLUSION: Gadobenate dimeglumine significantly improves brain lesion enhancement compared with the same dose of gadodiamide. The increased diagnostic information provided by gadobenate dimeglumine may potentially influence clinical decision-making through improved characterization of primary brain tumors, earlier detection of tumor recurrence, or detection of additional metastatic lesions.

p923
Functional imaging in epilepsy

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KEY LEARNING OBJECTIVES: To identify the current developments in functional imaging of the bain in epileptic patients, evaluating the benefits and limitations of different modalities in relation to the clinical diagnosis and treatment. DESCRIPTION: Epilepsy is a condition common within the general public with incidences in the region of 80 cases per 100 000. The treatment of epilepsy is primarily aimed at seizure control, avoidance of social consequences and secondary handicap, but primarily to improve the patient quality of life. A recent study by the epilepsy foundation of America found the indirect cost of epilepsy to be approx. $12.5 billion each year, making any potential diagnostic or treatment aid finically advantageous even with large financial outlays. Traditionally diagnosis was aimed at outlining any structural abnormalities and analysing electroencephalographic data. However, with the advent of fMRI, DwMRI and further developments of PET/CT and SPECT with and without CT, allowing a more targeted approach to treatment. Non-invasive epileptic source location techniques have limited success, with EEG and MEG being insensitive to deeper sources, PET and SPECT are sensitive to regional changes, but are not specific enough to identify local abnormalities, and MRI although having the highest spatial resolution, has little sensitivity in small cortical dysplasia. This review aims to provide a literature based evaluation of the current modalities available and glance into future developments. CONCLUSION: With increasing access to functional imaging and the development of more patient specific treatment, the role of functional imaging especially fMRI in accurate diagnosis and treatment looks set to continue.

Neuroradiology Electronic Poster

e924
Neuroimaging: artefacts at 1.5 T and 3 T MRI

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OBJECTIVES: To illustrate the various artefacts seen in MRI of the brain and spine and suggest ways of identifying and reducing them. DESCRIPTION: We present patient, sequence and scan related MR artefacts and also illustrate some of the differences between 1.5 T and 3 T MRI scanner. We also provide tips on recognizing these artefacts and suggest means for reducing them. CONCLUSION: With the advent of 3 T MRI scanning in District General Hospitals it is important to be able to identify artefacts and differentiate them from abnormal pathology. Awareness of these may also help in reducing unnecessary patient investigations.

e925
Pictorial review of neuronal migration disorders

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LEARNING OBJECTIVES: To understand the normal pattern of neuronal migration. To recognize the imaging findings of various neuronal migration disorders. To get an overview of the clinical findings in the various neuronal migration disorders. DESCRIPTION: Neurons start to migrate to the cortex as early as in week 8. Neuronal migration is a two step process, neurogenesis followed by radial migration of the neurons along the glial fibres and organization into 6 layers. The disorders usually present with epilepsy, intellectual impairment and variable neurological deficit with reduced life expectancy. Imaging has an important part to play not only in the diagnosis and management, but also in genetic counselling. The widespread use of MRI in the investigation of neurological symptoms, and particularly in the imaging of epilepsy, has made the correct recognition and interpretation of these disorders important. Antenatal imaging, especially foetal MRI can be useful in identifying these cases. The poster provides a pictorial review of these disorders. CONCLUSION: Neuronal migration abnormalities are an important group of disorders. Knowledge of the normal processes of neuronal generation and migration is useful in the recognition of these disorders. Accurate recognintion of these disorders is important not only in their magement, but also approriate counselling.

e926
Pictorial review of primary intraocular lymphoma

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KEY LEARNING OBJECTIVES: To review the appearances of primary intraocular lymphoma (PIOL) seen on ultrasound, CT and MRI. DESCRIPTION: Primary intraocular lymphoma is a rare disease which affects 1 in 100 000 of the immunocompetent population. The incidence over the past 15 years is rising, though the cause for this is not known. Lesions are single at diagnosis in up to 70% of cases. The presentation is often non-specific, and the course of the disease is often aggressive. We show case histories of primary intraocular lymphoma (PIOL) on ultrasound, CT and MRI. We also show examples of typical patterns of spread, including diffuse infiltration of the orbit. CONCLUSION: Primary intraocular lymphoma (PIOL) is a disease with an increasing incidence. We provide a high quality pictorial review of the imaging appearances.

e927
Pictorial review of intracranial infection

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KEY LEARNING OBJECTIVES: Intracranial infection is an important life threatening condition. Prompt diagnosis and treatment can help to prevent associated morbidity and mortality and radiology has a key role in early diagnosis and complications of infection. DESCRIPTION: We present a pictorial review of imaging findings in intracranial infection including infection arising from the skull vault, meninges, extra axial spaces and the brain parenchyma. The accurate interpretation of imaging requires knowledge of the possible source of infection as well as the pathogen involved. Early features can be subtle so a high index of suspicion in combination with correct imaging protocols is important. The poster will also focus on the common diagnostic dilemmas of differentiating abscess from tumour and how to differentiate subdural haemorrhage from empyema. Diffusion weighted imaging plays a key role in the former case and will be discussed. CONCLUSION: The consequences of failing to recognize the condition early are severe. It is therefore important for every radiologist to have low threshold for further imaging if there is clinical concern.

e928

A radiological review of HIV intracranial complications

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KEY LEARNING OBJECTIVES: The purpose of this exhibit is: (1) discuss the complications of HIV intracranially. (2) review the different manifestations of HIV, intracranially on MRI and CT. (3) describe imaging features specific to these conditions. DESCRIPTION: (1) Describe the complications of HIV in the CNS: (a) Conditions caused by HIV itself: AIDS dementia complex, vacuolar myelopathy; (b) Conditions caused by infectious, autoimmune, or neoplastic processes secondary to immunodeficiency including CNS lymphoma, progressive multifocal leukoencephalopathy, cryptococcal meningitis, toxoplasmosis, and CMV. (2) Review radiological manifestations of these on MRI and CT. CONCLUSION: The major teaching points of this exhibit are: (1) to learn how HIV manifests intracranially. (2) to learn the radiological features on CT and MRI. (3) learn imaging features to differentiate between different pathologies.

e929

Perimesencephalic subarachnoid haemorrhage: a different entity

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KEY LEARNING OBJECTIVES: To understand what is meant by perimesencephalic subarachnoid haemorrhage (PMSAH) and to recognize its imaging appearances. To appreciate that the aetiology and morbidity and mortality of PMSAH are different from aneurysmal SAH. To consider how the subsequent imaging of patients with PMSAH may differ from those patients with aneurysmal standard SAH. DESCRIPTION: PMSAH is a variant of SAH in which blood is confined to the basal cisterns. This is a condition with a different aetiology and natural history than aneurysmal subarachnoid haemorrhage and is thought to account for approximately 10% of cases of SAH. The prognosis of patients with PMSAH is excellent, in contrast to those patients with aneurysmal SAH. The exact cause of PMSAH remains unclear though approximately 96% of cases are non-aneurysmal, and probably of venous origin, and therefore digital subtraction angiography is usually negative. A small proportion (approximately 4%) of patients with a perimesencephalic pattern of haemorrhage have a ruptured vertebrobasilar aneurysm but the need to identify such an aneurysm in all patients with perimesencephalic haemorrhage has to be weighed against the risk of complications from conventional angiography, particularly taking into account the excellent prognosis in this group of patients. Computed tomography angiography (CTA) has been demonstrated to be accurate in demonstrating and excluding vertebrobasilar aneurysms in patients with PMSAH. CONCLUSION: We argue that patients with PMSAH on a non-contrast CT scan of the brain can be investigated solely with CTA without the need to expose them to the additional risks of conventional angiography.

e930

Important features of magnetic resonance imaging of meningeal disease in breast cancer

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PURPOSE: Increased survival from breast cancer has led to metastatic disease developing in uncommon sites, including the meninges. We assessed patterns of meningeal disease (MD) on MRI of brain and spinal cord in patients with breast carcinoma. MATERIALS/METHODS: We identified 21 patients with breast carcinoma and MD treated at our institution between 2002 and 2007. MRI was reviewed for patterns of MD affecting the neuroaxis. MD affecting the spinal canal (SC) was described as cord-related or cauda equina, and divided into focal (>2 vertebral body heights), or diffuse (>5 vertebral body heights) and smooth or nodular. Cranial disease was categorised as parenchymal, leptomeningeal or dural. The presence of systemic metastases was recorded. RESULTS: 7 of 8 (88%) of patients with SC MD also had cranial involvement. Cranial MD was present in 17 patients. Parenchymal brain disease without cranial MD occurred in only 2 patients and isolated cord parenchymal disease occurred in only 1 patient. All SC disease was found to be diffuse. 17/21 patients (81%) also had systemic metastases. There was no difference in the pattern of LPM disease according to the site of SC involvement. CONCLUSION: As most patients with SC MD also had cranial involvement, imaging of the whole neuroaxis should be considered. All SC disease was extensive, so careful examination of the entire SC is recommended. MD usually signifies advanced disease as most patients had systemic metastases. MD can, however, develop without systemic metastases so contrast enhanced studies should be performed in patients with neurological signs and symptoms.

e931

MR spectroscopy explained

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KEY LEARNING OBJECTIVES: To review the fundamental principles of magnetic resonance spectroscopy (MRS). (1) To give an overview of the interpretation of MRS and recognition of potential pitfalls. (2) To pictorially illustrate the clinical applications of MRS. DESCRIPTION: MRS is a valuable tool that can be used to obtain information on biochemistry *in vivo*. Using the metabolic profiles generated it is possible to provide additional information about tumours, demyelinating disease, metabolic disorders and epileptic foci in the central nervous system. This technique is being employed more frequently as a result of improved software and increased awareness of its potential. The use of Stimulated Echo Acquisition Mode and Point Resolve Spectroscopy as methods of pulse sequence acquisition are explained. Images demonstrate the application of MRS in differentiating primary from secondary brain tumours, and malignant from non-malignant lesions. They also highlight the use of MRS in determining the degree of malignancy and in distinguishing between tumour recurrence and post-radiotherapy changes in the brain. Similar principles can also be applied to the imaging of breast and prostate lesions. The use of MRS in characterizing the stage of demyelinating disorders and its use in paediatric metabolic disorders is also presented. CONCLUSION: MRS is especially useful in discriminating between different central nervous system pathologies. More recently applications of MRS have expanded to involve breast and prostate imaging. Knowledge of the principles and applications of MRS may enable increased use of this modality and allow more accurate diagnoses to be made.

Head and Neck Poster

p1001

Top ten reasons to include the eye in an emergent CT brain study

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KEY LEARNING OBJECTIVES: To illustrate the positive findings which can often be noted within the orbit and globe on Emergent CT Brain studies. To highlight this important review area by demonstrating potential pathology in this area. DESCRIPTION: Many centres will not routinely include the globe and orbits on a CT brain study due to the well recognized effects of radiation induced cataract formation. Increasing availability of CT has meant that some patients will undergo multiple CT Brain studies during their lifetime with a not insignificant cumulative radiation dose. We hope to demonstrate that the inclusion of the globe and orbit, and subsequent risk of radiation induced cataract formation can be justified in the emergent setting. We illustrate 10 single slice axial CT brain studies, where inclusion of the globe and orbits returned positive findings which subsequently influenced clinical management. All examinations were performed as emergent studies, to exclude intracranial pathology, and positive findings within the globe and orbit were added incidental findings. These incidental findings include traumatic, acquired, mitotic, vascular and inflammatoty change and were not fully elicited in the clinical history or examination. CONCLUSION: In an emergent setting with an unwell patient, the risk of cataract induction can arguably be offset by the benefit of demonstrating clinically important pathological findings in the globe and orbit.

p1002

A review of facial fractures – findings on imaging the clinical significance

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KEY LEARNING OBJECTIVES: To review facial fractures on plain films and CT, and correlate the images with clinical presentation and subsequent management. DESCRIPTION: Facial fractures are a common finding in trauma patients and result from a wide range of injuries. The clinical significance and subsequent management is dependant on the fracture pattern. CT imaging and multiplanar reformatting allow detailed assessment of the bony and soft tissue injury. However, many patients are initially assessed with plain films, and familiarity with the interpretation of primary and secondary signs of fracture is important. CONCLUSION: Facial fractures are a common traumatic injury, and radiologists who provide an on-call service are often required to report such injuries. Understanding the imaging findings and subsequent patient management are important.

p1003

Glomus tumours of head and neck: location and imaging characteristics

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KEY LEARNING OBJECTIVES: When investigating patients with suspected paragangliomas, it is not only necessary to characterize the lesion, but also to study the presence of multiplicity, complications and surgical resectability. This educational poster aims to demonstrate the various locations and describe the important imaging characteristics of glomus tumours on different modalities. DESCRIPTION: Glomus tumours represent 0.6% of neoplasms of the head and neck neoplasms. They arise from paraganglionic tissue, which is of neural crest origin. They are located at the carotid bifurcation (carotid body tumour), along the vagus nerve (vagal paraganglioma or glomus vagale), in the jugular fossa (glomus jugulare) and in the tympanic cavity (glomus tympanicum). As they are of neuroendocrine origin, these tumours tend to be highly vascularized. MRI and contrast enhanced CT are the imaging modalities of choice for diagnosis. Angiography is helpful if the diagnosis is obscure or if embolisation is contemplated. Ultrasound with colour Doppler is also helpful in aiding the diagnosis. MRI can demonstrate the soft-tissue mass and its relationship to adjacent structures in multiple imaging planes. This capability is particularly helpful in skull-base imaging, in which both extracranial and intracranial components can be evaluated. It is inherently limited in its ability to show subtle areas of bony destruction, while CT can demonstrate this particularly well at the skull-base. CONCLUSION: Glomus tumours are rare benign neoplasms with a characteristic appearance and location. Imaging plays an important role in diagnosis and management of these patients and helps differentiate them from other pathologies in this region.

p1004

Initial experience with a tertiary referral skull base multidiscplinary team meeting

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PURPOSE: Imaging of the skull base and skull base pathologies are often a complex radiological issue. We describe our initial experience following 3 months of a formal tertiary referral skull base multi-disciplinary team (MDT) meeting. METHODS: The skull base MDT meets on a fortnightly basis and is composed of radiologists, skull base neurosurgeons, specialist skull base ENT surgeons, radiotherapists, head and neck cancer specialist nurses and an MDT co-ordinator. We have reviewed our initial experience with the first 50 cases and evaluated the MDT outcomes. RESULTS: The pathology has been categorised into a number of groups and the distribution of disease in the first 50 cases is as follows: Skull base tumours 28%; Complex Benign sinus disease 8%; Acoustic Neuroma 12%; Benign temporal bone Pathology including cholesteatoma 20%; Sinus Tumours 20%; Others 12%. CONCLUSION: Evaluation of these cases has indicated that most valuable radiological input in to the skull base MDT is the differentiation between benign and destructive processes of the skull base. The majority of benign lesions were managed by conservative measure with early follow-up imaging. The majority of destructive lesions require further radiological imaging including the exclusion of systemic disease prior to surgical intervention. We present representative cases and their complex cross sectional imaging illustrating features that allow this differentiation.

p1005

The use of sliding thin slab maximum intensity projections in imaging the ossicular chain

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PURPOSE: Imaging of the auditory ossicles remains a challenge despite the improvements in resolution which has come with multislice CT scanners offering 0.5 mm cuts. This paper describes the use of sliding thin slab maximum intensity priojections and shows that they can give better resolution than standard images. MATERIALS/METHODS: Patients are scanned on a 16 slice Siemens CT scanner, using the workstation images of the ossicular chain are then reconstructed using sliding thin slab MIP and compared with images from conventional slices. The ease with which the parts of the ossicular chain can be visualized is assessed with consensus between the two readers. RESULTS: Sliding thin slab MIP reconstruction improved the ability to see the auditory ossicles. Representative images will be included on the poster. CONCLUSION: Sliding thin slab maximum intensity projection reconstructions can result in easier depiction of the ossicular chain improving diagnostic accuracy of scans.

p1006

Radiological review of mandibular lesions: spectrum of imaging findings and a systematic approach to diagnosis

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KEY LEARNING OBJECTIVES: (1) To understand the anatomy of the mandible and its relevance to the imaging features of mandibular lesions. (2) To appreciate the variety of appearances of mandibular lesions and the features that help distinguish them. (3) To provide a systematic approach to assist with the classification of mandibular lesions. (4) To optimize further imaging. DESCRIPTION: Mandibular lesions may be encountered by general and subspeciality radiologists. They may be difficult to differentiate on plain film appearances alone. We propose a systematic approach to assist with their classification. Cases will be illustrated with plain film and cross-sectional imaging cases. CONCLUSION: We present an imaging review of mandibular lesions and discuss a structured approach to their diagnosis.

p1007

Bisphosphonate associated osteonecrosis of jaw an emerging epidemic

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KEY LEARNING OBJECTIVE: Osteonecrosis of jaw is a recently described adverse side effect of bisphosphonate therapy. Patients with multiple myeloma and metastatic disease to skeleton receiving intravenous nitrogen-containing bisphosphonate are at greatest risk. DESCRIPTION: Most important predisposing factors for bisphosphonate – associated osteonecrosis (BON) are type and total dose of bisphosphonate, history of trauma, dental surgery or dental infection. Reported case involve mandible only (65%), maxilla only (26%) or both (9%). The prevalence of osteonecrosis in patients with cancer is 6–10%. Radiological and nuclear medicine are of crucial value in the recognition and definition of bone lesions. Conventional radiographs (orthopantomograms, OPG) have been recommended as first routine investigation. Most lesions have been seen on posterior lingual mandible near mylohyoid ridge. Advanced cases show a moth-eaten, poorly defined radiolucency, with or without radio-opaque sequestra. Isotope bone scan is much more sensitive than radiography in detecting early and subclinical osteonecrosis. Isotope bone scans are usually available for some patients receiving bisphosphonates as part of investigation for bony metastatic diseases and therefore should be interpreted carefully in at risk patients. Other diagnostic modalities include CT and MRI. We present examples of the imaging finding of BON in few patients identified in our hospital. CONCLUSION: Radiologists should be aware of this entity as an early diagnosis can make a significant difference to the outcome of the disease. An awareness of the imaging feature, particularly OPG and isotope bone scan, would be helpful in establishing correct diagnosis.

p1008

Ultrasound guided core biopsy in the evaluation of a parotid mass – results in 200 patients

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PURPOSE: To determine the diagnostic accuracy and safety profile of ultrasound guided core biopsy (USCB) in the evaluation of a series of patients presenting with a palpable parotid gland swelling. METHOD: 200 consecutive patients who presented with a parotid swelling were enrolled in this study over a 10 year period. Initial lesion characterization was undertaken with ultrasound utilizing a high resolution linear array transducer. Following written consent and using local anaesthesia the patients then proceeded to fine needle core biopsy (18 G or 20 G, mean of 2 passes per patient) under ultrasound guidance using an automated biopsy device with a variable throw facility (15/22 mm). RESULTS: There were 109 benign neoplasms, 50 malignant neoplasms and 39 miscellaneous non-neoplastic lesions. 116 patients had subsequent surgery and 84 avoided surgery. 12 of 22 patients with lymphoma avoided surgery. In the surgical group there was correlation with surgical histology in 113/116 patients. 2 samples were considered non-diagnostic and there was a single false negative. In the surgical group the technique had a sensitivity of 97%, a specificity of 100% and an accuracy of 97%. No significant complications occurred. CONCLUSION: USCB is a safe and accurate method of acquiring a histological diagnosis in the parotid gland and should be considered as the initial diagnostic procedure of choice in patients who present with a parotid mass.

p1009

Pre-operative imaging localization of adenomata in primary hyperparathyroidism: the experience of a tertiary centre

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PURPOSE: Most cases of primary hyperparathyroidism are due to a solitary parathyroid adenoma. There has been a recent trend towards minimally-invasive surgical approaches in parathyroid surgery as opposed to the traditional bilateral neck exploration. With these newer focused operations, pre-operative localization of the hyperfunctioning parathyroid adenoma becomes imperative. We evaluated the effectiveness of pre-operative imaging (using ultrasound and $^{99}Tc^{m}$ labelled sestamibi scans) in localizing adenomatous parathyroid glands at our centre. MATERIALS/METHODS: 75 patients with primary hyperparathyroidsim who underwent surgery during a 2 year period were included. Data collected included pre-operative imaging results and eventual surgical/histological findings. The data was evaluated to determine the accuracy of the pre-operative imaging in correctly localizing the pathological parathyroid gland. RESULTS: Pre-operative ultrasound was performed in 69% of patients, $^{99}Tc^{m}$ sestamibi scans were carried out in 52% and 43% had both types of imaging (n=75). Surgery revealed a single adenoma in 76% and hyperplasia in 17% (n=75). The sensitivity for correctly localizing a solitary adenoma was 71% for ultrasound (n=52), 67% for $^{99}Tc^{m}$ sestamibi scans (n=39) and 91% when the two modalities were combined (n=32). However, despite both pre-operative imaging modalities being performed (n=32), only 25% of patients had a focused operation. CONCLUSION: The sensitivities of our pre-operative ultrasound and $^{99}Tc^{m}$ labelled sestamibi scans in correctly localizing solitary parathyroid adenomata compare favourably with published work. With this imaging expertise, there is scope for more patients with primary hyperparathyroidism to safely undergo targeted parathyroid operations than is done at present.

p1010

A pictorial review of thyroid ultrasound: technique, interpretation and pitfalls

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KEY LEARNING OBJECTIVES: To understand ultrasound technique, interpretation and pitfalls in the evaluation of thyroid disease with the help of a pictorial review. DESCRIPTION: Ultrasound is the first line imaging test for the investigation of thyroid disease. Its superficial location facilitates interrogation using high frequency probes which provide exquisite anatomical detail. In this review we describe the technique of thyroid ultrasound evaluation with tips on image optimization. In addition we provide a comprehensive review of the spectrum of commonly encountered thyroid pathologies including Grave's disease, Hashimoto's thyroiditis, sub-acute thyroiditis, benign nodules, and carcinomas. We also highlight the common interpretive pitfalls of these pathologies. CONCLUSION: The reader will have a clear understanding of how to best perform thyroid ultrasound and be alert to the appearances of a wide range of thyroid pathology. Clear examples of each of these conditions are provided.

Head and Neck Electronic Poster

e1011

Imaging of orbital trauma

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KEY LEARNING OBJECTIVES: Radiological features of orbital fractures, penetrating and soft tissue injury and complications of orbital fracture repair will be presented. DESCRIPTION: Orbital injury is a common sequelae of motor vehicle accidents, assaults, falls and blunt trauma. CT is the modality of choice to evaluate the extent of injury and help in the surgical management of these patients. CONCLUSIONS: Accurate radiological diagnosis of orbital trauma is necessary to prevent functional debility and cosmetic deformity.

e1012

The CT appearances of normal and abnormal craniofacial topographical anatomy

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KEY LEARNING OBJECTIVES: (1) To learn the normal 3D surface anatomy of the external ear, nose, lips and associated facial structures with the help of volume reconstructed multislice CT. (2) To appreciate the 2D planar correlates of this topographical anatomy on reconstructed axial, sagittal and coronal CT scans. DESCRIPTION: Cross sectional imaging is principally required to complement clinical examination by assessing the deeper craniofacial structures. When describing the clinical appearances of lesions and abnormalities related to the ears, nose or lips, clinicians frequently use surface anatomical terms which are less familiar to the radiologist. Contemporary imaging allows us to view and describe the topographical changes in surface facial anatomy occurring in disease. We shall illustrate the normal three dimensional anatomy of these regions on volume reconstructed multislice CT and demonstrate the corresponding locations as on planar cross-sectional imaging. We will then illustrate how understanding these anatomical terms helps describe craniofacial pathologies such as congenital craniofacial anomalies and skin carcinomas. This improves the ability of the radiologist to relate the clinicians findings in superficial structures to the imaging appearances of deeper structures allowing accurate descriptions and dialogue with the referring clinician. CONCLUSION: This exhibit will permit the radiologist to understand and describe craniofacial topographical anatomy on CT so aiding radiological descriptions and correlation with superficial clinical findings.

e1013

Bony lesions of the skull

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KEY LEARNING OBJECTIVES: To emphasise the importance of dedicated review of the skull during all cranial imaging. To illustrate the spectrum of common and rare skull pathology that may be encountered. To demonstrate normal anatomical variants that may be confused with pathology. DESCRIPTION: CT is the imaging modality of choice for suspected skull lesions. The skull is most often imaged during CT brain imaging, with the focus on intracranial pathology. Important skull lesions may not be appreciated on brain windows. The skull is a very important review area and requires assessment with a dedicated bone algorithm window. Skull lesions may be focal single lesions or be part of a polyostotic or generalized pathological process. A skull vault abnormality can be the first presenting feature of a systemic disease. Skull lesions may produce symptoms that mimic intracranial pathology and without careful review, the causative lesion may be overlooked. The complex anatomical normal variations of the skull sutures, venous sinuses, paranasal sinuses and petrous pneumatiztion may produce confusing findings. Important normal variants that may be mistaken for pathology will be illustrated. CONCLUSION: Careful review of the skull and appreciating the broad spectrum of pathology that may be encountered is essential when reporting cranial imaging. Illustrative examples will be demonstrated with CT, MR and plain films.

e1014

Paranasal sinuses - what does the surgeon want to know?

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KEY LEARNING OBJECTIVES: Identify the imaging features of rhinosinusitis. Describe and identify the paranasal sinuses anatomy, post-surgical changes and the normal anatomical variants important for the ENT surgeon prior to surgical intervention. Provide good quality images in planes relevant to site of pathology, for intraoperatively reference. Identify imaging features indicative of malignant pathology. DESCRIPTION: The symptoms of rhinosinusitis can be variable and non-specific in nature. There are circumstances in which the diagnosis of rhinosinusitis cannot be assessed on clinical examination alone. In these circumstances radiological imaging can be a valuable aid to diagnosis and further management. In other cases, clinical diagnosis and the extent of pathology need to be confirmed prior to surgical intervention. Sinus CTs are important in diagnosis and staging of nasal and paranasal sinus tumours. We review the clinical management and discuss the imaging features important to the ENT surgeon for reporting sinus CTs. CONCLUSION: Sinus CT imaging is used for other indications then pre-operative road maps. An appreciation of surgical management of rhinosinusitis is invaluable for the reporting radiologist. Close working relationship with clinical colleagues is essential and will provide an open two-way forum for learning.

e1015

Aggressive paranasal sinus disease; malignant or benign?

