Contents

EPONYMOUS LECTURES

ADVANCES IN TECHNOLOGY

CLINICAL

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SERVICE DELIVERY

DIGITAL IMAGING AND HEALTH INFORMATICS

DEBATES

SPECIAL FOCUS GROUPS

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WORKSHOPS

POSTERS

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Notes

Scientific programme abstracts Monday 11 June

0830–1030

Back to Basics: The plain film revisited. Lumbar spine radiographs: Should we still be doing them?

0830 Invited review: MRI should replace radiographs

Teh, J.

Nuffield Orthopaedic Hospital, Oxford, UK

In patients with back pain there are four main clinical scenarios: Acute non-specific low back pain which resolves spontaneously. No imaging is usually required; Chronic back pain without sinister features. No imaging is usually required; Back pain with sciatica, which is usually due to disc prolapse. Imaging only required if failed conservative therapy and surgery is contemplated; Back pain with red flags (such as night pain, fever, neurological disturbance, weight loss) indicating possible serious pathology such as osteoporotic collapse, malignancy, infection and spondyloarthropathy. Imaging is usually required. For back pain with red flag symptoms, plain radiographs are usually unhelpful in the early stages of disease. Up to 50% of bone may need to be destroyed for a lytic lesion to be appreciated on a plain radiograph. MRI has far greater sensitivity and specificity and is also able to demonstrate non-spinal causes of low back pain such as abdominal aortic aneurysms. A limited MRI protocol comprising sagittal T_1 and STIR sequences is suggested as a cost effective and rapid examination for evaluating low back pain due to possible serious pathology. This lecture will demonstrate the MRI appearances of the main causes of back pain with red flags, illustrating the advantages over plain radiographs.

0850 Invited review: Physiotherapy can replace radiographs

Raby, N.

Western Infirmary, Glasgow, UK

In Glasgow the Lumbar spine radiograph has been abandoned for all non trauma cases. This has been achieved by investing in several specialist physiotherapists who see all patients with acute back pain. GPs have direct access to this service which satisfactorily manages the great majority of patients. Physiotherapists can have rapid access to MRI and specialist opinion but this accounts for only a tiny proportion of total referrals. These are mostly appropriate and there are positive MR finding in over 50% of patients referred in this way. The service is holistic with exit pathways to pain specialists, back classes and ongoing exercise classes. There is high patient and GP satisfaction with the service. It is a sensible and viable approach to back pain which does not require any imaging in the great majority of patients.

0910 Invited review: What can you see on radiographs?

Whitehouse, R.

Manchester Royal Infirmary, Manchester, UK

Lumbar spine radiographs are perceived by many radiologists as having the worst combination of radiation dose (high) and diagnostic yield (low). Consequently there is pressure to resist doing the examination, or to limit it in some way (laterals only for General Practitioner requests for example). Now that outsourcing of MR has increased the availability and reduced the waiting time for this modern alternative examination, it is reasonable to limit plain films where MR can be performed in a timely fashion. Consequently, however, we are becoming de-skilled in the interpretation of lumbar spine plain films. In this presentation the changes in lumbar spine plain radiography that have occurred in the last 20 years will be described and the lecture illustrated with plain films. Plain films may compliment an MR scan, or provide timely information that may result in an MR scan being organized with greater urgency. Until we completely abrogate responsibility for the interpretation of plain radiographs to our reporting Radiographer colleagues, we must maintain the expertise required to justify performing the examination.

0930 Invited review: The 10 most common fractures and how to avoid missing them

Barron, D.

Leeds General Infirmary, Leeds, UK

The incidence and location of fractures is highly age related. Therefore the most important considerations when assessing for likely fractures are the age of the patient and the mechanism of injury. In children the 10 most common fractures are: Radius/ulna, carpal (in metacarpals), greenstick, humerus, clavicle, foot, tib/fib, skull, ankle and femur. In adults this changes to radius/ulna, carpus and femur. Up to the age of 50 years fractures are more common in men but after this women quickly overtake them. In addition there is then a massive increase in pelvic, proximal femur, distal radius, vertebra and proximal humeral fractures. Therefore the most common fractures for this talk will be distal and proximal radius/ulna, phalanges, carpal, greenstick, humeral, pelvic, proximal femoral, clavicle, foot inc the ankle. These will be discussed with emphasis on relevant mechanisms, age related differences and pitfalls.

0950 Invited review: Tumours: what plain films tell you and how they mislead you (e.g. infection, stress fracture)

Saifuddin, A.

The Royal National Orthopaedic Hospital, Stanmore, UK

Plain radiology provides the first clues to the likely diagnosis of a suspected primary bone tumour. For any lesion, radiographic diagnosis depends upon assessment of the following features: site within the skeleton; site within the individual bone, both in the axial (central, intracortical, surface) and longitudinal (epiphyseal, metaphyseal, diaphyseal) planes; size of the lesion; margin and pattern of bone destruction, pattern of matrix mineralization (osseous, chondroid, ground glass); presence of cortical destruction; presence and type of periosteal reaction. Using these criteria, an assessment of the rate of growth of the tumour and the likely histological origin can be made and a correct diagnosis suggested in approximately 80% of cases. MRI and CT are mainly used for staging and biopsy guidance, but may occasionally advance lesion characterization by the demonstration of fluid levels, fat and occult matrix mineralization. However, radiographs can be misleading in a number of ways. First, a relatively non-aggressive appearance may be demonstrated, suggesting a non-neoplastic lesion or a benign bone tumour, examples being the rare variants of pseudocystic osteosarcoma and sclerotic Ewing sarcoma. Second, there are a large variety of non-neoplastic disorders that can clinically and radiologically mimic a bone tumour. Aggressive radiological features can be seen with acute and sub-acute osteomyelitis, stress fractures, acute bone infarction and LCH. Again, CT and MRI can help in lesion characterization, mainly by demonstrating a pattern of reactive marrow oedema rather than marrow infiltration, thus avoiding ++an unnecessary and potentially harmful biopsy.

1010 Discussion

0830–1000

Genitourinary I: Prostate

0830 Invited review: Staging prostate MRI

Carey, B.

Cookridge Hospital, Leeds, UK

MRI is the best imaging technique for the detection and staging of prostate cancer. Currently, the best results are obtained with endorectal coil imaging at 1.5 Tesla, but this may change with improving coil technology and higher field strength MRI systems. Imaging is an important part of the staging of prostate cancer but its exact role in clinical practice remains unclear. Imaging accuracy may not impact on patient management for prostate cancer and cost-effectiveness will need to be considered. Developments in MRI such as spectroscopy and diffusion imaging may improve the contribution of imaging to the management of prostate cancer in the future but these newer techniques are not yet in routine clinical practice. This talk will highlight the present status of MRI in staging prostate cancer and review areas of future development.

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0900 Invited review: Minimally invasive therapy for prostate cancer

Allen, C.

University College Hospital, London, UK

No abstract supplied.

0930 Retrospective review of hysterosalpingogram (HSG) results in patients whose partners have male factor subfertility

Jones, B. P.•Williamson, R.•Lavery, S.•Hemingway, A. P.

Hammersmith Hospitals NHS Trust, London, UK

PURPOSE: To evaluate the abnormalities encountered on HSG examinations of women presenting to a tertiary referral centre where male factor sub fertility has been reported by the patient as a contributory cause of subfertility. METHODS: The reports for HSG examinations were reviewed over a 10 year period. 380 studies were examined where a contributory male factor for subfertility or planned Intracytoplasmic sperm injection therapy (ICSI) was reported by the patient. Abnormalities were categorised according to site of pathology: tubal, uterine or cervical. RESULTS: 133 of the 337 studies showed an abnormality on HSG (39%). Of these 91% were uterine abnormalities, with fibroids and endometrial polyps making up the majority. 13 (10%) women showed evidence of Adenomyosis, with a further 13 (10%) showing varying degrees of Ashermann's syndrome. Abnormal uterine configuration accounted for 6%. Tubal pathology accounted for 21 (16%) of the abnormalities with hydrosalpinges detected in four women. CONCLUSION: Male factors are reported to account for approximately 30% of overall subfertility. 15% of couples are thought to have more than one cause of subfertility. Our HSG data indicates that up to 39% of females whose partners have significant male factor abnormalities also have abnormal HSGs. These findings suggest that all women undergoing fertility treatment in the context of male factor subfertility should be screened for uterine abnormalities, which may affect implantation, prior to the commencement of infertility treatment.

0940 Propofol, the 'milk' of kindness for patients undergoing trans-rectal ultrasound-guided prostate biopsies

Awsare, N. S.[1]•Green, J. S. A.[2]•Aldwinckle, B.[3]•Hanbury, D. C.[3]•Boustead, G. B.[3]•McNicholas, T. A.[3]

[1]University Hospital of Wales, Cardiff, UK, [2]Whipps Cross University Hospital, London, UK, [3]Lister Hospital, Stevenage, UK.

PURPOSE: Men undergoing trans-rectal ultrasound-guided prostate biopsies (TRUS-B) may experience moderate to severe pain and anxiety, even with peri-prostatic block. This study assessed pain and patient satisfaction using propofol sedation for TRUS-B. MATERIALS/METHODS: 104 men answered a questionnaire containing items relating to a visual analogue pain score (VAS) and satisfaction, after undergoing day-case TRUS-B under propofol sedation; and another relating to complications (including admissions) in outpatients' clinic, while awaiting biopsy results. RESULTS: Mean (95% CI) VAS (scale 0–10) was 1.5 (1.2–1.8), with 93% experiencing no or mild pain (score 0–5). 66% found their TRUS-B experience better, 31% as, and 3% worse than expected. No patient would refuse a repeat procedure under sedation, while 94% would recommend it to a friend who has been advised to have it, with the remaining not knowing what to recommend. The most common complications were haematuria (65%) and haematospermia (38%), with 2 admissions for reasons unrelated to the anaesthetic. CONCLUSION: Use of propofol sedation is safe and reliably relieves pain and anxiety in men undergoing TRUS-B, as evidenced by low pain scores and high patient satisfaction and acceptability. It has an important role during TRUS-B in younger and anxious men, especially if undergoing repeat or extensive biopsies.

0950 Potential value of diffusion weighted imaging as an indicator of tumour aggressiveness in prostate cancer

deSouza, N. M.[1]•Riches, S. F.[1]•vanAs, N.[2]•Morgan, V. A.[1]•Parker, C.[2]•Sohaib, S. A.[3]•Payne, G. S.[1]

[1]Section of Clinical Magnetic Resonance, Institute of Cancer Research and Royal Marsden NHS Foundation Trust, Sutton, UK, [2]Clinical Academic Radiotherapy, Institute of Cancer Research and Royal Marsden NHS Foundation Trust, Sutton, UK, [3]Radiology, Royal Marsden NHS Foundation Trust, Sutton, UK

PURPOSE: To investigate value of DW-MRI as a biomarker for prostate cancer aggressiveness by determining differences in apparent diffusion coefficients (ADCs) between patients with low-risk versus high-risk prostate lesions. METHOD: 21 consecutive patients classified as low- (n=11) or high- (n=10) risk underwent DW- with T_2W-MRI. Characteristics of low-risk group: age (mean 64.7±6.9 years.), stage (T1=10, T2=1), Gleason Grade ≤6, PSA <10; of high-risk group: age (mean 68.9±7.2 years.), stage (T1=6, T2=2, T3=2), Gleason grade ≥7, PSA >10. Endorectal MRI (Philips 1.5 T) acquired T_2W FSE in 3 orthogonal planes and axial DW images (5 b values, 0–800 s mm^{-2}). Isotropic ADC maps including b=0 (perfusion and diffusion components) and excluding b=0 (diffusion component alone) were generated. Regions of interest drawn on T_2W axial scans (around whole prostate, central gland [CG] and tumour) were transferred to ADC maps on co-registration by matching centre of mass and whole gland outlines. ADCs from tumour, CG and peripheral zone [PZ] were obtained. RESULTS: There was a significant difference in the ADCs of tumour between low- and high-risk patient groups when b=0 was excluded (p=0.012) but not when b=0 was included. PZ and CG values in these groups did not show significant differences between groups. There also was a significant difference in ADCs between tumour and PZ, and between PZ and CG in both groups, and between tumour and CG for the high-risk, but not the low-risk group. CONCLUSION: When the perfusion component is excluded, significant differences exist between the ADCs of tumours in high-risk compared with low-risk patients.

0830–1000
Breast SFG I
Mock MDT Panel

Wells, C.

St Bartholomew's Hospital, London, UK

MacNeill, F.

The Royal Marsden Hospital, London , UK

Pinder, S.

Addenbrooke's Hospital, Cambridge, UK

Evans, A.

Nottingham Breast Institute, Nottingham, UK

Britton, P.

UK

In this session a mock breast multidisciplinary review panel will discuss controversial and difficult areas of diagnosis and management in breast disease, including the histopathology and management of borderline and difficult lesions. The NHS Breast Screening Programme histopathological classification includes categorisation of core biopsy samples from B1 to B5. This session will concentrate on lesions regarded as B3 (uncertain malignant potential) and B4 (suspicious). These "borderline" entities include radial scars, papillary lesions and atypical epithelial proliferations (atypical ductal hyperplasia and lobular *in situ* neoplasia).

0830–1015
Workforce Issues
0830 Invited review: Workforce innovation in ultrasound

Wilson, J.[1] Dixon, A.[2]

[1]University of Leeds, Leeds, UK, [2]University of Bradford, Bradford, UK

AIM: To expand the current workforce and create a career progression structure in Diagnostic Medical Ultrasound. METHOD: At the request of a clinical manager who was experiencing recruitment problems and wanted to explore the potential of ultrasound practice at practitioner level, six final-year BSc(Hons) Diagnostic Radiography students were recruited to a collaborative Department of Health funded pilot project involving NHS Yorkshire and the Humber, the Universities of Bradford and Leeds. Minor changes were made to some Level 3 modules to incorporate additional clinical

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competencies in early pregnancy dating ultrasound; these were formally approved by the academic institutions, the CoR and the HPC. Selected students incorporated additional lectures and some practical experience, in early pregnancy ultrasound, into their final year, with workplace supervision provided by experienced ultrasound lecturer/practitioners at Leeds Teaching Hospitals, Calderdale and Huddersfield, Mid-Yorkshire and York District, NHS Trusts. It is anticipated that clinical managers will create first-post employment opportunities; a further phase of the project involves the development of a Consultant Sonographer post. RESULTS: Interim outcome measures (for evaluation in July 2007) include student achievement of radiography and ultrasound competencies and their potential for first-post employment. Long term success indicators include the impact of the sonographer "practitioner" on clinical service delivery and on the ultrasound workforce profile. CONCLUSION: Interim success will prompt consideration of incorporating focused areas of ultrasound, and other specialist imaging technique competencies into subsequent undergraduate radiography provision. Long term success will help deliver ultrasound service provision targets and facilitate career progression for sonographers.

0855 Invited review: Clinical supervision

Hussain, M.

Southampton General Hospital, Southampton, UK

This paper explores the theory and practice of clinical supervision in the development of a radiographer in the 21st century. Recent work by the Department of Health and the Society and College of Radiographers has produced a Clinical Supervision Framework for radiographers. This can be used when developing skills and abilities in the workplace, for example, when utilising the Knowledge and Skills Framework and advancing practice. Far from being yet another fad from management, clinical supervision can also be seen as pastoral care for busy radiographers. Developed and explored in the nursing arena for many years, radiographers can make clinical supervision their own concept, utilising ways it may be used in everyday practice, from developing critical reflection and improving clinical effectiveness to tackling difficult situations or preparing a CPD portfolio. Clinical supervision can offer a way of providing professional autonomy and development for radiographers despite numerous service pressures. Handled thoughtfully, it offers a sensitive means to address professional concerns relating to patient care and clinical practice.

0920 Invited review: Preceptorship in radiology

Blakeley, C.

University of Salford, Salford, UK

This talk will explore the experience of radiographer preceptorship in a large inner city teaching hospital. A preceptor is defined as: a teacher who is responsible for upholding a certain tradition; an expert who facilitates suitable practical experience and training for their learner. Preceptorship in the nursing professions has been in existence for several years. It was introduced because of the perceived gap between theory and practice in the newly qualified nurse. Nursing preceptorship involves a named experienced nurse (preceptor) being assigned to a newly qualified nurse. The intention being that the preceptor mentors their novice colleague to assist them in gaining confidence and capability in their role. Preceptorship in Radiography is a fairly new concept; it was acknowledged by the Society of Radiographers (2003) as a valuable way of supporting newly qualified radiographers. The intention of radiographer preceptorship has similarities with the nursing professions in that a primary purpose of it is to assist novice radiographers gain confidence their role. Agenda for Change (NHS Terms and Conditions of Service Handbook) states that newly qualified staff starting at band 5 should have a 12 month period of preceptorship. This requirement was the main driver for implementing radiographer preceptorship within our hospital.

0945 Invited review: National workforce competences

Fox, J.

Skills for Health, Leeds, UK

No abstract supplied.

1010 Discussion

0830–1010
Current issues in image perception for diagnostic radiology

0830 Invited review: Optimizing the display environment

Brennan, P. C.

University College Dublin, Dublin, Ireland

The production of high quality radiological images has been a core aim of imaging personnel. Evidence-based diagnostic imaging techniques and comprehensive quality assurance procedures are in place so images contain the required anatomic and pathological information facilitating high diagnostic efficacy. Such rigour has not been applied to optimizing ambient lighting even though it is well known that inappropriate lighting in viewing areas affects detail visualization. This is particularly of relevance in the modern clinical arena where images are often viewed on low-luminance visual displays in high illuminance environments. The current presentation will: present some of the latest research on ambient light optimization; consider the rational for specific lighting levels; investigate the relevance of current recommendations. Traditional and current *modi operandi* may need to be re-considered.

0855 Invited review: The effects of dose control on lesion detection in digital mammography

Tingberg, A. Ruschin, M. Timberg, P. Svahn, T. Hemdal, B. Andersson, I. Mattsson, S.

Malmö University Hospital, Malmö, Sweden

PURPOSE: The purpose of this study was to evaluate the effect of dose reduction in digital mammography on the detection of two lesion types – malignant masses and clusters of microcalcifications. MATERIALS/METHODS: Two free-response observer studies were performed – one for each lesion type. 90 lesion-free unprocessed mammograms were retrospectively selected: each image was originally acquired under AEC conditions, corresponding to an average glandular dose of 1.3 mGy for a standard breast (50 mm compressed breast thickness with 50% glandularity). For each study, one to three simulated lesions were digitally added to each of 40 images, while 50 were kept without lesions. Each of these images underwent simulated dose reduction by adding simulated quantum noise, to represent images acquired at 50% and 30% of the original dose. This resulted in 270 images for each of the two studies. The manufacturer's standard display processing was subsequently applied to all images. Four radiologists experienced in mammography evaluated all images with the free-response receiver operating characteristics (FROC) method, and the results were analysed with the JAFROC method. RESULTS: For the detection of masses, there was no significant difference between the figure-of-merit (FOM) for the three dose levels, but showed a decreasing trend. In contrast, in the microcalcification study there was a significant difference between the FOM for all three dose levels. CONCLUSION: The results indicate that lowering the present dose level by a factor of two compromised the detection of microcalcifications but had a weaker effect on mass detection.

0920 Invited review: Modelling visual search in medical images

Chakraborty, D.

University of Pittsburgh, Murrysville, Pennsylvania, USA

In the FROC paradigm the data-unit is a variable number of mark-rating pairs per image. A mark is the indicated location of a suspicious region. The rating is the corresponding degree of suspicion. Prior to analysis the data is classified or "scored" into lesion and non-lesion localizations. The scoring is done by choosing an acceptance-radius and classifying marks within the acceptance-radius of lesion centres as lesion localizations, and all other marks are classified as non-lesion localizations. The scored data are plotted as a free-response receiver operating characteristic (FROC) curve, essentially a plot of appropriately normalized numbers of lesion localizations *vs*. non-lesion localizations. Scored FROC curves are frequently used to compare imaging systems and computer aided detection (CAD) algorithms. A recent search-model for free-response data will be described. The search model can be used to infer a figure of merit of observer performance and to predict ROC and FROC curves. An approach to estimating search model parameters for CAD algorithms and human

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observers is described. Also described is a method of analysis that does not require the specification of an arbitrary acceptance-radius. The method allows one to plot a "perceptual FROC curve". Unlike a scored FROC curve, a perceptual curve is independent of the choice of acceptance-radius.

0945 The effect of perceptual feedback in fracture detection and lung nodule perception

Donovan, T.[1]•Manning, D.[1]•Phillips, P.[1]•Crawford, T.[2]

[1]St Martin's College, Lancaster, UK, [2]Lancaster University, Lancaster, UK

PURPOSE: To determine the effect of perceptual feedback by measuring imaging task performance pre and post feedback in a fracture detection task and lung nodule identification task. METHOD: Four observer groups (n=10 in each group) with different levels of expertise were recruited for each radiology task. The four groups were naive observers, 1st year radiography students, 3rd year radiography students and experts (radiologists and reporting radiographers). Each task used a test bank of 30 verified images with a 50% prevalence of pathology. Eye tracking was used, and feedback was presented to the observers in the form of circles displayed on the image where visual fixations had occurred, the size of which was proportional to the length of fixation. Observers were required to identify the location of the fracture/nodule and provide a confidence rating pre and post feedback. Indices of performance were provided by ROC analysis for the fracture task, and jack-knife FROC (JAFROC) for the lung nodule task. RESULTS: In the fracture task performance declined significantly for the experts and 3rd year students (both $p<0.05$). Performance improved although not significantly for the naive observers and 1st year radiography students. In the lung nodule task feedback had no significant effect on performance. CONCLUSION: Perceptual feedback in a simple fracture detection task can have a negative effect on image interpretation performance for the expert groups. This finding was not replicated in the more complicated lung nodule detection task. These findings may have significant implications for CAD design and other perceptual prompts.

0955 Discussion

0830–1015

Writer workshop

0830 Invited review: How to write an abstract for a journal or conference

Tyson, S.