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LEARNING OBJECTIVES: This pictorial review presents a pathway for the differentiation of benign aggressive disease versus malignant aggressive disease of the paranasal sinuses. Pitfalls of imaging and clinical presentation are addressed and how these can influence treatment. BACKGROUND: The paranasal sinuses are very common site of benign disease that is commonly incidentally picked up and often ignored. To appreciate the aggressive disease which may involve or even destroy the fine anatomical structures is important for early diagnosis and treatment. IMAGING FINDINGS: Sinonasal anatomy needs to be appreciated for the differentiation of aggressive disease from a malignant process. Propensity for direct invasion to the orbital cavity and skull base, cavernous sinus, infratemporal fossa and masticator space involvement, vascular and perineural spread as well as foraminal enlargement will be discussed for the various pathological processes. Different imaging modalities are complimentary for the accurate assessment. CT is the modality of choice for assessment of the bone anatomical margins whereas MR is superior in soft tissue involvement. Findings that make malignant disease inoperable as well as signs of benign aggressive mimics will be emphasised. CONCLUSION: Aggressive benign and malignant sinonasal disease may have similar clinical and radiological presentation. Accurate diagnosis is important for prompt referral and treatment.

e1016

Sinus CT: red flags & potential pitfalls

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KEY LEARNING OBJECTIVES: This will aid the general radiologist in the interpretation of sinus CT by an interactive assessment program, alerting the radiologist to prompt further assessment. Enable the general radiologist in understanding of normal sinus anatomy. Identify the "red flag" sign to aid the differentiation between benign and malignant processes. DESCRIPTION: Sinus CT is commonly requested as an aid to diagnosis or as a pre-operative assessment. A spectrum of pathologies affecting the paranasal sinuses can have similar imaging features on CT. Some are more aggressive than others. We reviewed a selection of sinus CT cases with unexpected histological findings from the several hospitals in the South West region. We have produced an interactive presentation to highlight anatomical imaging and "red flags" which should prompt further assessment; clinical, radiological or histological. We discuss the key learning point in each case with a summary of the disease process. CONCLUSION: The majority of sinus CT examinations are usually preformed for rhinosinusitis and its variants. However, not all paranasal soft tissue opacification is due to mucosal disease. There are certain subtle imaging "red flags" that can alert the general radiologist to prompt further assessment. Once aware, the potential for pitfalls can be minimized.

e1017

Imaging of middle ear cholesteatoma: pictorial review of anatomy and complications

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KEY LEARNING OBJECTIVES: (1) Illustrate normal CT anatomy of the petrous temporal bone. (2) Discuss the pathology of cholesteatoma. (3) Demonstrate imaging findings in cholesteatoma and its complications. DESCRIPTION: Cholesteatoma is a relatively common ENT problem, presenting with conductive deafness and a discharging ear. Otoscopy and pure tone audiometry give only limited information – however, CT scan of the petrous bone provides an excellent anatomical roadmap and gives invaluable information of disease extent. CT is also very useful in cases where the diagnosis is unclear. We present a pictorial review of CT images to demonstrate the anatomy of the temporal bone, discuss the pathology of cholesteatoma, and illustrate the main intra-aural and intracranial complications. CONCLUSION: CT is an excellent tool in the evaluation of cholesteatoma and its complications. Knowledge of anatomy of the petrous temporal bone and awareness of the pathology and complications is essential for useful interpretation of images.

e1018

Stone deaf: the petrified ear

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KEY LEARNING OBJECTIVES: Identify the imaging features of the "petrified ears" on high resolution CT. Investigate the possible aetiology of the clinical entity. Discuss the differential diagnosis for the common causes of conductive hearing impairment due to pathologies in the external ear system. DESCRIPTION: There are many causes of conductive hearing impairment but none as uncommon as the petrified ear. Calcification of the auricular cartilage is known as "petrified ears". It is an uncommonly reported condition in the dermatology literature and to the best of our knowledge unreported in the radiology literature. It is characterized by development of complete or partial calcification of the auricle without any visible change externally. It is reported due to a variety of causes, mainly metabolic causes of elevated calcium. We present and illustrate a case of idiopathic petrified bilateral auricular calcification. We will discuss the systemic causes associated with this unusual clinical entity and review the literature on the "petrified ears". CONCLUSION: The petrified ear is very rare and there is very little information regarding the condition, or its treatment. Cases were previously diagnosed based on histology. However we present the first known case in the radiology literature and diagnosed by imaging alone.

e1019

Imaging of the sublingual space – an overview of the imaging anatomy and pathology

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KEY LEARNING OBJECTIVES: To evaluate the use of various imaging modalities in evaluating the sublingual space. To detail the radiological anatomy with emphasis on key anatomical landmarks. To illustrate the disease spectrum that involves the sublingual space and correlate with histopathology. DESCRIPTION: Introduction to the anatomy of the sublingual space and its contents. Highlight key anatomical landmarks such as mylohyoid, hyoglossus and diagastric muscles. Demonstrate how various imaging modalities can be used for evaluation, with particular emphasis on ultrasound and MRI. Illustrate the radiology of the various pathological processes that involve this area and correlate with histopathology CONCLUSION: Ultrasound and MRI are particularly useful in the imaging of the sublingual space The mylohyoid, hyoglossus and diagastric muscles are key anatomical landmarks that need to be identified when imaging the sublingual space.

e1020

Role of ultrasound in imaging of the salivary glands

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LEARNING OBJECTIVES: To review the normal ultrasound anatomy of the salivary glands along with tumoural, lithiasic and inflammatory pathologies. DESCRIPTION: Diseases of the salivary glands are common and immensely diverse. Ultrasound is a nonionizing, readily available investigation modality for assessment of salivary gland pathology. It is also useful for differential diagnosis of diseases of the major salivary glands. This poster describes the sonographic anatomy of the major salivary glands. Ultrasound features of a range of salivary gland lesions are presented. Ultrasound can frequently offer guidance for fine needle aspiration and biopsy to aid histological diagnosis. Obstruction, infection, autoimmune processes and congenital anomalies can also be diagnosed. CONCLUSION: Ultrasound is an effective first line investigation for salivary gland pathology. A good knowledge of normal ultrasound anatomy and the appearance of various salivary gland pathologies are vital for the radiologist.

e1021

Laryngeal ultrasound

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KEY LEARNING OBJECTIVES: This educational exhibit will describe the technique and applications of laryngeal ultrasound. The ultrasound anatomy and a variety of laryngeal pathology will be demonstrated. DESCRIPTION: Laryngeal ultrasound may be performed during the course of cervical lymph node ultrasound, in the assessment and staging of laryngeal malignancy. In conjunction with cross-sectional imaging it increases diagnostic confidence when assessing malignant involvement of the superior thyroid notch, thyroid lamina (where CT and MRI appearances may be difficult to interpret) and the cricothyroid region. Concurrent assessment of small metastatic nodes and fine needle aspiration cytology may be performed. Correlation of ultrasound findings with both cross-sectional imaging and pathological specimens will be illustrated, highlighting the potential benefits of this underused modality when staging laryngeal malignancy. The ultrasound appearance of a variety of laryngeal pathology will be demonstrated including laryngeal cysts and mucoceles, thyroglossal cysts, thyroglossal cyst tumours, and laryngeal carcinoma. CONCLUSION: This exhibit will demonstrate

the effective role that laryngeal ultrasound can play in the evaluation of laryngeal neoplastic and non-neoplastic disease.

e1022

Para pharyngeal space – a pictorial review of anatomy and pathology

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KEY LEARNING OBJECTIVES: To be able to identify the various pathologies affecting the parapharyngeal space. DESCRIPTION: The parapharyngeal space is a large predominately fat filled space extending from the skull base down to the sub mandibular triangle. It contains some neurovascular structures and is a very useful anatomical land mark when evaluating head and neck imaging, allowing the interpreter to differentiate between the many causes of para pharyngeal masses. Multiple images incorporating CT and MRI are presented, demonstrating the normal anatomy of the para pharyngeal space and its important relationships. The causes of para pharyngeal masses are divided into site of origin in relation to the para pharyngeal space. We present approximately 20 different cases which show how displacement of the parapharyngeal fat pad and the major vessels of the adjacent carotid sheath influenced the choice of diagnosis. The pathologies include, anterior maxillary antrum carcinomas which displace the fat pad posteriorly, superior nasopharyngeal carcinomas which displace the fat pad anteriorly and inferiorly, tumours arising from the posterior carotid sheath which show displacement of the major vessels anteriorly (these are usually of neurogenic origin) and those pathologies arising in a lateral position usually from the deep lobe of the parotid which cause medial and posterior displacement of the major vessels and of the para pharyngeal fat pad. CONCLUSION: We present CT and MRI images depicting normal anatomy of parapharyngeal space and also 20 different cases of parapharyngeal masses.

Paediatric Poster

p1101

Controversies in the imaging of non-accidental head injury in children

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KEY LEARNING OBJECTIVES: To recognize the features of subdural haemorrhage (SDH) that are specific for non-accidental head injury (NAHI) in children. To appreciate that acute SDH can have a variable appearance on CT and MRI and that mixed density collections do not necessarily represent acute on chronic haemorrhage. To understand that in many cases of NAHI, based on the imaging appearances, it may only be possible to provide an estimate of a potential time of injury. DESCRIPTION: NAHI is an emotive, complex subject with implications for the accused, the child and their family. Since there is rarely a confession, establishing evidence to prove guilt can be difficult. In order to implicate a particular individual, radiologists are often asked in the context of legal proceedings to provide a time of injury, based on the ageing of subdural blood on CT and MRI. This is fraught with difficulty and often not possible, except in the case of a uniformly dense collection on CT; recognition of this is vital. In particular, it has recently become recognized that low density subdural collections on CT are not necessarily chronic in nature and similarly, mixed density collections do not necessarily represent acute on chronic haemorrhage. Examples of such cases will be presented. CONCLUSION: In the context of NAHI, one should be cautious about attempting to accurately age a subdural collection based on its CT and MRI appearances.

p1102

Evaluation of multiple unexplained fractures in infants: non accidental injury or osteogenesis imperfecta

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KEY LEARNING OBJECTIVES: (1) To describe the clinical presentation and understand the spectrum of imaging findings of Non-accidental injury and Osteogenesis Imperfecta. (2) To differentiate these two conditions based on the imaging findings. DESCRIPTION: When infants present with multiple unexplained fractures, the differential diagnosis can be difficult. Although child abuse is the most frequent cause of multiple fractures in children in this age group, there are other pathologies that can present this way. This includes various forms of Osteogenesis Imperfecta. We discuss the clinical presentation, radiological findings and differential diagnosis of these two conditions. CONCLUSION: Differentiating Non-accidental injury from Osteogenesis Imperfecta can be difficult. However, a good understanding of the clinical presentation and the radiological findings helps in accurate diagnoses of these conditions.

p1103

A pictorial review of imaging of paediatric sports injuries

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KEY LEARNING OBJECTIVES: To describe the mechanism of paediatric sports injuries and discuss the imaging findings. DESCRIPTION: To excel in sports today, the athlete is forced to train longer, harder and start at an earlier age. Whilst this has numerous health benefits, many children are injured as a result of it. The pattern of sports injuries sustained by children differs from that seen in adults. The growth cartilage is susceptible to damage and to overuse injury. Also, mismatch between bone growth and soft tissue growth in the adolescent growth spurt can cause an increased risk of injuries in this age group. We describe the mechanisms of injuries, clinical presentations and the imaging findings in children involved in various sports including rugby, cricket, football, gymnastics, cycling and athletics. CONCLUSION: Paediatric sports injuries are becoming more common. Imaging plays an important role in identification and appropriate management of these cases.

p1104

Red dot labelling by radiographers in paediatric practice

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OBJECTIVE: To retrospectively review the accuracy of red dot labelling by radiographers in paediatric skeletal radiographs. MATERIALS AND METHODS: Consecutive radiographs of 460 new patients (275 male and 175 female) in a 20 day study period were reviewed retrospectively and the results were compared with the report by radiologists. Radiographs of upper limb, lower limb, spine and skull were included. Chest and abdominal films were excluded. The reference standard was from a recent systematic review which showed sensitivity of 90% and specificity of 94%. RESULTS: Radiographs of 82 patients were marked with a red dot. There were 66 true positives, 16 false positives, 347 true negatives and 21 false negatives resulting in a sensitivity of 76%, specificity of 96%, positive predictive value of 81%, negative predictive value of 94%, kappa of 89%, odds ratio of 68 and an overall accuracy of 92%. The common sources of error by radiographers were failure to identify Salter and Harris fractures and misinterpretation of normal growth plate variants for fractures. A similar study done in our institution on age unselected patient group showed a sensitivity and specificity of 67% and 98%, respectively. CONCLUSION: The sensitivity of red dot labelling in paediatric practice is low. Radiographer's red dot is less reliable around growth plates.

p1105

Lens exclusion in paediatric CT head – individual feedback and education measures can make significant improvements

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PURPOSE: Radiation to the lens of the eye has a deterministic effect. Cataracts are induced above a threshold of 5 Gy in adults. Ideally for CT head examination, the lens of the eye should be excluded from the field whenever possible. In the paediatric population this is especially important as a child is 2–4 times more sensitive to radiation. The purpose of this audit was to quantify lens exclusion at our institution and to see if this could be improved. MATERIALS/METHODS: Retrospective audit of CT head examinations performed 1 March to 7 May 2007 (examinations excluded where lens inclusion was necessary/unavoidable, e.g. CT orbits). Lens inclusion, operator, patient age and time of scan (on call/routine) were recorded. Results were presented at the departmental audit meeting. Individual operator feedback/re-education was given at subsequent yearly performance review. Examinations were retrospectively re-audited 6 months later. RESULTS: Initial audit (99 includable examinations) – only 42% of examinations excluded both lenses (40% both, 18% one lens included). There was significant variation between operators. Re-audit (195 includable examinations over 3 months) 6 months later – 67% of examinations now excluded both lenses (rising to 75% when results from a single operator who is new to the department are excluded). The younger the child, the more likely the lens is included. CONCLUSION: Audit and one-to-one individual feedback have significantly improved our rates of lens exclusion, which is especially important given our patient population.

p1106

Paediatric fluoroscopy dose area product levels – national reference doses are not necessarily best practice

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PURPOSE: The most recent national guidelines published by the National Radiological Protection Board (NRPB) recommended National Reference Doses (NRDs) for paediatric fluoroscopic examinations. NRPB found differences in dose–area product (DAP) levels across institutions attributed to variations in equipment. Following this, Great Ormond Street Hospital (GOS) reviewed DAP levels for their paediatric fluoroscopic examinations and found that using a single dedicated fluoroscopy suite, the diagnostic reference levels (DRLs) were significantly less than NRDs and suggested that NRDs are not necessarily best practice. We studied local DAP levels for two paediatric procedures – micturating cystograms and upper GI barium studies and compared with NRDs and DAP levels and DRLs from GOS. MATERIALS/METHODS: 184 procedures were studied retrospectively and the DAP levels obtained and compared. RESULTS: A total of 184 procedures were reviewed. Six different screening rooms with similar equipment were used. For both procedures, one of the screening rooms consistently delivered a significantly lower dose than the others. The results from this screening room (where almost 60% of the studies were performed) were comparable to GOS data. The DRL equivalent levels from this screening room were approximately 10 times less than recommended NRD for cystograms and 5–10 times less for GI barium studies. CONCLUSION: Use dedicated screening room for paediatric screening; NRDs are not best practice; Paediatric units should review local DAP levels and establish best practice.

p1107

Imaging of paediatric nasopharyngeal masses

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KEY LEARNING OBJECTIVES: (1) To understand the anatomy of the paediatric nasopharynx. (2) To describe the imaging findings of benign and malignant nasopharyngeal masses in children along with clinical and pathological correlation. DESCRIPTION: The nasopharynx is a small space in an obscure location at the craniopharyngeal junction. Its radiological importance is disproportionate to its size as a wide variety of benign and malignant lesions occur within it. Radiological investigations often provide the first evidence of a pathological process and can delineate an abnormality fully whilst an endoscopic examination may only reveal the surface of a lesion. In the younger infant, anomalies that result in compromise of the nasal cavity are especially problematic, as infants in the first 6 months are predominantly nasal breathers. Anomalies presenting at this stage include bony abnormalities of the nasopharynx and congenital nasal masses. In the older age group, there are a range of benign and malignant conditions which present with nasal obstruction, pain or bleeding. We review the imaging of these conditions with clinical and pathological correlation. CONCLUSION: Radiology has much to offer to aid the clinician investigating suspected disease of the nasopharynx in children. CT is very helpful for the ENT surgeon planning surgery in children with choanal atresia and MRI provides the oncologist with detailed information on malignant lesions of the nasopharynx and the response to treatment. The nasopharynx is a difficult area to assess clinically or endoscopically and CT and MRI have a key role in the full evaluation of nasopharyngeal lesions in children.

p1108

Imaging of congenital nasal airway obstruction in infants

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KEY LEARNING OBJECTVES: To highlight the different causes of congenital nasal obstruction, the techniques required for imaging and their imaging appearances. DESCRIPTION: A variety of congenital midface anomalies occur in children. A group of these conditions affect the nasal cavity causing nasal obstruction in infants and young children. This can cause significant respiratory compromise especially in infants who are obligate nasal breathers. Familiarity with the imaging techniques and features of these uncommon yet important anomalies helps to prevent misinterpretation of anatomical variations that may simulate disease. We present a review of the imaging techniques used and the characteristic imaging features of this group of anomalies, including choanal atresia and stenosis, piriform aperture stenosis and dacrocystoceles. CONCLUSION: A pictorial review of the imaging features of congenital nasal obstruction in infants and young children.

p1109

Differential diagnosis for low attenuation lung lesions on CT in neonates and infants

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KEY LEARNING OBJECTIVES: To illustrate a spectrum of causes of low attenuation lung lesion on CT and to explain the pathophysiology for each of the causes of low attenuation lung lesion described. DESCRIPTION: CT and radiographic imaging correlated with histopathological findings of the following conditions: persistent pulmonary interstitial emphysema, congenital lobar emphysema, CCAM, giant bullous disease and hyperinflation secondary to an endobronchial polyp. The current management for each of these conditions will be discussed. CONCLUSION: Most causes of low attenuation lung lesion such as CCAM and congenital lobar emphysema undergo surgical management. However, knowledge of the differences in radiological appearance can assist in cases where surgical management is not always the first line treatment, such as persistent pulmonary interstitial emphysema where management may be conservative if there are no signs of respiratory distress.

p1110

Respiratory distress in neonates: a pictorial review

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KEY LEARNING OBJECTIVES: To identify and describe a spectrum of diseases causing neonatal respiratory distress and the radiographic manifestations that distinguish them. DESCRIPTION: Respiratory distress is a frequently encountered sequelae in neonates. The causes are diverse and include pulmonary diseases, cardiac diseases and other causes. From a therapeutic viewpoint, pulmonary diseases can be usefully divided into two broad categories, i.e. medically or surgically treated, which has a bearing on management. Therefore, it is important to be able to identify specific radiographic features of these common conditions and thus be aware of possible differential diagnoses. In this pictorial review, we describe and illustrate the key features of a wide spectrum of causes of neonatal respiratory distress which include surfactant deficiency lung disease, transient tachypnoea of newborn, chronic lung disease, pulmonary interstitial emphysema, meconium aspiration, neonatal pneumonia, cystic adenomatoid malformation, pulmonary hypoplasia, congenital lobar emphysema and congenital diaphragmatic hernia. We also present a stepwise approach to common neonatal cardiac diseases, emphasising diagnostic features on plain radiographs. CONCLUSION: This pictorial review highlights specific radiographic features of various causes of respiratory distress in neonates. The presentation will help the reader to distinguish the features that will help to provide the referring clinician with the diagnosis or relevant differential diagnosis when confronted with an abnormal neonatal chest radiograph.

p1111

CT usage in young patients – a study in progress

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PURPOSE: While CT plays an important role in the diagnosis and management of disease and injury, the long-term risks of using CT are unknown. Our ongoing study will investigate late health effects related to CT scans in children and young people. As part of this study, trends in CT usage in this age group are also being assessed. METHODS: A 5-year study of 200 000 patients (aged <22 years at time of first scan) scanned using CT prior to 2002 is being conducted. Detailed information, including radiological, clinical and demographic details, is being obtained from information systems in radiology departments across the UK The data collected so far are summarized in terms of time, sex, age, scan frequency and examination type. RESULTS: The information obtained to date comes from a range of NHS Trusts, including national and regional referral centres. While the pattern of CT use varied by Trust and over time, most Trusts showed an increase in usage in the more recent years of the study. As expected, the paediatric and regional referral centres scanned more infants than other centres and also had higher proportions of patients undergoing multiple scans. In all centres, the proportion of patients scanned increased after the age of 16 years and the majority of scans were of the head. CONCLUSION: In spite of the introduction of MRI, CT usage has not fallen over time and patient ages, numbers of repeat scans and examination type vary according to type of NHS Trust.

p1112

Imaging of complications of haemolytic uremic syndrome: a 5 year experience of a tertiary centre

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PURPOSE: To understand the spectrum of clinical findings and complications of haemolytic uremic syndrome and the key concepts of imaging in these cases. METHODS AND MATERIALS: The study was performed at a tertiary paediatric renal unit. 62 cases of HUS were admitted and treated at our institution over the past 5 years and a retrospective review of these cases was performed. Note was made of the history, clinical findings, imaging findings and the complications involved. RESULTS: 37 (59%) of these children had acute renal failure. 16 (25%) of them had complications involving the CNS, GI and chest. A renal ultrasound scan was performed in 24 cases (44%). The most common finding among these was increased echogenecity which was seen in 8 cases (33%). Even though 16 of the ultrasound scans were normal, 12 (72%) of these cases still required dialysis. 12 (19%) children required imaging which included barium studies, CT and MRI of the head, chest and abdomen. CONCLUSION: Initial renal tract ultrasound scan in Haemolytic Uremic Syndrome is normal or nonspecific in most cases, but can be useful to rule out other causes of acute renal failure. Children can also present with a variety of complications and therefore imaging of the involved organs is helpful in the management of these cases.

p1113

Multicentre clinical study of gadobenate dimeglumine (multihance) for enhanced MR neuroimaging in children

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PURPOSE: To evaluate use of the high-relaxivity contrast agent gadobenate dimeglumine (MultiHance) in children. MATERIALS/METHODS: Children ages 2–17 years with CNS disease referred to MR examination were enrolled at 6 centres worldwide. Monitoring included history and physical examination, vitals signs, 12-lead electrocardiograms (ECG), and blood and urine samples. Gadobenate dimeglumine (0.1 mmol kg^{-1}) was given IV at ≤2 ml s^{-1}. Predose (T1wSE, T2wFSE, and FLAIR sequences) and postdose (T1wSE) images were obtained; postdose sequences were evaluated for lesion enhancement, border delineation, and visualization of internal lesion morphology. Subjects were monitored for adverse events for 72 h and final diagnosis was determined at 30 days. RESULTS: 41 children (21 boys and 20 girls; mean age: 10.1 years [range: 2–17.4 years]) were enrolled for MRI of worsening symptoms, post-op follow up, follow up of untreated lesions. Mean contrast dose was 8.1 ml. Four mild adverse events were reported (drowsiness, vomiting, 2 cases of headache); no serious adverse events were reported, and no clinically meaningful changes in laboratory or ECG parameters were observed. Pathologies evaluated include malignant and benign neoplasms, vascular malformations, and demyelinating processes. In patients with enhancing lesions, assessment of lesion border delineation, definition of disease extent, visualization of lesion internal morphology and lesion contrast enhancement were considered good to excellent. Gadobenate dimeglumine provided clinically significant information which led to a greater understanding of the disease processes found on pre-dose images. CONCLUSION: Gadobenate dimeglumine is a safe and effective MR contrast agent for the evaluation of CNS lesions in children.

Paediatric Electronic Poster

e1114

The role of radiology in a child with stridor

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LEARNING OBJECTIVES: To familiarize with various causes of acute and chronic stridor in children. To review the role of various modalities in imaging of children with stridor. To illustrate the imaging appearances of various conditions causing stridor. DESCRIPTION: Stridor is a medium pitched respiratory noise caused by partial obstruction of the large airways at the level of pharynx, larynx or

trachea. Children and neonates are particular susceptible to stridor because their immature airways are more compliant than those of an adult and have a smaller cross sectional area. Stridor can be acute or chronic. Acute stridor is usually diagnosed clinically and radiology investigations are rarely required. However, if imaging is performed the radiologist should be familiar with the possible findings so that correct diagnosis is made and appropriate management is not delayed. Imaging frequently plays an important role in accurately determining the cause of chronic stridor. In this poster, we discuss the possible causes of stridor and role of different imaging modalities used in their diagnosis. We include imaging examples of acute and chronic conditions which may result in stridor. CONCLUSION: Radiology plays an important role in diagnostic work-up of stridor. It is important for the radiologist to be familiar with the radiological findings in these cases.

e1115

The advantages of multiplanar reformatting using multidetector-row computed tomography in paediatric abdominal trauma

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KEY LEARNING OBJECTIVES: 10% of paediatric trauma-related deaths are caused by blunt abdominal trauma, particularly following road traffic accidents. Despite the radiation dose, CT imaging is the optimal diagnostic imaging investigation. The advent of multidetector CT has revolutionized CT imaging providing faster data acquisition, reduced motion artefact and improved *Z*-axis spatial resolution, all allowing accurate multiplanar reconstruction. We examine the additional diagnostic yield of multiplanar reconstruction of multidetector CT (MDCT) images, over conventional axial CT images, in paediatric blunt abdominal trauma. DESCRIPTION: We examined paediatric MDCT studies for 51 patients (mean age 13 years) who presented to a large teaching hospital during 2005–2007. Studies were performed on 16 or 64 multidetector CT machines. The axial images and multiplanar recontructions of all studies were assessed by three independent radiologists. Findings were of 3 multi-system trauma, 11 liver injuries, 6 splenic lacerations, 2 renal lacerations, 2 small bowel perforations, 1 mesenteric haematoma, 4 pelvic fractures, 1 subcutaneous haematoma and 1 bladder rupture. Multiplanar reconstructions were particularly helpful in improving the detection and evaluating the extent of liver lacerations and renal lacerations, vascular injury and pelvic skeletal injuries. Multiplanar reconstruction did not give additional diagnostic information over axial images in spleen and bowel trauma. CONCLUSION: Multiplanar reconstruction of MDCT in paediatric abdominal trauma can provide additional diagnostic information and can improve the detection of injuries, the full extent of which may otherwise not be appreciated using axial CT imaging alone.

e1116

Improving the detection of paediatric supracondylar fractures by emergency medicine doctors, a novel educational tool

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KEY LEARNING OBJECTIVES: Educate Emergency Medicine doctors in the methodical interpretation of paediatric elbow radiographs, by a novel teaching tool. DESCRIPTION: A group of 19 Emergency Medicine and Paediatric Junior Doctors were invited to conduct a short questionnaire, examine 20 random anomymised elbow radiographs (13 normal and seven abnormal), then undergo a short educational intervention. This consisted of working through a specially designed interactive PowerPoint presentation. The participants then repeated an analysis of the previous 20 elbow radiographs, which had been rearranged into a different order. Before completing the educational tool, only 16% felt confident in the interpretation of paediatric elbow radiographs. After the intervention, 55% felt confident. Before the intervention, an average of 5.1 abnormal radiographs were detected. Afterwards, this increased to 5.5. As paediatric elbow injuries are commonly missed in Accident and Emergency by inexperienced juniors, we showed that our straightfoward, accessible tool both increased confidence of the doctors that are asked to interpret these, and also demonstrated an objective improvement in the detection of elbow injuries. CONCLUSION: A straightforward education intervention (15 min) improved the detection rate of paediatric elbow fractures in our department. We hope such tools form part of the departmental induction in the future.

e1117

The paediatric micturating cystourethrogram: an overused investigation?

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PURPOSE: The MCUG has historically been used primarily in the evaluation of urinary tract infections (UTIs) or antenatally detected hydronephrosis. Its value has been questioned as the majority of the latter resolves spontaneously. Recent NICE guidelines have reflected this, with significant changes to its indication. We evaluated MCUG use at our centre and provide our results with a synopsis of its history and future. METHOD: Using the RIS, PACS and pathology databases, we retrospectively reviewed all MCUGs done in 2007 and correlated their indications with the results, ultrasound and microbiology findings of the same patients. RESULTS: 63 tests were performed; the mean age was 5.6 months; 60% were males. The main indication was antenatal hydronephrosis (46%), with 21% done for UTIs and 14% for children with a family history of reflux. 25% of MCUGs performed were not indicated according to new NICE guidance. Overall, 21% demonstrated reflux of varying grades. Of the children with proven UTIs, nearly half had reflux. Conversely, only 20% of antenatally detected hydronephrosis showed reflux. 95% of infants had a postnatal ultrasound, of which 28% were abnormal. Most surprisingly, only 3 of the abnormal ultrasounds showed subsequent reflux on the MCUG. CONCLUSION: The MCUG is a valuable test in the evaluation of infant UTIs, with a high proportion showing reflux. However, many infants are having an MCUG for a wide range of other reasons, with only a minority resulting abnormal. Clinicians need to be aware of the new NICE guidelines to prevent unnecessary irradiation of infants.

e1118

Pyomyositis of the pelvic musculature in children – diagnosis by magnetic resonance imaging

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KEY LEARNING OBJECTIVES: (1) Understand the role of MRI in the diagnosis of Pyomyositis. (2) Recognize the MRI features of Pyomyositis that permit diagnosis and differentiation from other inflammatory processes. (3) Raise awareness of the value of early MRI in children who present with a history of atypical hip pain, transient bacteraemia and pyrexia. DESCRIPTION: Pyomyositis is a purulent infectious process involving striated muscle. The last decade has seen increasing sporadic reports of this entity in healthy children living in temperate climates. The insidious bacterial process requires a high index of suspicion to facilitate prompt diagnosis. Early detection and management can considerably reduce the risk of serious sequelae. We report the cases of two previously healthy children diagnosed with Pyomyositis by MRI following surgical intervention for presumed appendicitis. This report describes the clinical presentation and MRI appearances that can facilitate early diagnosis of this condition. CONCLUSION: MRI has the sensitivity and specificity to accurately detect soft tissue and osseous infection permitting definitive management of Pyomyositis at an early stage.

e1119
Pelvis X-ray referrals in children under 1 year

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PURPOSE: DDH screening is provided at our institution for children with risk factors. The gold standard is that no child under 4 months should have a pelvic X-ray for? DDH. It is local (NI) recommendation to investigate unequal creases as an indication for same. MATERIALS/METHODS: 100 consecutive GP referrals for pelvis X-rays? DDH in children under 1 year of age were reviewed. The request card and all radiological reports were reviewed. RESULTS: Patient age ranged between 2 months and 11 months. Three children were aged under 4 months and therefore should not have had an X-ray. Unequal skin creases was the lone indication in 80 cases. Indications in remaining cases included clicky hip, limited hip abduction, unequal leg length and family history. X-ray findings were entirely normal in 97 cases. DDH was present in 3 patients 2 of whom were referred with unequal skin creases and one with that in addition to unequal leg length. Seven patients with a normal X-ray had undergone a normal ultrasound hip examination at age 6 weeks. These patients should not have had an X-ray unless there were other abnormal findings. CONCLUSION: Better communication with GPs, health visitors and radiographers about protocols is required. There is a low pick up of abnormality if children have unequal creases only and these patients should probably have referral to a specialist clinic for assessment rather than X-ray.

Nuclear Medicine Poster

p1201
Radiological and radionuclide imaging of suspected thyroid carcinoma recurrence

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LEARNING OBJECTIVES: (1) To understand the varied clinico-pathological manifestations and imaging appearances of recurrent thyroid malignancy. (2) To describe the role of different imaging techniques for assessment of suspected disease recurrence and understand their limitations. (3) To outline a suggested diagnostic imaging algorithm. DESCRIPTION: Thyroid cancer is the most common endocrine malignancy and recently the incidence has started to rise. Up to 20% of patients develop either local recurrence or distant metastases. Clinical assessment and biochemical testing remain the cornerstones of patient follow-up. Diagnostic imaging has a vital role in the assessment of patients with suspected disease recurrence. Accurate imaging frequently guides optimal patient management. Methods employed include cross-sectional imaging using high resolution ultrasound, MRI or CT. Functional imaging evaluation is complementary and techniques include iodine, sestamibi, octreotide and metaiodobiguanidine (mIBG) scintigraphy. Hybrid imaging using SPECT-CT can improve the accuracy of lesion characterization. Fluorine-18 FDG PET-CT has a valuable role in patients with dedifferentiated thyroid carcinoma. Emerging techniques using more specific tracers so promise for the future. The aim of the exhibit is to review the diverse imaging appearances of recurrent thyroid malignancy, illustrate the contribution of the different imaging techniques, demonstrate potential pitfalls and provide a suggested imaging algorithm. CONCLUSION: Diagnostic imaging has a vital role in the evaluation of patients with suspected recurrence of thyroid cancer. A multi-modality imaging approach using a combination of anatomical and functional techniques is often required. Accurate imaging guides optimal patient management.

p1202
Radionuclide imaging of sentinel nodes

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A precise diagnosis of lymph node metastases status is essential for (a) staging of disease, (b) selection of the appropriate treatment (surgical procedure/adjuvant therapy). The sentinel lymph node (SLN) is the first node to which lymphatic drainage/metastasis from the primary tumour occurs. Currently SLN imaging is used in malignant melanoma, breast, penile and vulval cancer. The commonly used techniques to identify the SLN's are radionuclide technetium-99m-labeled colloid or blue dye. The radionuclide technique involves injecting the radiopharmaceutical around the tumour, which then migrates through the lymphatic channels to the first draining lymph node. An excised SLN can indicate the need for further dissection of the nodal basin or alternatively avoid unncessary further surgery. The precise localization of the SLN's is important for surgery and avoids incomplete removal of the SLN's. Integrated single-photon emission computed tomography/computed tomography (SPECT/CT) scanners have are also used in the localization of SLN. PURPOSE: (1) To review the role of SLN imaging in various tumours; (2) To review the importance of SLN and limitations in various cancers; (3) To discuss the radiopharmaceutical properties and limitations; (4) Tracer administration routes; (5) To emphasise the importance of obtaining good images and skin marking. CONTENT ORGANIZATION: (1) Injection techniques; (2) Illustrated review of the imaging appearances, (a) Single SLN, (b) Multiple nodes, (c) Pitfalls and artefacts. CONCLUSION – MAJOR TEACHING POINTS: (1) SLN scintigraphy is a useful technique; (2) Good clinical history, surgical details and marking aid in interpretation and localisation; (3) The precise appearances/patterns and examples of SLN.

p1203
Sarcoid-like reactions on whole body ^{18}F-FDG PET/CT: a potential pitfall

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KEY LEARNING OBJECTIVES: After reviewing this exhibit, the delegate will be able to: Understand the importance of recognising sarcoid-like reactions on whole body ^{18}F-FDG PET/CT and how it may mimic recurrent metastatic disease. Describe the incidence and pathogenesis of sarcoid-like reactions. Analyse a number of illustrative clinical cases that show the typical PET/CT appearance of sarcoid-like reactions. DESCRIPTION: Sarcoidosis is a systemic inflammatory disease of unknown aetiology that is characterized by the presence of non-caseating granulomas in affected tissues. Sarcoid-like reactions refer to the development of non-caseating epithelioid cell granulomas in patients who do not fulfil the criteria for systemic sarcoidosis. It has been estimated that approximately 1–8% of all patients with cancer exhibit localized sarcoid-like reactions. Some of these patients may develop a radiological pattern that is indistinguishable from sarcoidosis, with enlargement of hilar and mediastinal lymph nodes and pulmonary interstitial infiltrates. It is important to recognize this pattern of disease and obtain histological clarification in order to avoid the potential pitfall of interpreting these changes as representing recurrent malignancy. To date, there have been only a few reports of sarcoid-like reactions mimicking recurrent metastatic disease on PET/CT. This exhibit is illustrated with cases with histologically confirmed sarcoid-like reaction to malignancy demonstrated on PET/CT. CONCLUSION: With the increasing utilisation of ^{18}F-FDG PET/CT in the assessment of oncology patients, it is important to remain vigilant about alternative explanations for atypical findings, and histological clarification should be obtained in suspected sarcoid-like reactions in order to prevent inappropriate management decisions.

p1204
PET CT as a clinical problem solver in oncology

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KEY OBJECTIVES: To understand the role of PET/CT in assessing indeterminate lesions identified on cancer imaging of the body. DESCRIPTION: The use of PET/CT is increasing in the UK, and relevant training and education is essential to understand its appropriate use. A common problem in cancer imaging is that of the indeterminate lesion identified on CT, MRI or bone scintigraphy. For example, the adrenal lesion in lung cancer, post-operative or post-radiotherapy changes, a residual mass in a variety of tumour types, and axillary lymph nodes. We will review the strengths and weaknesses of PET/CT in assessing these types of lesions. Clinical examples will be used from our extensive PET/CT experience to illustrate its current use in a range of malignancies. The place of PET/CT relative to CT, MRI and bone scintigraphy will be addressed, detailing the current relative strengths and weaknesses of these techniques in different clinical situations, enabling appropriate patient pathways and investigation algorithms. CONCLUSION: The role of PET/CT in the assessment of the indeterminate lesion is defined.

p1205

The clinical role of PET/CT the management of malignant melanoma

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KEY OBJECTIVES: To understand the technique, clinical role, false positives and interpretation of PET/CT in malignant melanoma. DESCRIPTION: The incidence of malignant melanoma is rising faster than any other malignancy with a current lifetime risk of 1 in 132 in the UK malignant melanoma is typically FDG-avid and although PET/CT is not helpful for imaging primary disease it is excellent for detecting occult sites of disease, for example within muscular compartments. The use of PET/CT in the UK is increasing and appropriate training and education is essential: we present our clinical experience from 5 years. Malignant melanoma can occur anywhere in the body hence our standard technique is to scan from the vertex to the feet. We also discuss the clinical role of PET/CT,whether it is useful prior to surgery or radical treatment, potential false positive findings, the assessment of response to treatment and how PET/CT compares to CT and MRI. Representative images from our clinical experience are used to illustrate these points. CONCLUSION: PET/CT has a clinical role to play in the management of malignant melanoma.

p1206

Localization of parathyroid adenoma

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KEY LEARNING OBJECTIVES: To review the additive value of SPECT and hybrid imaging in localizing parathyroid adenomas and evaluating parathyroid hyperplasia. To discuss the advantages and limitations of SPECT, SPECT-CT and PET-CT. To illustrate SPECT, SPECT-CT and PET-CT examples, variants and pitfalls. DESCRIPTION: Background. A variety of localization techniques are used in the assessment of the parathyroid glands in hyperparathyroidism. Difficulties arise due to the small size of the abnormal glands, ectopic location, presence of thyroid nodules and cervical lymph nodes. Parathyroid scintigraphy remains an important investigative tool for guiding clinical and surgical decisions. The addition of single photon emission computed tomography (SPECT) increases sensitivity and improves localization of enlarged parathyroid glands. More recently, $^{99}Tc^{m}$-sestamibi SPECT/CT has been used in the localization of adenomas. Positron emission tomography (PET) imaging using [11C] methionine is reported to accurately localize abnormal parathyroid glands in patients with recurrent hyperparathyroidism in whom conventional nuclear medicine techniques have failed. Content Organization. (1) Normal biodistribution of radiopharmaceuticals and technique; (2) Imaging review illustrating learning objectives will include, (a) Normal appearances, (b) SPECT localization of parathyroid adenoma and ectopic parathyroid adenoma, (c) SPECT/CT localization of parathyroid adenoma, ectopic adenoma and multifocal localization, (d) Atypical wash out, (e) Focal localization of abnormal thyroid gland, (f) PET-CT [11C methionine -PET]. CONCLUSION: Radionuclide scintigraphy is a useful diagnostic modality in localizing parathyroid adenoma. SPECT-CT helps in localization of ectopic parathyroid adenomas. Preoperative localization of parathyroid adenomas using hybrid technology may minimize operative time.

p1207

Extra osseous hot spots in $^{99}Tc^{m}$ bone scan – pictorial review

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KEY LEARNING OBJECTIVES: To describe and illustrate the imaging characteristics of soft tissue uptake in bone scan. DESCRIPTION: Radionuclide bone scans with technetium-99m-labelled diphosphonates are often performed in the evaluation of skeletal pathology. However, bone isotope may accumulate in many soft tissues due to a variety of both benign and malignant conditions. This finding on a bone scan may give valuable clues about some diagnoses that may not be apparent on clinical examination or with other imaging modalities. Examples of such conditions include shin splints, hypercalcaemia and soft tissue malignancies. We describe our experience and illustrate a few very interesting cases of extra-osseous uptake. We also present some imaging pitfalls that one must be aware of when interpreting isotope bone scans. CONCLUSION: This pictorial assay reviews a wide variety of benign and malignant causes that may demonstrate increased soft tissue isotope uptake in bone scan films. Awareness of these findings can be crucial to the diagnosis of clinically unsuspected conditions.

p1208

Recent advances in targeted radionuclide therapy

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Radionuclide therapy (RNT) is characterized by selective delivery of radiation to the target tissue. Apart from its use in endocrinology and rheumatology, therapeutic nuclear medicine is developing rapidly as an adjunct modality in oncology. A wide range of tumour specific radiopharmaceuticals administered through multiple routes and mechanisms to target tumours are currently used for diagnostic scintigraphy and therapy. In targeted radionuclide therapy, the biological effect is obtained by energy absorbed from the radiation emitted by the radionuclide. There are three types of particulate radiation of consequence for targeted radionuclide therapy; beta particles, alpha particles and Auger electrons, which can irradiate tissue volumes with multi-cellular, cellular and sub-cellular dimensions, respectively. RNT serves as a systemic treatment for some malignant diseases. The therapeutic radiopharmaceuticals that are currently available are reviewed according to the accumulation site in relation to the cell nucleus. The optimum characteristics of a radionuclide to be considered as an effective radiopharmaceutical for therapy include a particulate emission of an appropriate energy and range, a physical half life that approaches the biological T1/2 of the radiopharmaceutical in the tumour, selective concentration in lesions, rapid blood clearance and low non-target tissue uptake. It should be available in a chemical form suitable to produce a stable radiopharmaceutical *in vivo.* Furthermore, it should produce minimal radiation exposure to personnel in contact with patient.

p1209

Radiation synovectomy. An alternative to surgery?

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Radionuclide therapy in joint diseases offers a cost-effective alternative method for treating inflammatory arthritis when standard methods of treatment such as oral anti-inflammatory drugs, intra-articular steroids, sclerosing agents, or surgical synovectomy fail. Radiation synovectomy is an effective treatment for chronic synovitis refractory to pharmacological treatment in patients with rheumatoid or seronegative arthritis. All major and minor joints including the interphalangeal joints can be treated with synovectomy, although the knee is most commonly treated. Concerns persist about possible radiation-induced cytogenetic (relating to the area of biology dealing in herdity and variation) damage after radiation synovectomy leading to recommendations to use this technique only in the elderly. Desirable radionuclides are those with beta-particle emissions capable of treating or destroying inflamed and diseased synovium. Beta particles are effective and have limited collateral effects because radiation from the beta particles travels only about 1–3 mm in soft tissues. Satisfactory results with resultant clinical improvement have been reported in 78–84% of patients having radiation synovectomy. No serious side effects have been found as much as 10 years after treatment.

Nuclear Medicine Electronic Poster

e1210

Value of clinical information, correlative imaging and SPECT/CT when interpreting orthopaedic bone scans

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PURPOSE: To examine the quality of bone scan referrals, images and reports and identify reasons for discrepancies with patient outcomes. MATERIALS/METHODS: Over a 1 month study period 27 bone scans using $^{99}Tc^{m}$ HDP were performed for orthopaedic referrals. Departmental notes, PACS images, CDR reports and clinic letters were reviewed. Comparison was made with guidelines from the European Association of Nuclear Medicine. Images were evaluated using a 6 point scale (1 = poor; 6 = excellent) of quality assessment. RESULTS: 41% of referrals had incomplete clinical information and 66% had no contact details (telephone or bleep number) on the request form. Planar whole body images scored a mean of 4.5/6 for image quality. The most common referral indication was for possible loosening or infection of joint prosthesis (33%). Use of ancillary imaging (X-ray, CT and MRI) and inflammatory markers was made in 9% of cases. Report conclusions answered the clinical question in 92% and were consistent with the clinical outcome in 60% of cases. Overcalls and undercalls of prosthetic joint infection in 5 patients accounted for 45% of discrepancies in outcome. CONCLUSION: More precise referral information, correlation with other imaging and blood tests and better use of SPECT/CT and white blood cell scans would increase accuracy of bone scan reports.

e1211

White cell scintigraphy for inflammatory bowel disease: the forgotten investigation

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KEY LEARNING OBJECTIVES: To review the technique and value of Hexamethylpropyleneamine Oxime (HMPAO) white cell scintigraphy in the management of inflammatory bowel disease (IBD). DESCRIPTION: Despite being minimally invasive, requiring little patient preparation, and having a lower radiation dose when compared with fluoroscopy and CT, radio-labelled HMPAO white cell scans are a relatively underutilized investigation, both in the diagnosis and follow up of IBD. In the appropriate clinical setting, studies have shown this nuclear medicine study to have a high sensitivity. Though capsule enteroclysis is also known to have a very high sensitivity, it is only available at specialist centres, and barium studies usually remain as a first line investigation for IBD. We believe HMPAO scintigraphy has an equally important role, and reviewed all such studies performed at our institution in the last 5 years to investigate IBD. These findings were correlated with the CT and fluoroscopic examinations of the same patients. Our presentation will illustrate the indications, key findings and pitfalls associated with HMPAO scintigraphy, with reference to other imaging modalities. CONCLUSION: HMPAO scintigraphy is an underused but important investigation and should be considered as a first line or complimentary investigation for IBD. This pictorial exhibit will promote awareness of this investigation, and we hope will be of educational value to trainees and general radiologists.

e1212

FDG PETCT in early dementia diagnosis; a pictorial review

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KEY LEARNING OBJECTIVES: Utility of FDG PETCT in diagnosis of early dementia compared with other assessments, patterns of FDG uptake seen in normal and different dementias, and difference in performing dementia FDG PETCT compared with oncological FDG PETCT. DESCRIPTION: Dementia is being increasingly recognized as an important condition in the medical world and general society. The NHS recently recognised early diagnosis as important in the management of these conditions. The majority of patients presenting with memory problems as a dominant feature have Alzheimer's disease. The distinction of this type of dementia presenting without prominent memory problems from other types of dementia is important in planning treatment and support. We present the data comparing the accuracy of clinical and detailed neuropsychological assessments (NICDSA-ADRDA), HMPAO SPECT and FDG PET brain imaging to validate the increasing use of FDG PET in the diagnosis of early dementia. With the expansion of PETCT and cyclotron services across the UK the availability of FDG PETCT in the diagnosis of early dementia will increase. We describe our technique and stress the differences with more routine oncological imaging. We will present the different patterns seen in FDG PETCT and describe the normal brain and the ageing normal brain. We will give examples seen in early Alzheimer's disease, more advanced Alzheimer's disease, frontotemporal dementia, dementia with Lewy bodies and mixed dementias including multi-infarct dementia. CONCLUSION: FDG PETCT will be increasingly important in the assessment of early dementia and we must become more familiar with the patterns seen on imaging.

Multisystem Poster

p1301

Under pressure! Spectrum of injury sustained following trauma involving high pressure water jet devices

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KEY LEARNING OJECTIVES: (1) To highlight the increasing frequency, spectrum, seriousness and potentially life threatening injuries sustained following high pressure water jet trauma. (2) To demonstrate, with imaging examples, that despite what may appear an innocuous entry site injury, the internal injuries may be severe and widespread. (3) To encourage the radiologist to be aware and vigilant when imaging patients involved in such incidents. DESCRIPTION: High pressure water jet devices are frequently used for complex industrial cleaning jobs with water pressures reaching up to 35 500 psi (2500 bar), resulting in water velocities of 1500 mph. Understandably, the capacity for serious injury when using these devices is vast, with many incidents reported in the literature. We review the literature and along with recent incidents imaged in our department, describe and demonstrate the extent, pattern and severity of injuries sustained in order to promote optimum imaging of such patients. CONCLUSION: High pressure water jet injuries are becoming increasingly common and result in diverse injuries which are often remote from the entry site. Radiologists involved in the care of such patients are required to consider the mechanism of injury and as such be vigilant for a myriad of findings.

p1302
CT signs of shock – a pictorial review

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KEY LEARNING OBJECTIVES: To illustrate the various well described signs of hypovolemic shock seen on abdominal and thoracic CT. DESCRIPTION: Patients with hypovolemic shock show several recognized features on CT imaging. Although assessment of the volume status of a patient is a clinical exercise in the acute scenario, knowledge of the secondary radiological signs are an invaluable adjunct in management of a patient. With increasing use of CT in patient management, it is important not to ignore the additional information which is there. Isolated case reports have been published across numerous reputed journals describing the various signs of shock on CT over the last decade. We have put together the more commonly recognized of these features, which we have come across time and again during our practice. CONCLUSION: Although a static image, CT is a true representation of the physiology of the patient at the time of data collection. Emphasis is on being aware of the secondary signs that shock produces on CT.

p1303
Pyrexia of unknown origin – a retrospection of the unknown causes?

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We retrospectively review the imaging findings and final diagnosis (including post-mortem) of cases which were classified as pyrexia of unknown (PUO) at a District General hospital over a 15 year period. Categorising an illness as "PUO" has both a psychological impact on the patient and cost implications for the hospital. Based on our findings we attempt to rationalize imaging modalities that can be used in a targeted manner and attempt to formulate a logical algorithm which would aid earlier diagnosis in such difficult cases.

p1304
Behcet's disease: a pictorial review along the Old Silk Route

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KEY LEARNING OBJECTIVES: To review the spectrum of radiological features seen in Behçet's syndrome. DESCRIPTION: Behçet's syndrome is a rare multisystem inflammatory disease classically characterized by the clinical triad of recurrent oral and genital ulceration and relapsing uveitis. The prevalence of the condition is increased in countries extending from the Mediterranean, through the Middle East to South-East Asia and Japan. This has given rise to the hypothesis of genetic susceptibility spread by migration along the Old Silk Route. The primary pathological process is a vasculitis and it is one of the few vasculitides that involves both the venous and arterial sides of the circulation. Unusually, it is the venous system that is more commonly affected than the arterial tree. The disease is multisystemic with neurological, cardiovascular, pulmonary, gastrointestinal, musculoskeletal and dermatological manifestations. The prevalence in the UK is very low (1 in 170 000) and our institution is a major tertiary referral centre for this uncommon condition. We reviewed the imaging of all patients referred to our hospital over the previous 8 years who had undergone a radiological investigation (129 patients). We present a pictorial review of the wide range of radiological features of this disease.

p1305
Intralesional fat – a pictorial review

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KEY LEARNING OBJECTIVES: Many radiologically detected lesions are characterized by the presence of intralesional fat. Often, identifying intralesional fat is key to making a specific diagnosis which clarifies subsequent management. This includes preventing unnecessary invasive procedures as well as ensuring that appropriate biopsy or surgery ensues. Intralesional fat can be identified with confidence using Hounsfield unit measurements on CT studies. In phase/out of phase MRI enables further clarification of the nature of a radiological abnormality by imaging its fat content. DESCRIPTION: This pictorial review includes a combination of ultrasound, CT and MR images of lesions with a significant fat content, including an adrenal adenoma, an adrenal myelolipoma, a renal angiomyolipoma, a prominent cisterna chyli, a hepatic lipoma, hepatic adenomas, pelvic lipomatosis, a dermoid cyst, a jejuno-jejunal intussuception, with obvious intervening mesenteric fat, and an intraosseus lipoma. Each image is annotated with a discussion of the imaging features that point to the likely diagnosis. The principles of in-phase/out-of-phase MRI are also discussed. CONCLUSION: In all cases the positive identification of intralesional fat improved diagnostic confidence in the nature of a lesion thus enabling appropriate management decisions to be made.

p1306
Atypical pelvic masses. What every radiologist should know

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LEARNING POINTS: Not all pelvic masses are genitourinary or gastrointestinal in origin and in cases of unusual imaging appearances, uncommon diagnoses need to be considered in the differential. We present a pictorial review of some uncommon pelvic masses, both benign and malignant which would help a radiologist in their day-to-day practice. DESCRIPTION: Detection of pelvic masses, especially in the female population, is common with the increasing use of ultrasound and CT. Most of these are ovarian, cervical or uterine in origin; less commonly they may have a bladder or colonic origin. However, it is not uncommon to come across pelvic masses which are wrongly interpreted as arising from the above structures. It is therefore important for every radiologist to be aware of these unusual pelvic masses. We retrospectively reviewed our RIS database for a period of 3 years and identified patients with atypical pelvic masses. We will demonstrate with illustrative examples, the CT and MR imaging appearances of pathologies including melanoma metastases, hypernephroma in a pelvic kidney, large iliac aneurysm, retained swab mimicking a mass, ganglioneuroma, Pagets with sarcomatous change. CONCLUSION: Atypical masses in the pelvis may present a diagnostic challenge to the radiologist; familiarity of the imaging features is important for correct interpretation and appropriate further management for the patient.

p1307
Gadobenate dimeglumine: a decade of clinical experience

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PURPOSE: To review published and unpublished efficacy and safety data on the higher-relaxivity MR contrast agent, gadobenate dimeglumine (Gd-BOPTA), and to discuss the implications for imaging specific patient populations. MATERIALS/METHODS: Gd-BOPTA is an extracellular gadolinium (Gd) contrast agent which transiently binds to serum albumin *in vivo*, resulting in markedly higher r1 and r2 relaxivity values at all magnetic field strengths compared with conventional Gd contrast agents. Efficacy data from published inter- and intra-individual comparative clinical trials involving >4500 subjects and a variety of clinical applications (i.e. liver, CNS, MRA, breast) and dosing regimens, are tabulated and reviewed. In addition, 10 years of safety surveillance data are summarized. RESULTS:

Gd-BOPTA was first approved for contrast-enhanced MR imaging of the liver in Europe in 1997. Its approval status now includes central nervous system (CNS) applications in the USA and Canada, and both CNS and liver and in Europe, Asia, and Australasia. Results from studies with Gd-BOPTA for MR angiography (MRA), as well as cardiac and breast MRI, and studies comparing the clinical safety and efficacy of Gd-BOPTA with those of other available Gd agents are presented. CONCLUSION: After a decade of clinical use, published data demonstrate that the higher signal provided by Gd-BOPTA is advantageous for all clinical applications, and that a standard 0.1 mmol kg^{-1} bodyweight dose can replace higher doses of other Gd agents for routine MR applications. Moreover, Gd-BOPTA has demonstrated an excellent safety record throughout this extensive monitoring period.