University of Salford, Salford, UK

The structure and content of an abstract will be discussed. Differences will be highlighted between a journal and conference abstract.

0900 Invited review: Constructing your article

Mackay, S.

University of Salford, Salford, UK

This will include the benefits of publishing, getting started, giving the paper some shape and form.

0930 Invited review: Journal processes

Hogg, P.

University of Salford, Salford, UK

This will include the selecting of an appropriate journal, complying with writer requirements and the behind the scenes processes at a peer reviewed international journal

1000 Discussion

0900–1000

Education Issues Scientific Session I

0900 Leadership personalities: What can we learn from research and literature?

Henwood, S.[1] Yielder, J.[2]

[1]Henwood Associates (South East) Ltd, Sevenoaks, UK, [2]UNITEC, Auckland, New Zealand

This paper presents international collaboration and discussion around the personality types attracted into radiography and how that may impact on future leadership potential within the profession. Through the use of the Myers Briggs Type Inventory and learning style studies in New Zealand, Jill Yielder has found that a high proportion of radiographers and student radiographers have a predominant learning style and personality type outside the proportions of the "normal" population. This may have implications for the profession in New Zealand, particularly when considering the typologies most likely to be attracted to leadership and management roles. In the UK Suzanne Henwood is exploring Neuro Linguistic Programming meta programmes and suggests what "types" would be most beneficial to consider in recruiting to leadership roles. Exploring some of the literature on current leadership issues, Jill and Suzanne bring together an evidenced based discussion to stimulate thoughts around how best to nurture and develop leadership in radiography. They offer some thoughts on the characteristics of radiographers who may (or may not) be attracted to these roles, and to potential issues staff in departments may face as a result of inappropriate leadership or management styles.

0910 The "swallowing disorders" service: changes in practice following practitioner attendance on a postgraduate programme

Nightingale, J. M.

University of Salford, Salford, UK

PURPOSE: Traditionally barium swallows and videofluoroscopy studies have been undertaken by radiologists, with radiographer and/or speech therapist support. Increasingly these practitioners are expanding their scope of practice, with the potential for practitioner-led swallowing services to affect a number of positive service improvements. This project aimed to identify the range of changes in practice, following practitioner attendance on a postgraduate programme. METHODS: 16 radiographers and 8 speech and language therapists submitted clinical portfolios as assessment for a 30 credit M Level "swallowing disorders" module (University of Salford). Following marking and moderation, these 24 portfolios were re-assessed to identify any evidenced changes in practice which had occurred following attendance on this module. The changes were documented and categorised into themes. RESULTS: All practitioners had identified a number of deficiencies within their service, and had consequently introduced a wide range of changes classified as service and role redesign. A number of these changes led to evidenced improvements in three categories: 1. Communication with patients and staff; 2. Examination protocols and safety; 3. Quality assurance and audit procedures. Examples of actual changes in practice will be given within each category. CONCLUSION: The development of the practitioner role generates a range of positive effects on the swallowing service. Attendance on a postgraduate programme enables practitioners to share best practice, and demonstrate that their developing practice is evidence-based. Dissemination of the positive effects of this service redesign to other departments will be advantageous in encouraging further service improvements for the benefit of their patients.

0920 The Continuous Professional Development (CPD) requirements of radiographers in Europe

Marshall, G.

St Martin's College, Lancaster, UK

PURPOSE: This study, co-funded by the European Commission under the auspices of the Higher Education Network for Radiography on Europe (HENRE), investigated factors relevant to CPD in twelve countries in the European Union. MATERIALS AND METHODS: A questionnaire was constructed and translated into the native language of 12 EU countries. It consisted of closed questions which investigated country of employment; length of time employed as a radiographer; training programmes undertaken; first language; knowledge of other languages and their possible use for CPD and to access learning materials; workplace; perceived importance of CPD; time respondents were willing to spend on CPD; areas where CPD input was required. 734 questionnaires were issued with a 75%

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response rate. RESULTS: CPD was important to most radiographers, although importance of CPD decreased with years qualified. 6–10 h monthly devoted to CPD was the preferred amount of study. A mixture of paper, e-learning and internet based materials in the native language of the radiographer would be most popular method for CPD delivery. English was the most popular non native language for CPD materials. More staff who had been qualified for short time periods could use a non native language to study. Cross sectional imaging was the most popular area for CPD training although training in digital imaging and trauma were also much sought after. CONCLUSION: Whilst tailoring CPD to the above requirements would be beneficial it must be remembered that antagonists to CPD exist, e.g. cost, work and family constraints.

0930 Radiographers' perspectives on their changing roles and some implications for their pre-service education

Pratt, S. D.

Cardiff University, Heath Park, Cardiff, UK

OBJECTIVES: A comparative study across three different settings of the factors influencing radiographer's roles, the general and specialist skills required their attitudes toward radiography education and its outputs, and changes which these matters imply might be made to the radiography curriculum. DESCRIPTION: A simple typology for distinguishing radiology departments of different size and structure was formulated. Three contrasting sites were selected. Focus groups prefaced the collection of data by questionnaire initially from 44 radiographers and managers. Biographies, current work and its context and their opinions as to the radiography undergraduate curriculum were obtained. Consequently informants for a second, interview phase of the study were identified. A number of themes emerged and provided the framework for the narrative presentation of findings. CONCLUSION: General radiography was seen to be giving way to increasing specialization. Radiologists were identified as pivotal in facilitating or hindering the extent and shape of changing radiographers' work and was central to radiologists' power and control. Size, range of operations, radiologists' inclinations and the staff structures and cultures which they engendered differed across departments. Agenda for Change, grading criteria, skill-mix and the introduction of a four-tier structure were received with scepticism. While advanced practitioner roles were embraced, informants were both relatively uninformed and sceptical of the feasibility of consultant practitioner roles and unwilling to accept assistant practitioners on both clinical and political-professional grounds. Respondents across three settings evinced different attitudes to and experience of student radiographers, graduates, radiography curricula and radiographers competency.

0940 The State of the Art in HENRE 2 (Higher Education Network for Radiographers in Europe)

Marshall, G.

St Martin's College, Lancaster, UK

This presentation will illustrate the three strands of work taking place in the radiography thematic network, HENRE 2 , the second phase of a project co-funded by the EU, under the auspices of Socrates. Subgroup 1 has concentrated its work around Tuning of Educational Structures and processes within Europe congruent with the Bologna Process 1999. Tuning aims to harmonize education within Europe to ensure courses in different EU countries and at different educational levels are comparable. Subgroup 2 has focused on the underpinning of teaching and learning via research and the development of a database of high quality but unpublished research from within the collaborating universities. Subgroup 3 has engaged with lifelong learning. Within this remit it has investigated the possibility of a HENRE CPD endorsement/accreditation system, the possibility of a collaboration of a minimum of three member countries to work towards an EU kite marked Erasmus Mundus Master's level course and there has been a drive to integrate Eastern and Central Europe within all these developments. All subgroups have integrated the key interface between science and society into their work plans. HENRE 2 is moving via all these agendas to promoting understanding, collaboration and integration across Europe. This should enhance transferability of labour across the EU.

0950 Research productivity among RT educators: the American experience

Fauber, T. L.

Virginia Commonwealth University, Richmond, Virginia, USA

PURPOSE: Full-time American RT educators were surveyed about research/scholarship productivity, perceived research needs and barriers, and to determine whether degree level and type of employer influenced these perceptions. METHODS: A simple random sample of full-time radiological technology (RT) educators was obtained from the American Registry of Radiologic Technologists. A survey was mailed covering demographic characteristics, research and scholarly productivity, and perceived needs and barriers to research. Chi-Square analysis was used to determine whether differences existed in responses among the groups for educators' degree level and type of employer. RESULTS: Survey findings show RT educators have low research productivity. RT educators reported needs such as training in research, access to space, equipment, research funds and personnel to assist in research. Additionally, more than half of survey respondents perceived low levels of research support within their work environment and a lack of research time. RT educator respondents working in 4-year institutions and having a higher academic degree reported higher research production. Educators with graduate level degrees perceived themselves with more research skills and knowledge yet with higher needs for grant funding. Educators employed in 4-year institutions perceived higher levels of environmental support for research, however, lack of time available for research was perceived similarly among educators surveyed regardless of degree level. CONCLUSION: An important finding in this study is that the majority of respondents believe that research is important to the profession; however, they also believe research negatively impacts their teaching and are unlikely to seek a position that emphasises research.

0930–1145
Working in Digital Radiography I

0930 Invited review: Basics of DR for practitioners

Parsons, S.

Addenbrooke's Hospital, Cambridge, UK

No abstract supplied.

1000 Invited review: Image artefacts in digital imaging

George, C.

Hull Royal Infirmary, Hull, UK

The majority of the hospitals within the UK now have computed radiography (CR) and/or digital radiography (DR). Knowledge and familiarity of artefacts related to CR and DR varies within the radiology community. This lecture aims to demonstrate various artefacts related to CR and DR. Most artefacts may not interfere with interpretation of radiographs and therefore may not compromise radiographic quality or radiological diagnosis. However, awareness of these artefacts will help identify and resolve their causes, thereby improving quality assurance and accuracy of diagnosis.

1030 Invited review: Digital imaging in mammography

Phelan, N.

National Breast Screening Programme, Dublin, Ireland

Conventional mammography has for many years been the standard examination for the early detection and diagnosis of breast cancer and is utilized extensively in screening and symptomatic settings. However, in recent years, there has been accelerated and sustained development of digital mammography technology and equipment as well as several clinical trials demonstrating equivalent and better cancer detection using digital mammography. Aside from the diagnostic performance, digital mammography offers several advantages which have the potential to improve the quality, efficiency and productivity of mammography screening as well as opening new frontiers for image acquisition and processing. Many of these advantages may only be fully realised through the implementation of an integrated approach to the management of patient image and clinical data. The principal technologies utilised for digital mammography will be reviewed as will the requirements for display, reporting and image management in the context of our experience of the implementation of digital

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mammography screening at the National Breast Screening Programme in Ireland. The implications for workflow will be outlined along with issues and challenges associated with standards, interoperability and compatibility of image data and information in a multi-vendor imaging environment.

1100 Invited review: DR in different environments

Hunt, E.

Addenbrooke's Hospital, Cambridge, UK
Digital Radiography has been available for a number of years and is now a mainstream technology. With greater reliability it can be applied to a number of different modalities and provide increased efficiencies in service. This talk will outline a number of settings and the service improvements that can be made.

1130 Discussion

1030–1200
Genitourinary II: Renal Artery Stenosis

1030 Invited review: Who do we screen?

Hilton, R.

Guy's Hospital, London,UK.
Atherosclerotic renal artery stenosis (ARAS) may cause ischaemic nephropathy and/or renovascular hypertension. In clinical practice the decision to screen for and treat ARAS requires an evaluation of the prospects of improving renal function and blood pressure versus the risks of an invasive procedure. In an unselected population of hypertensive patients the prevalence of ARAS is low. However, key clinical characteristics can help increase the likelihood of ARAS and thus the cost-effectiveness of screening. There is as yet no consensus view regarding the benefits of percutaneous transluminal angioplasty (PTA) above medical treatment in patients with ARAS, but certain subgroups of patients may benefit from intervention. This talk attempts to shed light on the problem of using clinical clues to identify those patients who are most likely to benefit from screening and intervention in ARAS.

1050 Invited review: Doppler ultrasound on renal arteries

Baxter, G.

The Western Infirmary, Glasgow, UK
The investigation of hypertension resistant to treatment, renal impairment or both with a view to finding an underlying treatable lesion such as renal artery stenosis, the most common secondary cause, has undergone many metamorphoses over the years. There is a now a myriad of possible investigative tests to confirm or refute the diagnosis, with many variations depending upon local expertise. The role of Doppler ultrasound, including colour, has had mixed press with significant variations in overall sensitivity and specificity between differing groups. Two basic ultrasonic techniques remain; (1) focuses on the main renal artery however incomplete studies have been recorded in up to 40% and (2) a technically easier examination focuses on the intrarenal vessels and although successful in almost all patients, false positives and negatives remain a problem. In addition to these technical considerations, success of the technique is also dependant upon the disease prevalence in the study population and the criteria for stenting. One perceived advantage is that non invasive follow up is possible with ultrasound; however, this is only of use if a baseline study has been performed. MRA is undoubtedly becoming the investigation of choice. Issues still remain regarding availability and in this context ultrasound may still have a role, albeit secondary. The use of ultrasound contrast agents will be addressed. The predictive value of ultrasound with regard to patient outcome and possible long term monitoring with this technique will also be discussed.

1110 Invited review: MRA in renal artery stenosis

Gedroyc, W.

St Mary's Hospital, London, UK
No abstract supplied.

1140 Invited review: CT of renal artery stenosis

Prokop, M.

UMC Utrecht, Utrecht, The Netherlands
No abstract supplied.

1150 Discussion

1030–1210
Breast SFG II

1030 Invited review: Blue sky breast imaging

Lyburn, I. D.

Cheltenham General Hospital, Cheltenham, UK
No abstract supplied.

1100 Image guided biopsy of mammographic microcalcifications

Vinayagam, R.•Gill, P.

University Hospital North Tees, Stockton-on-Tees, UK
PURPOSE: To audit the accuracy of radiographers taking stereotactic core biopsies; To study if cluster morphology influences calcium retrieval rates; To compare radiological opinion against histological findings. MATERIALS/METHODS: Retrospective analysis of all stereotactic 14 G core biopsies performed in a Breast Screening Unit over an 18 month period (Jan 04 to June 05). Use of department database, mammograms and case notes. RESULTS: Of 300 biopsies, 264 were performed by radiographers. All cases had specimen radiography. The calcium retrieval rate was 80% in the early 2004 and 95% by the end of July 2005. The calcifications were classified into cluster, tiny cluster and scattered cluster, according to the mammographic appearances. In the negative biopsies they were 32%, 43% and 25%, respectively. The comparison between the radiologist opinion against the final core biopsy results shows 90% concordance with pathology for Opinions 2 and 5 and 75% for opinions 3 and 4. CONCLUSION: Calcium retrieval rates for radiographers initially matched, then exceeded those for radiologists. They also showed a steady improvement during the study period, rising to 95%. The cluster morphology did influence the calcium retrieval rate. There was a good concordance of radiology and pathology opinion.

1110 Can microvascular imaging of breast lesions using microbubbles accurately distinguish benign from malignant lesions?

Sorelli, P. G.•Lim, A.

Charing Cross Hospital, London, UK
AIMS: We investigate whether microvascular enhancement of benign and malignant lesions using microbubbles have characteristic distinguishing patterns and correlate these findings with histology. MATERIALS/METHODS: 15 patients were recruited with palpable breast lumps. 2.4 ml of the microbubble SonoVue (Bracco, Milan, Italy) were injected intravenously. Video clips of lesion enhancement were obtained using high frequency, low mechanical index specialised bubble mode, Microvascular Imaging (MVI) using a 7.5 MHz probe (HDI 5000; Philips Medical Systems, Bothwell, USA). Lesions were biopsied using a 14 gauge needle. Clips were reviewed by a Consultant radiologist who scored each lesion on the following characteristics: benign *vs*. malignant, homogeneous *vs*. heterogeneous enhancement, presence or absence of focal defects, well *vs*. ill-defined structure and Vascular Morphology Score (VMS). Statistical analysis was carried out using the Mann Whitney U and Chi-square tests. RESULTS: 15 solitary lesions were examined in 15 females (median age 44 years, range 23–73 years). Seven were malignant and 8 benign histologically. 8 patients underwent surgery, 3 core biopsy, 4 fine needle aspiration. The sensitivity was 100%, with a 37.5% specificity. The overall mean VMS and mean VMS for localization, vessel pattern and density were higher in the malignant lesions compared with the benign lesions (9.3 *vs*. 6.9, 9.5 *vs*. 6.7, 8.5 *vs*. 7.6, 9.6 *vs*. 6.6, respectively). CONCLUSION: We have not shown any additional benefit in the use of contrast enhanced ultrasound over conventional triple assessment. The positive trend seen in the higher mean VMS for the malignant tumours needs further investigation with larger patient numbers.

1120 The e-Medi project: an educational resource for breast Imaging

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O'Keeffe, S.•Boyle, G.•McDermott, R.

St. James's Hospital Dublin, Dublin, Ireland

This project presents the e-Medi platform, a breast imaging teaching resource for radiologists. The objective is to demonstrate the major features of e-Medi and its utility as a teaching tool. The e-Medi project is a European initiative to develop online, high quality, standardized teaching materials for breast imaging. With the e-Medi platform, the student is lead through breast imaging cases in a manner mimicking the real world, expert assisted training experience found in a teaching hospital. The core content of e-Medi is approximately 100 breast imaging cases containing mammography, ultrasound and MRI images. The e-Medi interface guides the student through each case, with the student reporting on case images, identifying lesions, taking work-up decisions and ultimately scoring the case under BiRads criteria. The e-Medi platform represents a considerable advance on simple online teaching files, leveraging the capabilities of electronic media to provide the student with an engaging, realistic exposure to the day to day decisions faced by the breast imaging expert. In this presentation we provide a guide to the main features of the e-Medi interface, provide example cases from the student's perspective and describe the underlying e-Medi case authoring system. The e-Medi project has developed a useful and novel teaching resource for breast imaging. The teaching paradigm employed in e-Medi is designed to expose the student to realistic imaging scenarios and decisions. The e-Medi project is funded by the European Commission under Leonardo da Vinci.

1130 Influence of radiological classification on cytology grading of breast lesions

Sivashanmugam, T.•Raj, J.•Denton, E.•Clarkson, K.•Al-Attar, M.

University Hospitals of Leicester, Leicester, UK

PURPOSE: There is increased number of C1 (inadequate) cytology in benign breast lesions (up to 30%) and the causes for this are multifactorial. It has been suggested in scientific papers, that radiological classification influences overall imprint cytology results, especially when the radiological classification is indeterminate (R3). The aim of our study was to assess this concept further. MATERIALS/METHODS: Review of collected data between December 03 and July 05. IC and core biopsy results were compared with overall radiological classification. RESULTS: 254 ultrasound guided core biopsies (with IC) were performed in 248 patients. On cytology, 186 (73%) were malignant, 23 (9%) were benign, 12 (5%) were indeterminate and 33 (13%) were inadequate for assessment. Of the 186 malignant cytology, 96%, *i.e.* 177, were radiologically malignant and there were no false positive or false negative. The number of C1 in radiological malignant group were 5.6% (11), in the benign group 22% (6) followed by 47% (16) in the radiologically indeterminate group. Of the 16 radiologically indeterminate lesions, classified as C1, 11 were benign, 3 were poorly differentiated malignancy and 2 were normal breast tissue on core biopsy. CONCLUSION: The positive predictive value of imaging, on malignant cytology was 96%. More of radiologically indeterminate lesions were deemed cytologically inadequate, compared with radiologically determinate lesions. This difference was statistically significant ($p < 0.001$). Although, the increased number of C1 in R3 group is likely to be due to the nature of these lesions (69% were benign), our study demonstrates that there is a significant radiological influence on cytological results.

1140 Diagnostic consistency of core biopsies and excised specimens in screen detected invasive breast cancers

Pagliari, C. M.[1]•Wilkinson, L. S.[1]•Given-Wilson, R. M.[1]•Thomas, V. A.[1]•Poloniecki, J.[2]

[1]St George's Hospital, London, UK, [2]St George's University of London Medical School, London, UK

PURPOSE: To evaluate the correlation between preoperative diagnostic information obtained on core biopsy and final histopathology in patients with breast cancer. MATERIALS/METHODS: 156 invasive foci were studied retrospectively in 153 patients with screen detected breast cancer diagnosed on core biopsy at St George's Hospital in 2002, who underwent surgical excision at 8 different hospitals. Tumour type, grade, overall oestrogen receptor (ER) status and the presence of lymphovascular invasion (LVI) on core biopsy were compared with final histopathology. RESULTS: There was 100% correlation between type in 5 mucinous carcinomas, 81.2% in 117 invasive ductal type, 55.6% in 9 tubular/cribriform type, 54.5% in 22 lobular carcinomas and 33.3% in 3 mixed ductal/lobular type ($p<0.0001$). Grade was correctly predicted in 69.6% of Grade 2, 68.4% of Grade 3 and 62.7% of Grade 1 carcinomas ($p<0.0001$). There was a very high correlation between ER status, (positive predictive value of 96.5% and negative predictive value of 100% ($p<0.0001$)). There was suspicion of LVI in 2 core biopsies, not seen in the final specimens. CONCLUSION: The concordance rates within the network compare favourably with published series. Highest concordance is seen with invasive ductal and mucinous tumours. There is a moderately good concordance for other tumour types and for grades, with the highest rates in Grade 2 carcinomas. ER status is very reliable. LVI is rarely observed in core biopsies. Discrepancy rates will reflect both variation in sampling and interobserver variation in pathology reporting. Awareness of concordance rates is important in treatment planning and prognostic estimates.

1150 Influence of basal phenotype on the metastatic pattern of breast cancer

Luck, A. A.[1]•Evans, A. J.[1]•Rakha, E. A.[2]•Green, A. R.[2]•Paish, C.[2]•Ellis, I. O.[2]

[1]Nottingham Breast Institute, Nottingham, UK, [2]Department of Histopathology, Nottingham University, Nottingham, UK

PURPOSE: To assess whether breast cancer basal phenotype status influences metastatic pattern and survival with metastatic disease. MATERIALS/METHODS: The basal phenotype status of a series of consecutive primary operable breast cancers diagnosed between 1986 and 1998 was ascertained using CK5/6 and CK14 (10% or more staining with either marker was taken as indicating a basal phenotype (BP), all others constituted the non-basal group (NBP)). The presenting metastatic pattern of disease in 113 women with BP cancers was compared with 178 women in the NBP group. RESULTS: Patients with the basal phenotype were more likely to present with intrapulmonary (25/48, 52% *vs.* 15/64, 23%; $p = 0.0009$) and/or brain metastases (20/113, 18% *vs.* 3/178, 2%; $p = 0.0000$). Patients with the non-basal phenotype were more likely to present with bone metastases in the absence of visceral disease (48/102, 47% *vs.* 14/62, 23%; $p = 0.0017$). There was no significant difference in the frequency of pleural or liver metastases. A basal phenotype is associated with a short median survival with metastatic disease (10.1 months *vs.* 25 months). CONCLUSION: Intrapulmonary and brain metastases are seen more frequently at metastatic presentation in BP breast cancer patients and a BP is associated with a poorer survival after metastatic presentation.