Multisystem Electronic Poster

e1308

Retrospectography – an analysis of the diagnostic accuracy of hindsight

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KEY LEARNING OBJECTIVES: To highlight the review areas and techniques for subtle pathologies on plain film radiographs of the abdomen and chest. DESCRIPTION: Plain films of the chest and abdomen represent a 2D view of a 3D object and are thus arguably more difficult to interpret than cross sectional imaging. Increasing availability of CT and MRI, and an emphasis on early subspecialist training has led to less exposure to basic plain film radiography for radiologists in training. We show a variety of apparently "normal" chest and abdominal radiographs which proceeded to have CT examinations. Positive findings on CT were retrospectively demonstrated to have been present on the initial radiographs. We demonstrate how a variety of pathologies can present with very subtle changes on plain film radiography, and highlight review areas and techniques to increase diagnostic accuracy. CONCLUSION: Modern radiology relies heavily on cross sectional imaging. Early detection of positive plain film pathologies can influence management and lead to early detection of disease, often negating the need for further imaging.

e1309

Imaging of infarction: head to toe

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KEY LEARNING OBJECTIVE The diagnosis of visceral infarction remains the holy grail of medical imaging. The advent of functional imaging is making their diagnosis easier, while Picture Archiving and Communication Systems (PACS) is make imaging more accessible. DESCRIPTION Cerebral infarction manifests with neurological deficits and is seen on MR/CT as an area of cytotoxic oedema with loss of grey-white matter differentiation. Myocardial infarction is now being more commonly imaged by MDCT/MR and PET/CT, and is seen as necrotic nonviable tissue. Pulmonary infarcts secondary to pulmonary emboli are seen as wedge shaped peripheral areas of air space change on radiography/CT and mismatch on V/Q scanning. Hepatic infarcts occur more commonly due to portal venous pathology as opposed to end arterial occlusion in other scenarios. Renal and splenic infarcts manifest as wedge shaped areas of hypoperfusion on cross sectional imaging secondary to end arterial occlusion. Intestinal ischaemia can manifest as pneumatosis, lack of bowel wall enhancement, gas in the portal vein and necrotic bowel. Mesenteric and omental infarcts are seen on CT as areas of stranding in the fat Bone infarcts are seen as serpentine abnormal areas in the end of long bones on radiography and MR scanning. CONCLUSION: Cross sectional and functional imaging now enables accurate diagnosis of visceral infarction along with angiography in most instances. It is of paramount importance for all clinicians to be conversant with their imaging appearances to guide further management.

e1310

Computed tomography appearances of functioning carcinoid tumours

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KEY LEARNING OBJECTIVES: (1)To describe the imaging characteristics of functional carcinoid tumours result in a clinical syndrome. (2) To illustrate the range of appearances, concentrating on CT. (3) To review optimal CT scanning protocols to improve detection. DESCRIPTION: Carcinoid tumours arise from the diffuse endocrine system which is distributed throughout the body. They are subdivided according to their embryological origin and their location will determine the hormones they secrete. Bronchial carcinoids are a source of ectopic ACTH which leads to Cushing's syndrome. They present as small pulmonary nodules and we will illustrate the CT characteristics. Midgut carcinoids usually result in the carcinoid sydrome and have the classical desmoplastic reponse. We present a pictorial review of these tumours and their metastases. CONCLUSION: Due to their small size these tumours are difficult to image, however, accurate detection will allow resection and cure. Raising awareness of these potential sources of excess hormone production will improve diagnosis.

e1311

Pictorial review of extrapulmonary manifestations of tuberculosis

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LEARNING OBJECTIVES: Review the wide range of manifestations of extra-pulmonary TB. Appreciate the need for high index of suspicion of extra-pulmonary TB. Appreciate that plain films can be normal and a low threshold for cross-sectional imaging in patients with confirmed TB is required. DESCRIPTION: The incidence of pulmonary TB is increasing in the UK The disease pattern has altered with a higher incidence of disseminated and extra-pulmonary disease. Extra-pulmonary TB includes pleural disease, tuberculous lymphadenitis, osteomyelitis and joint involvement, meningitis, intracranial tuberculomas, enteritis and peritonitis and genitourinary disease. The patient often presents with non specific symptoms and an indolent course. The key to prompt diagnosis and appropriate therapy of extra-pulmonary infection is a high index of suspicion. The plain films appearances are often non-specific or even normal in the acute stages and therefore low threshold for cross-sectional imaging is required, particularly in proven cases of TB. The radiologist can enable tissue diagnosis with imaging directed lymph node fine needle aspiration (FNA), biopsy of the pleura, synovium and any solid organ involved. Radiology also plays a role in diagnosing the complications of extra-pulmonary TB such as sinus tract formation (from lymph node masses, empyema or tuberculous enteritis), psoas abscess, spinal cord compression and unstable vertebral lesions. CONCLUSION: A review of the plain film and cross sectional imaging of extra-pulmonary tuberculosis, which highlights cases where a high index of suspicion has identified potentially serious occult disease.

Oncological Imaging Poster

p1401

It's more than just skin deep: a pictorial review of metastatic malignant melanoma

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KEY LEARNING OBJECTIVES: (1) To establish a system for appropriate assessment of metastatic malignant melanoma. (2) Develop an awareness of the wide spread variety of metastatic spread throughout the body. (3) To appreciate the varying appearances of metastatic disease on different imaging modalities. DESCRIPTION: Malignant melanoma develops from melanocytes derived from neural crest cells. It constitutes approximately 1% of all cancers. Risk factors include excessive sun exposure, but despite health campaigns to raise

awareness the incidence has increased more than any other cancer in the UK Unlike other malignant disease where disease progression often occurs in a predictable manner, metastatic malignant melanoma can be extremely varied. This makes comprehensive assessment very challenging. Using cases from our hospital, a regional oncology center, we present a structured multimodality pictorial review of the wide variety of metastatic spread of malignant melanoma. This is to help facilitate accurate interpretation and staging of this disease. CONCLUSION: The patterns of malignant melanoma metastatic spread are extremely varied. We provide a systematic approach for detection of disease, and review the variety of appearances and locations of metastases using multi modality imaging.

p1402

Unusual/occult sites of activity on 18F-FDG PET/CT in clinical practice – benign or malignant?

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KEY LEARNING OBJECTIVES: Understanding the importance of unexpected sites of activity in 18F-FDG PET/CT and how to further manage such cases. DESCRIPTION: PET/CT, a relatively new imaging technique, is increasingly being recognized as a fundamental modality required for the appropriate and optimal management of oncology patients. During the imaging of different malignancies, including lung, colorectal and breast cancer, the lymphomas, melanoma and sarcomas, amongst others, we see occult and unexplained sites of 18F-FDG uptake. Such areas include diffuse or focal uptake within the thyroid gland and bowel, head and neck, tonsils, retroperitoneum, adnexa, femora, prostheses and anastomotic/surgical sites. The reasons for these appearances can vary and these will be discussed. The important question of their significance and relevance in individual patients poses an additional dilemma of the need for further investigation, and if so, how. In particular, given the patient population imaged, the probability of an unexpected focus of activity being benign or malignant will be addressed. CONCLUSION: It is essential to understand significance of these sites of unusual activity on 18F-FDG PET/CT so as to best manage patients.

p1403

What is the hold up? Metastatic bladder cancer causing upper gastrointestinal tract obstruction

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KEY LEARNING OBJECTIVES: (1) To discuss common patterns, and unusual sites, of metastatic spread in transitional cell carcinoma. (2) To review the imaging appearances of upper gastrointestinal tract obstruction and its surgical, and interventional treatment. (3) To highlight the importance of confirming tissue diagnosis using biopsy rather than making a presumptive diagnosis, as metastases to rare sites do occur and may lead to inappropriate therapy. DESCRIPTION: Approximately 90% of urothelial cancers are transitional cell carcinomas and they represent the fourth most common male cancer in the UK. Typically the disease presents with superficial tumour involving bladder epithelium, but in about 5% of cases patients present with metastatic disease; the most common site being the regional pelvic lymph nodes. Malignant gastric outlet and duodenal obstruction is more usually associated with the late complications of pancreatobiliary and gastric cancers than metastatic bladder cancer. Using cases from our hospital, a regional oncology cancer centre, we present a series of patients with upper gastrointestinal tract obstruction resulting from metastatic bladder cancer. Imaging, pathology and discussion of surgical, and interventional procedures are included to detail this rare complication of distant disease. CONCLUSION: The common patterns of transitional cell carcinoma spread are to pelvic lymph nodes, lungs, liver, bones, adrenals and brain. We provide a series of interesting cases of metastatic transitional cell carcinoma presenting with upper gastrointestinal tract obstruction and review the radiological appearance, and therapeutic options.

p1404

Evolving practice in prostate cancer diagnosis and staging using magnetic resonance imaging

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PURPOSE: MRI of the prostate is increasingly used in cases of proven or suspected prostate cancer. It has been performed for nearly 5 years at the University Hospital of North Staffordshire (UHNS) and during this period the technique has evolved, introducing new imaging sequences. A retrospective analysis of the effect of these new sequences on diagnostic accuracy has been performed to gauge improvements made and also guide further developments. METHOD: MRI scan reports were compared with histological data on each patient obtained by ultrasound guided sextant biopsy or by prostatectomy. RESULTS: Between July 2002 and May 2007 83 prostate MRI scans were performed. 67 patients had 89 biopsies. Prostatectomy was performed in 19 patients. An endorectal coil was used in 69 patients. Dynamic contrast enhancement was obtained during 65 scans, spectroscopic analysis in 41. Overall sensitivity is 96% and specificity 75%. For patients in whom the dynamic contrast enhanced sequence influences the report the sensitivity and specificity are 96% and 80%, respectively. With spectroscopy the sensitivity remains unchanged but the specificity falls to about 50%. CONCLUSION: The data suggests that the new sequences do not improve sensitivity of the technique, however the ability to avoid false positives is improved by using the dynamic contrast enhanced sequence, but not spectroscopy. It is hoped that the dynamic contrast technique be extended to calculate contrast transfer constants, another technique believed to be of value in accurately detecting prostate cancer.

p1405

Do hospice patients need imaging? A review of recent experience in east Lancashire

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INTRODUCTION: Technology and treatments in medicine continue to make significant progress. Palliative care is no different and physicians in this specialty are able to offer their patients improved quality of what is often a limited life expectancy. Imaging can play a pivotal role in both diagnosis and, not infrequently, treating symptoms to enable these patients to make the most of their remaining time. DESCRIPTION: We have reviewed the interaction between our department and the local hospice over the last 2 years and present cases to illustrate how imaging has helped these patients, one of whom was as young as 35 years. We highlight those cases where imaging was of great value in either diagnosis or treatment. The cases include diagnoses of both malignant and co-existent non-malignant diseases. Treatments initiated either a correct diagnosis or administered using imaging control, greatly enhances these patients' lives; examples include not only the diagnosis of spinal cord compression, unusual complications of advanced malignancy, non-malignant conditions and the insertion of various stents and tubes. CONCLUSION: In the palliative care setting, imaging plays a pivotal role in management. Even patients with advanced malignancy can develop conditions of a non-malignant aetiology that can reduce their quality of life and are eminently treatable. Imaging departments should adopt an understanding relationship with their local palliative care physicians to foster an empathetic and effective care pathway for this challenging group of patients who often benefit greatly from after interaction with imaging departments.

Oncological Imaging Electronic Poster

e1406

Standardizing follow-up imaging reports for solid cancers, an illustrated guide

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KEY LEARNING OBJECTIVES: To understand the requirement and tools for accurate and standardized CT reports in the context of solid cancer follow-up imaging. DESCRIPTION: Almost all radiologists who report CT scans, whether specialists or generalists, will be responsible for reporting scans that demonstrate solid cancers. Communication of the findings in an accurate and reproducible way is essential for best patient management. This is important when multiple scans of the same patient occur particularly if these occurs in different institutions or in the context of a treatment trial. Reporting cancer response, or lack of it, to treatment requires particular attention. There are two widely accepted methods of measuring response of cancer to treatment on CT. These are the Response Evaluation Criteria in Solid Tumours (RECIST) and World Health Organization (WHO) guidelines. In this review they are explained and discussed with the emphasis on demonstration by CT examples. CONCLUSION: For the cancer patient much can ride on the result of a follow-up CT scan. This illustrated review shows the radiologist how to accurately and reproducibly assess and describe the treatment response of solid cancers.

e1407
PET/CT in testicular germ cell tumours

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KEY LEARNING OBJECTIVES: (1) To illustrate the imaging appearances in patients with testicular germ cell tumours. (2) To assess the benefit and limitations of PET/CT in the assessment of patients with testicular germ cell tumours. DESCRIPTION: We will be using case material from our hospital (tertiary referral centre for testicular cancer) to illustrate the imaging features. Imaging data has been collected from 49 patients with a variety of testicular germ cell tumours to demonstrate: The pattern of disease spread and relapse with imaging correlation. The relationship of imaging findings in the assessment of disease response. Evaluation of residual masses following chemotherapy. Illustrative cases with clinico-pathological correlations. Limitations and pitfalls of PET/CT. CONCLUSION: At the end of this exhibit the reader should have an understanding of: (1) Role of PET/CT in the evaluation of residual masses following therapy; (2) Strengths and limitations of the use of PET/CT in testicular germ cell tumours.

Education Poster

p1501
Modeling task complexity in image interpretation from a cognitive perspective

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KEY LEARNING OBJECTIVES: Present an overview of the perceptual and cognitive processes involved in interpretation of radiological images. Model the nature of complexity in image interpretation from a cognitive perspective. Outline the implications of improving awareness of the cognitive complexity perspective on improved observer performance. DESCRIPTION: Complexity in the interpretation of radiological images predominantly focuses on perceptual factors in the radiological literature. Such descriptions tend to overemphasise aspects that limit or constrain effective interpretation because of low feature conspicuity (such as feature size, its contrast detectability and the extent of camouflaging that may exist with other image elements). Since image interpretation is based on the use of both perceptual (where the observer is looking and what is being seen) as well as cognitive (what the observer is thinking about when looking at features within the image) processes, this presentation contends that cognitive aspects of image interpretation represent important sources of task complexity which are overlooked in texts on image interpretation. This presentation argues that theoretical models of task complexity are highly relevant to the radiological image interpretation task and that their application can aid considerably in understanding the complex processes underlying interpretation. CONCLUSION: Moving away from thinking of complexity in interpretation in terms of inherent image (perceptual based) characteristics and moving towards the need to improve awareness and consideration of the cognitive factors that encompass task complexity is considered essential in shaping the continued development of film readers.

p1502
Radiology training in sedation: are we sleeping on the job?

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PURPOSE: Sedation is widely used in radiological procedures. "Safe Sedation, Analgesia and Anaesthesia within the Radiology Department", published by the Royal College of Radiologists in 2003, states that: appropriate life support training is mandatory, trainees should receive formal training in sedation; radiologists must demonstrate competence and adequate performance as part of revalidation. Our aim was to audit training in safe sedation techniques in Radiology. MATERIALS/METHODS: Questionnaire based study involving Radiologists in the North West. A single interviewer documented practitioner grade, sub-specialty interest and frequency of involvement with patient sedation. Participants were asked if they had received training and what format this had taken. Knowledge of the adult life support algorithm was assessed and the date of most recent training was recorded. RESULTS: 100 Radiologists were questioned (Consultants: n=40; Registrars: n=60). Just 21% had received training and only 6% before first clinical involvement in patient sedation. "Essential elements" had not been covered in 48% of training sessions. 67% (n=28/42) that attended life support training within 6 months, correctly completed the life support algorithm compared with only 17% (n=10/58) that had not attended for greater than 6 months (p<0.05; Chi-squared). CONCLUSION: This audit demonstrates that Radiologists are neglecting sedation and life support as an important component of their continuing professional development. Safe sedation should be included early in Registrar training and updated with new practices. Appropriate life support training is mandatory for all staff working with sedated patients and refresher courses should be attended at regular intervals.

p1503
How not to miss a fracture? Assessing the impact of focused radiological teaching

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PURPOSE: To evaluate whether formal teaching of radiographic "rules" improves the diagnostic accuracy of trauma radiographs reported by emergency department officers. MATERIALS/METHODS: Nine emergency department officers, of varied experience, reported 30 radiographs of the upper limb, in three separate reporting tests. It was clarified that the assessment included both normal and abnormal cases. They were asked to comment on the presence of an abnormality and its nature. Sensitivity, specificity and overall accuracy were assessed. Once phase 1 was completed, formal teaching of radiographic "rules" was given under consultant radiologist guidance. A new reporting test was conducted as previously, immediately post teaching. After 2 weeks, a final reporting test was conducted. All radiographs used were independently reported by two consultant radiologists. Paired sample t-test was used to compare data to assess for statistical significance. RESULTS: A statistically significant improvement (p=0.0055) in the mean value sensitivities was seen between phase 2 (81.00±12.91) and phase 1 (64.33±17.37). Likewise, a significant improvement (p=0.0022) was also seen in mean value sensitivities between phase 3

(75.78±14.06) and phase 1. No Significant difference in sensitivity was identified ($p=0.3043$) between phase 2 and phase 3, indicating that the "rules" were being appropriately maintained. Overall accuracy also improved throughout the study. CONCLUSION: Formal radiological guidance has demonstrated significant improvement in identification of abnormal radiographs despite limited radiological training. This study supports education in radiographs interpretation of emergency officer prior to clinical practice, which will have a positive impact on patient management in a busy Accident and Emergency department.

p1504

The implementation of protected study time (PST) programme in a district general hospital

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KEY LEARNING OBJECTIVES: This poster will discuss the drivers for the implementation of PST. It will identify the benefits to radiographers and make suggestions on how to utilize protected time. It will highlight and discuss some of the barriers that may be encountered. It will demonstrate how these can be overcome. DESCRIPTION: The experience of implementing PST within a DGH will be discussed. Areas of success will be shared. The problems encountered shall be explored. Initially a dedicated Continuing Professional Development (CPD) session was organized. Each member of staff was issued with a portfolio. Once funding was received for additional staff, a PST programme was introduced. Several methods of PST allocation were tried with varying degrees of success. A department CPD area was identified. Some staff were initially reluctant to participate. Discussions took place with staff regarding how to utilize their time and the most appropriate approach to PST as a department. CONCLUSION: Through introduction of a PST programme individuals can demonstrate their competence for HPC registration. Departments also benefit as increased knowledge and skills will improve patient care. A PST programme can be established in any department. Staff have an onus of responsibility. The motivation of newly qualified staff to progress through NHS Flying Start/Linked Grading/Annex T will encourage others to participate in PST.

p1505

Education and assessment: the value of a daily "review" meeting in a training radiology department

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KEY LEARNING OBJECTIVES: As part of the Postgraduate Medical Education and Training Board (PMETB) requirements, it is becoming necessary to provide documentary evidence of assessment of competency of each individual doctor in training. Each speciality is developing methods of assessment. There are significant concerns around the time required for this. We present our experience of using routine morning review meeting of out-of-hours radiology to assess radiology specialist registrars (SpRs). DESCRIPTION: For over 10 years we have held a morning meeting at 9 am (for 30 mins) which is attended by all the registrars, any available consultants (1–6) and visiting medical students. The out of hours CT scans (provisionally reported by the SpR) are reviewed and reports amended as appropriate. Using a pilot proforma, these studies and their respective provisional reports are reviewed by the consultants and assessed for accuracy. Immediate feedback and any learning objectives are identified. We have found this to be an efficient process. We present the proforma and the results of the evaluation with example cases. The issues of standardisation and reliability are discussed. CONCLUSION: We suggest that this may be a method which could be adopted by other imaging training centres, and might be used to assess competency in other modalities.

p1506

Hot topics affecting radiology registrars

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AIM: To determine the opinions of radiology trainees to controversial issues affecting radiology in the UK. MATERIALS AND METHODS: An e-mail linked web-based questionnaire using "surevymonkey.com" was forwarded via the head of training in each deanery onto their trainees. The response rate was 37% (297/812). RESULTS: 75% (220/296) of trainees do not think that they will get a consultancy post within their period of grace, however only 12% (36/295) of trainees want to work abroad permanently after finishing their schemes, and only 4% (12/295) want to work solely in the private sector. Implying trainees want to work within the UK in the NHS when they finish training, but do not think that they will get jobs. Only 7% (21/293) of trainees are not in or planning to do subspecialty training. Interventional radiology is the most popular choice (22% (65/293)) of subspeciality, followed by gastrointestinal 12% (36/293), musculoskeletal 11% (33/293), and breast 10% (30/293). 90% (258/291) of trainees do not consider the "F2 programme" as adequate preparation for entrance into radiology schemes, and a further 62% (181/295) think postgraduate exams should be a prerequisite for entrance. 71% (208/295) think that the European Working Time Directive will impact negatively on their training, while 69% (204/294) would not be prepared to work in a shift system when the hours change to 48 in 2009. 71% (15/21) of the trainees who replied from academies did not think that the academy would adequately prepare them for hospital radiology, and only 9% (2/21) think that they will get consultant jobs when they qualify.

p1507

How hard do radiology registrars work on call

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PURPOSE: Our institution implements an overnight on-call by radiology registrars with full weekend cover. We have analysed the referral pattern looking at; referral times, intensity, and imaging modality. MATERIALS/METHODS: On-call investigations were documented prospectively over a 4-week period (October 2007 to November 2007). Findings were validated using the radiology department computer information system. Direct referrals to the consultant on call were excluded. MRI scanning was not available on call. RESULTS: 85 patients were investigated over the 4 week period. 41 investigations were performed during weekday on calls (Monday to Fridays inclusive) all of which were for CT scanning. On the 4 Saturdays there were 24 investigations performed of which 19 were CT scans and 5 were ultrasounds. On the 4 Sundays there were 20 investigations performed, 11 of which were ultrasounds, 8 CT scans and 1 nephrostomy insertion. During the weekday on calls the number of investigations performed between 5pm and 8pm was 9 (22%), 8pm and 11pm 14 (34%), 11pm and 2am 11 (27%), 2am and 5am 6 (15)% and 5am and 8am 1 (2%). During the 8 weekend days the number of investigations performed between 8am and 11am was 12 (27%), 11am and 2pm 11 (25%), 2pm and 5pm 3 (7%), 5pm and 8pm 6 (14%), 8pm and 11pm 6 (14%), 11pm and 2am 4 (9%) and 5am and 8am 2 (4%). CONCLUSION: The rate at which investigations were performed varied according to the time of day they were referred with a significant fall observed between 2am and 5am with few referrals after this. Registrars can expect to perform mainly CT scans on call with additional ultrasounds during the weekend days.

p1508

Medical student learning of cardiac structure and function with magnetic resonance imaging

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KEY LEARNING OBJECTIVES: As well as re-iterating the importance of anatomy and physiology in the medical curriculum, the General Medical Council's "Tomorrow's Doctors" calls for medical schools to take advantage of new technologies to deliver teaching. We

aim to demonstrate that MRI can enhance medical student learning of cardiac anatomy and physiology. DESCRIPTION: A 10 h cardiac MRI student selected component (SSC) has been devised in which 8 first year medical students use MRI to acquire knowledge and understanding of the structure and function of the heart and to relate clinical examination of arterial and central venous pulses to cardiovascular physiology. Following an initial session on MRI safety, consenting volunteers from the group undergo clinical examination including identification of the surface markings for the cardiac valves and assessment of arterial and venous pulses. The volunteers then undergo MRI to relate their clinical findings to a range of images including cine acquisitions and estimations of arterial and venous pulse wave-velocity. The SSC will be evaluated by formative assessments before the SSC, immediately afterwards and 6 months later with comparison to a control group who did not complete the SSC. CONCLUSION: MRI offers an innovative and useful educational tool that enhances medical student learning of cardiac anatomy and physiology. Its potential for expansion to other areas of undergraduate medical education is vast and warrants further exploration. By exposing medical students to MRI early in their training, this teaching approach may also stimulate an early career interest in medical imaging.

p1509

What is the level of competency of final year medical students at radiograph interpretation