1200 The role of breast MRI in the assessment of pre-operative malignancy

Hoang, T.•Pienaar, W.•Jones, A.

Guy's and St Thomas' NHS Trust, London, UK

PURPOSE: Evaluating the use of breast MRI in assessment of primary breast cancer and response to primary chemotherapy. MATERIALS/METHODS: Over a 3 year period a retrospective analysis was performed of 45 patients undergoing breast MRI to evaluate the primary breast carcinoma or response to chemotherapy. Patients were examined on a Siemens magnet with dynamic enhancement. Correlation was made with conventional imaging and final pathology from surgery. The chemotherapy group underwent 3 scans pre, mid and post treatment. RESULTS: There was marked discordance between the MRI findings and pathological findings in over 50% of patients. Variation between MRI and pathology included MRI reporting no residual disease when significant disease was seen at pathology in 4 patients. In patients undergoing MRI for primary assessment of tumour size again significant discrepancies in size between MRI and pathology were found with both overestimation and underestimation of size. Results will be discussed along with discussion of the present literature. CONCLUSION: This review of effectiveness of breast MRI in pre-operative evaluation of breast carcinoma markedly disagrees with the literature. Breast MRI is unreliable in both assessing response to chemotherapy and evaluating primary tumour size. It should not be used alone in making management decisions regarding surgery. Clinical and conventional imaging should be used as standard practice

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with MRI reserved for difficult or occult cases on current imaging. A large randomized controlled trial is required to evaluate breast MRI, a costly and time consuming procedure, prior to this becoming standard practice.

1030–1230
Radiation Protection Update

1030 Future approaches to inspecting the IR(ME)R

Fredericks, P.

Healthcare Commission, London, UK

No abstract supplied.

1100 Invited review: IRMER doses much greater than intended?

Temperton, D.

RRPPS, Birmingham, UK

The Ionising Radiation (Medical Exposure) Regulations 2000 and the associated amendment Regulations 2006 require that the employer notifies the Healthcare Commission when a person, undergoing a medical exposure receives an exposure "much greater than intended" due to a procedural failure or human error. Interpreting "much greater than intended" has generated much debate. Initially the Department of Health, DH, suggested that it was appropriate to use the guidance issued by the Health and Safety Executive, HSE, in their publication PM77. PM77 specifically addresses notification of incidents to HSE involving doses "much greater than intended" as a result of equipment failure as required by the Ionising Radiation Regulations 1999. The DH convened a multidisciplinary working party in 2004 to consider guidance specifically for IRMER. This group produced some preliminary recommendations. The third edition of PM77, published in 2006, which requires notification in some cases for incidents where the actual dose given is only 1.5 times the intended doses for diagnostic procedures emphasised the need for the IRMER specific guidance. The DH requested additional advice from various individuals and professional body's and reconvened a working party in October 2006. The most current DH guidance will be discussed highlighting some of the debate that has taken place particularly in relation to diagnostic procedures. There is concern that the guidance requires notification of incidents even when the risk is negligible. The DH would like to be notified about incidents involving major system failures – not just those where the risk is significant.

1130 Reporting doses in interventional radiology

Rogers, A.

Nottingham University Hospitals NHS Trust, Nottingham, UK

Patient dose in interventional radiology is an important topic due to the potential for both high doses in general, and specifically, high doses to the skin. The former is of importance with regard to optimization and reducing stochastic risk. The latter is important due to the desire to minimize the occurrence of deterministic effects such as erythema or, in extreme cases, skin necrosis. This review will concentrate on the reporting of such doses using interventional cardiology as a specific example. It will discuss aspects such as measurement methodologies and their errors and will review the dose data currently available. This data can be used to predict the frequency of deterministic effects likely to be seen by a centre, which is important when formulating monitoring strategies. The review will also summarize current frameworks for dose reporting, including ICRP, FDA and DH thinking on the issue. Finally, the issue of risk and benefit will be discussed, both in terms of the irradiated patient and also the monitoring regimen employed.

1200 Skin doses from interventional neuroradiology procedures and their relationship to "much greater than intended"

Kotre, J.•Hind, N. J.

Newcastle General Hospital, Newcastle-upon-Tyne, UK

PURPOSE: To estimate and collate skin radiation doses for patients undergoing complex interventional neuroradiology procedures at a tertiary referral centre and to review them in relation to the proposed "much greater than intended" guidance on the Ionising Radiation (Medical Exposure) Regulations. METHODS: The skin dose readout for a new flat-panel intensifier biplane fluoroscopy unit was calibrated then used to estimate skin doses for patients undergoing complex interventional procedures, predominantly embolisations, over a period of months. Any cases of skin reaction reported as being a problem at routine follow-up were noted. RESULTS: Skin doses for these procedures were frequently higher than the 1 Gy level which has previously been proposed as a reporting level, and were not uncommonly higher than the 3 Gy level at which deterministic effects would be expected. CONCLUSION: These results were obtained on new high-specification equipment, at a specialist regional centre with a high concentration of expertise. It is argued that the high skin doses are justified in relation to the life-threatening conditions being treated and the complexity of the procedures required. The fact that these levels extend into the region at which deterministic skin damage might be expected does not make the doses "much greater than intended" or imply that practice is poor. It may be that interfering with practice on the grounds of radiation protection could pose a greater risk to the patient than accepting these high skin doses.

1210 Investigation of skin doses during interventional cardiology procedures

Sawyer, L. J.[1]•Holmes-Smith, W.[2]•Starritt, H.[1]

[1]Royal United Hospital, Bath, UK, [2]St Mary's Hospital, Portsmouth, UK

PURPOSE: Interventional cardiac procedures, such as percutaneous coronary intervention (PCI) may result in high radiation doses to the patient due to the long and complex nature of the procedure. In this study, three methods of measuring skin doses were investigated and the results compared with commonly recorded parameters in order to determine a practical indication of skin dose for routine use. MATERIALS/METHODS: Skin doses were measured for patients undergoing percutaneous coronary interventions, using a TLD array, Kodak EDR2 film, and a self-developing Gafchromic XRQA film. Variable parameters were also recorded, including operators, screening times, skin dose indicator and DAP values, in order to assess any correlations with peak skin doses. RESULTS: The doses measured by EDR2 films matched well with the TLD arrays. The XRQA type of Gafchromic film was too sensitive for these high dose procedures, although it produced dose distributions with excellent resolution. Maximum skin doses ranged from 0.2 Gy to 1.9 Gy, just below the threshold for erythema as reported in ICRP publication 85, and a correlation was found with DAP and skin dose indicator for each type of procedure. CONCLUSION: EDR2 film and TLDs provide an accurate method of directly measuring skin dose, and a less sensitive type of Gafchromic film would provide the most efficient direct measurement. Once the relationship between peak skin dose and skin dose indicator or DAP has been determined, these may be used to indicate skin doses and limits can be set to minimize skin damage.

1220 Should current DRLs be used to assess patient dose delivery in computed radiography?

Hughes, D.•Connolly, P. A.•McHale, S.•Charnock, P.

Integrated Radiological Services Ltd, Liverpool, UK

PURPOSE: To investigate set up of AEC system following installation of computed radiography (CR) and the suitability of using current Diagnostic Reference Levels (DRL) to optimise patient dose delivery. MATERIALS/METHODS: Patient entrance surface doses (ESD) were calculated both pre- and post-installation of the CR system. ESDs were then compared with National Diagnostic Reference Levels (NDRL). Image receptor doses were measured and Exposure Indices (EI) recorded as part of assessment of AEC performance. An experienced radiographer carried out a subjective assessment of image quality by reviewing images taken of an anthropomorphic phantom at successively increasing levels of receptor dose using the density correction function. RESULTS: Patient entrance surface doses were higher than NDRL both pre- and post-CR installation. Measured image receptor doses, post-CR installation, of 7 μGy were typical after service engineer intervention. Following image quality optimization, image receptor doses were able to be reduced to between 3 μGy and 4 μGy (the EI being at the lower end of the recommended range suggested by the manufacturer). However, ESD remained higher than NDRL by a factor of 2. Reduction in ESD resulted in a level of image quality that was clinically unacceptable to the radiology department. CONCLUSION: Current DRLs appear unsuitable for assessing patient dose with certain CR manufacturers.

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Patient entrance dose data and equipment performance data should be utilized when optimizing AEC devices used with CR systems. CR equipment suppliers should recommend image receptor doses as well as EI range for AEC optimization.

1030–1200
Debate: Advances in imaging technology will render the radiologist and radiographer redundant!

1030 Invited review: Speaking for the motion

Smith, M.

Sheffield Hallam University, Sheffield, UK
No abstract supplied.

1050 Seconding for the motion

Bury, B.

Leeds General Infirmary, Leeds, UK
No abstract supplied.

1100 Invited review: Speaking against the motion

Maskell, G.

Royal Cornwall Hospital, Truro, UK
Advances in imaging technology have occurred at an ever increasing pace in recent decades. At the same time, society is demanding a more patient-friendly service from healthcare professionals. Despite the rise of internet medicine, demand for face to face consultation with medical professionals continues to rise. Although so-called intelligent diagnostic systems are increasingly available, it is becoming clear that their role is to filter the data to allow the attention of the human reader to be focused most usefully. The wider accessibility of information has not made other professionals redundant because one of the key constituents of professional advice is interpretation. Many questions in imaging do not have yes/no answers – it is in the grey areas that the machines will fail. The human face of radiology and radiography is essential and will never be made redundant.

1120 Invited review: Seconding against the motion

Bloor, C.

Royal Cornwall Hospital, Truro, UK
No abstract supplied.

1130 Discussion

1030–1140
Education Issues Scientific Session II

1030 Radiologists' satisfaction with training and support in suspected non-accidental injury: a telephone survey of BSPR members

Landes, C.[1]·Offiah, A. C.[2]

[1]Alder Hey Hospital for Children, Liverpool, UK, [2]Great Ormond Street Hospital for Children, London, UK
PURPOSE: To determine levels of satisfaction of members of the British Society of Paediatric Radiology (BSPR) as regards the current training, service and support they receive in the diagnosis of suspected non-accidental injury (NAI). To seek their opinion on how professional development needs in this field might best be met. MATERIALS/METHODS: This is a work in progress. A web-based questionnaire – www.surveys.emnm.co.uk/gosh/index.php – has been designed. Researchers are currently soliciting the views of 125 members of the BSPR via telephone. Salient questions include: (1) Practice in DGH or tertiary hospital; (2) Level of seniority; (3) Area of expertise (expert witness for the courts?); (4) Exposure to cases of suspected NAI; (5) Awareness of the BSPR guidelines for skeletal surveys in suspected NAI; (6) Level of satisfaction with service/support available; (7) Suggestions for improving the current training/continuous professional development in this field, including: (a) Attendance at regular courses/conferences; (b) Development of local/regional/national support networks; (c) Participation in an optional web-based course with award of CPD credits; (d) Formal assessment and accreditation akin to the process practised by breast radiologists. CONCLUSION: Results of this survey should inform future training programmes and professional development of radiologists in the field of suspected non-accidental injury. More robust training and support may attract an increasing number of radiologists to this difficult and often controversial area.

1040 The setting up of a successful collaborative ultrasound training scheme for non-imaging clinicians

Chow, K. H.·Beardshall, M.

Chesterfield Royal Hospital, Chesterfield, UK
We plan to present an excellent model of training non-imaging clinician to perform ultrasound. FAST Scan training is unregulated and is a license for dangerous misuse of ultrasound technique. The Royal College of Radiologists recognized this and introduced guidelines for the training of non-imaging clinicians in the use of ultrasound. These guidelines were endorsed by the College of Emergency Medicine Ultrasound sub-committee, and level 1 training should be in place by 2010. They also recommend that the training is delivered in collaboration with local universities accredited by the Consortium for the Accreditation of Sonographic Education. In 2005, Chesterfield Royal Hospital and University of Derby developed a quality controlled, collaborative 5 days Ultrasound Training Course for non-imaging clinicians. All successful trainees now regularly use ultrasound in their current A&E practice. Day 1: Physics, Artefacts, Image/Report storage and Clinical Governance. Day 2, 3 & 4 involved 19.5 h of scanning 54 patients and 3 h of tutorial in 3 consecutive days. Day 5: Occurs after 1 month and requires an examination, completion course log book and to write up 25 cases. The examination of trainees involves scanning 4 patients and this assessed by a Clinical tutor from University of Derby. We would like to share our experience in the setting up this sustainable high quality course which is highly appreciated by our A&E colleagues in Chesterfield and hope this would help the development similar courses. A system of accreditation is needed for similar short course in the UK.

1050 The application of emerging imaging and internet technology in online radiology education

McLaughlin, P. D.

Cork University Hospital, Cork, Ireland
PURPOSE/AIM: To demonstrate the use of emerging Imaging and Internet Technology in the delivery of advanced online Radiology Educational Content. BACKGROUND: Existing Radiology E-Learning Initiatives, some examples listed below, have used Traditional Educational material (text, static images, graphs, diagrams) delivered in an online platform to good effect. RSNA - Medical Image Resource Centre (MIRC); RCR - Radiology Integrated Training Initiative (RITI); ECR - European Association of Radiology E-Learning (EURORAD). A number of recent advances in Internet technology have allowed the delivery of Rich Audiovisual and Multimedia Content in Websites to an increasingly wider audience of Internet users. Rich Content formats which may be specifically useful to Online Radiology Education include: Scrollable Multi Slice Images (Axial and Multi Planar Views); Cine Images; Interactive 3D Reconstruction Images; Subscribable Lectures; Audio Lectures (Podcasts); Audiovisual Lectures (Videocasts). MATERIALS & METHODS: A framework for an Online Radiology E-Learning Website capable of utilizing rich multimedia content was designed. Priorities in the design process included: Easily Updateable Content; Multiple Teachers/Contributors; User Friendly and Interactive Design; Online Assessment/Correction. The published website, www.radiology-ucc.com, was developed using Osirix, an Open Source Macintosh based DICOM/PACS workstation and Moodle, an Open Source (Free) online Learning Content Management System. CONCLUSIONS: Using newly available Open Source software it is possible to develop an advanced solution for Radiology E-Learning which widely delivers rich imaging and multimedia content in a student and educator friendly package.

1100 Podcasting: A possible innovation in Radiology education?

Yap, K. S.[1]·Mankad, K.[2]

[1]Huddersfield Royal Infirmary, Leeds, UK, [2]Leeds General Infirmary, Leeds, UK

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PURPOSE: Podcasting is an efficient way of syndicating materials over the internet by an on-demand basis to personal computers and portable players. Text, audio and images can be downloaded and viewed at leisure. It has great potential to be used as a flexible training tool. This study measures the potential of online home learning using podcast technology. METHODS: 35 final-year medical students and FY-1 trainees from Leeds were surveyed using a simple questionnaire. Participants then downloaded an online learning module containing a pre-test, two lectures and a final test. The lectures were targeted to chest X-ray interpretation. The tests involved pictorial labelling of normal anatomy and chest X-ray spotters. A survey was repeated after the test module to check if the participants had found the learning tool useful. RESULTS: In the initial survey 58% of participants claimed that there was insufficient radiology exposure as undergraduates. 57.1% of responses on the anatomy and 65.7% of responses on the X-ray spotter pre-tests were incorrect. Final test results (post lectures) showed a 10-fold improvement in anatomy and 6-fold improvement in spotter test scores. All participants on a feedback questionnaire agreed that podcast learning could provide a standardized and effective learning experience with the flexibility of loading the modules on portable players allowing convenient revision during commutes and free time. CONCLUSIONS: There is potential for using Podcasting for training undergraduates and junior doctors in radiology. The technology may also benefit specialist registrars in radiology by enabling "portable" and self-paced learning.

1110 MMC meets RCR; foundation training in the radiology department

Allcock, E. S.•Thompson, S.•Ahmed-Little, Y.•Strong, P.

Royal Bolton Hospital, Bolton, UK

KEY LEARNING OBJECTIVES: (1) To introduce the novel concept of the radiology foundation trainee in the context of Modernizing Medical Careers; (2) To describe the role of the foundation trainee within the radiology department; (3) To discuss ways in which this position can be expanded to incorporate service provision as well as educational activity. With the implementation of changes in training brought about by Modernizing Medical Careers, junior doctors are undertaking posts in increasingly diverse specialties. The Royal Bolton Hospital introduced the new post of Foundation Year 2 (FY2) trainee in radiology in August 2006. FY2s undertake a 4-month placement in the department. The role is mainly observational, with most activity centred on ultrasound, CT, MR and plain film investigations. IVU and barium enema studies may be independently reported by trainees and subsequently verified. In line with the Royal College of Radiologists' recommendations regarding the use of ultrasound by non-radiologists, FY2 trainees are strongly encouraged to develop skills in this discipline. Current FY2s are involved in the attainment of RCR gastrointestinal ultrasound accreditation. It is expected that FY2s in radiology will develop a key service provision role in obtaining informed consent and delivering appropriate peri-procedural care to patients undergoing interventional procedures. CONCLUSION: Radiology foundation trainees are provided with a unique opportunity to develop highly desirable analytical and practical skills and nurture an appreciation of the appropriate application of radiological investigations. Radiology departments may gain mutual benefit from previously overlooked service provision roles being delegated to foundation trainees.

1120 The power of PACS as a teaching tool: the radiology academy concept in the DGH

Woolfall, P.

University Hospital of North Tees, Stockton on Tees, UK

KEY LEARNING OBJECTIVES: To use the tools built into an off the shelf PACS product (Agfa Impax) to provide the best possible learning opportunities for radiology trainees, reporting radiographers and others. DESCRIPTION: Many DGH radiology consultants provide teaching for radiology trainees, radiographers, medical students and clinicians both within and outside of their departments. PACS has many tools which simplify this task. The collection and ordering of teaching cases is made simple by the use of "keywords" which can quickly be assigned to a case during day to day reporting. While the traditional "*viva voce*" style tutorial format remains useful, PACS also allows the easy creation of themed teaching files which trainees can attempt alone and review later either alongside their trainer or using written feedback material. Different sets of teaching files can be created which vary in difficulty according to the experience of the learner. For junior radiology trainees, "workshops" using labelled cross-sectional studies and a pre-printed workbook are an effective and popular way to learn radiological anatomy. Anatomy assessments for trainees can be carried out using the same techniques. For radiologists teaching outside of their departments, PACS allows the easy creation of image files (such as JPEG) which can be exported into a Powerpoint presentation, onto the internet or into other applications. CONCLUSION: PACS brings many educational as well as clinical benefits and allows high quality teaching material to be easily created in the DGH.

1130 Utilization of non visual aid for radiology learning

Haroon, A.•Moholkar, S.•Dickinson, F. Jones, R.

United Lincolnshire Hospitals, NHS Trust, Pilgrim Hospital, Boston, Lincolnshire, Peterborough, UK

PURPOSE: To assess the usefulness of digital format verbal dictation in improving time utilisation and knowledge for radiology trainees. METHOD: 20 radiology topics were dictated in MP3 format with the help of 512 MB Teknika MP3 Player with built in recording and playing function. Radiology review manual 5th edition was used after copyright permission. Two radiology trainees filled 10 points self-assessment proforma on day 1 and day 4 after listening to these MP3 files. RESULTS: The average distance travelled and time spent on journey towards hospital by our two radiology trainees is 56.5 miles and 67.5 min per day (one way), respectively. 20 radiology topics (duration 0.30–5.40 min; average 2.17 min; total 43.54 min) were dictated by observer A and listened by A and B (n=1-6 times; average 4.17 times) either while driving to work or doing domestic work at home. The average perceived concentration level was 5.325 (range 2–7). On 9 out of 40 occasions these were heard while the observers were short of sleep. Observer A preferred to repeat 6 out of 20 topics verbally while listening. The average day 1 and day 4 recall were 7.55 (range 6–10) and 6.15 (range 4–9) respectively. CONCLUSION: A verbal aid to facilitate learning is a very effective method while on the move. It saves time and improves recall as well. We would encourage availability of academic material in audio format. (We are grateful to Lippincott Williams and Wilkins to give us permission to utilize their material.)

1045–1200
Business Planning

1045 Invited review: Marketing your service

Wall, M.

Taunton and Somerset NHS Trust, Taunton, UK

This session will look at marketing your service in the modern health market. It will not contribute to the debate about whether the new competitive market in the NHS is a good thing, but will equip participants with the theory and models to enable them to plan a marketing strategy for their service to succeed in this new environment. The session will look briefly at key marketing theories (to include the four and seven Ps, market segmentation, the theory of communications, the zones of perception and key touch points) and suggest some tools that can be used to exploit your market position. Examples from the NHS and the private sector will be used to illustrate the points made. The session will concentrate on providing information, techniques and tools for participants to use and apply to their own situation, but there will be time given for discussion and questions.

1110 Invited review: How to produce a business plan

Sharpe, P.

Taunton & Sommerset Hospital, Somerset, UK

Business planning is an essential component of any successful business but is often overlooked due to pressure of day to day operational issues. A well constructed business plan can not only attract and safeguard funding for a project, but focus efforts and provide a yardstick to measure progress. Radiology has been susceptible to creeping developments, where "the odd case" becomes the norm over time

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without any funding attached to the new service. As the NHS adopts a system where increasing the money follows the patients, this perhaps provides greater opportunities to develop business cases focusing on efficiency, cost reduction and income generation. This presentation considers the key requirements to produce a concise and successful business plan. Methods of evaluating alternative options within the plan will also be considered.

1135 Invited review: Negligence avoidance

Leigh, B.

Hempsons Solicitors, London, UK

No abstract supplied.