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BACKGROUND: Accurate interpretation of radiographs is an integral tool to aid in clinical decision-making. OBJECTIVE: An audit was carried out to assess if implementation of teaching guidelines at medical school is leading to competency at radiograph interpretation. Four standards: (1) Competency at reading radiographs should be 100%; (2) Total hours of teaching (no standard set); (3) Students must be satisfied with the teaching received; (4) The overall structure of teaching must be satisfactory. METHOD: Medical students based at Warwick University were asked to complete a questionnaire with two sections. Section one related to interpretation of seven radiographs. Two consultant radiologists verified these as being within capabilities of students. Section two focused on teaching. This included total hours of teaching received, student assessment of effectiveness of teaching and satisfaction with overall teaching (1–5 scales). RESULTS: There were 53 participants. Average score was 4.7/7 for interpretation. Only 11% of students interpreted 7 radiographs correctly. Best performance for pneumonia (92%), worst for bowel obstruction (57%) and fractured femur (45%). On average students that interpreted individual radiographs correctly received 5.6 h of more teaching compared with incorrect interpretation. Satisfaction with teaching received and structure of teaching was low 3.2 and 2.26, respectively (1–5 scale). DISCUSSION: We identified that student X-ray reading skills are poor, as is satisfaction with teaching received. However, teaching contributes to improved competency but without students realising its benefit. RECOMMENDATION: Increased the amount of teaching at medical school particularly for less common radiographs.

p1510

Internet based international PBL

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PURPOSE: At our university we run a problem-based learning (PBL) Radiography curriculum. Students have the opportunity to gain clinical experience in Finland. Students taking this opportunity miss university-based learning and [PBL] group dynamics. The primary aim of this project was to allow our students on exchange in Finland to participate in England-based PBL; a subsidiary aim was to allow Finnish students and tutors to participate in PBL. MATERIALS/METHODS: Action research was adopted; this resulted in 3 implementations – 2 and 3 built on previous experience. Each implementation comprised 3 web-based PBL sessions. After each implementation, focus group analysis of student and tutor (participants) opinion was established and analysed (thematic). The first implementation involved webcams and Microsoft MSN. Subsequent implementations used dedicated video-conferencing facilities. The PBL triggers and supporting academic material were made available to UK and Finnish participants via a Virtual Learning Environment. RESULTS: Web cams proved inadequate. Sound and video quality was poor. Nevertheless PBL participants felt they engaged in fairly effective PBL. The second implementation attempted to address the technical deficiencies by using dedicated video conferencing facilities. Sound and video quality was considerably improved; however some technical problems still existed. The PBL participants now seemed to be able to concentrate more on engaging with the PBL process. In this implementation many more comments were made on how to improve the learning process; fewer comments were made about technical limitations. The third implementation took advantage of educational lessons learnt, and this is currently ongoing.

p1511

MRI reporting by radiographers: the findings of an accredited postgraduate programme

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PURPOSE: To analyse the objective structured examination (OSE) results of the first three cohorts of radiographers (n=40) who completed a postgraduate certificate (PgC) programme (accredited by the College of Radiographers) in reporting of MRI investigations. MATERIALS/METHODS: 40 MRI investigations were used in the OSE which included: knee; meniscal/ligament injuries, bone bruises, effusions and osteochondral defects; lumbar spine: intervertebral disc morphology, vertebral collapse, tumours (bone and soft tissue), spinal stenosis and/or nerve root involvement; internal auditory meatus: acoustic neuroma. Incidental findings included maxillary polyp, arachnoid cyst, renal cyst, hydroureter, pleural effusion and metastases (adrenal, lung and/or thoracic spine). Sensitivity, specificity and total percentage agreement rates were calculated using all reports (n=1600) and a small subgroup of reports were compared with the three consultant radiologists' reports used when constructing the OSE and kappa values for interobserver agreement calculated. RESULTS: The sensitivity, specificity and agreement rate rates for the three cohorts of radiographers were 99.1%, 99.1% and 89.5%, respectively. For the majority of anatomical areas and/or pathological categories no significant differences (p>0.17) were found between the group kappa scores for different groups of observers whether radiographers were included in the group analysis or not. Where differences were apparent, this was in cases where the variation was either no greater than found between radiologists and/or of no clinical significance. CONCLUSION: These results suggest that this group of radiographers can report MRI investigations to a satisfactory level of competence but further work is required to confirm clinical application of these findings.

p1512

Enhancing the undergraduate radiographer learning experience through improved social cohesion

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BACKGROUND: Two-thirds of students who leave university do so during the first year. Factors that can minimize this include effective programme design and strong student social cohesion. Social cohesion fosters feelings of belonging and support – thereby enhancing the student experience, this also minimizes attrition. AIM: With regard to social cohesion, to evaluate 2 web-based discussion forums for new undergraduate students. METHOD: One discussion board was implemented pre-induction (i.e. the month before registration), the other during induction (i.e during the first week at university). Their purpose was to encourage social interaction between new students,

existing students and staff. Both were facilitated by a tutor. Existing students and staff were encouraged to participate. Analysis comprised statistical breakdown of discussion board usage and first-year student opinion solicited though focus groups. Qualitative data was analysed using a themed approach. RESULTS: Participants included: 41 (76%) of the new students; 8 (53%) staff and 5 (36%) student mentors. 170 "posts" and 5718 "hits" were recorded across the 2 discussion boards. Themed analysis revealed several positive issues related to new-student socialization, e.g. getting to know that "staff are human", sharing common concerns and building up profiles of people ready for face-to-face introduction. Areas for attention included: improving the process to maximize participation, e.g. focused thread questions, improved awareness-raising of the availability of the site, and the benefits of participation. CONCLUSION: Pre induction and induction discussion boards facilitate student social cohesion.

Education Electronic Poster

e1513

Breaking the bad news from the perspective of a radiologist

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KEY LEARNING OBJECTIVES: To provide a guidance and template for radiologists to communicate effectively with patients in regards to "breaking bad news". DESCRIPTION: Doctors in general are poorly taught to deliver news of diagnoses that may be suboptimal to patient's desire. Radiologists are not exempted from this as increasingly, radiologists are expected to provide results of both diagnostic and/or therapeutic procedures to patients. We have an obligation directly to the patients to provide them with the diagnosis when asked. It is important we are not responsible for increasing further a patient's grief by our poor delivery of this news. Understanding what it is that constitutes "bad news" is the first step. The proper setting in which this situation occurs proves a challenge for most radiologist-patient environments. We should remain emphatic to patients at all times in order to continue this empathy when this situation arises as well. The pitfalls that can be avoided are discussed. A simple protocol to remember and utilize the key features is provided. CONCLUSION: Breaking bad news to patient is never easy and it is even more complicated in a radiology setting. However, by understanding the background of this scenario and delivering it according to a trained protocol with an emphatic manner in a suitable environment is something we can all learn from.

e1514

A healthy dose of competition

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PURPOSE: Currently there is concern about radiation dose involved in plain radiography and MDCT. We aimed to compare knowledge of radiation dose between different groups of doctors and media-exposed general public. MATERIALS/METHODS: Radiation questionnaires were completed for radiologists, surgeons and physicians during multidisciplinary team meetings. The groups of clinicians and radiologists included a mixture of seniority from a selection of London Hospitals. These assessed two fields, equivalent dose of CXR and risk of fatal malignancy induction for a range of imaging modalities. RESULTS: Knowledge was poor and we present the most interesting results here. For assessing the dose involved in CT thorax (CXR equivalent), the mothers scored joint first position with radiologists for a correct answer (35% radiologists, 35% mothers, 29% physicians, 16% surgeons). Mothers were second for assessing the relative risk of fatal malignancy with CT abdomen (radiologists 47%, mothers 22%, physicians 16%, surgeons 5%). Radiologists' knowledge of CXR risk of fatal malignancy induction was poor (surgeons 79%, physicians 71%, radiologists 65%, mothers 57%). CONCLUSION: Accurate information regarding doses needs to be more widely available for all health professionals to ensure appropriate investigations are requested and delivered. Electronic requesting is about to be commenced at this institution and doses will be attached to initial request forms and reports. We have printed dose equivalents as posters and placed these within key areas. A low overall score rate for doctors in comparison with informed members of the general population highlights a need for better education.

e1515

Verification of reports: radiologists as proofreaders

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PURPOSE: Report verification can be a weak link in the chain of communication. We wished to asses our radiologists skills in verifying report text. MATERIALS/METHODS: We assessed radiologists proofreading by means of a test. 25 Random reports were selected from RIS. 17 changes were made to the reports: 15 reports had 1 change, 1 had 2 changes, 10 were as original. Changes varied from altered words to omissions. Some changes were obvious e.g. the word "rabbit" appearing in the report, others were difficult to detect in particular the word "no" being omitted from a sentence. 10 radiologists reviewed the text. They were scored out of 17 for detection of changes and the total number of alterations recorded. RESULTS: Scores ranged from 10 to 16 out of 17, mean 14. Each change was detected by at least 2 readers. Total corrections ranged from 10 to 106 mean 37. While no "rabbits" escaped, text omissions were missed by many. CONCLUSION: Proofreading is a demanding vigilance task scoring highly on the NASA Task Loaded Index scale. This exercise illustrates the demands of the proofreading task. Protocols for phraseology in and verification of reports are discussed.

e1516

Where has the tube gone?

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LEARNING OBJECTIVES: (1) For radiologists to be aware of and recognize the dangers of catheters inserted for a multitude of clinical uses. (2) To be able to identify the correct and incorrect placement of catheters and their complications, thus enabling prompt appropriate subsequent clinical management and re-siting if required. BACKGROUND: Catheters are utilized daily for many different applications and uses by clinicians. From simply providing vascular access through to drainage of fluid collections or blockages. Correct insertion of these catheters entails a range of interventional and surgical procedures requiring great skill, some performed on wards and others in theatre. Inevitably some are not sited correctly and there may also be complications as a result. The aim of this exhibit is to demonstrate a series of cases where catheters have been incorrectly placed and complications have ensued. We demonstrate a range of catheters used in different specialities including ventriculoperitoneal shunt, central venous access, chest and biliary duct drains causing a range of problems including haematoma, abscess, accidental arterial puncture and lung penetration. Our exhibit uses both ultrasound and multidetector CT utilizing multiplanar reformats and post-processing to best demonstrate these. CONCLUSION: Radiologists must recognize the correct position of catheters inserted. In doing so any incorrect placement and presence of complications can be identified and facilitate prompt appropriate management and avert any potential patient harm.

e1517

What can OsiriX do for you – a primer for radiologists

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LEARNING OBJECTIVES: To illustrate the utility of OsiriX, a state-of-the-art, open-source image navigation and viewing software package. To explore the potential uses of OsiriX for radiological

research, training and administration. To review recent upgrades to the software which allowing more advanced data manipulation. DESCRIPTION: OsiriX is a free DICOM viewer which runs on the Mackintosh platform. It utilizes the powerful MacOS X operating system and has been specifically designed for navigating large multimodality and multidimensional image datasets. All of the advanced post-processing tools available on commercial workstations are supported such as multiplanar reconstruction (MPR), surface and volume rendering and maximum intensity projection (MIP). It is easy to fuse images between two different series which facilitates viewing of hybrid imaging techniques such as PET-CT. The software has a simple user interface and can be readily customized. As the software is freely available it can easily be used for as a low-cost alternative, or complement, to PACS. the software can be readily adapted for use in radiological training and research. This exhibit will provide a primer on the key features of OsiriX, illustrate potential uses in radiological administration, teaching and research and review recently added functionality which has further extended the utility of the software. CONCLUSIONS: OsiriX is an open-source image viewing software par excellance which is of great value to radiologiy professionals for image navigation, radiological training and research purposes.

e1518

PACS in the dissecting room

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KEY LEARNING OBJECTIVES: Historically medical students have been taught anatomy in the dissecting room with the aid of anatomy atlases. The GMC's Tomorrow's Doctors ask medical schools to take advantage of new technologies to deliver teaching. This poster aims to highlight: (1) The role of imaging in undergraduate anatomy; (2) How imaging is beneficial in the dissecting room; (3) The potential use PACS in medical education to support the learning and teaching of anatomy. DESCRIPTION: During a dissection lesson on the chest wall small groups were given a short presentation on the imaging of the thorax. The presentation included normal and abnormal images including chest X-rays, mammograms, chest CT and 3D reconstruction of the thorax. The images were accessed from the medical school's dedicated PACS system which uses Sundial software (Cambridge Computed Imaging) linked to the local hospital's PACS system. Radiologists can select images which are anonymised and then sent to the medical school PACS accessed via the web. The similarities in cadaveric and "virtual" dissection were highlighted by pointing out the anatomy they were dissecting on the images. CONCLUSION: Previous research has found that integrating radiological imaging into normal anatomy teaching is associated with high long-term knowledge retention. Also it has been found that digital images in the dissecting room, including radiographs and CT sans, enhance students proficiency, improves the quality of anatomy instruction and improves the efficiency of dissection time. The availability of PACS in the dissecting room offers a novel way to enhance the learning of anatomy.

Audit Poster

p1601

Effectivness of a departmental training programme on compliance with checking patient identification prior to examination

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PURPOSE: Following incidents where patients were incorrectly identified prior to examination, or where the wrong patient was selected on the RIS system, a department wide policy and training programme was developed. A3 posters were put in all examination rooms and clinical staff were given pocket guides to highlight the need for systematic identification of patients. Clerical and reception staff were given training to ensure that the correct patient was selected from the RIS. MATERIALS/METHODS: Retrospective data collected over several weeks to ensure widest possible number of staff included. Request cards from all areas were included, numbers from each area reflected the throughput of that area. A total of 464 request cards were checked. Cards were reviewed to ensure an ID check had been made, a positive check was deamed to have occured if the address label was checked or ID check box completed. A further check was made to ensure the RIS sticker matched demographic details on the request card. RESULTS: Every card checked the RIS sticker matched details on the request card. All but two discreate areas there was a 97% compliance with the patient identification policy.The two areas of concern showed less than 60% compliance, and will be reaudited early 2008, the rest of the department will be reaudited in 6 months. CONCLUSION: Training put in place has been very effective in ensuring patients are correctly identified prior to examination, in most areas of the department. Data input at reception has been shown to have improved significantly.

p1602

Audit of generic reporting and effective communication

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PURPOSE: In 2006 the Royal College of Radiologists published the document "Standards for the Reporting and Interpretation of Imaging Investigations" giving guidance for governance and reporting by both radiologists and non-radiologists. This audit aims to assess the compliance of local standards derived from national guidance applied specifically to the content of issued reports with respect to appropriate communication. MATERIALS/METHODS: In a retrospective study, 50 plain film and 50 ultrasound examination requests from general practitioners (GPs) were obtained over a 2 week period during October 2007. The request cards and issued radiology reports were simultaneously assessed as to whether clinical issues were addressed and if the reporting style and content were appropriate for GPs. RESULTS: Clinical issues were addressed in 93% and 98% of the reports issued for plain film and ultrasound examinations respectively. When clinical advice was given it was appropriate in 100% of cases for both types of examination. The reporting style and content were appropriate in nearly 100% of all reports. However the grade of reporter was stated in only 40% of reports issued for ultrasound examinations compared with 100% of reports produced for plain film examinations. CONCLUSION: The Radiology Department is meeting targets derived from national guidance in virtually all categories assessed. The main local recommendation is that the grade of reporter is added to reports issued by all non-radiologists.

p1603

An audit of plain film reporting in a central London teaching hospital

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PURPOSE: RCR guidelines state that every imaging examination should be reported in an appropriate timescale commensurate with the outline of the clinical problem. In early 2005 there seemed to be a significant number of unreported plain radiographs at our Trust with potential secondary effects on patient management. Audit standard: At our institution all plain radiographs should be formally reported. AIM: Reduce the number of unreported plain films. MATERIALS/METHODS: Plain film reporting statistics were collated from February to July 2005 using our radiology information system. RESULTS: February to July 2005: 25% plain films not reported. Reporting of GP films over 95% but reporting of IP, OP and A&E suboptimal with up to 65% unreported. Initial intervention: encourage plain film reporting and permit trained radiographers to report. August 2005 to January 2006: 22% unreported. Intervention: publishing consultant and trainee reporting figures and the introduction of PACS. June to November 2006: only 8% unreported. CONCLUSION: Concerted and sustained efforts can improve plain film reporting rates; although the introduction of PACS was clearly positively contributory.

p1604

The extended role of radiographers reporting orbit radiographs for foreign body in the MRI department of a district general hospital

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PURPOSE: Advantages of radiographer reporting of orbit X-rays prior to MRI examination include availability, time saving, reduced cancellations and competence.Two MRI radiographers in our department recently completed a postgraduate diploma in IOFB reporting. The following audit targets have been set (1) 100% concordance between radiographer and radiologist reports (2). All cases of "not sure" and "IOFB" are referred to radiologist. MATERIALS/METHODS: 100 consecutive orbit X-ray reports were double reported by radiologist and radiographer. The referrer, stated indication, date of report and MRI and incidental findings were also recorded. RESULTS: In 80% of cases the radiographer acted as a referrer. The stated indication was felt to be appropriate in 100% of cases. In 95% of cases the radiographer issued the final report. There was 100% concordance with the radiologist. In 5% of cases the radiographer referred the examination to a radiologist. Findings included an IOFB in 1 case; metallic foreign body in overlying soft tissues confirmed on lateral view in 2 cases; intraorbital densities identified as artefact in 2 cases. 95% of orbit X-rays were reported on day of examination. All examinations were reported prior to MRI examination (mean 2.4 days). In 7 cases incidental findings were noted by the radiologist. They included frontal sinus aplasia, mucosal thickening within the maxillary antrum and a craniotomy which had been mentioned on the request form. CONCLUSION: The targets have been met. Radiographer reporting will continue and is felt to improve efficiency within the department. Its introduction is recommended in all radiology departments.

p1605

Are both cervical spine views necessary for atlanto-axial subluxation in suspected rheumatoid arthritis patients?

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PURPOSE: Approximately 550 cervical spine radiographs in suspected Rheumatoid Arthritis patients are performed every year at Wrightington Hospital, Centre of Excellence in the treatment of musculoskeletal disease. The aim of our study is to establish the usefulness of both flexion and extension views of the cervical spine in order to establish atlanto-axial subluxation (AAS) in this group of patients. MATERIALS/METHODS: A retrospective analysis of the cervical spine radiograph reports during the period November 2005 to October 2006 was performed. The results were analysed using descriptive statistical analysis. A literature review was performed regarding the management of patients with AAS secondary to rheumatoid disease. The literature reports a wide range of positive cases in this group of patients with a recent study reporting a positive value of 52.9% [1]. RESULTS: Our results found a surprisingly low positive rate of 5.9% (29 positive out of 489 cervical spine radiographs). CONCLUSION: We propose one flexion view is necessary to identify AAS (as measurements are made in flexion). Only after the positive diagnosis, patients should then have additional investigations performed, in order to reduce unnecessary radiation exposure. [1] Vesela et al. Prevalence of C1/C2 involvement in Czech rheumatoid arthritis patients, correlation of pain intensity, and distance of ventral subluxation. Rheumatol Int 2005;26:12–5.

p1606

An audit of GP referrals of patients with breast symptoms to Oxford Breast Unit – implications of proposed 2 week referral guidelines

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PURPOSE: We offer an open access referral system for GPs for patients with breast symptoms. With the proposed change in referral of these patients to specialist out-patients to meet with 2 week wait targets, we have questioned the necessity of this open access service. We have quantified the numbers of patients referred directly to our unit over 12 months, reviewed the referral patterns, imaging and outcomes. We have quantified the impact on the specialist outpatient services in our hospital, which will have significant man power, delivery of service implications and increased cost per patient referred. MATERIALS/METHODS: A retrospective analysis of primary care referrals to our unit over 12 months. CRIS was used to obtain referral figures, clinical indications, examinations, referral outcomes and diagnoses for these patients. RESULTS: 308 symptomatic patients were referred directly to our unit from primary care. 64 were referred with palpable lump, 142 for pain (2 of these patients had abnormal imaging), 38 referrals were made to the specialist outpatients secondary to the radiological outcomes. 27 went on to have core biopsy/FNA. CONCLUSION: By ceasing our direct access service, we predict an increase in the workload to specialist outpatients by over 300 patients per annum. This will have major manpower, service and cost implications as described. We found that referral is predominately for breast pain, which has a low positive predictive value for pathology. Continuing direct access for primary care in patients with mastalgia may be a feasible option to reduce excess burden for the speciality outpatients.

p1607

MRI requests from general practitioners

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PURPOSE: To evaluate the appropriateness and outcomes of MRI requests from General Practitioners. To see how well the outcomes of GP requests compare with that of clinician requests (taken as standard) for similar clinical problems. MATERIALS/METHODS: 9 months study (June 2005–March 2006) of all MRI requests from GPs to Durham hospital Radiology department from one PCT which included about 30 surgeries. Detailed analysis was performed with regard to the relevance of the requests, viewing the images and radiologist reports and also analysing the reports with regard to clinical relevance. The results were compared with similar outpatient/clinic referrals. RESULTS: 114 studies analysed of 120 requests. Age groups varied between 32 years and 82 years (80% 40–60 years). Male:Female ratio 52:68. The regions of scan included mainly musculoskeletal (spines, knees, shoulder) and Brain. Highest requests were for lumbar spine (61%). History was relevant in 99%. Positive results for musculoskeletal MRIs fell between 72% and 100% with a 8% irrelevant finding. Only 25% of brain scans showed positive results. When compared with 100 requests from outpatient/clinic referrals, very similar outcomes observed in musculoskeletal scans while there was a significant difference with brain scans. CONCLUSION: Most MRI requests from General Practitioners were found clinically appropriate. Most referrals included musculoskeletal disorders with 72–100% positive results. Significant negative results with brain scan requests compared with outpatient/clinic referrals however, the General Practitioners requests produced quicker results and certainly found to be cost-effective overall.

p1608

Awareness of MRI safety factors among hospital clinicans

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PURPOSE: To assess knowledge of MRI safety factors among clinicians in a district general hospital. MATERIALS AND METHODS: Questionnaires were e-mailed to all hospital consultants in the Southern Area Trust. The questionnaire was designed to assess knowledge of factors that may place a patient at risk during an MRI examination or prevent it being performed. RESULTS: 40 (50%) of questionnaires were returned. None of the respondents had received

formal training in MRI. 5% of respondents believed that patients incurred radiation exposure during an MRI examination. 100% were aware that MRI was not safe in all patients and could have fatal consequences. 8% of respondents felt that pregnancy was an absolute contraindication. None were aware that renal impairment could be a contraindication to MRI scanning. 95% knew that pacemaker insertion was a contraindication to MRI scanning. 93% were aware that a history of metal work may place a patient at risk but only 58% were aware that an orbit X-ray would be required to clarify risk in these patients. Only 38% were aware that the timing of sterilization clips, vascular stent insertion and CABG affected risk. CONCLUSION: Knowledge of MRI safety is an important part of clinical governance in risk assessment. The results of this questionnaire survey will be circulated. We are aware that there is a role for further education and plan to produce a simple safety guide for referring clinicians to ensure patient safety.

p1609

An audit of abdominal ultrasound requests

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BACKGROUND: Following the external review of provisions of acute services across Teesside (Darzi recommendation) surgical emergencies were transferred to one of the hospital of the twin hospitals trust. Post re-organisation, the ultrasound requests for study group has increased by 52%, data collected from PACS system [1]. Following the increase in workload this audit was initiated to highlight the appropriateness of requests in accordance with guidelines [2] from the Royal College of Radiologist and to increase awareness among the junior doctors regarding guidelines. METHODOLOGY: With the aid of the CRIS system we looked into all North Tees Surgical inpatient urgent ultrasound requests during January 2007. A total of 86 request cards were reviewed. RESULTS OF THE FIRST AUDIT ROUND: The majority of requests were requested by foundation doctors. 13% requests were inappropriate, not warranting ultrasound investigation. 41% of patients had an ultrasound the preceding month with similar ultrasound findings. Previous results were not considered before re-requesting. On informal inquiry only 10% of Junior Doctors were aware of RCR ultrasound guidelines. According to the Radiologists the majority of requests had insufficient clinical details. RECOMMENDATIONS: (1) Increase awareness among Doctors about the latest RCR guidelines. (2) A definite clinical reason documented on the request. (3) Vetting of the request cards should be rigorous. (4) Re-audit after the implementation of our recommendations. [1] PACS system identified clinical coding for request as UABDO, UABPE. [2] "Making the Best use of a department of Clinical Radiology" - 5th Edition 2003.

p1610

What is the impact of the new nice head injury guidelines on a teaching hospital?

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PURPOSE: The NICE head injury guidelines were updated in September 2007. Their adoption as "best practice" within our trust has lead to changes in referral patterns from A&E. The purpose of this audit was to assess the impact of the updated guidelines on radiology workload and comparison with a similar audit performed in November 2005. We also audited the adherence to the recommendations regarding timing of CT scans following referral. METHOD: Patients presenting to A&E at St Thomas' Hospital during November 2007 were included in this audit. Data were recorded prospectively and included the clinical indications for CT scan, the times from referral to reporting and the outcome of the scan. The indications and times were compared with NICE guidelines and with the results from November 2005. RESULTS: 87 patients with clinical signs meeting NICE criteria had a CT scan in November 2007. 106 patients were scanned in November 2005, representing a 18% reduction in workload between the two audit periods. The median time from referral to report was 29 min (range 5–272 min). 75 patients (86%) had a scan within 60 min of referral. CONCLUSION: Our results confirm that introduction of the updated NICE guidelines has lead to an 18% decrease in workload. 86% of referrals met the guidelines that scan reports should be available to the clinician within 1 h. Efficient implementation of nationally agreed guidelines requires agreement between radiologists and referring clinicians. By establishing effective lines of communication, results of CT scans can be disseminated rapidly and consistently.

p1611

Compliance at the Northern General Hospital: NICE head injury guidelines

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PURPOSE: To determine if all patients who had a CT scan following trauma at the Northern General Hospital were managed by the NICE head injury guidelines 2003 algorithm 3. MATERIALS/METHODS: 102 head Injury patients who entered A&E between January and March 2007 and received a CT head scan were used in this study. A standardized proforma was used to analyse A&E medical notes for head injury criteria and radiology systems were used to determine time of CT scans and skull X-rays. The data were then inputted into a Microsoft Excel programme for analysis. RESULTS: All head injury patients who entered A&E between January and March 2007 did receive a CT Head scan. 62/102 required a scan within 1 h of request according to NICE 2003 algorithm 3, only 21/62 received a scan within 1 h. 11/102 patients required a scan within 8 h of request and this was successfully managed in 10 of these cases. 18/102 did not qualify for a scan but received one. 5/102 also received a skull X-ray which is not in accordance with the NICE guidelines. Overall less than half the sample were managed successfully by the NICE head injury guidelines 2003. CONCLUSION: At present the Northern General Hospital does not successfully undertake NICE Head Injury guidelines 2003.

p1612

Out of hours head CT: are radiology specialist registrars safe to provisionally report?

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PURPOSE: Clinical Governance demands the safeguarding of high standards of care. The increased demand for out of hours CT scanning has led to an increase in the number of head CT examinations that are provisionally reported by registrars. The aim of this audit was to assess whether any discrepancies were occurring in the provisional report and if these affected the patients' outcome. MATERIALS/METHODS: Over a period of 8 weeks, the provisional reports of consecutive out of hours head CT scans were compared with the final report. The discrepant reports were analysed and categorised into minor or major and an assessment made as to the impact on clinical management and outcome. RESULTS: There was full agreement in 152/165 (92%) of examinations. Of the 13 discrepancies, 2 were normal variants overcalled in the provisional report and 7 were categorised as minor misses with no clinical impact. Two of the 4 major discrepancies did not affect the clinical management or outcome and in the remaining 2 cases, although the management was affected, there was no detrimental effect on the patients' outcome. These figures are in line with previously published studies. The audit was presented at the departmental audit meeting and the images of the discrepant cases reviewed. From this a check list of review areas was made for registrar teaching in an attempt to minimize the future discrepancy rate. CONCLUSION: Specialist Registrars are safe to deliver an out of hours reporting service for head CT.

p1613

Are subarachnoid haemorrhage investigated appropriately?

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PURPOSE: Subarachnoid haemorrhage (SAH) can be detected in 98% of CT, when performed in an appropriate timeframe. Lumbar puncture (LP) should be performed for cerebrospinal fluid (CSF) analysis in cases where CT head is negative. This audit investigates compliance with the recommended pathway for investigation in suspected cases of SAH as advised by the British Society of Neurological Surgeons. MATERIALS/METHODS: Cranial CT reports between May and November 2006 were reviewed retrospectively. Suspected SAH cases with negative CT were identified on the hospital pathology system for evidence of LP and CSF analysis. Notes of patients with no CSF results were reviewed to identify reasons why no LP was performed. Results were presented to physicians to emphasise the guidelines for investigation. A re-audit followed as above for July–October, 2007. RESULTS: 1054 CT reports were reviewed, 91 were indicated for SAH. Of these, 11 had SAH, 3 other haemorrhages and 77 were normal. Of those with negative CT reports, 58(75%) had no evidence of CSF analysis. Notes review showed, 6 (21%) had no justifiable reasons documented. Re-audit: 325 CT reports were reviewed, 74 were indicated for SAH. Of these, 7 had SAH, 11 had alternative diagnosis and 56 were normal. Of those with negative CT reports, 34 (61%) had no evidence of CSF analysis. Notes review showed, 2 (4%) had no justifiable reasons documented. CONCLUSION: This audit has demonstrated poor compliance with the standard of investigative pathway for a potentially fatal condition. With simple educational methods, re-audit has demonstrated significant improvement in compliance with the standard investigative guideline.

p1614

Deep venous thrombosis is routine serial ultrasound necessary

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PURPOSE: Ultrasound is accurate for revealing femoral and popliteal vein thrombus but less sensitive and specific for deep vein thrombosis (DVT) confined to the calf. Rescanning within 1–7 days, has been proposed to identify patients who develop extension of thrombosis into the proximal veins. Approximately, 80% of suspected DVT have negative findings on initial ultrasound and require a repeat scan. This audit investigates whether a positive rescan rate of 4%, based on local standards at a tertiary hospital, is currently being achieved at our institution. MATERIALS/METHODS: Serial Doppler ultrasound reports for clinical suspicion of DVT over a 6 month period were reviewed using the hospital computerized radiology information system. Findings from the initial phase of the audit were disseminated to key clinical workers to increase awareness of the pathway for investigating DVT. A DVT algorithm was devised based on a clinical scoring system (Wells score) and the D-Dimer biochemical assay. A re-audit followed an education period reviewing clinical serial Doppler ultrasound rates as above. RESULTS: Serial ultrasound detected above-knee DVT in 2/110 (1.8%) patients. Re-audit revealed that serial ultrasound detected above-knee DVT in 2/33 (6%) patients. CONCLUSION: The pick-up rate for DVT on serial ultrasound was initially too low a yield to justify serial ultrasound routinely. Increasing the awareness of the investigative pathway for suspected DVT has lead to an improvement in pick-up rates on serial ultrasound thus conforming to the standard.

p1615

Service to patients with suspected pulmonary embolic disease improved by introduction of new request form

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KEY LEARNING OBJECTIVES: The British Thoracic Society (BTS) published guidelines for imaging of pulmonary embolic (PE) disease in 2003 outlining the clinical information to be supplied on radiological request forms including an assessment of the clinical pre-test probability, the interpreting a contemporaneous chest X-ray (CXR), and the d.dimer result if clinically relevant. Can we improve service to patients by following these guidelines? DESCRIPTION: 50 consecutive requests forms for CTPA examinations in 2003 were assessed for compliance with the guidelines. The time from request to scan was also documented. A new request form was designed and distributed. After 1 year of use a second audit was performed to ascertain any improvement in service. The number of documented pre test probabilities rose from 2% to 68%. Appropriate and documented d.dimer results were unchanged, 58% to 60%. The assessment of a recent CXR rose from 32% to 64% but accuracy of interpretation fell slightly from 87.5% to 75%. The number of request forms providing all relevant information rose from 2% to 52%. The number of scans performed within 24 h rose from 58% to 88%. In turn the number performed with 48 h fell from 22% to 6% and those taking longer than 48 h fell from 20% to 6%. CONCLUSION: The new request form ensures that the radiologist is provided with the essential information to enable swift and accurate prioritising of patients for imaging of suspected PE. As a result we have been able to considerably improve our service to the patients.

p1616

Incidental adrenal adenomas: are we doing the right thing?

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KEY LEARNING OBJECTIVES: To evaluate the local practice of reporting incidental adrenal masses. METHOD: The initial report of adrenal adenomas picked up incidentally on CT or MR between January and December 2006, at the Royal Liverpool University Hospital, was looked at retrospectively. The contents of the initial report were analysed for documentation of the need of biochemistry assessment, size, morphology, HU or signal drop of the lesion, and follow-up imaging. DESCRIPTION: 56 CT and 31 MR adrenal scans were analysed. Female to male ratio was 38:49, mean age of 55 years. 40 scans were carried out as follow-up investigations of a previous incidental finding. Adrenal masses picked up as part of abnormal biochemistry work-up or if malignancy was suspected were excluded. The National Institutes of Health (NIH) Consensus Development Panel on Management of the Clinically Inapparent Adrenal Mass (2002) was referred to as a standard. Differences emerged when compared with standard: biochemistry investigations were suggested in only 37.5% of cases, morphological description was documented in 42.5%, size of the lesion was measured in 87.5% and HU/signal drop were documented in 40%. Follow-up imaging was advised in 67.5%, although the majority did not specify a time interval. Follow-up imaging suggested varied between CT (42.5%), MR (27.5%) and ultrasound (5%). 17.5% of scans were requested by clinicians despite contrary advice given by the reporting radiologist. CONCLUSION: In the absence of official UK national guidelines, we propose recommendations for reporting of incidental adrenal adenomas to advise appropriate management aimed at eliminating unnecessary over-investigation.

p1617

Envisaging a role for intravenous urography (IVU) in the era of CT based investigations of urinary tract

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PURPOSE: We assessed the usefulness of intravenous urography (IVU) at a time when CT urography and unenhanced renal CT are becoming increasingly popular. MATERIALS/METHODS: 61 consecutive elective IVUs performed in a 3 month period were identified from institutional radiology information system. Protocol included a control film followed by injection of 100 ml of the contrast. Sequential films were obtained till complete visualisation of the renal tract or up to 24 h whichever was earlier. Mean effective dose for IVU at our institution is 0.9 mSv. RESULTS: There was an almost equal gender distribution with an age range of 19–87 years (mean 54 years).

Mean duration from request to examination was 29 days (range 0–101 days). The most common indication was for calculus disease (39%). IVU was performed as a follow up study in 28% cases. 12 patients had non-obstructing calculi with further four showing varying degrees of calculus obstruction. 38 (61%) patients had a normal study and did not require further investigations. Only two patients underwent unenhanced renal CT following the IVU. In neither case, significant additional information was obtained. CONCLUSION: IVU is a good screening test for investigating the urinary tract. Although various low dose renal CT techniques have been described, many centres still use high mA protocols. In 97% patients, high dose CT examinations were avoided. In a patient group with a mean age of 54 years, including 36% females of reproductive age, this represents substantial dose saving which could translate into reduced cancer and genetic risk.

p1618

Management of reactions to intravenous contrast/ knowledge of the Royal College of Radiologists 2005 guidelines

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KEY LEARNING OBJECTIVES: (1) Patient survival depends on prompt initial management of contrast reactions which are infrequent but a high impact risk management issue. To demonstrate the knowledge of first-line management of acute severe/life threatening reactions to iodinated contrast in the radiology department [1]. (2) All radiologists must possess knowledge of optimal management of acute severe iodinated contrast reactions. All radiographers/assistants and nurses must be aware of the location of resuscitation equipment and crash number. DESCRIPTION: A single day audit of all relevant staff present in department involved a questionnaire filled in on the spot. There were separate forms for radiologists and radiographers/ RDAs/nurses. Radiologists data (16 forms: consultants n=7, registrars n=9). Radiographers/RDAs/nurses data (20 forms: radiographers n=17, RDAs n=2, nurse n=1). CONCLUSION: Severe reactions witnessed by 31% of radiologists. 63% Radiologists were aware of the imtravenous contrast administration RCR 2005 guidelines [2]. Only 31% of radiologists felt confident in managing a severe contrast reaction. Radiographers' knowledge of location of equipment was satisfactory, although specific management in contrast reactions can be improved. The recommendations are for regular training for all staff in management of reactions to iodinated contrast medium, display of the Royal College of Radiologists guidelines in rooms where contrast media are used and re-audit after training. [1] Thomsen HS, Morcos SK, et al. Management of acute adverse reactions to contrast media. Eur Radiol 2004;14:476–81. [2] Standards for Iodinated Intravascular Contrast Agent administration to adult patients: Royal College Radiologists: July 2005.

p1619

Image guided biopsies at a cancer centre, comparison of two audits

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PURPOSE: We present the results of two audits performed at a large cancer centre. The aim was to evaluate the department standards in line with the RCR national standard of 80% diagnostic yield. MATERIALS/METHODS: First audit was conducted in 2002 and a re-audit was performed in 2006. Data was collected retrospectively over a 12 month period. 111 and 147 results were available in 2002 and 2006, respectively. RESULTS: Core biopsy rate was 30% in 2002 and 57% in 2006, while FNA rate was 70% in 2002 and 43% in 2006. The 2006 audit showed that out of 147 biopsies, 79% were performed under ultrasound and 21% under CT guidance. Different needle sizes were used ranging from 18 to 25. Major biopsy sites were thyroid, liver, neck, followed by abdomen and chest. The results were malignant in 71%, non-diagnostic/insufficient in 14%, benign in 13% and suspicious in 2% cases. Diagnostic yield was taken to include all positive malignant and benign results. Diagnostic yield was 81% in 2002 and 84% in 2006. CONCLUSION: National standard for diagnostic yield were met for both core and FNA biopsies. There was no difference in results for FNA and core biopsies. Moreover, for FNA there was no difference in success rate between size 25, 23 and 21 needles. FNA in a centre with a dedicated cytology service is a cheap, quick and effective day case procedure. Coagulation profile check is not a pre-requisite to FNA, although anticoagulant treatment remains a contraindication.

p1620

Auditing compliance with an additional MRI safety questionnaire for MR contrast

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PURPOSE: Patients with renal impairment undergoing MR studies with gadolinium-based contrast agents are considered to be at risk of developing nephrogenic systemic fibrosis, a rare but potentially fatal condition. An updated MR safety questionnaire were introduced after new guidelines were introduced to detect patients at risk. Specifically, contrast administration is contraindicated in patients with eGFR <30 ml min^{-1}. Patients with no available blood results should be asked for a history of diabetes or renal disease and the answer to these questions recorded. A negative response makes unsuspected severe renal disease highly unlikely and it is considered safe to proceed. MATERIALS/METHODS: The records of 100 consecutive patients receiving gadolinium-based contrast were reviewed, in a period spanning 3 months after the guidelines were updated in June 2007. RESULTS: Of the 100 patients, a serological estimate of renal function during the preceding 6 months (eGFR or serum creatinine) was available in 44. Of the remaining 56, in only 10 was the absence of diabetes or renal disease clearly documented in the patient record. In no patient was contrast witheld because of a known eGFR<30 ml min^{-1} or on the basis of the updated questionnaire. CONCLUSION: Despite recent guidance, a clear record of adequate renal function and the absence of diabetes or renal disease was only clearly documented in 54% of cases. As a result, our electronic request form for MR investigation, the requesting and recording of renal function data and the patient safety form have been revised.

p1621

Head and neck cancer service meets national targets

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PURPOSE: The 'NHS Cancer Plan' and NICE 'Improved Outcomes Guidance for Head and Neck Cancer' contain guidance for efficient cancer service provision. Local previous audits identified delays in management of patients with suspected head and neck cancer. Subsequent changes in work patterns included fast access to clinics, imaging/biopsy and histopathology. A re-audit of local service provision was undertaken to assess trust compliance with proposed national targets. STANDARD: 14 days wait for outpatient appointments for suspected cancer; 31 days wait from diagnosis to treatment; 62 days wait from urgent referral to treatment; Imaging performed timely to meet above targets. METHODOLOGY: 209 Patients were referred for suspected head and neck cancer in 2006 (194 referred urgently as '2-week-waits', 15 patients diagnosed with head and neck cancer from other referral routes). Data compiled after review of patient notes included details of management pathways and the timeframe within which these took place. RESULTS: Of 194 patients only 2 breached the 2 week target. Imaging was utilized in 90 (of 209) patients and in no instance delayed management. Breaches of other targets were recorded in 5 (out of 50) cancer patients, due to delayed treatment or complex diagnostic pathways. CHANGES: Whilst changes planned on regional level will positively affect local services, current local service provision for head and neck cancer is efficient following

changes instituted in 2005. Access to imaging is very satisfactory. Re-audit is planned once regional changes in surgical and radiotherapy provision have been instigated.

Audit Electronic Poster

e1622

Radiology led fast track chest X-ray referral service: an audit of service and outcome

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PURPOSE: (1) Assess the accuracy of fast tracked CXR (Chest X-Ray) referrals to the Chest Clinic. (2) Evaluate service delivery and patient journey time to diagnosis. (3) Determine clinical outcome of referrals. METHOD: 143 CXR referrals over a 23-month period are included. Data regarding the index CXR abnormality, the corresponding Chest CT findings and the final clinical/pathological outcome were collated. Accuracy of the initial radiographic diagnosis was ascertained by correlation with CT findings. Service delivery data of door-to-door times of CXR to CT were evaluated against Cancer service guidelines. RESULTS: Of the 143 CXRs (n=143) referred, 132 had a CT scan. Of these 132, 117 CTs (89%) showed abnormalities, of which 78% were concordant with the index CXR abnormality. 70% patients had their CT performed within 2 weeks of the CXR; 80% within 4 weeks; the remaining 20% experienced delays >28 days. Delays in CXR to CT times beyond 28 days were largely attributed to delays in CXR reporting. 55/143 CXR referrals had a histologically proven malignancy. CONCLUSION: The Fast Track CXR Service is a useful model, approximating a 40% malignancy hit rate. Radiographic-CT correlation is high and justifies this system of referrals. If we achieve CXR to CT times of <2 weeks (70% referrals in this study) we minimize patient journey time significantly. Any breaches beyond 28 days can have an adverse impact on the journey time to diagnosis. Analysis of reasons for delays in this sub-group has allowed us to institute service improvements.

e1623

Audit of primary care open access MRI spine examination

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PURPOSE: To evaluate (1) the referral pattern for MRI spine from the primary care, (2) compliance with RCR enabled acess guidelines, (3) correlation of clinical history and MRI findings, (4) justification of the continued provision of service. MATERIALS/METHODS: Retropective analysis of all MR spine performed over 24 month period (January 2004 to December 2005) across UHL. Patient list, clinical details and MR report obtained from radiology information system – CRIS. Correlation of clinical information and MRI findings from the MRI report. RESULTS: Total 315 examinations (144 males). Age range 17–87 years (mean 52 years). 52% were between 41 years and 60 years. The MRI scans performed were Lumbar 72%, thoracic 4%, cervical 18%, whole spine 2%. Cllinical indications included degeneration (76%), metastasis/primary malignancy (12%), infection (2%), trauma (1.5%), osteoporotic collapse (3%) and in 4% no clinical details were documented. Only 34 (11%) had plain X-ray prior to MRI. MRI findings were degenerative spine disease 94%, malignancy/metastasis 2%, infection 1% and osteoprorotic collapse 3%. 8% had normal findings. 2% were cancelled. Incidental findings included spondylolisthesis, ankylosing spodylitis, chronic sacroilitis, arachnoid cyst, haemangiomas etc. 38% (115) of the referrals were compliant with the enabled acess guidelines. MRI findings correlated with clinical impression in 31% (93). CONCLUSION: Majority of the referral is for degenerative spine disease. This study indicates the need for more awareness of the guidelines amongst the referer and provision of more clinical information to the radiologist. There is also a need for continued provision of service with more robust vetting service and further education of the referer. Future reaudit is recommended.

e1624

Magnetic resonance imaging claustrophobia – an audit of good medical practice

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PURPOSE: To assess the incidence of MRI claustrophobia and find out if alternative imaging has been suggested by the radiologist in keeping with GMC's good medical practice. MATERIALS/METHODS: We looked at the amount of MRI scans that had been performed in a University Hospital between November 2004 and November 2005 and calculated the incidence of MRI claustrophobia. The following details including age, gender, area scanned, inpatient/outpatient status, and consultant or GP referral were recorded. We also found out whether MR claustrophobia was documented in the patients computed radiology records and alternative imaging offered. Interestingly, no particular MR coil had a significantly higher incidence of claustrophobic reaction when compared with others. RESULTS: A total of 10 003 scans were performed in 3 MR scanners in the above period. 22 cases of MR claustrophobia were identified. There was equal sex incidence and the median age was 62 years. It was seen that the majority of the patients were outpatients. While all the cases of MR claustrophobia were incorporated in that particular event's report, only 3 cases were actually recorded on the ALARMS system (patients computed radiology records which would help in future to opt for alternative imaging instead of MRI). 16 out of the 22 patients were offered alternate imaging. CONCLUSION: This audit is aimed to remind the radiologists to offer further imaging for patients with MRI claustrophobia whenever possible as that is part of our duty outlined by GMC.

e1625

The barium meal – where are we now?

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PURPOSE: The barium meal (BM) is an investigation performed to evaluate the upper gastrointestinal tract (GIT). The number of BMs performed by trainees is declining annually. A combination of decreasing demand for a 2nd line investigation, and escalating SpR service and training demands reduces experience. Is this detrimental to the quality of provision? MATERIALS/METHODS: 224 BM investigations over a 6 month period from 1 January 2006 were evaluated. A comparison of yield and radiation dose of examinations performed by SpRs and consultants was assessed. RESULTS: 224 patients (147:77 F:M) were examined. The mean number of annual examinations performed by trainees (n=18.5 full time equivalent) is 8–9, and for consultants (n=2) is 146. Insignificant findings of reflux and hiatus hernia were excluded for the purposes of statistical analysis. Yield was 8.2% for consultant examinations, and 7.9% for trainee examinations (p<0.001). Average effective radiation dose was 0.6 mSv for consultants versus 1.2 mSv for trainees (p<0.001). CONCLUSION: There is no significant difference in yield of pathology despite significant differences in experience and number of examinations performed. Despite the average effective dose being double for an examination performed by trainees it was within the recommended typical effective dose of 2.6 mSv.

e1626

Guided lung biopsy. Analysis of complications, diagnostic rate, and waiting times. a change in expectations

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KEY LEARNING OBJECTIVES: A review of lung biopsy in our centre with analysis of complications and diagnostic rate and comparison with British Thoracic Society (BTS) guidelines. We also note waiting times for biopsy and discuss the increased pressure to perform these procedures quickly. DESCRIPTION: This is a 7 year audit of CT guided lung biopsy. We have retrospectively reviewed

the case notes of 161 patients and have analysed our data to show a pneumothorax complication rate requiring treatment of 3% and a diagnostic rate of 85%; both within expectations according to BTS guidelines. We have also reviewed bed-stay time and show that 95% of cases stay in hospital for less than 24 h, the majority (75%) being admitted and discharged as day cases. Most importantly, we review the waiting time for this procedure in our institution (7 days in 2007), and show how rising expectations have resulted in a falling waiting time for biopsy since the inception of the service in 2000. We also review the waiting time post biopsy for the patient to be reviewed in clinic or by multidisciplinary meeting (8 days in 2007) and demonstrate how these have also decreased significantly over the period of the study; over 90% now seen within 2 weeks of biopsy. CONCLUSION: We review BTS lung biopsy guidelines and compare our data with them. We analyse waiting times and show that despite increased pressure, the wait for the X-ray procedure is not the most significant in the patient pathway.

Digital Imaging and Health Informatics Poster

p1701

What clinicians really think about PACS

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PURPOSE: To investigate clinicians' expectations of PACS prior to its introduction, and to assess the extent to which this technology met expectation. MATERIALS/METHODS: Questionnaires were sent just before PACS was adopted to all non-radiological consultants in the Trust, using a visual analogue scale (VAS) to assess (1) adequacy of information provided prior to introduction, (2) whether consultants were adequately consulted in advance, (3) whether PACS would make access to radiology images easier, and (4) make the hospital more efficient. Comments were invited about anticipated problems after introduction. Repeat questionnaires have been sent concentrating on issues (3) and (4) above and seeking suggestions for further improvements in the quality and efficiency of the PACS solution. RESULTS: There was a 61% response rate to the initial survey. Clinicians were not generally impressed about the information received (VAS 51/100) or about the adequacy of consultation about the introduction (same score), but were positive in anticipation that PACS would make access to radiology images easier (71/100) and make the hospital more efficient (72/100). The most common anticipated problem was IT failure (27% respondents). CONCLUSION: Clinicians felt they had not had adequate information or consultation about PACS introduction but were generally positive about expected benefits. Review data show continuing high acceptance levels.Two years on, PACS has proved reliable, with no unplanned downtime in the core network.

Digital Imaging and Health Informatics Electronic Poster

e1702

Health effects of digital imaging: what radiologists need to know

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KEY LEARNING OBJECTIVES: To describe the adverse health effects of digital imaging and highlight the steps that we can take to minimize these adverse effects. DESCRIPTION: Lack of attention to ergonomics, while designing a radiology reporting area, not only decreases efficiency and productivity but can cause harm to the user, in the form of visual and musculoskeletal problems. We discuss the various factors involved in minimizing these adverse effects which include lighting, positioning, monitors factors and planning and designing of the reporting area. Interactive video clips and images are included to understand these concepts. CONCLUSION: Understanding the ergonomics in relation to digital imaging is extremely important. Appropriate planning and designing a reporting area is crucial to minimize work related illnesses and to increase productivity.

e1703

An audit tool for GE Centricity PACS

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PURPOSE: To present methods of using GE Centricity PACS (V3.02) log files for audit and incident investigation. MATERIALS/METHODS: General Electric Medical Systems provide the Trust with a daily log file of PACS activity including login activity and examinations viewed. This is recorded in eXtensible Markup Language (XML) files. The work had three phases: develop and test robust, automated methods for importing GE Centricity PACS log files into a relational database management system; write a set of queries in Structured Query Language (SQL) to answer relevant clinical questions; develop a simple interface to allow a user to adapt and run these queries. RESULTS: The tool was used to audit activity on clinical and reporting workstations looking at exams viewed, number of logins and number of users. Three clinical workstations and four reporting workstations were being underused. Clinicians are being consulted to identify more convenient locations. Workstations in communal reporting areas were used more effectively. To comply with Information Governance requirements, the tool is being used to monitor failed login attempts and to identify suspected session sharing. CONCLUSION: A method for auditing GE Centricity PACS is essential for ensuring PACS hardware resources are well deployed, maintaining Information Governance standards and investigating incidents.

e1704

Voice recognition reporting. Does the right hand know what the left is doing?

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PURPOSE: Since December 2004, voice recognition (VR) has been the sole means of reporting in our institution. VR-reporting requires integration of a handheld microphone with the keyboard/mouse-controlled PACS. Studies are opened and navigated with the mouse. Reports are generated and corrected via the microphone buttons or with voice commands with minimal keyboard use. Optimal efficiency requires simultaneous use of both devices. Radiologist adaptation to this challenge was evaluated and correlated with handedness. MATERIALS/METHODS: Radiologists were observed during routine reporting and the hand(s) used for microphone and mouse-control recorded. Subsequently, a questionnaire established participant (writing) handedness. RESULTS: 48 radiologists (31 male, 17 female) were observed. The study group comprised 45 (93%) right-handed (RH) and 3 (6%) left-handed (LH) individuals. 35 RH individuals used the mouse in their dominant hand with the microphone in the left. Eight RH individuals alternated both in the dominant hand. One RH individual and all 3 LH individuals used their left hand for mouse-control and right for dictation. CONCLUSION: Some operating systems allow reversal of mouse button functions for LH individuals. The hand-held microphone can also be configured for use in either hand, theoretically permitting efficient two-handed use of the VR/PACS by both RH and LH subjects. When presented with two devices normally used in the dominant hand, the majority (81%) adapted by retaining the mouse in their dominant hand with the microphone in the non-dominant hand (irrespective of handedness). A small number (perhaps strongly right-dominant individuals) used both devices in the same hand, with possible efficiency implications.

e1705

Can liver volume prior to hepatectomy be accurately measured on a standard PACS workstation?

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PURPOSE: A major factor in mortality and morbidity following hepatic resection is the volume of the future liver remnant (FLR).