1100–1200
Radiographs and Arthritis

1100 Invited review: Radiological characterization of arthritis

Campbell, R.

Royal Liverpool University Hospital, Liverpool, UK

Disease characterization in rheumatology relies primarily on careful interpretation of conventional radiographs. This lecture will review the basics of radiographic interpretation with special emphasis on patterns of erosive disease, reactive bone formation and soft tissue calcifications by which the differential diagnosis may be defined. Although the role of ultrasound and MRI in rheumatology has been focused on the early diagnosis and detection of disease, both may demonstrate disease specific radiological findings. Ultrasound can differentiate effusion from synovial proliferation, but may also show features such as calcification not appreciated on radiographs. Erosions are not only detected earlier by ultrasound, but may show specific features of proliferative bone formation. MRI is contributory to the evaluation of some cases of monoarthropathy, and may identify features such as rice bodies and haemosiderin deposition. MRI may also detect radiographically occult enthesitis due to the presence of marrow oedema in patients' with sero-negative spondyloarthopathies.

1120 Invited review: Should we still be doing radiographs for early erosive arthropathy: radiographs *vs*. ultrasound *vs*. MRI

O'Connor, P.

Chapel Allerton Hospital, Leeds, UK

Rheumatoid arthritis (RA) is a chronic autoimmune multisystem disorder of unknown aetiology. It has an incidence in the community of approximately 1% and represents an important cause of morbidity and mortality. The defining pathological feature of RA is bone erosion. Erosions are important in RA diagnosis and their presence is a key indicator of prognosis. Erosions are common in RA patients and have been found in up to 97% of patients. The majority developing during the first 2 years of the disease. Recently introduced biological disease-modifying antirheumatic drugs (DMARDS) have been extremely successful in suppressing disease activity. They work by inhibiting the inflammatory cascade reducing inflammatory change in and around joints. Their effect in preventing irreversible joint damage is most marked when treatment is initiated early in the disease process. Accurate and early diagnosis of RA has become imperative placing increased demands on imaging to identify the earliest sign of erosive joint damage and predict future structural and functional deterioration. Radiography, ultrasound, CT and MRI can all be used to image erosions. A study of 50 patients with polyarthralgia suspected of having early RA clinically and radiographically underwent gadolinium (Gd-DTPA) enhanced MR imaging of the hands. 30% more patients were correctly diagnosed using MRI than using the classification tree of the American Rheumatism Association. Imaging modalities that facilitate multiplanar imaging such as ultrasound, CT and MRI have been shown in several studies to demonstrate erosions with greater sensitivity than conventional radiography (CR), particularly in early RA. In a comparison of ultrasound, MRI, CT and CR in detecting bone erosions in the humeral head in 26 patients with RA, MRI depicted erosions in 25 (96%), ultrasound in 24 (92%), CT in 20 (77%) and CR in 19 (73%) cases. This study also showed CR to frequently miss small erosions. Erosions generally only become visible on conventional radiography (CR) after a large proportion of the bone is destroyed and one study concluded that detection of MCP radiographic erosions was only possible once MRI-estimated bone erosion volumes reached 20–30% of the metacarpal head. To assess the literature effectively it is important to differentiate between clinical practice and clinical trials imaging papers. In general the literature is based targeted on using imaging as an outcome measure for clinical trials work. The roles played by imaging in clinical trials are similar to those in clinical practice, such as disease diagnosis, severity assessment and prognostication, monitoring of disease progression and treatment response and evaluation of complications. However, the priorities do differ between these two contexts. Methods described in the literature to score erosions and determine disease progression may be impractical to implement in daily clinical practice that is geared towards individual patients rather than a study population. For example the Larsen and Sharp radiographic scores and their modifications are standard methods for determining joint damage and its progression in clinical trials but are rarely used in clinical practice to determine a management plan. The role of clinical trials in validating precise methods for identifying patients that would benefit from DMARDS and for monitoring therapy is essential to establish the efficacy and safety of new drugs. In fact it is often during clinical testing of new therapies that imaging tools that will ultimately be used in clinical practice first get developed. The use of advanced imaging such as MRI and ultrasound in clinical trials is of great financial advantage to drug companies as it allows study populations and study duration to be decreased with a subsequent large incentive to use expensive equipment in trials. Biological agents are currently very expensive and clinicians are increasingly relying on advanced imaging modalities to identify a subset of patients with aggressive disease suitable for treatment. With these therapies being used with increasing frequency it is likely that advanced imaging techniques will play an increasing role in the management of patients with early RA. This lecture compares radiography, ultrasound CT and MRI in the assessment of rheumatic joint disease in terms of both diagnosis and disease activity assessment.

1140 Invited review: Optimum demonstration of articular cartilage

Hide, G.

Freeman Hospital, Newcastle upon Tyne, UK

No abstract supplied.

1230–1330
BIR Eponymous Lecture

Digital imaging: past, present and future challenges

Horii, S.

Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania, USA

The rapid advances made in digital imaging have paralleled similar progress in electronics. As computers evolved from room-sized behemoths to hand-held wonders, digital imaging progressed from low-resolution CT to sub-millimetre imaging. The progress predicted by Gordon Moore's famous paper in 1965, that the number of transistors on an integrated circuit "chip" would double every 24 months, has been true now for more than 40 years. This progress in solid-state electronics has had direct impact on digital imaging as it has enabled the detector systems, processing, communications, display, and storage needed. Though digital imaging in healthcare has its roots in nuclear medicine, the idea of being able to use the images in digital form rather than printing them on film or paper can be traced to the late 1970s through early 1980s. The decade of the 1990s saw the development and deployment of clinically useful filmless medical imaging systems. What led from research systems to commercial products for PACS is multifactorial. The speaker will elaborate on the major aspects of this change, the diffusion of these systems in healthcare, and potential barriers to such diffusion. Some of the challenges facing digital imaging are evident now. The number of images generated in medical imaging departments is increasing exponentially. Current systems were not designed for such volumes, so a major challenge is how the conflicting goals (generate more images, interpret more studies) are to be reconciled. An important factor in future digital imaging is the rapid growth of digital imaging outside of radiology. The speaker will also discuss the potential impact of adding digital images from other specialties to a hospital's PACS.

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1330–1540

X-ray equipment performance testing

1330 Invited review: A new paradigm for CT dosimetry

Huda, W.[1]·Smyth, J. M.[2]

[1]University Hospital, Syracuse, NY, USA, [2]Ninewells Hospital, Dundee, UK

The current method of CT dosimetry is based on the computed tomography dose index (CTDI), obtained by performing a line integral of the dose profile from a single CT section. Derived CT dose descriptors include a weighted CTDI, volume CTDI, as well as a dose–length product. The current approach to CT dosimetry is complex, and there are ambiguities regarding the definition and interpretation of most CTDI dose descriptors. Furthermore, the advent of multidetector CT with wide X-ray beams will result in practical difficulties to measurement of dose profiles that will exceed the length of current pencil dosimeter (*i.e.* 100 mm). A radical revision to CT dosimetry is proposed that eliminates all CTDI metrics, as well as the acrylic phantoms in which CT dose profiles are measured. The radiation output of the CT scanner may be determined by measuring the isocentre air kerma (free-in-air). Localized doses in patients may be obtained by combining output data with CT tissue air ratios (TAR) obtained from phantom measurements. The total amount of radiation received by the patient may be specified as the air kerma–area product incident on the patient that may be measured or calculated. Conversion factors obtained through Monte Carlo calculations can be used to covert air kerma–area product values into corresponding effective doses for patients whose size can range from newborns to adults.

1400 Invited review: Display specification and viewing conditions

Robson, K.

Newcastle General Hospital, Newcastle, UK

With the proliferation of digital imaging technologies, the use of soft-copy reporting is become more widespread. Although offering undoubted benefits, care must be taken to ensure that the monitors used are fit for purpose and are located in an appropriate environment. In this presentation, the properties of the different monitor classes and technologies will be briefly discussed in terms of their luminance characteristics. However, the specification of the monitor is not the whole story; it is the combination of the display device and the viewing conditions that is crucial. Poor viewing conditions, particularly reflection, can degrade the image presented to the observer. The influence of viewing conditions on the observer and on the photometric properties of the different types of display will be explored. From these findings, a new method for assessing the viewing conditions will be proposed which takes into account the interaction of the display with the viewing conditions.

1330 Invited review: How to test the integrity of manipulated images

Brettle, D.

Leeds General Infirmary, Leeds, UK

No abstract supplied.

1500 Optimization of chest X-ray exposures for use with a Kodak DirectView 850 computed radiography reader

Jefferies, A.·Aitchison, F.·Benham, J.·Courtney, J.·Thomson, B.·Whittingham, A.·Wingate, J.

Sandwell and West Birmingham Hospitals NHS Trust, Birmingham, UK

PURPOSE: X-ray equipment used with Kodak DirectView CR850 CR readers was initally set up to produce an "exposure index" (EI) of 1800–2000, as recommended by Kodak at the time of installation. Measurements and audits showed that receptor exposure and patient dose were 2–2.5 times those delivered in a 400-speed film room. Kodak retrospectively installed new "image processing libraries" (IPLs) which they claimed would improve the image sufficiently to allow doses to be reduced to film levels. Exposure parameters were adjusted accordingly, but our radiologists complained about the quality of chest images. This study assessed the quality of the images and related it to dose and IPL, to determine whether dose, image processing and/or default window levels required further adjustment. METHOD: 75 chest images were selected from PACS, covering a range of exposure indices and both old and new image processing methods. The images were anonymised and scored by three consultant radiologists. Image appearance (default window settings) was rated ok, light or dark, flat or contrasty. Diagnostic information (window adjusted to give the best possible image) was rated unacceptable, acceptable, good or very good. RESULTS: Work in progress; preliminary results suggest that the lower dose images, processed with the new IPLs, contain adequate diagnostic information but the window width and level need to be adjusted. CONCLUSION: There is a known dose issue with Kodak CR, but we have worked with Kodak to overcome this, with some success as at the time of writing this abstract.

1510 Optimization of digital mammography systems

Oduko, J. M.·Young, K. C.

National Coordinating Centre for the Physics of Mammography, Guildford, UK

PURPOSE: To determine optimal exposure factors for several computed radiography (CR) and direct digital (DR) mammography systems. MATERIALS/METHODS: Contrast-to-noise ratio (CNR) and mean glandular dose (MGD) were measured, using PMMA phantoms to simulate breasts 20–90 mm thick. An aluminium square 0.2 mm thick provided contrast. For each system, the current settings and a range of other mAs, kV and target/filter combinations were used at each phantom thickness. The optimal exposure factors to achieve the target CNR (that necessary to meet the NHSBSP image quality standard) were determined. RESULTS: Optimization generally resulted in the selection of the target/filter combination giving the highest energy, *e.g.* W/Rh or Rh/Rh for all but the thinnest breasts. Tube voltage selection was less important. Since contrast decreases for higher energies, detector dose was increased for greater thicknesses, to reduce noise and maintain the target CNR. For the Siemens Novation the use of the W/Rh combination instead of Mo/Rh led to a dose saving of about 12–19% for PMMA thicknesses from 50 mm to 70 mm. For an Agfa CR1C system the use of a W/Rh combination instead of Mo/Rh led to a dose saving of about 22–34% for PMMA thicknesses from 50 mm to 70 mm. CONCLUSION: Current AEC systems which aim for fixed detector dose are not optimal as they result in a loss in image quality with increasing thickness. The availability of a target material such as Rh or W appears to be beneficial for optimising both DR and CR systems.

1520 Automated measurements of image quality for QA of digital mammography

Young, K. C.·Oduko, J. M.

Royal Surrey County Hospital, Guildford, UK

PURPOSE: European and NHSBSP QC Guidelines on image quality in digital mammography rely on human observers reading images of the CDMAM test object. However, this is time-consuming and affected by interobserver error. This paper describes an alternative automatic method. MATERIALS/METHODS: 59 sets of CDMAM images were produced using 34 different CR and DR digital mammography systems at a range of exposure factors. A software program attempted to locate each of the gold discs in the test images. The proportion of correctly detected discs was used to automate determination of threshold contrast. Three experienced human observers also measured threshold contrast for these images. The average ratio of automatic to human threshold contrast was used to predict human results, and to determine the dose required to reach the image quality standards. RESULTS: The automatic method led to threshold contrasts that were lower than for those of human observers. The ratio of human to automatic threshold contrasts varied with detail diameter and was 1.58±0.08 (sem) at 0.1 mm and 1.83±0.07 at 0.25 mm. The predicted results had a good correlation with human readings (R= .94, CoV = 5% for 0.25 mm details). The mean glandular dose required to reach the minimum image quality levels ranged from 0.61±0.17 mGy for a Siemens Novation and 1.78±0.16 mGy for a Fuji Profect. CONCLUSION: This method provides a useful tool for quality control and acceptance testing of digital mammography systems and could be incorporated into future guidelines.

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1530 X-ray tube and generator surveys – are we testing for its own sake?

Paul, C.•Cheshire, P.

The Radiological Protection Centre, London, UK

PURPOSE: IPEM 91 is the latest guidance document to advise medical physicists on the tests required on diagnostic X-ray equipment. However, since its earliest predecessor HPA report 32(1) was introduced in 1980, the standard tests for X-ray equipment have largely remained unchanged. The increasing reliability of modern X-ray systems may mean there is a danger of testing for its own sake, and this study investigates whether current performance testing can be reduced accordingly. MATERIALS/METHODS: The Radiological Protection Centre tested over 1200 X-ray units of varying ages and type during 2006, covering most major manufacturers. The data were analysed to determine the frequency of failure to comply with the performance standards set in IPEM91. RESULTS: Analysis of the data shows that less than 1% of surveys showed the performance of the X-ray tube and generator to fall outside the remedial limits set by IPEM 91. This is a vastly less than the 20% stated in HPA 32(1). There were no occasions where the suspension level was reached. CONCLUSION: It is proposed that the number of X-ray exposures for a routine tube and generator survey could be drastically reduced, whilst keeping within national guidelines on X-ray testing. This could free up time to test critical parameters such as digital detector performance and automatic exposure control function. Reducing unnecessary testing will have a positive impact on resources such as time and energy consumption.

1345–1455
Musculoskeletal Scientific Session

1345 Evidence base vindicates early MRI for wrist injuries – why aren't we changing practice?

Sinha, R.[1]•Smith, F. W.[2]

[1]Aberdeen Royal Infirmary, Aberdeen, UK, [2]Woodend Hospital, Aberdeen, UK

PURPOSE: To generate adequate evidence from a large study as to which modality is superior? MATERIALS AND METHODS: A 3 year retrospective study was performed assessing all patients who attended A&E following a wrist injury and subsequently had scaphoid film series done. In all patients with normal plain films but a strong clinical suspicion of underlying injury; a MRI scan was performed. RESULTS: Of the 378 patients scanned 56% of them had no abnormalities on the scan. The rest 44% had some positive MRI finding. Bony injury was detected in 22.7%. The scaphoid was involved in 9.3%. Only the scaphoid was fractured in 6.9%. Other bones were fractured in 12.9% the most common being the distal radius followed by the lunate and the radial styloid. The scaphoid was involved with other bone fractures in 7 cases. The distal radius was the other bony injury commonly associated with scaphoid injury. Bony fracture was involved with ligamentous injury in 4 and the most common ligamentous injury to be involved with a bony fracture was a TFC tear. 10% had evidence of ligamentous injury of which the most common was a TFC tear in 2.9% followed by a radial collateral tear in 9. The scapholunate ligament was ruptured in 5. CONCLUSION: This study conclusively proves the benefits of early MRI in these situations. All Hospitals should now change practice and offer early MRI to this group of patients.

1355 CT guided radiofrequency ablation of osteoid osteoma – A District General Hospital experience.

Bates, J. L.•King, D. G.

York Hospital, York, UK

PURPOSE: To examine the results of CT guided percutaneous radiofrequency ablation (RFA) of ostoid osteoma performed at York Hospital. MATERIALS/METHOD: 24 patients with a clinical and radiological diagnosis of osteoid osteoma were treated using CT guided RFA under general anaesthesia between January 1997 and December 2006. The first 4 patients treated had biopsy samples taken for histology – failure to reach a specific histological diagnosis meant that biopsies were not performed thereafter. The nidus was located with thin section CT and penetrated with a bone biopsy needle (An 11 G Jamshidi needle in the first two cases and the Bonopty system for subsequent cases). A 5 mm blank tip radiofrequency needle was inserted and heated to 90°C for 4 min. A check scan determined if there was a need to reposition the needle to cover any untreated nidus. Records were reviewed for patient age, gender, lesion location and nidus size. Outcomes and complications were obtained by questionnaire via telephone or mail along with review of notes and imaging. RESULTS: Follow-up data was available for 21 patients. Complete pain-relief was achieved in 20 patients (rate of primary success 95%). One patient experienced recurrent pain 1 month after treatment but was successfully re-treated. There were no complications. CONCLUSION: CT guided RFA is a safe and effective treatment of osteoid osteoma with results achieved in our institution comparing favourably with those published by bone tumour centres and larger teaching institutions.

1405 Efficacy of ultrasound-guided biopsy of soft tissue tumours and effect of NICE Guidance

Oh, T. C.•Liew, C. K.•Wilson, J. P.

Manchester Royal Infirmary, Manchester ,UK

PURPOSE: Traditionally, non-guided (outpatient) or computed-tomography (CT) guided biopsies have been used to obtain musculoskeletal biopsies at our institution. Although core needle biopsy (CNB) has gained acceptance over open biopsy, the modality of imaging was not previously widely considered. We aim to show efficacy of ultrasound-guided biopsies in soft tissue lesions as part of a sarcoma multidisciplinary team. We also look at how recent changes following National Institute for Health and Clinical Excellence (NICE) guidance for sarcoma management in March 2006 has affected referrals. MATERIALS/METHODS: Patients identified retrospectively from ultrasound list over a 2 year period of a single consultant radiologist with a special interest in musculoskeletal radiology. Site and number of samples taken are documented and analysed by pathologists with osteoarticular speciality. Results are considered diagnostic if a histological diagnosis was made and inconclusive if non-diagnostic or a repeat biopsy advised. RESULTS: For all the patients performed (n=48), average age was 59 years old, 28 male and 20 female. There were 11 of these cases prior to and 37 cases after March 2006. In majority of samples, 46 (96%) were considered diagnostic while 2 samples (4%) were deemed inconclusive. Of the diagnostic samples, 24 (50%) showed benign disease and 22 (46%) showed malignancy. Both inconclusive samples showed no malignancies and subsequent excision biopsy showed haemangioma. There were no complications. All results were statistically significant. CONCLUSION: Ultrasound-guided CNB have a high diagnostic yield rate comparable with published rates. Referral rates have more than tripled since NICE Guidance was issued.

1415 CT guided radiofrequency ablation of osteoid osteoma. Experience from a DGH

Alex, J.[1]•Williams, M.[2]•Bradley, M.[2]

[1]Bristol Royal Infirmary, Bristol, UK, [2]Southmead Hospital, Bristol, UK

PURPOSE: CT guided radiofrequency (RF) ablation is increasingly used as first line treatment for osteoid osteoma. We analyse our experience with this minimally invasive modality. MATERIALS/METHODS: Between July 2004 and November 2006, 11 patients underwent the procedure. All procedures were performed using the Bonopty needle. Case-notes and radiological investigations were analysed. RESULTS: Clinical presentation varied from, pain in all cases to reduced range of movement in one case involving the elbow. Male to female ratio was 7:4. The imaging modalities used for diagnosis included plain X-ray (11/11), CT (10/11) and MRI (5/9). The mean age at procedure was 16 years (range 6–25 years). Histological confirmation from probe samples was possible in 6 out of 9 cases. The lesion sites included tibia (6), femur (2), hip (2), and elbow (1). While most were cortical diaphysial lesions, one was intramedullary (tibia) and another involved the elbow. There were no immediate complications. Mean follow-up period was 24 months (range 2–32 months). One patient underwent surgical treatment for recurrent elbow pain at 6 months. One patient had a traumatic fracture involving the procedure site at

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12 months. The overall success rate in terms of tumour eradication was 91%. Additional advantages of the procedure over surgery include less postoperative pain, shorter duration of hospitalization, earlier mobilization and return to normality. CONCLUSION: Our limited early experience indicates that CT guided RF ablation is a safe and cost effective modality of treating osteoid osteoma. The low recurrence rate and earlier mobilization following the procedure justifies using it as the first-line approach to treating the condition.

1425 A novel MRI application to visualise the intra-articular synovial folds of the lateral atlanto-axial joints

Darekar, A. A.[1]•Webb, A. L.[1,2]•Sampson, M.[1]•Rassoulian, H.[1]

[1]Southampton General Hospital, Southampton, UK, [2]University of Southampton, Southampton, UK

PURPOSE: The intra-articular synovial folds (IASFs) of the lateral atlanto-axial joints have not previously attracted significant radiological attention, being small and not routinely demonstrated on conventional MRI; however they are considered to be a potential source of neck pain and headache. The purpose of this study was to develop a method for the reliable and reproducible demonstration of normal IASFs using MRI and to describe their appearance on such images. METHODS: MR images of the cervical spines of 20 healthy volunteers were acquired using a Siemens Symphony 1.5 T scanner. Seed growing and thresholding methods were used to identify the IASFs within contiguous sagittal T_2 weighted MR images. IASF dimensions were quantified and the precision of the method was determined using the Bland and Altman limits of agreement method. MRI data was correlated to the physical dimensions and ranges of motion of the volunteers, as well as qualitative background information. RESULTS: (1) A novel MRI application has been developed, which allows clear and reliable visualization of the IASFs of the lateral atlanto-axial joints. (2) A new system of classifying normal IASFs with respect to their shape, size and signal intensity on MRI has been proposed. CONCLUSION: This is the first study to use MRI to characterize the IASFs *in vivo* in healthy volunteers and will provide a baseline for further investigation into the role of the IASFs in the generation of clinical symptoms.

1435 The influence of hand and foot dominance on quantitative ultrasound measurements

Franklin, C.•Hart, K. L.•McInnes, F. A.•Knapp, K. M.

University of Exeter, Exeter, UK

PURPOSE: Mechanical loading has an important influence on bone density. The aim of this study was to investigate the influence of hand and foot dominance on speed of sound (SOS), measured by axial transmission quantitative ultrasound at the radius and tibia. MATERIALS/METHODS: 41 subjects (mean age 26 years) had SOS at both distal radii and midshaft tibiae measured using the Sunlight Omnisense (Tel-Aviv, Israel). Their dominant side was recorded for both hand and foot dominance. Two operators completed all measurements, with each volunteer being completed by a single operator to reduce precision errors. The data were analysed using a paired *t*-test and linear regression. RESULTS: The mean T-score for the dominant radius was significantly greater at -0.4 than the non-dominant radius at -0.7 (p=0.04). However, the tibia measurements demonstrated no difference between the sides, with the T-scores for both tibiae being -0.4 (p=0.8). Correlation between sides was r=0.5 (p=<0.01) at the radius and r=0.4 (p=0.02) at the tibia. CONCLUSION: These results demonstrate that SOS measurements at the radius in this population are greater on the dominant side. However, this relationship was not demonstrated in the tibia. This suggests that the increased mechanical loading on the dominant arm has an effect on bone quality, which is not seen at the weight-bearing site of the tibia. The moderate correlations for both sites may be attributable to measurement error. In conclusion, the non-dominant radius should be selected for clinical or research measurements and consistency of side selection should be maintained for repeated scans.

1400–1530

Ear, Nose and Throat

1400 Invited review: Imaging of maxillofacial and skull base trauma

Connor, S.

King's College Hospital, London, UK

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

1430 Invited review: Multimodality approach to salivary imaging

Beale, T.

Royal National Nose, Ear and Throat Hospital, London, UK

No abstract supplied.

1500 Invited review: Cervical nodes

Richards, P.

St Bartholomew's Hospital, London, UK

A patient presents with a neck lump which is thought to be cervical lymphadenopathy. This common clinical scenario causes concern because the chance of malignancy is high and the imaging strategy must be both prompt and accurate. The role of ultrasound, CT and MRI in the investigation of cervical lymphadenopthy will be discussed with reference to a one-stop service. Imaging characteristics of a range of nodal pathologies will be reviewed with tips on perfecting FNA technique.

1400–1530

Finance and Planning

1400 Payment by results in radiology

Department of Health Speaker

No abstract supplied.

1425 Invited speaker Recovering from the red

Rich, G.

United Bristol Healthcare Trust, Bristol, UK

Dr Rich will tell the story of how United Bristol Healthcare NHS Trust has met the financial challenges faced by acute trusts in today's NHS and how UBHT achieved a financial surplus. He will cover Income and Expenditure, reference costs, the importance of promoting cost awareness, defining responsibility and managing performance, the wrong way and the right way to financial recovery, financial strategy, cost control measures and approaches, and the evolution from financial stability to efficiency business development.

1450 Invited review: Choose and book

Chapman, N.

Department of Health, London, UK

No abstract supplied.

1515 Discussion

1400 – 1450

Working in Digital Radiography II

1400 The virtual imaging service

Robson, P.•Bishop, H.

Quo Vadis Consulting Partners Ltd., Kingston, UK

KEY LEARNING OBJECTIVES: To understand the opportunities that the widespread adoption of information technology, such as the Care Record Service (CRS), Radiology Information Systems (RIS) and Picture Archiving and Communication Systems (PACS) provide for innovative, more efficient ways of delivering imaging services. DESCRIPTION: All acute NHS Trusts in England will have PACS installed by December. 2007 PACS are also currently being widely implemented in the independent sector and in Scotland. To maximize the benefit from the significant investment already made, it is essential

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that organizations review their service delivery models and are open to the adoption of new work practices. We will highlight a number of these practices, such as decentralized reporting, setting up of imaging networks and evolution of job roles. Opportunities and challenges will be discussed, such as working relationships between the NHS and the independent sector. Decentralisation. Opportunities: Maximized workload capacity; Maximized use of sub-specialists; Faster report turnaround; Extended service hours. Challenges: Reduced size of departments leading to less stimulation reduced staff motivation; Reduced contact between clinician and radiologist, reducing quality; Lack of adequate patient information making interpretation more difficult; Risk of increased report turnaround time; Deployment of the required RIS/PACS and networking infrastructure that is sufficiently flexible to support both initial service reconfiguration and its future evolution. CONCLUSION: Successful adoption of new work practices will ensure that an organisation can deliver cost effective services and therefore survive in the new competitive imaging marketplace.

1410 Web-based PACS extending to the whole community

Pohjonen, H.

Rosalieco Oy, Espoo, Finland

PURPOSE – MATERIALS: Dedicated stand-alone PACS workstations have dominated the way how radiologists work and web-based tools have been used for delivering images to clinicians mainly. The main reasons for not using web for diagnostic work have been the lack of diagnostic and sophisticated analysis tools – like 3D reconstruction – in web. This paper describes the benefits and impact on working practices when introducing emerging technologies to the radiological practice. METHODS: Today, several vendors are starting to offer holistic web-based solutions for radiologists, radiographers and clinicians – a single platform for all users. Besides traditional web, streaming technology is also emerging; streaming refers to sending portions of data from a source to a client for processing or viewing, rather than sending all the data first before processing or viewing. RESULTS: The web-based solution provides healthcare professionals with enterprise-wide access to all patient data and analysis functions. Web-based diagnostics integrated with web RIS enables a virtual radiological environment to be built, where radiologists can remotely use viewing tools and RIS across organizational or national borders. Streaming technology can use network bandwidth in a well estimated manner, and in many cases such bandwidth usage is more efficient than with traditional web enabling mobile solutions as well. Furthermore, increased security and data consistency is achieved because data can be prevented from being downloaded to local clients. CONCLUSION: Pervasive and mobile access to patient data and analysis tools can open up new avenues of secure communication for radiologists and clinicians.

1420 Reformatting CT angiography images for presentation on PACS. A role extension for radiographers

Rundle, A.•Edwards, A.

Royal Cornwall Hospitals NHS Trust, Truro, Cornwall, UK

KEY LEARNING OBJECTIVES: To give an overview of the development of a new service and the methods used in producing reformatted CT images for display on a Picture Archival and Communication System (PACS) in support of a radiological report. DESCRIPTION: A radiographer with experience in CT and angiography was given access to CT angiography reporting sessions and training on the image manipulation software available on the workstation. This included multiplanar reformatting (MPR), maximum intensity projection (MIP), volume rendering (VR) and vessel analysis. These techniques, useful in the reporting process, were used to produce images which simplified the presentation of the available information for the referring clinicians. For each of the common CT angiography examinations a structured sequence of images was produced, which over time became standardized, to send to PACS alongside the axial views. The process progressed to the radiographer independently producing supporting images with reference to an online report, allowing a prescribed and focused approach to demonstrating any findings highlighted within it. Any discrepancies discovered during the reformatting stage were discussed with the reporting radiologist and in a small number of cases this identified some important findings previously overlooked. CONCLUSION: The images have proven invaluable to the referring clinicians and have been particularly useful in vascular theatre and multidisciplinary vascular meetings. This approach to radiographer role extension provides a unique learning experience whilst allowing the radiologist more of their valuable time and the benefit of a second viewing.

1430 Optimum ambient lighting conditions for the softcopy recognition of chest lesions

McEntee, M. F.[1]•Ryan, J. T.[1]•Evanoff, M. G.[2]•Manning, D.[3]•Keeling, A.[4]•Chakraborty, D.[5]•Brennan, P. C.[1]

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PURPOSE: Increasingly clinical radiological judgments are being made on softcopy LCD monitors. The ambient lighting in rooms where clinical judgments from images are made can vary widely. Inappropriate ambient lighting has a negative impact on diagnostic performance in several ways: contrast is reduced through reflections; veiling glare reduces contrast; the dynamic range is limited; detectability of low contrast objects is reduced. This study aims to determine the optimum ambient lighting for the recognition of chest lesions within chest images. MATERIALS/METHODS: The following ambient light levels were tested: 400 lux (office lighting); 100 lux (WHO recommendations); 40 lux; and <10 lux. All monitors were calibrated to DICOM part 14 GSDF. 60 radiologists were presented with 30 chest images, 15 images having simulated nodular lesions of varying number, subtlety and size. Each image was presented for 30 s and viewers were asked to identify and score any visualized lesion from 1 to 4 to indicate level of visibility. At the end of the session, a JAFROC figure of merit was calculated. RESULTS: Early analysis of the data suggests that visualization of chest lesions is affected by inappropriate lighting, with radiologists specialising in thoracic imaging demonstrating less dependency on varying levels of ambient lighting compared with non-specialists. The results are in general agreement with optimum light levels established for orthopaedic images in our earlier work. CONCLUSION: Inappropriate ambient lighting affects visualization of chest lesions. The results have particular importance for the non-specialist clinician viewing images in non-reporting environments.

1440 Comparison of the quality of soft copy diagnostic radiographs on different monitors and viewing conditions at the RVI

Kallarackel, L. J.

Freeman Hospital, Newcastle upon Tyne, UK

OBJECTIVES: To determine if established image quality criteria can be used to demonstrate differences in the perceived quality of computed radiography (CR) images between monitors of different specifications in different viewing conditions. METHODS: The quality of CR images was compared on three different monitors (High spec: Eizo-Radiforce G21, Medium spec: Samsung 193T, Low spec: Dell E153FP) and in different viewing conditions. Photometric measurements were made to assess the viewing conditions and greyscale performance of the monitors. Nine observers compared 16 normal radiographs (4 Chest PA, 4 Pelvis AP, 4 Lumbar Spine AP and 4 Lateral Skull radiographs) using the CEC (Commission of the European Communities) quality criteria. RESULTS: Data obtained were analysed using Graphpad Instat software. Spearman Rank correlation showed strong correlation between all three groups (High spec. and Med. spec. p= 0.0007, High spec and Low spec. p=0.0031, Medium spec. and Low spec. p=0.002) A Kruskal-Wallis test showed no significant differences across the three groups as a whole (p=0.40). However analysis of the individual groups against each other using the Wilcoxon matched-pairs signed-rank test showed significant differences between the high and medium specification monitor compared with the low specification monitor (p=0.008 for both). CONCLUSION: The analysed data indicate a real difference between the high specification and medium monitors compared with the low specification monitor. We therefore advise caution in the use of non medical-grade monitors for reporting. We conclude that the CEC image quality criteria provide a useful tool for this sort of comparison.

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1400–1530

BAMRR SFG I

1400 Invited review: Identification of imaging based biomarkers to predict outcome in patients undergoing endoscopic third ventriculostomy, using magnetic resonance imaging

Sinclair, D. A.

Hope Hospital, Manchester, UK

Hydrocephalus is a common disorder classically treated using ventriculo-peritoneal shunting; Endoscopic Third Ventriculostomy (ETV) is increasingly replacing this procedure, and is now standard therapy for patients with obstructive hydrocephalus. Therapeutic response varies with patient group, age and duration of hydrocephalus. Currently it is not possible to predict the outcome of this treatment in an individual patient. Quantitative phase contrast MRI is capable of measuring time resolved flow in arteries and cerebrospinal fluid (CSF) spaces. Combined with ECG gating, velocity maps allow estimations of blood and CSF flow at strategic points such as the major intracranial arteries, cerebral veins, cerebral aqueduct (AQ) and foramen magnum (FM). Using MRI it is also possible to measure total cerebral CSF which acts as a sensitive surrogate of total brain volume. The aim of this project was to examine the ability, if any, of pre-morbid measurement of abnormalities in cerebral blood and CSF flow in patients with adult onset hydrocephalus to predict specific outcome measures of ventriculostomy. Objective outcome measures selected for the study were: (1) increase in brain volume and (2) ventriculostomy flow. METHODS: Nine patients with chronic hydrocephalus underwent MR investigation. Technique included quantitative phase contrast velocity imaging of cerebral blood flow and CSF and anatomical imaging suitable for segmentation of CSF volume. Imaging was performed prior to and 1 week following ETV. Normal data for comparison was obtained by scanning 10 volunteers using the same protocol. RESULTS: Comparison of data from normals and patients demonstrated significantly lower cerebral blood flow (CBF, 361(73) mls *vs.* 537(79), $p<0.001$) and foramen magnum (FM) CSF flow (in patients (22(13) *vs.* 36(8), $p<0.05$) in volunteers. Following ventriculostomy there was no significant change in any pre-morbid measured variable. Multiple regression analysis demonstrated that change in brain volume (BV) following ventriculostomy was predicted by a model containing measures of CBF and aqueductal (AQ) CSF flow (BV=-15.196 +(0.65×CBF)-(5.96×AQ-ve; adjusted R2 =92%, $p<0.001$. Ventriculostomy flow was predicted by a model containing measures of foramen magnum (FM) and AQ CSF flow (V= -0.456+(0.017×FM-ve)+(0.687×AQ+ve); adjusted R2 =96%, $p<0.01$). DISCUSSION: The results of this study suggests that objective measures of change following ventriculostomy can be predicted with high degrees of accuracy from simple phase contrast flow measurements. Although this study chose to concentrate on objective measures of change it will be important to extend the study by examining the relationship between the predictive factors and clinical outcome.

1430 Invited review: MRI of spinal cord compression

Scurr, E. D.

Royal Marsden Hospital, Surrey, UK

AIM: To describe the current practice in the imaging and management of spinal cord compression in patients who have known malignancy. The anatomy, aetiology, clinical presentation, and diagnosis of malignant spinal cord compression (MSCC) will be described and illustrated. MRI is the imaging modality of choice and imaging protocols and strategies will be described. This will include clinical examples of typical and atypical appearances. The current and future treatment options of radiotherapy, chemotherapy and surgery will be discussed. LEARNING OUTCOMES: To be conversant with the clinical presentation of MSCC and to implement a suitable diagnostic imaging approach in order to influence appropriate patient management.

1500 Invited review: MRI safety update/forum

Condon, B.

Institute of Neurological Sciences, Glasgow, UK

Issues which will be discussed include: (i) The latest on the rapidly evolving tale of the EU Directive and its effect on the MR community: can its effects be mitigated, is it already too late, and how will we have to adapt to stay within the law? (ii) The latest on concerns regarding gadolinium contrast, patients with poor renal function and the potentially fatal induced condition of Nephrogenic Systemic Fibrosis. If the MHRA has issued guidelines by the time of the lecture these will be described, otherwise the approach taken in Glasgow will be detailed; (iii) Constructing your own MR Implant Safety Database. Shellock's book and website are very helpful but often don't cover locally common implants: how to improve on this; (iv) The referring clinician, their role in MR safety and how you might exploit it; (v) Some miscellaneous new implants and how they make our lives more interesting.

1430–1600

Genitourinary III: Scientific Session

1430 Renal artery stenosis: retrospective comparison of gadolinium enhanced MR angiography with colour Doppler ultrasound

Bansal, G. J.•Hoey, E.•Fowler, R.

Leeds General Infirmary, Leeds, UK

PURPOSE: The aim of this study was to calculate the sensitivity, specificity, positive and negative predictive value of intra-renal colour Doppler in assessing renal artery stenosis, taking gadolinium enhanced MRA as the gold standard. It was also the purpose of this study to estimate any correlation between two kidney sizes and the MRA finding. METHODS: 89 patients with suspected renovascular disease were referred for colour Doppler examination and then proceeded to have MRA of the renal arteries between the years 2002 and 2006. The size difference between the two kidneys were recorded, along with the right and left Doppler findings, which were then correlated with right and left MRA results, respectively. Any stenosis greater than 50% on MRA was taken as significant stenosis and an abnormal result for the purpose of this study. Microsoft Excel and SPSS 13.0 were used for all data analysis. RESULTS: Sensitivity and specificity of colour Doppler compared with MRA was 35.29% and 94.2%, respectively ($p<0.006$). The positive and negative predictive values were 87% and 75%, respectively. There was also no statistically significant correlation between the size difference of the two kidneys and the MRA finding ($p=0.464$). CONCLUSION: Intrarenal colour Doppler examination has low sensitivity but similar specificity to MRA for diagnosing renal artery stenosis. This study also highlights that size difference between the two kidneys could not reliably predict the presence or absence of renovascular disease. Therefore, this study questions the value of intrarenal colour Doppler as a screening tool for diagnosing renal artery stenosis.

1440 Sixteen-row multidetector computed tomography in pre-operative renal donor assessment: comparison with magnetic resonance angiography, digital subtraction angiography and intraoperative findings

Mishra, A.

NOTP, New Delhi, India

PURPOSE: Determine accuracy of 16-row multidetector computed tomography angiography (MDCTA) in assessment of renal vasculature and upper urinary tract in living renal donors and correlate with magnetic resonance angiography (MRA), digital subtraction angiography (DSA) and surgery. MATERIALS/METHODS: MDCTA and MRA were obtained in 350 prospective live-related renal donors between 10 October 2004 and 30 June 2006. Contrast-enhanced MDCTA was performed during arterial and venous phases and excretory phase scans for MDCT-urography. The findings were analysed by two independent trained radiologists and compared with DSA/surgical findings. At MDCTA and MRA, the number of vessels and the presence and pattern of early branching arteries and veins was assessed. MDCT-urographic images were evaluated for pelvicalyceal system and ureteric abnormalities. Interobserver agreement between the two reviewers and between MDCTA and DSA/surgical findings was quantified by using weighted kappa statistics. MDCTA findings were compared with MRA taking surgical findings/DSA as the gold standard. Sensitivity and specificity of MDCTA in identifying accessory vessels and branching pattern was also evaluated. RESULTS: MDCTA showed clear delineation of the main renal arteries and veins in all the donors with detailed vessel morphology. Correlation between

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MDCTA and MRA findings was excellent for renal arteries (κ=0.821) and good for renal veins (κ=0.637). Agreement between MDCTA and surgical findings/DSA was excellent for renal arteries (κ=1.0) and veins (κ=0.889). Sensitivity and specificity of MDCTA was 100% for early branching arteries, accessory arteries and veins. CONCLUSION: MDCTA is superior to MRA in the detection of accessory vessels and should be the standard imaging method for living renal donors.

1450 Uterine artery embolisation of symptomatic fibroids: can elective bilateral femoral punctures reduce patient dose?

Ramachandran, N.[1]·Sheppard, N.[2]·Kyriou, J.[1]·Bratby, M.[1]·Belli, A.[1]

[1]St. George's Hospital, London, UK, [2]St. George's University of London, London, UK

PURPOSE: To study the effect on patient dose of elective bilateral femoral arterial puncture compared to unilateral puncture for uterine artery embolisation (UAE) of symptomatic fibroids. METHODS: A prospective study of twenty patients undergoing bilateral uterine artery embolisation by the same two operators. Patients underwent either (i) elective bilateral arterial punctures from the outset (n=10) or (ii) unilateral arterial puncture (n=10; contralateral puncture was not required in these patients). Outcome measures were total fluoroscopy time, dose–area product (DAP) and skin dose. Simulations of both techniques, using mean fluoroscopy times from the *in vivo* studies, were performed on an anthropomorphic phantom to measure ovarian dose using thermoluminescent dosemeters (TLDs). Monte Carlo-based software modelling was also used to estimate ovarian and effective doses. RESULTS: Bilateral embolisation was achieved in all patients. Mean fluoroscopy time following elective bilateral puncture was 13.4 min *vs.* 17.3 min with unilateral puncture (p=0.07). There was no significant difference in measured dose (DAP p=0.32; skin dose p=0.13) but this most likely reflects the wide variation in patient characteristics, particularly body mass. Simulated mean ovarian dose, however, was lower for the bilateral puncture group (7.0 mGy *vs.* 9.4 mGy on direct TLD measurement; 8.4 mGy *vs.* 13.7 mGy on Monte Carlo model) as was effective dose (2.3 mSv *vs.* 2.9 mSv on Monte Carlo model). No puncture site complications were seen in either group. CONCLUSION: Bilateral elective femoral arterial puncture has the potential to reduce patient dose from UAE of symptomatic fibroids.

1500 Incidental CT finding of an ovarian cyst in post-menopausal women

Keaney, C. F.·López, C.·Balogun, M.·Ganesan, R.

Birmingham Women's Hospital, Birmingham, UK

PURPOSE: Ovarian cysts are a common incidental finding on abdomino-pelvic CT scans in post-menopausal women. The reports are not always addressed to gynaecologists and therefore, radiologists need to understand this finding's significance to appropriately advise other clinicians. Some guidelines recommend tumour markers measurement and follow-up with ultrasound, but these are not widely known and not always followed. To review the literature regarding post-menopausal ovarian cysts; analyse recommendations given by radiologists in this situation and whether they are followed; describe the imaging morphology of these cysts and their changes on follow-up; study a histological control group to determine their likely nature; and issue follow-up guidelines. MATERIALS/METHODS: Reports, CT findings, imaging and clinical follow-up of 106 cases of incidental ovarian cysts in post-menopausal women during 2004 and 2005 were reviewed retrospectively. A cohort of cases of incidental cysts in postmenopausal women having hysterectomy and bilateral oopherectomy for uterine pathology will be studied in parallel. RESULTS: Upon finding a well-defined, adnexal cyst in a post-menopausal woman, 53% radiologists advise nothing, 42% advise combinations of ultrasound, tumour markers and gynaecological referral. Imaging follow-up is poor (22 %) but when available, most cysts had resolved or remained unchanged. Preliminary histological data suggests most of these cysts but not all are benign. CONCLUSION: The radiology report in these cases should advise assessment of tumour markers and calculation of the malignancy risk. Guidance on subsequent type and interval of imaging for follow-up may be helped by the awaited results of a histological cohort.

1510 Assessment of acute renal colic with unenhanced multidetector CT: incidence and spectrum of alternate acute abdominal pathologies

Wee, B. B. K.·Colley, S.·Tudway, D.·Patel, R.·Pallan, A.·Morris, S.·Roy-Choudhury, S.