A measure of the FLR is required prior to hepatic resection. Liver volumes are usually calculated on a CT workstation. Given the current volume of CT examinations, each study may only be available on the workstation for up to 2 weeks. Also as a tertiary referral centre, external CT studies are received for assessment of surgical suitability. Hence, we need to determine the accuracy of measuring liver volumes on PACS compared with the gold standard of a CT workstation. MATERIALS/METHODS: A prospective study initially involving patients referred for potential hepatic resection but subsequently including other patients undergoing abdominal CT, to a total of 50 patients. The liver volume of the FLR or in non-hepatic resection patients, the volume of segments 1–3 was measured on the Siemens CT workstation with Syngo software. The same radiologist then measured the volume on a Philips EasyVision PACS workstation using with SECTRA software. This was performed by manually outlining the area on each slice at 1 cm intervals and calculating the sum of areas (volume = length × breadth × height). The two volumes were compared. RESULTS: To date 10 patients' liver volumes have been measured with good correlation. Work is in progress for the remaining patients. CONCLUSION: As liver volume measurements dictate potential suitability for hepatic resection, it is important to assess whether volume calculation on PACS gives an accurate measurement compared with specific CT volume software.

e1706

Double reading of brain MR. 12-month results

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KEY LEARNING OBJECTIVES: To achieve highest diagnostic accuracy, reduce incidence of errors, and attain high level of clarity and comprehension of the reports. DESCRIPTION: TMC provides teleradiology for hospitals throught Europe. Radiologists from several European countries report on adult outpatient examinations, performing 100% Double Reading (DR). We have retrospectively reviewed DR done in 2006 by 8 experienced Neuroradiologists. Our protocol defines 5 grades of Disagreements: Grade 0: full agreement. Grade 1 – minor: changes with no clinical consequences. Grade 2 – moderate: changes made unlikely to have significant clinical consequences. Grade 3 – significant: changes with potential clinical significance. Grade 4 – different interpretation: high potential for clinical consequences. For Grade 0, the report issued by the first reader was approved. For Grade 1, changes introduced by the second reader were considered as definitive. For Grades 2–4, changes were communicated to the first reader for discussion. When no consensus was achieved, the Section Leaders decided the final diagnosis. Out of a total of 12 176 reported brains most disagreements were of no clinical consequence (65.93% Grade 0; 22.86% Grade 1; 6.71% Grade 2). Clinically important disagreements were only 4.50% (4.14% Grade 3; 0.36% Grade 4). We categorize errors as hypo-concentration errors ("slip-mistakes"), radiologist expertise-dependent errors (misinterpretation) and oversight omissions. CONCLUSION: Systematic and controlled DR lowers errors/mistakes, improves reporting skills and is an important tool for sharing experience. It also provides for better communication among radiologists and with the referring physicians. Ultimately, most discrepancies were simply due to different reporting styles.

Equipment Performance and Radiation Protection Electronic Poster

e1801

Mimicking the chest radiograph: patient equivalence of the CDRH chest phantom with added insert

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PURPOSE: To evaluate medical X-ray doses and image quality, so called phantoms that mimic particular aspects of the patient are used. The Centre for Devices in Radiological Health (CDRH) chest phantom has been used for studies of radiation exposure to the lung fields. A modified version has been reported with the introduction of a quasi-anatomical insert to create contrast between chest organs. Direct comparison of the phantom performance with clinical chest images has not been reported. This study applies the phantom to conventional radiography imaging of the chest to establish patient equivalence. MATERIALS/METHODS: Entrance surface dose (ESD) and beam transmission were monitored for 77 patients undergoing were compared with similar variables obtained by exposing the CDRH phantom under similar conditions. TLDs were used for all dose measurement, and doses included backscatter. Optical density was measured with an X-rite® 311 digital densitometer. RESULTS: Mean ESD is about 13.5% (AEC) and16.5% (manual) higher for the phantom than patient ESD values. Optical density differences in the lung area were 29.9% higher in CXR than the phantom films. Mean values of OD for the clinically important mediastinum vary by 32.8% for AEC exposure. Mean beam transmission and the intensity of the transmitted beam for both patients and phantom are in good agreement in both AEC and manual exposures. CONCLUSION: The phantom mimics the chest radiograph of an average patient to good approximation. This justifies its utility in QA programmes in chest radiology. Differences should however be accounted for in using the phantom.

e1802

Primary beam shielding. Are lead backstops necessary for ward radiography or is the wall adequate?

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PURPOSE: To analyse the amount of primary beam radiation transmitted through internal hospital walls at energies consistent with those used in mobile X-ray examinations. MATERIALS/METHODS: Three walls of different construction (brick, Gypsum plasterboard type 1) of 12.5 mm Gypsum plasterboard type 2 of 12.5 mm) were identified in areas where mobile radiography was commonly carried out. Under controlled conditions, using a mobile X-ray unit (GE-Medical AMX4) these walls were exposed to primary beam radiation. Primary beam wall-entrance and wall-exit intensity was measured using calibrated dosemeters at kV commencing at 60 stepping through to 120 in 5 kV increments. Random error was minimized by averaging 4 readings at each kV. mAs remained constant for all exposures (5). Source to wall distance remained constant at 100 cm. RESULTS: The results showed a direct relationship between kVp and the amount of transmission. None of the walls fully attenuated the primary beam through the full range of kV. The brick wall had the highest level of attenuation with a mean transmission over the kV range of 0.01%. Plasterboard 2 transmitted a high level of radiation at 15.70% with Wall 2 transmitting a medium level of radiation at 0.91%. Using ANOVA the results were found to be statistically significant ($p<0.0005$). CONCLUSION: No type of wall assessed in the experiment offered full attenuation of primary beam radiation as wall types transmitted a measurable amount of radiation. Consequently backstops should be used for mobile X-ray examinations when the primary beam is directed to an internal hospital wall.

e1803

The potential of copper filtration as an effective tool in the optimization of paediatric X-ray examinations

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PURPOSE: Children are more vulnerable to the harmful effects of radiation than adults and therefore every effort should be made to keep radiation doses as low as reasonably achievable. One effective dose-reducing tool for paediatrics is additional filtration. This anthropomorphic phantom-based study explores use of additional filters for the radiographic anteroposterior pelvis examination. MATERIALS/METHODS: Image quality using a visual grading analysis was assessed and entrance surface (ESD) and effective doses (ED) were measured with the existing inherent level of filtration for 0, 5 and 15-year-old paediatric phantoms. A range of aluminium,

compound and copper filter types and thicknesses, totalling 23 combinations, were added to the inherent filtration and changes to image quality and radiation dose were monitored. RESULTS: Results showed statistically significant ($p<0.05$) decreases in ESD by up to 62.9%, 56.4% and 55.0% and ED by up to 46.4%, 36.1% and 28.7% for the 0, 5 and 15-year-old, respectively, when particular filtration types were added, compared with the current level of filtration. No significant degradation in image quality was noted. CONCLUSION: Despite compound filters offering marginal benefits over copper, 0.3 mm copper filtration is recommended for clinical trials due to reduced physical thickness. Results demonstrated that additional filtration in excess of current recommendations may offer important benefits for children undergoing this radiographic examination. A clinical based study is now required.

e1804

Computed radiography quality assurance - a review of data for Kodak, Agfa and Philips systems

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PURPOSE: The aim of this work is to review performance test results on computed radiography (CR) systems according to the parameters contained within the current UK test protocols published by IPEM and KCARE. Analysis of system properties, in particular dose detector indicator (DDI) response with respect to imaging plate (IP) receptor dose is included. Comparisons have been made with manufacturers' published data. The CR systems analysed comprise Kodak, Agfa and Philips units. MATERIALS/METHODS: Conventional diagnostic X-ray sources and physics test objects have been used in conjunction with calibrated Keithley TRIAD and Radcal quality control equipment in order to test the CR readers sequentially over a 2-year period. RESULTS: Even within the same reader model and manufacturer subset, CR system performance data for many readers in the sample shows a wide range of performance results. Furthermore, when considering dual DDI parameters of a single system, such as Agfa SAL and LgM numbers, the calculated IP dose has been found to differ even on a single reader. Parameters such as dark noise are difficult to assess between systems, owing primarily to a large portion of the sample processing low or unexposed plates as high signal (bright) images, and the remaining portion operating in the converse manner. CONCLUSION: The results support the case for carrying out local checks on CR readers. New proposed standards from the scientific community based on establishing an independent DDI and a common radiographic beam quality are welcomed in order to further investigate this subject.

e1805

Dose audit in a direct digital radiography department: new standards and investigation levels

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PURPOSE: The aim of this study is to review dose data for all common torso examinations delivered in a direct digital radiography (DDR) department over a continuous 18-month period. MATERIALS/METHODS: Output data for 6 Philips DDR installations has been obtained according to current national protocol, and entrance surface doses (ESDs) subsequently calculated using the kVp and mAs values for each examination event logged in the RIS. The subroutine employed assumes standard focus-to-skin distances and nominal backscatter factors from the literature. Over 85 000 individual examination events have been supplied – the most common torso examinations comprise approximately 50 000 data within this 18-month sample. The results are stored in a single SQL database with Excel and Statistica connecting to it. RESULTS: ESD results have been analysed in terms of their mean and standard error in line with the guidance stated in IPEM Report 88. Furthermore ESD, kV and mAs values for the respective exams have been charted with respect to time in order to investigate those examinations most susceptible to exposure creep in the DDR environment. CONCLUSION: Dose audit through the RIS is possible and efficient. Local DRLs can be established using RIS data and survey information specifically for the DDR department. A report template showing the kV, mAs and dose parameters provides the radiation protection supervisor with a clear standard for dose audit. The approach taken through RIS shows that a large patient dose database can be established and analysed with great precision according to several parameters.

e1806

Dose–area product levels for patients undergoing fluoroscopy in a London teaching hospital compared with national standards

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PURPOSE: A retrospective single centre study has been performed to assess dose–area product (DAP) values in patients undergoing fluoroscopic examinations and to see how these compared with national reference doses. METHODS: DAP measurements for 1400 examinations performed in a dedicated fluoroscopy room over a period of 12 months were analysed. The effect on mean DAP value was correlated with factors such as when new staff started, how this changed with experience, and during training for FRCR part 1, how dose compared between radiologists and non-radiologists, and, what happened to the dose as time from passing FRCR 1 increased. RESULTS: The overall results demonstrated that the DAP for all studies was substantially lower sometimes by a factor of up to 50% of the current national reference doses (NRDs). There was a slight increase in mean dose around the time of new staff intake which then demonstrated a gradual decrease as operator experience and radiation protection awareness increased during the training period for the FRCR part 1. This was sustained for a period of time approximating 5 months after which the levels rose until a sharp rise corresponding to the new intake of registrars. CONCLUSIONS: The low DAP values in all examinations demonstrate the substantial reduction in dose and consequent risk that is usually achieved. This is further optimized by increased radiation protection awareness and training. The fact that national reference doses are much higher than those achieved by even the most inexperienced staff perhaps indicate that these need to be reviewed.

e1807

A comparison of radiation doses from Babygrams and neonatal chest and abdomen X-rays

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PURPOSE: When both a chest and abdomen X-ray are required on a neonate then a Babygram has routinely been carried out. This involves producing a image which includes the chest and abdomen in a single exposure. Concerns were expressed about the image quality of the chest and abdomen regions of the Babygram compared with separate X-rays. This prompted an investigation into the difference in dose received from the Babygram and separate chest and abdomen X-rays. MATERIALS/METHODS: Dose–area product (DAP) values for the three examinations were calculated from machine output data and beam areas measured from a sample of 12 Babygrams, chest X-rays and abdomen X-rays. Conversion factors published by the NRPB for neonates were used to convert the DAP values to effective dose for the chest and abdomen X-rays and also for the Babygram. RESULTS: The calculated effective doses for a Babygram, chest X-ray and abdomen X-ray were 8.9 μSv, 5.7 μSv and 6.2 μSv, respectively. A baby receiving separate chest and abdomen X-rays would therefore receive a dose of 11.9 μSv, an additional 34% compared with a Babygram. The absolute risks associated with these doses were also calculated. These were balanced against the significant image quality gain from separate X-rays. It was still considered justifiable to change practice and to perform separate chest and abdomen X-rays in future. CONCLUSION: The Babygram is convenient and gives a lower radiation dose. However the image quality is poor and taking this and the absolute risks into account separate chest and abdomen X-rays are recommended.

e1808
Computed radiography image quality optimization

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PURPOSE: To optimize CR image quality across 5 Trusts. MATERIALS/METHODS: CR technology is not new, but since the creation of NHS CfH, has become widespread throughout the NHS in England. However, it would appear that there remains some dissatisfaction amongst radiographers with the technology and the quality of images it produces. In 2007 a pilot Radiology Network was established in Kent and Medway involving 5 acute Trusts, the SHA and NHS CfH. One of the elements within the pilot was the creation of a cross-organization Best Practice Forum. This forum was tasked with optimizing the image quality of the CR across the area. An initial audit identified areas of concern and the forum quickly established that a multi-stranded approach was necessary with input from Medical Physicists, radiographers, radiologists, technical specialists and suppliers (Carestream). Over a period of 6 months work was undertaken with all these groups resulting in a wide-ranging set of recommendations covering aspects such as radiographic technique, image processing algorithms and routine care and maintenance. RESULTS: Agreements reached on standard approach to hardware and software configuration. Educational materials for radiographers produced and refresher training carried out. Guidance documentation produced CONCLUSION: CR optimization requires a multi-factorial approach in order to succeed.

MR Imaging and Spectroscopy Poster

p1901
Clinical applications and benefits of a 3D turbo spin echo isotropic sequence (space)

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KEY LEARNING OBJECTIVES: This poster describes the clinical applications and benefits of using the SPACE (Sampling Perfection with Application optimized Contrasts using different flip angle Evolution) sequence – a high resolution, sub millimeter, fast 3D TSE acquisition. DESCRIPTION: SPACE is a 3D turbo spin echo sequence offering T_2, T_1, STIR, Proton Density and Dark fluid weighted images with high resolution and isotropic voxels, allowing multiplanar reconstructions (MPR) in any plane. SPACE can be used in all areas of the body with multiple channel coils, partial fourier, high turbo factors, and GRAPPA (parallel imaging) allowing reduced scan times. Reduction in specific absorption rate (SAR) is achieved using lower flip angles. SPACE can be used for neuro, body and orthopaedic applications, potentially allowing a reduction in total number of sequences performed by replacing multiple 2D acquisitions, improving workflow and allowing physicians to view anatomy in any orientation. This poster will provide examples of clinical applications where this technique can be used. CONCLUSION: SPACE is now a commercially available product allowing improved workflow and patient throughput, and adding significant clinical information by allowing MPRs to be produced in any orientation.

p1902
Clinical applications of time resolved contrast enhanced magnetic resonance angiography (TWIST)

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KEY LEARNING OBJECTIVES: This poster will describe the technical and clinical aspects of TWIST (Time resolved angiography With Interleaved Stochastic Trajectories), providing examples of applications where this technique can be utilized and demonstrating the benefits over conventional contrast enhanced MRA. DESCRIPTION: The TWIST sequence is a modified 3D T_1 weighted Gradient Echo sequence providing high resolution images during the passage of contrast agent with significantly improved temporal resolution. TWIST uses a scheme whereby the outer lines of K space are visited less frequently allowing the time to be shortened between subsequent central regions of K space. This results in an apparent increase in temporal resolution and allows smaller doses of contrast agent to be used. TWIST can be used together with parallel imaging (iPAT) and inline technology to produce automatically subtracted MIPS (Maximum Intensity Projection) over time, comparable to digital subtraction angiography (DSA). TWIST can be used to provide dynamic information for better detection of vascular diseases such as arterious venous malformations and shunts. The haemodynamics of a vessel can also be visualized allowing better assessment of diseases such as peripheral obstructive artery disease (POAD), subclavian steal and aortic dissections. In addition, venous contamination can be eliminated in cases of acute peripheral vascular disease. CONCLUSION: TWIST is now a commercially available product which can be used to display the dynamics of a vessel with high spatial and temporal resolution.

p1903
Lava or grass; dont make a desicion in haste

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If you think you have enough knowledge about MRI, think again! Various commercial, major manufacturers of MR scanners present sequences with structural similarities, different nomenclatures and yet have subtle differences in their implementation. Acronyms have been the bane of MR. Acronyms in MRI are good and useful particularly as they facilitate communication amongst individuals, and qualitatively characterizes the technicalities of a MR sequence. The links, differences, and similarities among MR sequences are too complex, and multidimensional. If you are annoyed by the abundance or abuse of acronyms in MRI, you are not alone. Whilst some authors discourage the use of unnecessary acronyms, others see it as a bewildering task. To mitigate this very problem, we illustrate a logical and descriptive MR sequence nomenclature with basic concepts and brief description of most commonly used acronyms. Inclusion of every acronym is beyond the scope of this presentation. A compendium of MR acronyms is presented, together with the spelled-out definitions and relevant imaging characteristics.

p1904
Clinical applications of susceptibility weighted imaging

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KEY LEARNING OBJECTIVES: An understanding of: The clinical usefulness of SWI in MRI. SWI is a technique that exploits the inherent susceptibility differences between neighbouring tissues. The clinical utility of the SWI sequence in neurological imaging presenting two clinical case studies which show SWI is a clinically relevant tool. DESCRIPTION: Susceptibility weighted imaging is a new method that exploits the susceptibility differences between tissues without the requirement of a contrast agent. It combines phase and magnitude information from a 3D high resolution, velocity compensated T_2* weighted gradient echo sequence. Clinically this technique has been proven to aid in the diagnosis of diseases such as occult vascular disease, trauma, stroke and haemorrhage, enhanced detection of tumours, calcium differentiation, MS and vascular dementia. SWI also has the ability to provide anatomical information about the structure of small vessels and other mid brain structures. Such structures have previously been challenging to demonstrate using other imaging modalities

including conventional MRI methods. CONCLUSION: SWI is a simple, non-invasive, yet high resolution technique that can easily be added to a conventional MRI brain examination and can prove invaluable in aiding in a clear diagnosis of many neurological disorders.

p1905

Open source software analysis of contrast enhanced MRI accurately predicts kidney volume in live donors

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PURPOSE: Enhanced renal parenchymal volume is a surrogate of nephron number and decreases with declining renal function when kidney length may not. The volume of perfused functional renal tissue is required to calculate split renal function. Contrast-enhanced MRI has been shown to be accurate for assessing porcine renal volume in an experimental model: however, there has been no validation in humans or with blood-pool contrast agents which have theoretical benefits for MRI renal perfusion analysis over conventional gadolinium agents. MATERIALS/METHODS: Ethics approval was obtained and 10 live renal donors undergoing pre-operative MRA to exclude underlysing disease and evaluate renovascular anatomy were studied. Post contrast enhanced (10 ml Vasovist) coronally acquired breath-hold T_1 weighted THRIVE 3D datasets were analysed using OsiriX – an open source image processing software. Using the semi-automated region growing tool, renal parenchymal volume was calculated. During transplant surgery, the volume of the transplant kidney was measured using a fluid displacement technique. Data was analysed using Pearson product–moment correlation coefficient. RESULTS: Excellent agreement was found between MRI measurement of total renal enhanced parenchymal volume and peri-operatively assessed volume, with a Pearson product–moment correlation coefficient of 0.96. CONCLUSION: MRI measurements of enhanced renal volume with blood pool contrast agents are accurate. This knowledge will aid in developing an accurate MRI assessment of differential renal function.

MR Imaging and Spectroscopy Electronic Poster

e1906

Survival of patients on dialysis diagnosed with nephrogenic systemic fibrosis – case control analysis

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PURPOSE: Accurate survival data for patients diagnosed with nephrogenic systemic fibrosis (NSF) are not known, previous crude mortality analysis of our series indicated no significant difference as compared with other patients on renal replacement therapy (RRT). The purpose of this study was to better determine accurate survival in an accepted manner for patients on RRT. METHODS : The survival of all patients on RRT in the West of Scotland renal registry between 1 January 2000 to 1 July 2006 was analysed using data abstracted from the electronic patient record (EPR) system. For all patients survival from date of commencement of RRT to date of death was ascertained as per accepted practice in this frail patient group. Survival was analysed by Kapan-Meier/Log rank analysis. RESULTS: 1824 patients in total on RRT, 14 diagnosed with NSF. Crude mortality of those without NSF 62.0% (688/1122) and those with 57.1% (6/8), overall 62.0%. Mean and median survival times for patients diagnosed with NSF were not statistically significantly different – Log Rank (Mantel-Cox) Chi Square 0.778 with 1 degree freedom and $p=0.378$. CONCLUSION: Our data do not demonstrate a survival difference in patients with NSF compared with those without in the RRT cohort.

e1907

Standard magnetic resonance cartilage imaging and T_2 colour mapping in evaluation of cartilage defect treatment with biodegradable scaffold (Trufit Cb plugs).

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PURPOSE: Porous, biodegradable scaffolds offer a new solution in the management of symptomatic osteochondral defects in the knee and other joints. They differ from other cartilage repair techniques in requiring removal of a core of cartilage, subchondral lamina and bone from the affected area; the remaining space is filled with this scaffold. This study evaluates the results of our initial 2 year imaging experience of this novel product using standard cartilage sequences and T_2 mapping. MATERIALS/METHODS: Prospective follow up of 8 active sporting patients who underwent cartilage repair using Trufit CB plugs (Smith and Nephew) for symptomatic defects of the femoral condyles. They underwent serial 6 monthly MRIs using cartilage dedicated sequences and T_2 colour mapping. Comparison was made between imaging characteristics as assesed by the internationally recognized Marvolitis scoring system and clinical outcome. RESULTS: All patients were improved at mean follow-up of 8 months, with 4 currently back to preinjury fitness. MRI demonstrated resolution of bone oedema within 6 months and initial differentiation of the scaffold into subchondral bone, lamina and cartilage layers in 80% by 1 year. However, there was no correlation between the Marvolitis scoring system and clinical outcome ($p>0.5$). CONCLUSION: These preliminary results indicate biodegradable scaffolds offer a potential solution for small focal chondral defects. Standard MRI allows visual assessment of the healing grafts demonstrating progressive incorporation and maturation of hyaline-like cartilage. T_2 colour mapping helps to objectify the maturation process. The currently available MRI scoring system needs to be adapted to reflect clinical improvement.

e1908

Clinical applications of functional MRI (fMRI)

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KEY LEARNING OBJECTIVES: To introduce the basic concepts of BOLD (Blood oxygen level dependent) imaging and applications of functional MRI (fMRI) in clinical practice in the form of case studies. We will also illustrate essential functional neuroanatomy of the brain and how to locate these areas on standard MRI brain sequences. DESCRIPTION: 3 Tesla Phillips MRI scanner has been used. The subject is assessed for the ability to perform the necessary commands. Baseline MRI acquisitions are obtained prior to the physical task. Further MRI acquisitions are obtained as the task is performed. Data is then processed with special software. CONCLUSION: We hope this poster will familiarize the radiologists to BOLD imaging and locate important areas of the brain on MRI in everyday practice and convey the relationship of the lesions to them.

e1909

Practicalities and potentials of breast magnetic resonance spectroscopy

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KEY LEARNING OBJECTIVES: An understanding of how MR spectroscopy (MRS) offers potential for improved diagnosis and early response of treatment-induced changes in breast cancer; the difficulties of performing MRS in the breast; techniques for dealing with these problems; a practical implementation of this technique into routine practice. DESCRIPTION: Breast cancer is the most common cancer in the UK and the second most common cause of death from cancer in women after lung. The sensitivity of breast MRI in detecting breast cancer is well known. MRS provides a metabolic profile of a lesion, and therefore offers functional information that is fundamentally different to that obtained from an anatomical MR

image. In the breast, elevated levels of the metabolite choline have been shown to be indicative of malignancy. Following treatment, changes in the choline peak have been shown to occur earlier than conventional measurements of lesion size. Large water and fat peaks in breast MRS present a technical challenge as they mask the smaller intensity choline peak. Physiological motion, e.g. breathing, can also lead to deterioration of MRS data. Novel single voxel MRS techniques have been developed which minimize the effects of motion and enable simultaneous water and fat signal suppression. A practical procedure for performing breast MRS, including planning and shimming, will be presented. CONCLUSION: Single voxel MRS techniques designed for choline detection in the breast offer the potential of improved breast cancer diagnosis and an early response indicator of disease response to treatment.

Optimization and diagnostic imaging Poster

p2001

The effect of ambient lighting on clinical and psychophysical image quality for 1 and 3 megapixel LCD monitors

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PURPOSE: This study aims to determine whether adequate image quality can be achieved on 1 megapixel (MP) compared with 3 MP and to determine whether different ambient light settings affect the detection of low contrast objects on 1 MP and 3 MP LCD monitors in the same way. MATERIALS/METHODS: The 3 MP monitor was a Barco Corinis MFGD 3420 and the 1 MP was a NEC Multisync 1980 SXi. A CDRAD test tool and an anthropomorphic phantom with nasogastric (NG) tube and central line were used. Three observers evaluated the CDRAD and phantom images on each monitor at two ambient light settings (35 Lux and 100 Lux). Low contrast detail was identified using a four alternative forced choice technique. Image quality figures (IQF) were calculated. Observers then scored visualization of structures on chest radiographs. Visual grading scores were calculated. Statistical differences among IQF scores was tested using ANOVA, Kappa test for observer agreement and for pairs at high and low ambient light settings paired sample *t*-test were conducted. RESULTS: The highest performance was achieved when using a 3 MP monitor at 35 Lux ($p \leq 0.01$). At 100 Lux (the ambient lighting commonly found in wards and clinics) there was no significant advantage in using a 3 MP over a 1 MP as no statistical difference was shown between the 1 MP and 3 MP at 100 Lux for either the CDRAD of NG tube identification. CONCLUSION: 1 MP monitors are adequate for the visualization of central lines and NG tubes in low and high light settings.