Birmingham Heartlands Hospital, Birmingham, UK

PURPOSE: This study was performed to determine the incidence and distribution of acute pathologies masquerading as renal colic. MATERIALS/METHODS: This department provides an unenhanced multidetector CT (MDCT) service for patients presenting with haematuria and symptoms of renal colic. The scans are performed within a 24 h period. The results of 1040 MDCT examinations performed between October 2005 and October 2006 will be reported. We have analysed 479 cases performed between the 6 months of October 2005 and March 2006. The CT reports were reviewed for information on acute abnormalities which could explain the patients' symptoms, the presence of renal tract calculi and other incidental pathologies. RESULTS: 227 (47.4%) CT examinations had definite renal tract calculi. 221 (46.1%) examinations did not reveal a cause for the symptoms. These included examinations which were entirely normal and those with incidental non acute findings. 31 (3.8%) CT examinations provided an alternative acute diagnosis which could explain the patients' acute clinical presentation. 74.8% (n=23) revealed a non-genitourinary cause versus 25.8% (n=8) genitourinary cause for the symptoms. Pathologies included among others, acute cholecystitis, acute appendicitis, acute pancreatitis, diverticulitis and diverticular abscess, ovarian vein thrombosis, renal cell carcinoma, appendagitis epiploicae, pneumonia, infected urachal remnant, omental infarction, mesenteric panniculitis, adnexal masses, inflammatory bowel disease, aortitis etc. CONCLUSION: A wide spectrum of acute abdominal pathologies are diagnosed or suggested on unenhanced MDCT performed on patients with suspected renal colic and are identified in almost 4% of cases in this initial series of 479 examinations.

1520 Atrophy of the limbs of the adrenal glands in primary adrenal Cushing's syndrome, as demonstrated by CT

Gangoli, S. V.·Narayanan, P.·Grossman, A.·Rockall, A. G.·Reznek, R. H.

St. Bartholomew's Hospital, London, UK

PURPOSE: Cushing's syndrome is a clinical syndrome caused by corticosteroid excess, and is caused by a primary adrenocortical lesion in approximately 20% of cases. The adrenal limbs, which predominantly contain cortex, normally have an average width of 3 mm on CT, and an upper limit of normal of 5 mm. The adrenal body, however, contains both cortex and medulla, and has an upper limit of normal of 10 mm. A primary adrenal source of excess corticosteroids, such as a functioning cortical adenoma or carcinoma, should therefore suppress pituitary ACTH, and therefore result in atrophy of the adrenal limbs bilaterally, excluding the limb containing the primary lesion. However, this has not been previously confirmed by their measurement on CT. MATERIALS/METHODS: 30 patients had CT of the adrenal glands, with a slice thickness of 1.2 mm, as part of the diagnostic work-up for presumed primary adrenal Cushing's syndrome. These scans were retrospectively reviewed, noting the abnormal adrenal lesion, and measuring the size of the adrenal limbs, unless directly involved in the lesion. RESULTS: The range of sizes of the adrenal limbs was 1–3 mm. The mean size was 1.9 mm. This is consistent with atrophy, when compared with a normal mean of 3 mm, as described in the literature. CONCLUSION: The results demonstrates that CT can confirm the atrophy of the adrenal limbs in the context of primary adrenal Cushing's syndrome. This may be helpful in confirming the cause or effects of Cushing's syndrome where there is diagnostic doubt.

1530 Is the KUB radiograph redundant for investigating ureteric colic in the non-contrast computed tomography era?

Kennish, S. J.·Lloyd, S. N.·Bush, S.·Wah, T.·Irving, H. C.

St James University Hospital Leeds, Leeds, UK

PURPOSE: To assess whether the KUB radiograph (plain abdominal film) is now redundant in the initial investigation of acute ureteric colic. METHOD: Retrospective review of 120 consecutive admissions to an Emergency Department-led ward with a management protocol for a provisional diagnosis of acute ureteric colic. Radiology database

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review of non-contrast computed tomography (NCCT) reports and KUB radiograph requests pre and/or post CT scan. RESULTS: 120 patients were admitted consecutively to the Clinical Decisions Unit with a provisional diagnosis of acute ureteric colic and underwent a NCCT scan from January to June 2006. 61 (50.8%) patients were found to have a calculus/calculi accountable for symptoms (+ve NCCT). 59 (49.2%) patients were found not to have a calculus (-ve NCCT) to account for symptoms, and 13 (11% of the total) of these had an alternative CT diagnosis. Pre NCCT scan KUB radiograph requests in the majority of cases (90 patients, 75%) led to 46 patients (38.3% of total) with -ve NCCT scans having KUB radiographs which made no contribution to management. CONCLUSIONS: Evidence indicates that NCCT is the best investigation for patients with acute ureteric colic. Whilst KUB radiographs have no initial role when NCCT is available, they can be useful as a reference for follow up and could be requested once a +ve CT diagnosis has been made. Current practice in our hospital is needlessly exposing patients without calculi to unnecessary KUB radiographs with radiation, cost and time implications, and should be changed. Prospective audit after staff education is proposed.

1540 Complication rate following percutaneous ultrasound guided renal biospy

Lim, K. P.•Pirzada, A.•Louden, J.•Naisby, G.

James Cook University Hospital, Middlesbrough, UK

PURPOSE: To assess the complication rate and time of occurrence of complications following percutaneous ultrasound guided renal biopsy (PURB). METHODS: A retrospective review of PURBs performed at one centre, from April 2004 to September 2005 was undertaken. Standard automated spring loaded biopsy device (16 cm × 16 G core biopsy needle) was used with ultrasound guidance for all biopsies. Patients were observed for 24 h with blood pressure/pulse monitoring and a urine sample collected prior to discharge. Complication occurrence was recorded from the time of biopsy and classified as minor or major (*i.e.* requiring intervention). RESULTS: Total of cases =140. Diagnostic value of tissue obtained was 100%. Overall complication rate was 3.6% (n=5). All complications were identified within 20 h. Minor complication rate was 2.9% (n=4, only 2 cases occurred after 8 h, between 16–20 h). Major complication rate was 0.7% (n=1, this complication was recognized within 4–8 h). Mortality rate = 0%. CONCLUSION: We have studied the temporal relationship of complications post PURB. Our complication rates lie within average published rates of 3–13% for overall complications and 0.3–7.3% for major complications. Although 40% (n=2) of complications did occur after 8 h, these cases were all minor; and would have required no further medical intervention. The single significant complication was identified within 8 h, and received appropriate treatment. We therefore conclude that PURB can be performed safely as a day case procedure with good patient selection and technique.

1550 Can contrast induced nephropathy (CIN) be safely predicted using estimated glomerular filtration rate (eGFR)?

McParland, P.•Enver, M. K.•Blaquiere, R. M.•Rogerson, M.

Southampton University Hospital Trust, Southampton, UK

PURPOSE: Iodixanol (Visipaque) is less nephrotoxic than Iohexol (Omnipaque), but it is more expensive. Our contrast protocol limits Iodixanol to those at highest risk of CIN (creatinine above 130). eGFR is a more accurate measure of renal dysfunction, and is now routinely calculated. We sought to determine whether our protocol was adherred to and if an estimated GFR based protocol could be safely implemented. Development of CIN was defined as a decrease in eGFR by 25% or more. MATERIALS/METHODS: The baseline renal function of 308 consecutive patients undergoing contrast enhanced CT was obtained and contrast agent noted. Follow up eGFR and creatinine were obtained. The percentage change in eGFR was calculated. RESULTS: 308 patients received contrast. 21 received iodixanol despite a creatinine below 130 and 21 patients with a creatinine above 130 received iohexol. Follow up renal function was obtained on 152 patients within 72 h of contrast. Patients were stratified into two groups by eGFR, >45 (127 patients) and <45 (25 patients). CIN was identified in 4 patients with an eGFR <45, and 3 with an eGFR > 45. This was a statistically significant difference (p= 0.014 Fisher exact test.) CONCLUSION: This study demonstrates that our current creatinine based protocol is not adhered to. An eGFR of >45 can safely predict patients at risk of CIN and thus is a safe alternative to using a creatinine based protocol.

1530–1700
Working in Digital Radiography III

1530 Invited review: Is life easier with digital imaging? Pitfalls of digital practice

Crotty, M.

NHS Connecting for Health, Leeds, UK

As a part of the delivery of a high quality imaging service, the modern radiology department is increasingly dependent on digital technologies for image acquisition, storage and display. There are many clear benefits of these technologies for both patients and staff, but there are also challenges to be overcome and pitfalls to be avoided, both in their implementation, and in their day to day use. This presentation will identify some of the more common challenges for staff, particularly radiographers and service managers, as well as looking at some of the possible solutions. Building on the lessons learned both inside and outside the NHS National Programme for IT, the presentation will cover two main areas - the pitfalls associated with the use of computed and digital radiography (CR and DR) to replace analogue plain films – and those associated with the use of PACS to support a filmless environment. Topics to be discussed will include technical elements, radiographic technique issues, and the particular challenge of maintaining an imaging service in the face of a system failure.

1600 Invited review: Is CAD the way forward for mammography?

Astley, S.

University of Manchester, Manchester, UK

No abstract supplied.

1630 Discussion

1530–1730
Reviewer workshop

1530 Invited review: Reviewing articles – background processes

Hogg, P.[1] McJury, M.[2]

[1]University of Salford, Salford, UK, [2]The Northern Ireland Cancer Centre, Belfast, UK

This invited presentation will give, as title suggests, a general overview of the reviewing process, for articles submitted to the scientific learned journals. The presentation will discuss the people involved: the role of reviewer and editor, selection of reviewers and considerations such as whether to review the article. The purpose of the journal and the reviewing process will be explained. This presentation will hope to offer an introduction to the more detailed assessment of what to look for in an article, and how to comment and report on it, which will be presented in the succeeding presentation.

Reviewing articles: how to do it

Mackay, S.

Salford University, Manchester, UK

Bury, B.

Leeds General Infirmary, Leeds, UK

This talk will examine, pragmatically, how an article might be reviewed. Time management will be considered and generic suggestions will be made about what to look for within the article. Plagiarism and ethical matters will be considered and the value of a "check list" will be explored as an aid to help minimize variation between reviewers and to assist them in covering all the important aspects within the article. The second talk will conclude with how to write the reviewer report, including the need to make constructive comments and how the report can be submitted.

1600–1700
Interventional

1600 Invited review: Facet joint injections

O'Donnell, P.

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The Royal National Orthopaedic Hospital, Middlesex, UK

The facet joint commonly contributes to chronic low back pain, probably through the mechanisms of synovitis, segmental instability, degenerative osteoarthritis and synovial distension stimulating capsular nociceptive nerve endings. Facet arthropathy usually follows anterior column failure (disc degeneration). The clinical "facet joint syndrome" (FJS) is imprecise and poorly identifies patients who benefit from facet intervention: Revel et al published a set of criteria, including pain not worsened by hyperextension or extension-rotation, which predicted good response to local anaesthetic blocks. This illustrates the clinical difficulty of assessing facet pathology in isolation from other pain generators in the lumbar spine. Identification of the symptomatic joint with imaging is unreliable. SPECT may, however, be a useful indicator of patients with LBP who benefit from lumbar facet injection. Therefore, the diagnosis of FJS relies on facet joint blocks. Injections are most accurately performed under CT guidance, especially if posterior spinal decompression has been performed, targeting either the joint space or, using a simpler vertical approach, the inferior recess. The capacity of the joint is usually <1 ml (larger at L5/S1). Volumes greater than this therefore suggest periarticular injection (or capsular rupture) and are less specific (affecting several levels, all branches of the posterior rami, and extending into the neural foramen/epidural space). Studies show good medium term efficacy of facet blocks, but evidence from randomized, controlled trials is lacking.

1615 Invited review: Nerve root blocks

Lloyd, D.

University Hospital Cardiff, Cardiff, UK

Nerve root blocks, or transforaminal epidural injections involve the injection of local anaesthetic and steroid adjacent to the nerve root as it exits the spine. The perineural fat is contiguous with the epidural fat and contrast injections outline the nerve root itself within the exit foramen, with peripheral tracking around the root and local spill into the epidural space. Nerve root blocks offer an effective therapeutic and diagnostic technique for patients with radicular symptoms. The technique is particularly straightforward in the lumbar spine where complications are extremely rare. Anatomy in the cervical region is more complicated and though complications here are also rare, cord infarction and CVA have been reported. In this illustrated talk, I will concentrate largely on the lumbar spine, as this technique is straight forward and quick and easy to learn. I will look at the anatomy, technique, including some tips and pitfalls, and the effectiveness of these injections.

1630 Epidural injections

Rankine, J.

St James's Teaching Hospital, Leeds, UK

Patients with low back and leg pain often present a difficult diagnostic dilemma. It is well known that degenerative changes seen on MRI of the spine are common in the asymptomatic population, and it is often difficult to be certain of the significance of such findings in an individual patient. Furthermore, many of the standard surgical treatments, such as spinal fusion, are unproven in the strictest sense of being subject to a randomized-controlled trial. Image guided injection of local anaesthetic offers a diagnostic option to help determine the significance of an abnormality and plan surgery. The injection of corticosteroids offers a therapeutic option, and an alternative to surgical intervention. The most common spinal injections performed are epidural, nerve root and facet joint injections. An anaesthetist using the technique of loss of resistance often performs epidural injections "blind". A caudal epidural involves injection of the sacral hiatus and can be performed '"blind" using palpation or under fluoroscopy. Image guided epidural injections allow the injection to be placed near to an area of abnormality, such as a disc herniation or epidural fibrosis. They are particularly useful in post surgical cases where scar tissue can make entering the epidural space difficult and the presence of a defect in the lamina increases the likelihood of inadvertently entering the thecal sac. The efficacy and technique for performing guided injections of the spine will be discussed in this presentation.

1645 Invited review: Frozen shoulder

Silver, D.

Royal Devon & Exeter Hospital, Exeter, UK

Frozen shoulder accounts for 5% of presentations to Orthopaedic Shoulder clinics and with increasing access to imaging directly from primary care it is important to consider the diagnosis and know how to diagnose this condition. The term frozen shoulder has been used loosely in the past in patients presenting with shoulder pain but is a specific entity associated with clinical, arthroscopic and pathological findings. The diagnosis should be considered in a patient who presents shoulder pain and limited active and passive movement particularly external rotation. Specific histological findings are present in tissue found in the rotator interval and are identical to those found in Dupytren's Contracture. At arthroscopy there is excess tissue in the Rotator Interval which appears hyperaemic together with thickening of the coracohumeral ligament close to its footprint where it inserts into the coracoid process. The aetiology of this condition is unclear but is associated with diabetes, Dupytren's contracture and ischaemic heart disease. Although described by Codman in 1934 as a condition characterized by typical clinical features and a normal X-ray there is increasing evidence that current imaging modalities including MRI and ultrasound demonstrate diagnostic features. MRI studies have described findings including increased enhancing tissue in the Rotator Interval, narrowing of the inferior recess and thickening of the coracohumeral ligament. Ultrasound is now the fist line investigation for shoulder pain and findings including hyperaemia and excess soft tissue in the Rotator Interval together with thickening of the coracohumeral ligament. Although imaging findings are not as specific as those for rotator cuff tears the presentation will discuss the current available evidence with regard to imaging findings in frozen shoulder.

1700 Invited review: Subacromial injections

Grainger, A.

Leeds General Infirmary, Leeds, UK

PURPOSE: To review briefly the pathology of the shoulder rotator cuff and indications for subacromial bursal injections. Techniques for image guided injection will be discussed and controversies explored. SUMMARY: The rotator cuff plays a critical role in maintaining the stability of the inherently unstable glenohumeral joint. The role of impingement from the coracoacromial arch in the development of rotator cuff pathology will be discussed and imaging techniques for it's assessment discussed. Injection of the subacromial bursa is widely used for both the diagnosis of impingement and its treatment. This can either be undertaken blind, or using imaging guidance. The indications and techniques for these procedures will be discussed. Subacromial bursal injection for therapeutic purposes remains a subject of debate with proponents and opponents citing literature to support their cause. Many of the studies that have been undertaken have flaws and differences in methodology makes comparison of one study with another difficult. These areas will be explored along with a description of how the literature and techniques available translate into practice in the speakers own department.

1715 Invited review: Dry needling/autologous blood injections for tendinosis

Connell, D.

The Royal National Ortopaedic Trust, Middlesex, UK

Tendinosis or is thought to be secondary to tendon degeneration. It is now accepted that it is not an inflammatory condition but a fibroblastic and vascular response pathologically known as angiofibroblastic degeneration. Repetitive microtrauma results in further tendon degeneration. A chronic cycle of tendon degeneration and repair ensues with further weakening of the tendon with potential for rupture. Treatments such as steroid injections have been focused on a presumed inflammatory process that does not exist in tendinosis. While it is recognized that steroid injections may provide symptomatic relief, there is no evidence that steroids promote healing. Other treatments such as forms of immobilization may even cause deleterious effects rather than cure. Various surgical treatments have been described which result in an improvement in outcome, but morbidity such as neurovascular injury, fracture and ligament rupture has been reported as has failure. Recently, an injection of autologous blood has been reported for the treatment of lateral epicondylitis. It is hypothesized that transforming growth factor-β and basic fibroblast growth factor carried in the blood will act as humoural mediators to induce the healing cascade. Ultrasound can accurately identify the site and

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document the pathology prior to the injection, and monitor tendon healing. Management of overuse tendon injuries has been limited by the understanding of the pathophysiology of overuse tendon injury. There may be a brief period of acute inflammation causing pain for a few days after tendon injuries but this is not felt to be the cause of patient's pain. Histopathological correlation of over 600 cases of tennis elbow demonstrated disrupted collagen fibres, increased cellularity and neovascularization in the common extensor tendons. The cellularity was due to myofibroblasts not inflammatory cells. In addition, there was evidence of tissue necrosis with myxoid and hyaline degeneration and fibrosis. The mechanism of short-term relief following steroid injection or needling is not understood. It is, however, postulated that fenestration of an area of tendinosis with needling may promote beneficial bleeding into new channels created through mucoid degeneration. The mechanical disruption may initiate healing response in the tendon. Neovascularization of the tendon has been postulated as a cause for symptoms in patients with tendinosis. The paratenon is highly innervated and vascularized when compared with the tendon, and is more likely to be affected by neurotransmitters such as substance P causing mast cell degranulation and secretory activity. Neural activity may be amplified when mast cells are released having an impact on vascular elements and fibroblasts. This process may explain the neovascularization of the tendon. Our studies have shown that there is a decrease in the number of blood vessels in the common extensor origin, Achilles and patellar tendons following autologous blood injection with complete resolution in a small number of patients. However, most patients had some persistent blood vessels remaining in the tendon origin at the 6 month and 12 month follow-up scans despite resolution of their symptoms. Clearly, the cause of patient's symptoms are more complex than can be attributed to neovascularity alone. Other researchers have demonstrated that the size of an abnormality as assessed on ultrasound does not necessarily correlate with increased pain or symptoms. We observed reductions in tendon thickness, hypoechoic changes and incomplete resolution of intrasubstance tears following autologous blood injection. However, our study demonstrated that patients can be symptom free following autologous blood injection, and yet still have these abnormalities on ultrasound. Unfortunately, the study cannot explain how an autologous blood injection improves symptoms. The study by Edwards and Calandruccio showed that 22/28 patients responded to autologous blood injections with average Nirschl Scores decreasing from 6.5 to 2.0 with a mean follow-up of 9.5 months. Their technique differed from ours in that they mixed the autologous blood with local anaesthetic before injecting along the undersurface of the extensor carpi radialis brevis tendon without guidance. In contrast, we injected 0.25% bupivacaine along the superficial surface of the tendon to have an anaesthetic effect before dry-needling and injecting the blood into the areas of tendinosis under guidance. Dry-needling has the advantage of fenestrating the tendon causing further fibril disruption and local bleeding before the autologous blood injection. We believe that a targeted approach is more likely to produce better results. Furthermore, we routinely performed 2 injections with an option of a third and monitored any changes in the tendon with ultrasound. We have observed that patients benefit occurs mostly between 2–4 weeks following the injection and that the pain relief appears cumulative following each injection. We postulate that the optimal time interval between injections should be about 4–6 weeks and if a patient is likely to respond then should do so by the completion of 3 injections. Like most procedures, we believe that patient selection is critical to the success of the procedure. At our institution, patients with partial or full-thickness of the tendon or involvement of any collateral ligaments are referred directly to surgery. In summary, the combined action of dry-needling and autologous blood injection under ultrasound guidance is an effective way in which to treat patients with refractory tendinopathy as demonstrated by the significant fall in pain and outcome scores.

1600–1730

Interventional/Vascular

1600 The value of repeat ultrasound in patients with a high clinical suspicion of DVT

Vundavalli, S.

North Tyneside District Hospital, North Shields, UK

PURPOSE: Deep vein thrombosis is a common, treatable, potentially fatal condition. Doppler ultrasound of the lower limbs plays a crucial role in diagnosis and management. It has 95% sensitivity but still remains the mainstay of diagnosis. The aim of our project was to assess the role of repeat ultrasound in patients with an initial negative scan but a high clinical suspicion for DVT. MATERIALS/METHODS: We followed a structured pathway for all patients with suspected DVT whereby all patients with initial negative scan but high risk for DVT (identified using the Wells scoring system and d-dimer) underwent a repeat ultrasound scan within 10 days. Data were collected retrospectively over 6 months from the patient records and radiology information services. RESULTS: A total of 244 patients were scanned for suspected DVT. 21% had an initial positive scan. 29% of patients with initial negative scan fulfilled the criteria for a repeat scan. 14.2% of these were positive. These patients would have otherwise been discharged. Half of the positive repeat scans demonstrated proximal DVT, one of which extended into the common iliac vein. In our experience, only 8% of the total scans were unable to reliably visualize the calf veins. CONCLUSION: A single negative ultrasound does not completely exclude the possibility of DVT. Repeat Doppler ultrasound within 10 days, in patients with a high clinical suspicion of DVT is feasible and has a significant role in improving the diagnostic yield of ultrasound and thereby improving patient care.

1610 Doppler ultrasound examination in outpatients with suspected deep venous thrombosis – Derriford experience

Narayanaswamy, S.•Venkatanarasimha, N.•Veitch, A.•Lester, Z.•Nokes, T.•Dubbins, P.

Derriford Hospital, Plymouth, UK

PURPOSE: Venous thromboembolism affects about 100 persons per 100 000 population per year. Doppler ultrasound is currently the imaging modality of choice in patients with suspected deep venous thrombosis (DVT). We report our experience with the use of Doppler ultrasound scan in outpatients over a 45 month period and also evaluate the need for repeat ultrasound scan in these patients. MATERIALS/METHODS: The Doppler scans were reviewed of 3582 consecutive patients over 45 month period, referred by the General Practitioners to the nurse led DVT clinic with symptoms suggestive of DVT. Plasma d-dimer, modified Wells score and the results of ultrasound examination were recorded for these patients. RESULTS: Initial ultrasound examination confirmed the presence of DVT in 857 patients (24%). Of the remaining 2725 patients 2305 had a repeat ultrasound scan at 7–10 days. 107 patients (4.6%) had deep vein thrombosis confirmed on repeat scan. CONCLUSION: The incidence of DVT in patients presenting to the DVT clinic from primary care in Plymouth is 24%. 107 patients (4.6%) would not have been detected if they had not had a repeat scan. The DVT was distributed equally in above and below knee veins on repeat ultrasound scan. There is a role for repeat Doppler ultrasound examination in patients presenting with symptoms suggestive of DVT, when the initial Doppler is negative and where no alternative diagnosis is made.

1620 Palliation of obstructing malignant colonic lesions using self expanding metal stents: a single centre experience

Shrivastava, V.•Tariq, O.•Marsh, R.

Sunderland Royal Hospital, Sunderland, UK

PURPOSE: To evaluate the efficacy, risks and survival after colorectal stenting at a single UK centre. MATERIALS/METHODS: A retrospective review of 91 consecutive patients who had colorectal stents inserted over an 8 year period (September 1998 to October 2006) to relieve an obstructing colonic tumour. All stents, either Memotherm or Wallstents, were inserted by a single interventional radiologist (RM). In general, Memotherm stents were used for more distal lesions and Wallstents, which are smaller and more flexible, were used for more proximal lesions. RESULTS: 91 consecutive patients with a median age of 73 years had a colorectal stent inserted for palliation of an obstructing colorectal malignancy. Technical success was achieved in 81/91 (89%) patients and clinical success in 80/81 (99%). At the time of analysis (December 2006), 13/91 (14.2%) patients were alive. For the patients that died, median survival was 59 days, IQR 17 – 181 days. Seven (7/81) suffered stent migration

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which occurred 10.3 days (IQR 5 – 14) after the procedure. Three patients (3/81) re-presented with intestinal obstruction secondary to tumour in-growth whilst 10 (10.9%) patients suffered bowel perforation. No procedure related deaths were identified. CONCLUSION: Colorectal SEMS for the palliation of obstructing colorectal carcinoma is a safe and effective mode of treatment which avoids high risk surgery.

1630 Hydronephrosis caused by uterine leiomyoma: is arterial embolisation adequate?

Mirsadraee, S.•Tuite, D.•Nicholson, A.

Leeds Teaching Hospitals, Leeds, UK

PURPOSE: Giant leiomyomas may rarely cause ureteric obstruction. Surgical removal is challenging and may damage pelvic structures. In this study, the efficacy and feasibility of uterine artery embolisation of cases with hydronephrosis secondary to large uterine leiomyomas is discussed. MATERIALS/METHODS: From 2004 to 2006 five patients with uterine leiomyoma and related hydronephrosis were treated with arterial embolisation. Embolisation of uterine arteries was performed using (500–700 μm) polyvinyl alcohol particles. Pre and post procedural investigations included abdominal and pelvic ultrasound, serum urea and creatinine, MRI, intravenous urography and renal diuresis. Outcome measures included procedural success, resolution of hydronephrosis and renal function/size. RESULTS: Ureteric obstruction was found in all cases at the pelvic brim. In two cases, hydronephrosis was only demonstrated at the time of procedure. Uncomplicated satisfactory complete angiographic evidence of arterial embolisation was achieved in all cases. One patient with unilateral renal impairment was treated with bilateral ureteric stenting prior to embolisation. Ureteric stenting failed in the second patient due to the distortion of uretero-vesical anatomy. Although kidneys could not recover, the serum creatinine level remained within normal range. Hydronephrosis resolved in the other three cases during the follow up period without effecting renal function. CONCLUSION: Uterine arterial embolisation can safely be performed in cases with very large uterine leiomyoma with secondary hydronephrosis. Prophylactic ureteric stenting may be necessary to ensure preservation of renal function before adequate tumour shrinkage.

1640 Electronic interventional radiology simulators: validation with novice radiology trainees

Coates, P. J. B.•Erng, W.•Zealley, I.•Chakraverty, S.

Ninewells Hospital Dundee, Dundee, Tayside, UK

PURPOSE: To establish whether or not delivery of training on a computer-based interventional radiology simulator improves objective and subjective measures of performance in novice radiologists. MATERIALS/METHODS: Directed by an experienced interventional radiologist 14 novice radiology trainees performed three interventional radiology tasks (aortography, renal angiography and iliac angioplasty) on the Mentice™ Procedicus VIST simulator. Each participant then received a 2 h training package on the simulator before repeating the three tasks. Objective outcome measures included total procedure time, fluoroscopy time and number of major errors. Subjective performance measures were rated using visual analogue scales and included (1) trainers rating of the participants overall performance, and (2) participants confidence to undertake the same tasks on real patients. RESULTS: After training both the objective and subjective measures of performance improved. Average total procedure time and fluoroscopy time for the three tasks fell by 32% and 14%, respectively, with 63% fewer major errors (*e.g.* loss of access). The trainers' subjective assessment of participants' performance rose by 36%. The participants' confidence to perform the tasks on real patients rose by 32%. All differences significant at $p<0.05$. CONCLUSION: A short training package on an electronic interventional simulator improves both objective and subjective measures of performance in novice radiologists while improving their confidence to perfom tasks on real patients. This electronic simulator appears to be a useful tool for basic interventional radiology training, allowing trainees to practice skills repeatedly in a low-stress environment under direct supervision and without risk to patients.

1650 Computed tomography imaging versus adrenal vein sampling in the differential diagnosis of Conn's syndrome

Lau, J. H. G.[1]•Reznek, R. H.[1]•Matson, M.[1]•Akker, S. A.[1]•Chew, S. L.[1]•Grossman, A. B.[1]•Metcalfe, K.[2]•Monson, J. P.[1]•Drake, W. M.[1]

[1]St Bartholomew's Hospital, London, UK, [2]Southend University Hospital, Southend, UK

PURPOSE: To evaluate the contributions of CT imaging and adrenal vein sampling (AVS) to the differential diagnosis of Conn's syndrome. METHOD: 35 consecutive patients admitted to our unit with Conn's syndrome were investigated with an identical protocol. Every patient underwent CT and AVS. A single radiologist, blind to the biochemical data, analysed all CT scans, and a single interventional radiologist performed all the AVS. The gold standard for a unilateral APA was confirmation of a typical aldosteronoma on histology and long-term post-operative resolution of renin and aldosterone levels. Where histology is not available, results from AVS were taken to be the gold standard. RESULTS: Both adrenal veins were cannulated in 43% of cases, left adrenal vein only – 43%, right adrenal vein only – 11%, and none cannulated – 3%. CT had an 82% sensitivity and 63% specificity for the diagnosis of APA, each judged against the above gold standards. If patients had surgery on the basis of imaging alone, 2 of 23 (9%) thought to have APA on CT would have erroneously had surgery for bilateral aldosterone production demonstrated by AVS, and 3 of 12 (25%) thought to have BAH on CT would not have had potentially curative surgery for unilateral aldosterone production demonstrated by AVS. CONCLUSION: To our knowledge, this is the first prospective study comparing CT imaging to adrenal vein sampling in the differential diagnosis of Conn's syndrome. Our results suggest that AVS is indispensable and has a significant impact on patient management.

1700 Uterine leiomyoma arterial embolisation: would you do it as a day case?

Mirsadraee, S.•Nicholson, A.

Leeds Teaching Hospitals, Leeds, UK

PURPOSE: A day case (DC) unit may reduce waiting list by admitting patients directly for their investigations/treatment without taking up bed space. The aim of this study was to examine the safety and feasibility of uterine leiomyoma arterial embolisation (UAE) in a day case unit. MATERIALS/METHODS: From 2003 to 2006, 107 patients received UAE of which 30 were performed as DC. Following written informed consent, unilateral UAE was performed using (500–700 μm) polyvinyl alcohol particles. Analgesia during and after procedure included titrated morphine, diclofenac and tramadol. Outcome measures included procedural/clinical success, pain management, readmission rate, and overall patients' experience. RESULTS: Menorrhagia was controlled in 96% of DC and 95% of inpatients (IP). 4 patients from the DC group were admitted post-procedure due to uncontrolled pain following which pain management protocol had to be revised. 2 more patients attended local hospital and 12 attended local GP with pain. No serious adverse-effect documented. From IP group (n=87), none were re-admitted, but 2 attended local hospital and 5 required GP visit. Median off-work time in DC group was 7 (3–10) days in the first, and 12 (10–20) days in the second visit. Median off-time work was 10 (7–20) days in IP group. 85% of DC group and 95% of IP group said that they would recommend the procedure. CONCLUSION: UAE could be safely performed in a day unit. A delicate pain management protocol as well as active participation of the community health system is necessary.

1710 Detailed anatomy of the adrenal veins on thin-slice CT, and correlation with success of adrenal vein sampling

Gangoli, S. V.•Bent, C.•Sonal, K.•Drake, W. M.•Matson, M.•Reznek, R. H.

St. Bartholomew's & The Royal London Hospitals, London, UK

PURPOSE: Conn's syndrome, or primary hyperaldosteronism, is most commonly caused by adrenal cortical adenomata, or by bilateral adrenal cortical hyperplasia. Therefore, adrenal vein (AV) blood sampling is often performed to assess differential aldosterone secretion in the AV, but cannulation can be difficult. This retrospective study investigates variations in AV anatomy on CT and consequent

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success rate of AV cannulation. MATERIALS/METHODS: 35 patients underwent triphasic CT scanning of the adrenal glands (slice thickness: 1.2 mm) for routine work-up to identify an adenoma. Three radiologists in consensus retrospectively obtained detailed anatomical measurements of the AV, including diameter, length, and variation in angle of exit from midline in 2 planes, from the IVC on the right, and the left renal vein on the left. RESULTS: The right AV had a mean diameter 1.7 mm (range: 1–2 mm) and length 3.7 mm (range: 1.3–7.5 mm). The angle in relation to the IVC was 3.8° (0–30°) sagittally and 29° (0–45°) on axial imaging. It was not clearly visualised on CT in 20%. Success rate of cannulation was 54%. The left AV had a mean diameter 2.9 mm (range: 1–4 mm) and length 18 mm (range: 14–30 mm). The angle in relation to the left renal vein was 49° (0–150°) sagittally and 48° (0–135°) on coronal imaging. Success rate of cannulation was 86%. CONCLUSION: The right AV is smaller and shorter than the left, but shows less directional variability. There is a consequent greater failure rate of AV cannulation on the right. Work in progress will assess the statistical significance for individual variables.

1720 Non-focal ultrasound-guided liver biopsy: how thin can you go?

Alex, J.·Moorghan, M.·Callaway, M.·Roach, H.

Bristol Royal Infirmary, Bristol, UK

PURPOSE: Historically, percutaneous liver biopsy specimen length of ≥15 mm and/or 6 portal tracts have been considered necessary for accurate diagnosis of chronic liver disease. With the increasing demand for biopsy to assess fibrosis in chronic hepatitis C and non-alcoholic fatty liver disease, specimen lengths of ≥20 mm and 11 portal tracts have been suggested as the necessary specimen size for diagnostic accuracy. Much of the literature refers to 16 or 18 gauge biopsies (or larger) and several authors discourage the use of smaller needles. The purpose of this study is to assess the diagnostic quality of specimens obtained using a 19 gauge coaxial system and 20 gauge tru-cut biopsy needle. MATERIALS/METHODS: The histopathological reports from 100 non-targeted ultrasound guided liver biopsies taken over a 24 month period were analysed for diagnostic quality and size of specimen. The results were compared with published recommendations. A further study was performed on 25 specimens performed after a change of practice incorporating the taking of (3–4 pass) specimens through a single 19 gauge needle puncture port. RESULTS: In the first 100 specimens though 98% were histologically diagnostic, only 65% were longer than 20 mm (mean 2.8 ± 1.5 mm) and met the recommended size guideline. Following the change in practice, 100% of specimens were diagnostic and longer than 20 mm (mean 3.98 ± 0.96 mm). CONCLUSION: 20 gauge biopsy specimens taken through a single puncture with a 19 gauge coaxial biopsy system are sufficient for diagnosis of chronic liver disease. Even longer total specimen length could improve accuracy further.

1600–1715
Education and Training I

1600 Invited review: Radiology academies

Williams, S. M.

Norfolk & Norwich University Hospital, Norwich, UK

PURPOSE: To review the process of developing and running a radiology academy as part of the RCR/Department of Health Radiology Integrated Training Initiative (RITI). Emphasis is placed on the changes needed in the transition from a traditional radiology SpR training program to academy-based training. SUMMARY: The Norwich Radiology academy opened on schedule in October 2005. The first academy cohort are now into their 2nd year of training. Through the adoption of the academy model, SpR numbers on the Norwich scheme have more than doubled over a 2-year period. We review the changes in the structure of training, novel approaches within the SpR1 year and outcomes in terms of internal and external assessment that have resulted from expansion. CONCLUSION: With investment in training infrastructure it is possible to markedly increase core radiology training capacity without compromising training quality.

1625 Invited review: Integrated training initiatives

Wivell, G.

Norwich Radiology Academy, Norwich, UK

PURPOSE: The Radiology Integrated Training Initiative is a collaborative project involving the Royal College of Radiologists, the Department of Health and the National Health Service. It was conceived to address the radiology workforce shortfall when it was shown that traditional training schemes were operating at full capacity. The primary aim of the initiative was to increase training capacity without increasing the pressure on the clinical departments. METHOD: The Integrated Training Initiative proposed supporting Specialist Registrars outside of the clinical departments by creating new learning materials and new training environments. RESULTS: An e-learning solution was created using material written by radiologists for radiologists and mapped into approx. 1000 h of short interactive learning sessions. This is now being rolled out to the traditional training schemes. Using a dedicated archive of cases validated by experts is a way to expose the trainees to many more cases with good learning opportunities. Three state of the art Radiology Academies opened in 2005. The investment in the Academies has already seen increased numbers in training. THE FUTURE: The Radiology Integrated Training Initiative is vital to the future of Clinical Radiology in England. It represents an exciting and innovative, 21st century approach to medical education, which has the potential to be rolled out across the wider NHS.

1650 Invited review: Radiographer image interpretation in A&E – where are we and where are we going?

Snaith, B.

Mid Yorkshire Hospitals NHS Trust, West Yorkshire, UK

INTRODUCTION: Professional practice has developed within diagnostic trauma radiography to a level at which the radiographer not only has responsibility for patient care and image production, but also image evaluation and communication of an interpretation to the referring clinician, whether through red dot, comment or definitive report. PURPOSE: This research establishes a baseline of current radiographer image interpretation practice in the UK. METHOD: Questionnaires were distributed to all hospitals and minor injuries units to identify the scope of radiographer image interpretation. Further questionnaires were distributed to all radiography programmes within higher education institutions to identify the programmes of education at both pre and post-registration levels. RESULTS: The results of the study will be discussed and recommendations on education development. This will identify whether the profession is able to deliver the College of Radiographers aim of all radiographers providing an initial interpretation to the emergency department. SPONSORSHIP: This research was funded by the College of Radiographers Research Award.

1650 Invited review interpretation in A&E – where are we and where are we going?

Hardy, M.

University of Bradford, Bradford, UK

INTRODUCTION: Professional practice has developed within diagnostic trauma radiography to a level at which the radiographer not only has responsibility for patient care and image production, but also image evaluation and communication of an interpretation to the referring clinician, whether through red dot, comment or definitive report. PURPOSE: This research establishes a baseline of current radiographer image interpretation practice in the UK. METHOD: Questionnaires were distributed to all hospitals and minor injuries units to identify the scope of radiographer image interpretation. Further questionnaires were distributed to all radiography programmes within higher education institutions to identify the programmes of education at both pre and post-registration levels. RESULTS: The results of the study will be discussed and recommendations on education development. This will identify whether the profession is able to deliver the College of Radiographers aim of all radiographers providing an initial interpretation to the emergency department. SPONSORSHIP: This research was funded by the College of Radiographers Research Award.

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1600–1730
Emerging imaging techniques
1600 Invited review: Diffuse optical imaging

Gibson, A.

UCL, London, UK

A new approach to medical imaging uses light to generate images of newborn babies' brains and breast cancer. Blood absorbs light strongly and its colour depends on how much oxygen it is carrying, so imaging using light provides a direct measurement of both the volume of blood and its oxygen content. We have used this technique, called optical tomography, to image the blood supply to the brains of both ill and healthy premature babies, and the increased blood flow to cancer in the breast. Optical tomography provides relevant clinical information which may not otherwise be available.

1630 Invited review: PET/MR systems

Carpenter, A.

University of Cambridge, Cambridge, UK

Since its introduction PET combined with CT has proven a winning combination, particularly in Oncology. This talk will explore the motivations for bringing PET and MRI into a single instrument for use in pre-clinical and clinical imaging. The technical challenges will be outlined and the various approaches to solve these will be reviewed. Finally progress with three scanners in active development will be discussed, namely the Cambridge preclinical imager, and insert systems for preclinical and clinical scanners.

1700 Optical coherence tomography

Drexler, W.

Cardiff University, Cardiff, UK

PURPOSE: Optical coherence tomography (OCT) is an emerging non-invasive, optical medical diagnostic imaging modality, which enables non-invasive *in vivo* cross-sectional tomographic visualization of internal microstructure in biological systems. METHODS/RESULTS: Recent developments in ultrabroad bandwidth laser as well as OCT technology enable three-dimensional ultrahigh resolution OCT with unprecedented axial resolution, approaching resolution levels of conventional histopathology, enabling optical biopsy of biological tissue. In addition, extensions of OCT are recently under development that should provide non-invasive depth resolved functional imaging of the investigated tissue, including extraction of spectroscopic, blood flow or physiological tissue information. These extensions of OCT should not only improve image contrast, but should also enable the differentiation and early detection of pathologies via localized spectroscopic properties or functional state. CONCLUSION: OCT has the potential to provide cellular level resolution visualization of tissue morphology (optical biopsy) and at the same time localized metabolic and physiological tissue information in performing a single volumetric OCT measurement.

1600–1730
BAMRR SFG II
1600 Invited review: Radiographer reporting in MRI

Bailey, B.

Leighton Hospital, Crewe, UK

PURPOSE: MR Advance practice radiographers have been practicing in this country for over 3 years. Their experiences and job roles are most varied. MATERIALS/METHODS: Through the experiences of advance practice MR radiographers around the country I will outline the benefits these staff can bring both to their trusts and ultimately the patients. RESULTS: The training and practicalities of the job role will be outlined. CONCLUSION: With more MR advanced practice reporting radiographers being trained I will speculate how the profession will proceed.

1630 Invited review: ^{3}He lung MR imaging

Woodhouse, N.

University of Sheffield, Sheffield, UK

Hyperpolarized noble gases were recognized as being of interest in the field of MRI In the early 1990s; the first images of hyperpolarized Xenon-129 (^{129}Xe) in the excised lungs of a mouse were demonstrated in 1994 and the first human images were produced in 1996, this time using Helium-3 (^{3}He). ^{3}He has been by far the most extensively used so far; mainly due to its higher polarization levels, non-anaesthetic properties and its' insolubility in blood. The development of improved polarization techniques for ^{129}Xe and imaging of gas exchange is leading to a re-evaluation of ^{129}Xe as a probe of lung function. However, to date the majority of work in this field has used ^{3}He which gives exquisite demonstration of ventilated airspaces and has been applied in many respiratory diseases such as COPD, asthma, lung cancer, bronchiolitis obliterans, cystic fibrosis and in the lungs of smokers. The apparent diffusion coefficient (ADC) of ^{3}He can be used as a probe of alveolar dimensions, and has also been used to demonstrate dependency changes. Dynamic imaging has been achieved through the development of ultrafast pulse sequences; radial imaging has proved the most robust method for imaging gas flow, although spiral acquisition techniques have been applied. The calculation of O_2 uptake in the lungs is also possible due to the predictable paramagnetic effect of O_2 on spin depolarization; this allows the construction of regional V/Q maps. ^{3}He MRI is ideally suited to segmentation and ventilated volumes can be easily calculated from these images.

1700 Invited review: Can neuro linguistic programming be used to reduce the need for general anaesthesia in magnetic resonance imaging? Early experience

Bigley, J.

Royal Hallamshire Hospital, Sheffield, UK

BACKGROUND: It is estimated that 1% of patients referred for MRI cannot tolerate the examination, mainly due to claustrophobia. Alternative diagnostic tests may be less appropriate but general anaesthesia (GA) carries an increased risk and cost. Neuro linguistic programming (NLP) claims to be able to cure phobias quickly and effectively. I was selected to undergo training in some basic NLP techniques, including the fast phobia cure, and present our early experience. METHODOLOGY: Following training, NLP techniques were introduced informally, on an everyday basis, into the MRI department. A research project has also been established. This aims to formally assess the efficacy of these techniques, in particular the fast phobia cure, in reducing anxiety and overcoming claustrophobia. A cohort of 50 patients will be recruited, all of whom have had a previous, failed, attempt to undergo MRI. LEARNING OUTCOMES: On an everyday basis NLP is being used to improve the patients' experience. The patient/Radiographer relationship is greatly enhanced by applying basic NLP techniques, such as rapport and calibration. This allows a greater level of trust to develop and reduces the patients' anxiety. Other NLP techniques, such as anchoring and submodalities, are used to help the patients to change their state and prevent the scan being abandoned due to claustrophobia. The patients are leaving the department feeling happier and more relaxed. This will also help if follow up examinations are required in the future. To date over 50% of cases have tolerated MRI without GA.