Service Delivery Poster

p2101

Safety and dignity in care of the obese patient

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PURPOSE: The purpose of this poster is to outline the current approach to maintaining the health, safety and dignity of obese patients undergoing medical imaging procedures. The poster also contains statistics relating to obesity in the general population. DESCRIPTION: Sources of data relating to bariatric moving, handling and patient gown design plus current health and safety legislation were reviewed. An informal survey of manufacturers' responses to maintaining or upgrading equipment sizes and loading specifications with the intention of coping with larger patients was carried out. A selection of manufacturers' literature was also reviewed. Graphic illustrations of reviews and survey are provided in the poster. CONCLUSION: For safe and professional practice, staff in medical imaging departments need to be aware of general health, safety and digity issues when approaching moving, handling and care of obese patients. Staff may need training in safe bariatric handling and should be aware of the limitations of equipment loading.

p2102

Lean thinking – much more than a modern myth

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PURPOSE: To improve the patient experience by streamlining their journey through the X-ray department. MATERIALS/METHODS: A team of people, both from internal and external source, examined the existing capacity and demand upon the X-ray department in question, using modern, lean tools and techniques gleaned from some of the most efficient and forward-thinking industrial corporations. The data gathered from initial observations was recorded, analysed and used as a benchmark against which and subsequent improvements could be monitored and measured. Changes were then made to address the issues exposed. RESULTS: The benchmark exercise demonstrated that whilst the department needed to process 18 patients per hour to achieve minimal waiting times, the reality was that only 12 patients on average were being processed per hour. After the service was redesigned, the figures showed that the rate of patient processing had improved by a little over 50%, achieving the departmental target. CONCLUSION: The exercise clearly demonstrated that the service redesign, using minimal increases in material resources and zero increase in staff budgets, achieved the required departmental flow-through. This resulted in greatly reduced waiting times for patients and better working conditions for the staff.

p2103

Procurement of consumables for radiology. A network approach reaps dividends

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PURPOSE: To establish if a network approach to procurement can save money for the participant organizations. MATERIALS/METHODS: In March 2007 a pilot project was established in Kent & Medway to investigate the possibilities and practicalities of a radiology network. 5 acute Trusts came together in co-operation with the SEC SHA and NHS CfH to establish and run the pilot scheme over 12 months. Within this project a group was created to examine possible cost savings associated with procurement on a community basis. The group was assisted in this by the South East Coast Collaborative Procurement Hub. Challenges encountered include difficulties gathering comprehensive comparable information, differences in local procedures within individual trusts. Different approaches were developed to deal with different situations, e.g. in some circumstances provision of information on comparative pricing was sufficient to allow Trusts to change supplier and make savings, in others the "bulk buying power" of the group was used to negotiate discounts with suppliers. Use of information gathering templates worked well, and clarity around local procurement processes and governance proved crucial. RESULTS: Savings associated with disposal of film, procurement of ultrasound gel. Currently investigating sterile packs and power syringes. CONCLUSION: A co-operative approach to procurement can be used to obtain significant cost savings.

p2104

The seated mammographer; a radical improvement in ergonomics

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KEY LEARNING OBJECTIVES: To reduce musculoskeletal discomfort and pain associated with mammography, through examining ways of improving posture and thereby reducing muscular loading. DESCRIPTION: Anecdotally there are many mammographers

that experience musculoskeletal discomfort, although it does not feature highly in published literature. This poster demonstrates how we evaluated our working practice with the support of ergonomic professionals, in order to reduce high risk techniques and postures. Our evaluation led to a radical change in the way our mammographers undertake the examination. CONCLUSION: This project has demonstrated the importance of examining our own working practice, seeking informed professional advice and being willing to change or adapt our techniques to minimize long term health implications.

p2105

The introduction of a radiographer led HSG service

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KEY LEARNING OBJECTIVES: Cervical cannulation during an HSG examination is traditionally carried out by a gynaecology registrar. This would often lead to several problems including; extensive delays for the patient whilst waiting for the registrar to attend, lack of flexibility as to when the examination could be performed and gynaecologists being unfamiliar with the department and clinical procedure. The aim of this project was to improve the service offered to patients undergoing an HSG, by introducing a radiographer led service. DESCRIPTION: Two fluoroscopy radiographers fully assessed the HSG service in order to highlight areas that could be improved. A visit to a radiology department where a radiographer led HSG service was already in place was undertaken. From this visit several issues were raised; the need for an improved appointment system, the introduction of radiographer led sessions, introduction of new protocols and procedures and the improvement of patient aftercare. A cervical cannulation training programme was established for radiographers. New information leaflets for patients were introduced and appointments polices were updated to ensure that patients could be seen as quickly as possible. The introduction of the above led to decreased waiting times for the patient and an improved service once in and on departure from the department. CONCLUSION: Radiographers are capable of extending their role into non-traditional areas such as cervical cannulation. This project has clearly identified that radiographer role development in such areas can have a huge impact on the quality and efficiency of the service offered.

p2106

Radiology reports: examining hospital clinician preferences regarding format and content

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PURPOSE: To compare clinician preferences for radiology reports with respect to content, structure and presentation. MATERIALS/METHODS: 99 questionnaires were sent to Consultant staff with responsibility for requesting ultrasound examinations. The participants were invited to rank a variety of hypothetical reports in order of preference. They were also asked if they felt other commonly included features of a radiology report were of value. Rank data were analysed by the Friedman statistic, Fisher's multiple comparisons least significant difference test and the Kemeny-Young method. RESULTS: 49 responses were received. Clear preferences for certain styles of report were detected (p for no preference between reports <0.0001). There was a preference for more detailed reports that included a clinical comment by the radiologist, for both normal and abnormal scans ($p<0.05$). Reports presented in tables were preferred for abnormal scans ($p<0.05$) but not normal ones (p=not significant). The combination of a detailed tabular report with a radiologist's comment was the most popular single structure. 94% of respondents wanted information regards quality of images obtained, 98% wanted recommendations for further imaging and 71% felt recommendations for additional non-radiological investigations were appropriate. CONCLUSION: Hospital consultants value the radiologist's conclusion as an important feature of a radiological report. Detailed reports are appreciated by clinicians, even for normal examinations. Tabular reports are preferred to prose for abnormal scans, but not for normal ones. The combination of all three of these features was the preferred format.

p2107

Are radiology reports answering the clinician's question?

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PURPOSE: RCR guidelines recommend that reasons for requests be clearly stated to justify under IR(ME)R Regulations. Ideally direct questions should be posed and radiological reports should answer these questions. Aim: to identify proportion of requests not answering the question and analyse how this could be improved. MATERIALS/METHODS: Chest X-ray, CT head, CT chest examinations were reviewed. The last 50 consecutive requests and corresponding reports were obtained by radiological database review for examination code and Consultant referrer. Acute and geriatric Consultant teams were analysed. Radiological requests and reports were reviewed in clinico-radiological consensus for (1) is there a question? (2) is the question explicit or implicit? (3) is the question answered? Chi-squared test used to analyse significance between explicit and implicit questions. RESULTS: Chest X-ray examinations for acute (geriatric): 40/50, 80% (44/50, 88%) posed a question of which 28/40, 70% (27/44, 61%) were explicit. Of the explicit questions 28/28, 100% (26/27, 96%) were answered. From implicit questions 7/12, 58% (15/17, 88%) were answered. p= 0.001 (p=0.55). CT head examinations for acute (geriatric): 43/50, 86% (42/50, 84%) posed a question of which 36/43, 84% (35/42, 83%) were explicit. Of the explicit questions 36/36, 100% (35/35, 100%) were answered. From implicit questions 0/7, 0% (5/7, 71%) were answered. p=<0.001 (p=0.02). CT chest examinations for acute (geriatric): 42/50, 84% (49/50, 98%) posed a question of which 34/42, 81% (42/49, 86%) were explicit. Of the explicit questions 34/34, 100% (41/42, 98%) were answered. From implicit questions 8/8, 100% (6/7, 86%) were answered. p=1 (p=0.27). CONCLUSION: There is a higher percentage of implied questions for Chest X-ray requests. The question posed by the clinician is more likely to be answered if explicit rather than implied.

p2108

Automated integration of patient's clinical information into the radiological report in a fully electronic environment

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KEY LEARNING OBJECTIVES: To understand the clinical and logistical value of incorporating a patient's clinical data into the final radiological report using an automated system. DESCRIPTION: Electronic requesting (e-requesting) was implemented along with worklist reporting at the Norfolk & Norwich University Hospital in August 2007. The new e-requesting system enables automated incorporation of patient clinical details into the final report. Conventionally, a paper request card with pertinent patient information is required to request an investigation by a clinician and subsequently, by the radiologist, to report the images thus obtained and answer the primary clinical question asked. This workflow pathway from requesting to reporting was longer, requiring 14 steps, whereas the automated requires five. Listed below are the other advantages which improve both report quality and workflow – (1) Combining clinical data with the report will aid future radiological reporting as previous events will help construct a more accurate medical history; (2) Displaying the clinical data provided is powerful incentive to provide up-to-date and accurate information by the requestor aiding the radiologist in producing clinically useful reports. (3) As the request card is redundant the radiologist is now able to carry out sporadic bursts of worklist driven reporting separated in time and location maximising efficiency and turnover. (4) Fewer errors in transcription creating a more robust and safe environment. CONCLUSION: The impact of this feature is immediate and the benefits will be felt far into the future. The real challenge lies in quantifying this effect and measuring the cost-benefit.

p2109

NHS Patient Safety Agency Bulletin 16 – what happened in your hospital?

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INTRODUCTION: The National Health Service Patient Safety Agency issued bulletin 16 in February 2007 highlighting patient's suboptimal management as a result of incidents in reporting systems, most of which were either fatal or brought about significant long term harm. The notice highlighted problems and made numerous suggestions and recommendations regarding the implementation of imaging reporting systems. This account highlights the difficulties and expectations in bringing around these changes in our organization. DESCRIPTION: East Lancs. NHS Trust has a Patient Safety Group (PSG) in which the main author was asked to chair a subcommittee to ensure the necessary changes were implemented throughout the organization. Several background audits were required to establish a base line of current service. Policies were drawn up regarding reporting time frames and included safety net procedures and commitment to reporting groups of images in set time frames, some bespoke, depending on the patients' clinical circumstances. Further policies were drawn up by clinical groups for how these reports were acknowledged and acted upon. The paper highlights the difficulties in this process and the means of establishing agreement and a functional mechanism. CONCLUSION: The paper provides charts and diagrams of how this process took place and offers a flow diagram of how reporting systems should work to offer the best communication for our patient's and building in of safety net mechanisms to ensure an absolute minimum of adverse incidents.

p2110

Reporting radiographers beware – it may not just be trauma

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KEY LEARNING OBJECTIVES: Make Reporting Radiographers aware of unusual findings and what to do when these are found. Provide a pictorial review of cases encountered. DESCRIPTION: Many Radiology departments now use reporting radiographers to report trauma films from the emergency department. While most of the films will simply be trauma other conditions may be encountered. It is important that these are recognized and a Radiologist's opinion sought where necessary. Interesting and unusual conditions found during appendicular reporting are collected in our digital film file for training and review. We reviewed a number these and present them as an educational poster. These include Ewing's sarcoma, SLACK wrist, femoro-acetabular impingement, osteoporosis, metastasis, charcot joint and benign bony lesions. CONCLUSION: Reporting Radiographers need to remain alert to the possibility of unusual pathology in their reporting lists. Where necessary a Radiologist's opinion may be needed.

p2111

Impact of extended CT colonography on colorectal cancer services – clinical, financial, technical success

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PURPOSE: The workup of patients with colorectal cancer involves multiple aspects of radiology including (a) Barium studies to rule out synchronous lesions, (b)CT scans for distant staging and (c) MR scans for local staging. The purpose of this study is to evaluate the efficacy of using the extended CT Colonography protocol in the work up of colorectal cancer patients. MATERIALS/METHODS: 75 patients with suspected or known colorectal cancer being worked up for surgery were included. Scans were performed on a 16 slice CT scannner. The colon was evaluated for any primary and synchronous tumours. IV contrast was given in the supine images and scans of the chest were performed,to aid in simultaneous staging. CLINICAL: (1) Reduction in waiting time prior to MDT and treatment, (2) Avoidance of additional tests (i.e. Barium enema in distal obstructing lesions), (3) Reduction of waiting time between Barium studies and CT staging (to avoid barium artefacts) were analysed. (4) Significant other pathology detected was analysed. FINANCIAL: Reduction of costs of additional appointments (Barium enemas). TECHNICAL: Ability to view colon in patients unfit for colonoscopy. RESULTS: The average reduction in waiting time was 23 days. Additional Barium study avoided – 73 patients. Average 26 days of delay between Barium and CT staging avoided. Significant radiation dose reduction,financial benefit. 12 patients demonstrated significant other pathology. All 75 patients (17 unfit for colonoscopy) underwent successful CT colonography. CONCLUSION: Extended CT Colonography allows simultaneous colonic evaluation and distant staging. Additional tests can be avoided with resultant radiation, financial benefits. High success rates were demonstrated leading to clinical,financial and technical benefits.

p2112

Periprostatic anaesthesia for prostate biopsy – are you a doubter?

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PURPOSE: To encourage doubters to adopt the use of local anaesthetic during prostate biopsies. Our original doubts were; What is the best way to do it? Does it really help? (prostate biopsy is not really painful anyway, is it?) Will it take long? It's the probe in the rectum that hurts – isn't it? MATERIALS/METHODS: 89 patients referred for routine outpatient prostate biopsy. 34 patients had local anaesthesia, the remaining 55 patients were not given any form of analgesia. The technique is described. Post biopsy, patients completed a 10-point pain questionnaire based on their experience of both the probe insertion, and of the biopsy itself. RESULTS/CONCLUSION: Periprostatic anaesthesia causes a reduction in average pain scores. Local anaesthesia can be given, and is effective in less than 1 min. A significant component of the patient's pain is due to the insertion and presence of the ultrasound probe in the rectum. Doubters were convinced of the efficacy of the technique.

p2113

Immediate characterization of sub centimetre liver lesions on staging CT scans with on table ultrasound – study of feasibility and efficacy

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PURPOSE: In oncological CT imaging, sub centimetre hypodense lesions (SHL) in the liver are difficult to characterize. The common differentials are cysts, haemangiomata, focal fat or metastases. Ultrasound and MRI are subsequently used,causing delay in staging and treatment planning, increasing the waiting time. A feasibility and efficacy study of using immediate targeted ultrasound for this purpose was undertaken. MATERIALS/METHODS: Prospective study over 3 months. All patients who underwent oncological CT imaging who had SHLs of the liver were included. CT – 16 slice, 40 slice MDCT, portal phase post contrast images. Ultrasound – Mobile scanner. The SHLs on CT were then classified on ultrasound as (a) definite cysts, (b) definite haemangiomata or focal fat and (c) indefinite lesions. Following were evaluated: (1) Follow up with MR scans within 2 weeks to evaluate accuracy of ultrasound. (2) Reduction of waiting time due to immediate staging. (3) Financial aspects-possible reduction of further imaging appointments. (4) Average increase in CT scan table time. RESULTS: 107 SHLs in 73 outpatients were evaluated, lesion sizes ranging from 3 mm to 1.1 cm. (1) Accuracy – definite cysts – 76/76 lesions, definite haemangioma or focal fat – 19/21 lesions. (2) Average reduction of 22 days prior to MDT discussion. (3) 73 ultrasound appointments avoided. (4) Average increase of 3 min of CT table time per patient. CONCLUSION: Immediate characterization of subcentimetere hypodense lesions in

oncological CT imaging by on table mobile ultrasound is feasible and accurate in characterizing cysts. Some hyperechoic lesions may still need to be followed up with MR scans. Significant reduction in waiting times and further appointments were achieved, with only a minimal increase in CT table time.

p2114

Implementing a departmental policy for screening of renal function prior to intravenous contrast media

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KEY LEARNING OBJECTIVE: Contrast induced nephropathy (CIN) is a significant complication of iodinated contrast medium and associated with excess morbidity and mortality. Gadolinium-based contrast agents have been associated with Nephrogenic Systemic Fibrosis (NSF). Both these complications are strongly linked to pre-existing renal impairment. Estimated glomerular filtration rate (eGFR) has been recommended as the most appropriate index of renal function. DESCRIPTION: Mandatory renal screening using eGFR was introduced in Aberdeen Royal Infirmary from 1 September 2007 prior to intravenous contrast examinations. Specific guidelines were drawn up for iodinated and gadolinium based contrast agents according to value of eGFR in conjunction with nephrology, biochemistry and intensive care departments. Referrers, including GPs and hospital doctors were informed with a 1 month notification period. As of 1 September, request forms without eGFR were returned to referrer. Concerns arose about extra workload and delay in investigations. Solutions to improve efficiency were proposed and implemented. Select radiology staff was given access to biochemistry. A questionnaire was introduced for those patients requiring contrast following review of non-contrast examinations. Standard letters were sent to GPs and patients to arrange eGFR prior to annual examinations. There have been a number of challenges but overall the policy has been a success. CONCLUSION: Radiologists and referring physicians should be familiar with risk factors for CIN and NSF. A renal screening policy is essential and either a questionnaire or eGFR based policy are recommended.

p2115

Predicting contrast-induced nephropathy: creatinine versus estimated glomerular filtration rate

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PURPOSE: Contrast induced nephropathy (CIN) is a potentially-serious complication of iodinated contrast administration. It is more likely to occur in patients with pre-existing renal impairment, although there is no clear guidance about the best way of assessing this. The Royal College of Radiologists' suggest that creatinine ≥130 μmol l^{-1} should prompt risk reduction strategies. New cardiology guidelines recommend eGFR <60 ml min^{-1}. The aim of this study is to find out if either of these methods is superior. MATERIALS/METHODS: We combined radiology and biochemistry databases to retrospectively study patients' biochemical parameters for 1922 intravenous contrast-enhanced CT scans. We used a 25% rise in creatinine 2–3 days after contrast to define CIN. RESULTS: Serum creatinine was available both before and 2–3 days after contrast in 289 scans (15%), and baseline eGFR was available in 243 of these scans. CIN occurred in 5(4%) of 114 patients with eGFR ≥60 ml min^{-1}, in 9 (9%) of 96 patients with eGFR 30–59 ml min^{-1} and in 3 (9%) of 33 patients with eGFR <30 ml min^{-1}. eGFR had a superior sensitivity (71% *vs* 14% $p<0.000$), positive predictive value (9% *vs* 4% $p<0.000$), and negative predictive value (96% *vs* 91% $p=0.160$) for predicting CIN. Creatinine had a better specificity (76% *vs* 48% $p=0.228$). The receiving-operator characteristic for eGFR was better (area under curve 0.606 *vs* 0.569 $p=0.153$). CONCLUSION: eGFR performs better than creatinine in 4 out of 5 statistical tests of screening, significantly so in sensitivity and specificity. This would support future guidelines using eGFR over creatinine for baseline renal function screening.

p2116

Quality assurance regarding salvage of haemodialysis arteriovenous fistula: role of diagnostic and therapeutic percutaneous interventions

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PURPOSE: To study the outcome of Fistuloplasty for stenosed arteriovenous fistula and its effect on anatomical, clinical and dialysis variables. MATERIALS AND METHODS: We performed a two-phase study aiming clinical, anatomical and dialysis variables according to the Standards for Percutaneous Interventions in Dialysis Access. {JVIR 1999 (1405}. Our targets following fistuloplasty were: Success of <30% residual diameter stenosis; Flow rate of >300 ml min^{-1}; Clinical survival of fistulae. PHASE 1: A total of 42 fistuloplasties (2001 and 2002) including 28 AV fistulae in 36 patients. Of these 78% (33) had clear indications documented. The most common 33% (14) stenosis were found near the anastamotic site while site was unclear in 3 patients. Minor complications included 1 clotted AVF and 2 delayed haemostasis. Measurements of lesions were not available. CHANGES: Clear indication; Time from abnormal study; Anatomical site; Size of balloon used; Exact measurements of the lesion; PHASE 2: A total of 30 angioplasties (2003 and 2004) demonstrated 100% documentation of clear indications, puncture site and stenotic lesions. 76% of those were performed with in 2 months of abnormal study, size of balloon was mentioned in (93%) of patients. About 46% had greater than 40% improvement in luminal diameter, 73% had satisfactory flow rate 300 ml min^{-1} or greater and having greater than 6 months patency rate. CONCLUSION: Fistuloplasty for stenosed arteriovenous fistula improves the outcome. It has positive effect on luminal diameter, clinical survival rate and flow rates via the fistula.

p2117

Localization of parathyroid adenoma using a one stop imaging pathway

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At our district general hospital we have been using a combination of functional imaging using $^{99}Tc^{m}$ MIBI planar imaging and neck ultrasound evaluation to confirm the presence and to accurately localize parathyroid adenoma(s) in patients with biochemically proven primary hyperparathyroidism. Both these investigations are performed on the same morning as a part of one stop imaging protocol. To maintain expertise and consistency, majority of examinations are preferentially performed and reported by the same radiologist. From our experience, we have found a high degree of correlation between the two tests, which are cost effective and involve a relatively small amount of radiation compared with other techniques like SPECT-CT. This has given our local ENT surgeons the confidence to perform a dedicated parathyroidectomy instead of conventional neck exploration. Our study looks at how successful one stop imaging has been, correlates with the surgical findings. We also evaluate the limitations of parathyroid imaging and the potential ways of improving the service.

p2118

Prevalence and distribution of putrefaction gas on post-mortem CT

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PURPOSE: Gas is commonly seen in the solid organs and intravascularly on post-mortem CT and has been attributed by others to the effects of trauma and advanced decomposition. Our purpose is to analyse a series of post-mortem CT scans to determine the presence and distribution of gas outside the gastrointestinal and respiratory tracts. MATERIALS/METHODS: All deceased persons scanned in the months of June and

December 2006 were examined. Deaths from trauma were excluded in order to rule out an external source of gas. Demographics including age, gender, BMI, cause of death, time interval between "last seen" and CT scan, CPR, and body location were recorded along with the presence, volume and distribution of gas. RESULTS: 506 consecutive deceased persons were evaluated and gas was detected outwith the gastrointestinal and respiratory tracts in 270 (53%). Distribution of gas included intrahepatic vasculature (74%), right heart (74%), central veins (53%) and abdominal wall (26%). Intrahepatic gas was more likely to be detected in summer; death outdoors; when CPR applied; with increasing BMI; and prolonged time between death and CT. Gas was found as early as 2 h and was also seen to propagate in the same deceased person scanned repeatedly over time in a distribution suggestive of putrefaction gas. CONCLUSION: The presence and timing of putrefactive gas is variable but, if detected, is located first in the intrahepatic vasculature, right heart and/or anterior abdominal wall. Before attributing this gas to trauma-related death, these facts must be taken into account.

Service Delivery Electronic Poster

e2119

Radiology in war and peace

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PURPOSE: To illustrate comparisons between radiology performed in a conflict environment compared with radiology performed during peacetime in an NHS district general hospital. We describe the formation of the radiology unit in a field hospital during the second Gulf War. We discuss types of investigations performed and the incidence of different types of injury and methods for diagnosis. Throughout we illustrate the operations of a field hospital with high quality pictures taken during wartime by the field commander of the field hospital. We compare these work-flow pattern and incidence of disease with the clinical caseload found in a district general hospital during peacetime. We also provide images showing the building of the field hospital within the desert setting and an insight into social life within this setting. CONCLUSION: Radiology is central to the effective running of a modern hospital. However, the priorities and case mix in wartime and peacetime are very different. We use high quality images taken at the time of the second Gulf War to illustrate this difference.

e2120

Marketing of radiology services to primary care commissioners

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KEY LEARNING OBJECTIVES: To give insight into the marketing strategies used by local hospital radiology departments to attract primary care commissioners to purchase their services. DESCRIPTION: Sandwell Hospital (an Acute Hospital Trust in Birmingham) held a 1-day marketing event in July 2007, aimed at advertising radiology services to local commissioners of primary care. The idea was to explain which services were on offer, and to market the advantages of purchasing care from their local radiology department, in order to compete effectively with new independent sector providers in the area. We describe the angle used by the local radiology department, in order to give it an edge over other providers. Some of the features covered include: emphasis of established clinical relationships between radiologists and clinicians in primary care, reliable track record of quality services, on-site support from experienced radiologists who are available at all times by telephone for help with interpretation of results, fast and efficient service with waiting times well within NHS targets, cost effective service with all prices based on the local tariff. We also discuss the topics of opening times, a patient-focused service and offering new services. We discuss the event itself, and important questions and feedback from primary care doctors. CONCLUSION: The delicate balance of providers and commissioners of care within the NHS can change rapidly and without warning. We discuss the important questions that local radiology departments have to get right in order to remain competitive.

e2121

CTPA and V/Q scanning: can the workload be reduced?

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PURPOSE: To identify the number of patients who underwent both CTPA and V/Q scanning and to assess whether this could have been avoided. To also assess whether chest radiography was performed within 10 days before the CTPA/V/Q scan, as alternative pathology may be found making the scan unnecessary. MATERIALS/METHODS: The total number of CTPA and V/Q scans for 2006 was analysed. Comparison was made for those cases where both scans were performed. RESULTS: 174 CTPA scans and 585 V/Q scans were performed. 23 patients (13% of the total CTPAs and 4% of the total V/Q scans) had both scans. Of these, 13 were in patients who had intermediate probability V/Q scans, of which only 2 (15%) were positive on CTPA. 8 were in patients who had low probability V/Q scans, all of which subsequently had negative CTPAs. 18% of CTPAs and 5% of V/Q scans didn't have a preceding CXR. CONCLUSION: All patients who had low probability V/Q had negative CTPAs. Therefore it is unnecessary to perform CTPA in this group. This confirms the high negative predictive value of V/Q scanning. All patients should have preceding CXR to rule out other pathology. In particular all those suitable for V/Q scan should have preceding CXR to avoid non-diagnostic reports, thereby decreasing the number of patients having both scans (studies in the medical literature have shown that CTPA is more diagnostic than V/Q in those with an abnormal CXR). These measures would decrease the workload on CT and nuclear medicine.

e2122

Performing flexible sigmoidoscopy and barium enema on same day – an audit of patients perspectives

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PURPOSE: To find out the patients' and radiologists' perspectives on performing flexible sigmoidoscopy and barium enema on same day. If found acceptable by both, this practice has obvious advantages, most important of which is reduction in the time from referral to diagnosis in possible cancer patients. MATERIALS/METHODS: 36 patients who underwent flexible sigmoidoscopy in the morning and barium enema in the afternoon were randomly chosen as study group. 30 randomly chosen patients who only had barium enema were also included as control group. Immediately after the barium enema, the patients filled a simple questionnaire prospectively, detailing their experiences and their preferences in future. The radiologists performing and reporting the barium enema also completed a questionnaire detailing any difficulties or inferior quality images etc. RESULTS: In spite of finding it very uncomfortable, all the 36 patients declared that they would opt to have both procedures on same day in future as that meant a single bowel preparation and reduced waiting period for the second test. From the radiologist's perspectives, there was some difficulty in performing the procedure in 8/36 patients due to retained air from the flexible sigmoidoscopy. However, all the procedures were completed and the images were found to be satisfactory when compared with the study population. CONCLUSION: This study shows that performing both procedures on same day is feasible and indeed offers great advantages.

Notes

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