1630–1730
Genitourinary IV: Management of Stones
1630 Invited review: Diagnosis – CTKUB

Wah, T.

St. James's University Hospital, Leeds, UK

Since the advent of multidetector CT, non-contrast enhanced CT of the urinary tract system (CTKUB) has become one of the most common examinations that we interpret in our daily practice. This lecture aims to outline the technique, define the common clinical indications for referral, and also to provide illustration of the common diagnostic CT appearances that we encounter in our routine practice. Potential pitfalls during interpretation will be highlighted. In addition, this lecture will discuss the implications of changing practice such as the increasing role of CTKUB as a first line investigation for imaging of acute renal colic patients.

1700 Management of renal stones

Sandhu, C.

Guy's Hospital, London, UK

Over recent years there have been considearble advances in the

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management of patients with renal stones. Radiology has an important role and many imaging modalities and techniques are currently available for the evaluation of patients with renal stones. This talk discusses these modalities with respect to: (1) Treatment planning and what radiological information the urologist/interventional radiologist need to know to choose and plan the appropriate treatment. (2) The procedure, for example, lithotripsy, percutaneous stone removal or flexible renoscopy and retrograde stone retrieval. (3) The post procedure care of the patient both in the routine and the complicated case.

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Scientific programme abstracts Tuesday 12 June

0830–1000

Neuroradiology SFG I

0830 Invited review: Update on imaging potential brain tumours NICE guidelines

Britton, J.

St George's Hospital, London, UK

Improving outcomes for people with brain and other CNS tumours was published in June 2006 by the NICEH. The guidance is aimed at improving care for all patients with brain and other CNS tumours. This should be independent of the hospital or clinician to which they present. Most patients will have their surgical management at a Neuroscience unit and they may or may not require radiotherapy or chemotherapy but they most commonly present to a wide range of different clinical disciplines at the acute Trust. Patient subsequently have either CT or MR imaging and this is the test which initially confirms the patient has a brain tumour. Access to appropriate clinical care is therefore dependent on interpretation of the imaging by the district radiologist prior to the patient's referral to the Neuroscience unit MDT. Not all intracranial masses are tumours and the lecture will cover the common pit falls in imaging masses in the head. Although it may be possible to suggest a histological diagnosis for a brain tumour it is just as important to exclude the possibility of an abscess or an infarct which may give a similar appearance on CT and MR imaging. There will be some discussion of modern imaging techniques such as spectroscopy, functional imaging and other advanced MRI techniques and the place of these techniques in the routine assessment of patients with brain tumours.

0900 Retrospective audit of nasolacrimal stent insertion: technical success, short term patency and procedural learning curve

Speirs, A. J. D.•Anderson, H. J.

District General Hospital, Eastbourne, UK

PURPOSE: To evaluate the technical and short-term patency rates for nasolacrimal duct stent insertion in the treatment of epiphora in a non-specialised centre. To identify the presence and discuss the relevance of a learning curve for this procedure. METHODS: A retrospective audit of all nasolacrimal stents inserted over a 10 year period by a single interventional radiologist (17/12/96–26/9/06). 112 nasolacrimal stents were inserted into 110 patients. The mean age was 70.1 years (24–93 years). 78 were female and 32 male. The majority suffered with longstanding idiopathic epiphora. 6 weeks post-insertion dacrocystography was performed to establish stent patency. RESULTS: Technical success was achieved in 99 stents (88.4%). 8 of the 13 failed stent insertions occurred in the first 31 patients whereas only 5 failed in the subsequent 81 (93.75%). Per quartile failures were 7, 2, 4, 0, respectively. Dacrocystography was performed in 77 patients (77.7%) at 6 weeks of which 44 (57.1%) were patent, 2 (2.6%) partially patent and 5 (6.49%) were initially occluded, but became patent post lacrimal system irrigation. A further 24 (31%) stents were completely occluded. CONCLUSION: The technical success rate was slightly inferior to some large published trials that used interventional radiologists previously experienced at nasolacrimal stent insertion. If, however, the first 31 patients are excluded then our success rate is comparable, suggesting a small but significant learning curve. Patency rates at 6 weeks were also marginally reduced compared with the literature, although there is little direct evidence for comparison. This is probably related to the lack of regular lacrimal system irrigation.

0910 The role of fetal MRI in assessing posterior fossa abnormalities detected by prenatal ultrasound

Wilding, L. J.•Fink, K.•Jan, W.•Lin, J.•Fox, G.•To, M.•Maxwell, D.

Guy's and St Thomas' NHS Trust, London, UK

PURPOSE: The antenatal ultrasound diagnosis of posterior fossa abnormalities is difficult and shows poor correlation with post mortem neuropathology. The aim of this study is to assess the role of fetal MRI in the further diagnosis of such abnormalities suggested by prenatal ultrasound. MATERIALS/METHODS: Between 2000 and 2003, 9 fetuses with the antenatal ultrasound diagnosis of a posterior fossa abnormality at Guy's and St Thomas' NHS Trust tertiary level obstetric unit were referred for fetal MRI. Neurodevelopmental assessment was performed at birth, 12 months and 24 months with postnatal imaging where clinically indicated. RESULTS: Within the 9 referred cases, antenatal MRI confirmed Dandy Walker Malformation in one case. Of the remainder, 2 cases were normal, 3 had abnormalities of the cerebellar vermis, 1 an enlarged cisterna magna, 1 an arachnoid cyst and 1 an enlarged fourth ventricle. Neurodevelopmental prognosis was generally good, the 2 cases with delay having associated congenital syndromes. CONCLUSION: Fetal MRI is useful in diagnosing posterior fossa abnormalities, allowing for more accurate prenatal counselling.

0920 Audit of CT head scans for patients on warfarin investigated for spontaneous intracranial haemorrhage

Popuri, R.[1]•Turnbull, I.[2]

[1]Manchester Radiology Training Scheme, Manchester, UK, [2]Hope Hospital, Manchester, UK

PURPOSE: CT head scanning is one of the most common special imaging procedures performed in any Radiology department. Of importance are those patients on warfarin where there is a request to perform CT head scans, often as an emergency investigation, to rule out spontaneous intracranial haemorrhage. The aims of our study are to determine if there is an increased incidence of spontaneous intracranial haemorrhage in patients on warfarin as compared with patients not receiving anticoagulants, and if yes, the level of INR below which anticoagulation doesn't pose an additional risk of ICH? MATERIALS/METHODS: The study group comprised of 160 patients on warfarin, being investigated for spontaneous intracranial haemorrhage (January 2000 to May 2006). A randomly selected group of 203 consecutive patients, not receiving anticoagulants, were selected as controls. The incidence of intracranial haemorrhage was calculated as a percentage of the respective total number from both groups. RESULTS: The incidence of spontaneous intracranial haemorrhage in the study group and control group was 6.40% and 6.25%, respectively. Of the patients with an INR $\leq$3.0; 4.8% had spontaneous ICH. The figure was 8.3% for patients with INR >3.0. Percentage of "out of hours" scans done in study group and control group was 29% and 37%, respectively. CONCLUSION: No appreciable difference was seen in the overall incidence of spontaneous intracranial haemorrhage between anticoagulated and non-anticoagulated patients. In particular there appears to be no increased incidence of spontaneous ICH in patients with an INR $\leq$3.0 and a slightly increased probability of bleeding in patients with INR>3.

0830–1010

Investigating the acute abdomen

0830 Invited review: Appendicitis/bowel obstruction

Krestin, G.

Erasmus MC, NL - 3000 Rotterdam, The Netherlands

KEY LEARNING OBJECTIVES: To discuss the imaging diagnosis of acute abdominal disorders focusing particularly on appendicitis, bowel obstruction and their differential diagnoses. DESCRIPTION: In its broadest sense, the acute abdomen refers to various disorders associated with more or less severe abdominal pain of rapid onset. The fact that emergency surgery is necessary in only one fourth of all patients hospitalized with an acute abdomen proves that the term "acute abdomen" is broadly defined and is used as a preliminary definition for acute abdominal pain until a definite diagnosis can be established. The leading symptoms of acute abdomen may direct the attention and determine the imaging modality that yields maximum of information. Acute appendicitis accounts for the majority of surgical cases of acute abdominal pain presenting to an emergency room. Overall sensitivity of unenhanced CT for the diagnosis of acute appendicitis has been reported to range between 93% and 98%, and

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specificity between 85% and 98%. Alternative diagnoses that should be differentiated from appendicitis are terminal ileitis, mesenteric lymphadenitis, ileo-cecal tuberculosis, perforated cecal diverticulitis and perforated Meckel's diverticulum. In bowel obstruction, CT not only allows localizing the level of obstruction but in many cases it also provides information on its aetiology. CONCLUSION: Multislice helical CT provides the combined advantages of speed and seamless coverage of the abdomen with outstanding spatial resolution. In many circumstances CT has become the gold standard and is even cost-effective as compared with other more time consuming and less accurate diagnostic modalities.

0900 Invited review: Trauma

Shanmuganathan, K.

University of Maryland Medical Center, Baltimore, MD, USA

Blunt bowel & mesenteric injuries are diagnostic challenge to the emergency radiologist and trauma surgeon. This lecture will demonstrate the various MDCT findings seen in patients with blunt bowel and mesenteric injury. Discuss the relevance of these findings to management. Discuss also the importance of communication of MDCT findings to the surgeon.

0930 Assessment of the effect of double reporting of minimal-preparation CT colons

Murphy, R. C.•Bungay, H.•Ferrett, C.•Slater, A.•Uberoi, R.

Department of Radiology, John Radcliffe Hospital, Oxford, UK

PURPOSE: Double reporting has been shown to reduce perception errors in a variety of radiological investigations. Minimal-preparation CT colon is a useful test for the frail elderly who tolerate full bowel preparation poorly. It is better tolerated by patients and identifies extracolonic pathology. This study quantifies the perception error reduction found by double reporting. MATERIALS/METHODS: A prospective cohort of 186 patients undergoing minimal-preparation CT colon in a single unit for lower gastrointestinal symptoms was double reported. Radiologists were blinded to each report. Reports were recorded on a standardized proforma. Data for each report was divided into clinically significant and clinically insignificant information. Each study was analysed for discrepancies. A significant colonic lesion was defined as one where direct endoscopic visualization was recommended. A clinically significant lesion was one where the finding could impact on future patient management. RESULTS: Differences were seen in 67% (124/186) reports. 13% (24/186) of patients had a significant colonic lesion – 7 of these lesions were missed on single reporting. 21% (39/186) of patients had at least one clinically significant finding absent on a report. Some reports had more than one significant extracolonic finding missed (range 1–3). CONCLUSION: A high number of abnormalities with the potential to affect patient care were not reported. These included colonic lesions. This study suggests the need for double reporting of minimal-preparation CT colons. We found that double reporting improved pick up of significant pathology. However, achieving this increase in patient care has impact on manpower and delivery of service.

0940 Experience of MRI of the bowel in Sandwell District General Hospital

Slaney, C. J.•Donovan, R.

Sandwell and West Birmingham NHS Trust, Birmingham, UK

PURPOSE: To review the effectiveness of MRI of the bowel with minimal preparation. MRI of the bowel is normally performed with enteroclysis. In this department, MRI of the abdomen was performed after encouraging an increased fluid intake for 6–8 h prior to the examination, with no oral contrast agent. METHODS: 43 patients underwent abdominal MRI for investigation of bowel symptoms or follow up of bowel disease. T_1 VIBE and gradient echo sequences, T_2 HASTE and HASTE fat saturated images were obtained. 19 patients also had a comparative barium study. The results of the barium studies and MRI examinations were reviewed. RESULTS: 12 MRI studies were reported as demonstrating no pathological features. 18 patients had changes within the small or large bowel using minimal preparation. 9 patients had mesenteric changes including lymphadenopathy and 6 patients had free fluid or collections. Of the 19 patients who additionally underwent a barium investigation, the diagnosis remained the same in 11 patients. 5 patients had additional findings on the MRI study and in 3 patients additional features were visible only on the barium study. CONCLUSIONS: MRI with minimal preparation offers a viable alternative to barium examination without the radiation dose or discomfort involved with a barium study. It also allows improved evaluation of the surrounding mesentery and other intra-abdominal organs.

0950 Shocking behaviour of the intestine!! The mechanism of intussusception exposed

Arun, C.

Diagnostic Imaging, Oxford University, Oxford, UK

PURPOSE: Nowadays, the preferred and needless to say, ideal treatment for pre-operatively diagnosed intussusception is hydrostatic reduction by the radiologist. Following on from our previous work presented elsewhere,(http://www.dfd2005.northwestern.edu/PosterEntries.pdf), in order to unravel the nature of this curious behaviour of hollow smooth muscle viscera, we undertook this simulation study. MATERIALS/METHODS: In the past, it has correctly been recognized (Reymond RD. Br J Radiol 1972;45:1–7) that experimental investigation of intussusception in technically infeasible. We computationally modelled intestinal peristaltic contractions as linear waves that are capable of nonlinear steepening upon encountering an obstacle. A modified form of the Burgers equation for this purpose. RESULTS: We find that from thermodynamic considerations, only circular waves (not longitudinal waves) of peristalsis can lead to intussusception. We find that intussusception is the end result of non-linear steepening of a linear wave in soft matter. Whereas with notional continua such as gases and liquids, a wave will break after overtopping due to its surface tension force being exceeded, in the case of soft matter, the shock is followed by an overlap of contiguous portions of hollow viscera. The soft matter analogue of the typical *N*-wave of gas-dynamic shock can be demonstrated as well. CONCLUSION: Intussusception is the consequence of a shock wave phenomenon in automotive soft matter. While this finding may come as a shock to many, the privilege of preventing the horror of intestinal gangrene and septic shock now rests with the radiologist!

0830–1000

Update on contrast medium

0830 Invited review: Contrast nephrotoxicity

Morcos, S.

Northern General Hospital, Sheffield, UK

Contrast media nephrotoxicity (CMN) remains an important complication of intravascular administration of contrast media (CM). Risk factors for CMN include raised creatinine levels, particularly due to diabetic nephropathy, dehydration, congestive cardiac failure, age over 70 years and concurrent administration of nephrotoxic drugs, such as non-steroidal anti-inflammatory drugs. Patients at risk of CMN should be identified prior to CM adminstration. If the administration of CM is deemed necessary in patients at high risk of CMN, volume expansion should be offered and the smallest possible dose of either non ionic iso-osmolar dimeric or non ionic low osmmolar monomeric CM should be used. Prophylactic administration of fenoldopam or acetylcysteine has not offered consistent protection against CMN. Sodium bicarbonate infusion has been shown to reduce the risk of CMN in one study. Haemofiltration for several hours before and after CM injection may offer good protection against CMN in patients with advanced renal disease requiring angiographic procedures. Prophylactic haemodialysis does not offer any protection against CMN. The use of gadolinium CM for radiographic examinations in preference to iodinated CM to reduce the risk of CMN is not advised. Gadolinium CM are more nephrotoxic than iodinated CM at equivalent X-ray attenuating doses.

0850 MRI contrast agents: mechanisms, chemistry, future

Dawson, P.

University College Hospital, London, UK

The chemistry, pharmacology and mechanisms of action of MRI agents will be comprehensively reviewed. Likely future developments will be surveyed.

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0910 Invited review: Ultrasound contrast

Sidhu, P.

King's College Hospital, London, UK

From the introduction of microbubble ultrasound contrast in the early 90s, there has been tremendous development in the technical aspects and clinical use of ultrasound contrast agents. The initial use was "Doppler rescue", particularly useful in the depiction of the abdominal vasculature, intracranial vessels and intraventricular lumen delineation in echocardiography. Attempts at characterizing focal liver lesions were dependent upon the vessel distribution in the lesions; a highly subjective method. In the late 90s, technical developments with ultrasound wave propagation and detection led to the development of pulse inversion techniques allowing for low mechanical index imaging. First generation microbubble contrast agents were not suitable for this technique, but the second generation more stable microbubble contrast agents allowed for continuous low mechanical index imaging of focal liver lesions. This allowed for characterization of focal liver lesions in the arterial, portal-venous and late portal phases. This is now well established and has proved to be extremely accurate. In addition, microbubble contrast agents continue to be used in Doppler rescue techniques, particularly in echocardiography and intracranial Doppler imaging. However, there are many other clinical uses for microbubble contrast agents, particularly in the assessment of renal and splenic lesions and also increasingly in the assessment of blunt abdominal trauma. The unique properties of microbubble contrast agents also allow for more esoteric imaging to be performed. There is a niche use in the treatment of vascular thrombus, in targeted gene therapy and drug delivery. Microbubble contrast agents are also finding a role in molecular imaging.

0930 Invited review: Contrast reactions – current thinking

Dawson, P.

University College Hospital, London, UK

The chemistry, pharmacology and mechanisms of action of MRI agents will be comprehensively reviewed. Likely future developments will be surveyed.

0950 Discussion

0830–1020
Target Delivery

0830 Invited review: Reducing elective waits – delivering 18 week pathways for patients

Robinson, P.

Department of Health, London, UK

PURPOSE: To present the latest news and views of the national 18 weeks Delivery Programme. MATERIALS/METHODS: Presentation will cover: Understanding the background to 18 Weeks and what it will mean for patients, the NHS and the public; Assessing the scale of the challenge nationally for delivery – sharing outcomes of Referral to Treatment data collection; Updating from the national programme and national projects to support local strategies; Highlighting priority areas of work for 07/08 and beyond.

0855 Invited review: The role of imaging in achieving cancer targets

Kershaw, M.

East Kent Hospitals Trust, Canterbury, UK

No abstract supplied.

0920 Invited review: Knowing your capacity

Shouls, S.

NHS Institute for Motivation and Improvement, Coventry, UK

No abstract supplied.

0945 Invited review: Achieving targets while improving quality

Cavanagh, P.

Taunton & Somerset NHS Trust, Somerset, UK

There are three key components in delivering healthcare: quality, access and efficiency. There is a strong feeling amongst the clinical staff that there has been too much focus on waiting times (access) and financial balance (efficiency) and not enough concern on quality (especially patient safety). It has often been said that if you want quality you have to pay for it. However, when we look beyond healthcare there is evidence that quality and efficiency are not competing agendas. In addition, there is further evidence from patient safety initiatives that high quality systems actually save money whilst enhancing the reputation of the organization. Quality is now becoming a key driver in healthcare service improvement now that access times are no longer the major concern of the public. This presentation discusses how we can improve quality whilst achieving access and efficiency targets with reference to evidence-based literature and case studies.

1010 Discussion

0830–1000
Managing the Digital Environment I

0830 Invited review: National Programme user's story I: Experience of the first wave

McGee, S.

Salisbury District Hospital, Salisbury, UK

KEY LEARNING OBJECTIVES: The requirements for a successful PACS/RIS implementation under the national programme are enormously complex, not only because of the fundamental process and work culture changes it demands of an organization, but also because of the number of different agencies involved in delivering the technology. DESCRIPTION: How was it for you? A frank and unexpurgated account of the pains and gains of a "big bang" simultaneous PACS/RIS implementation in the earliest stages of the national programme. With the dust starting to settle, a look to the hopes and fears of the future. CONCLUSION: Be afraid, be very afraid... but it can be made to work?

0900 Invited review: National Programme user's story II: Implementation across a cluster

Blanchard, T.

South West Peninsula Strategic Health Authority, East Exeter, UK

DESCRIPTION: An anecdotal account of some of the highs and lows of the LSP PACS and RIS deployments across the South West. The main challenges faced by both the trusts and CfH in deploying such a large project, *e.g.* resources and domain working. The key lessons learned and those that can be applied to other NPfIT projects. The relationship with the LSP and the subcontractors; how it developed on the ground from the start of deployment through service management. What worked well, *e.g.* clinical involvement, issue resolution, experience sharing, multidisciplinary project teams and service support. Why it has not fulfilled what it intended in image sharing and bundled applications. Future directions and why the story does not finish at the end of the deployment phase. When and how PACS will integrate with the rest of the NPfIT. How the success of PACS has raised expectations in the wider health community. How the scope of PACS functionality has already started to extend into other "ologies". SUMMARY: Was it worth it? Despite the struggles, the projects were all successfully implemented and the SW is now almost "filmless". Virtually all sites in the SW going live on time or even earlier than planned. Clinical feedback has been very good, with a considerable improvements to the radiology service locally, and soon regionally and beyond.

0930 National PACS Team "lessons learned and next steps forward"

Barber, M. Jennings, D.

NHS Connecting for Health, Leeds, UK

No abstract supplied.

0830–1000
Advances in cartilage imaging

0830 Invited review: Latest developments in cartilage imaging techniques

Jenkins, J.

Manchester Royal Infirmary, Manchester, UK

Imaging of articular cartilage has assumed an increase in importance

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with the advent of new surgical and pharmaceutical treatments for osteoarthritis and cartilage injury. It is important to have a clear understanding of the structure and function of articular cartilage and subchondral bone in order to detect early changes. Whilst the plain radiograph is useful in demonstrating advanced osteoarthritis, its early detection requires the use of more complex imaging techniques. The pre-treatment evaluation of traumatic, degenerative and inflammatory articular cartilage changes requires the use of MRI or CT arthrography, with ultrasound (+ Doppler) used to assess the peripheral small joints. There is an array of MR techniques available for imaging articular cartilage. Standard techniques using spin echo and gradient echo sequences, which require optimization, with newer methods including faster data acquisition and higher resolution provide detailed review of cartilage in the clinical setting. Further advances have been achieved with higher field strength magnet systems (3 T), the use of physiological and quantitative imaging with T_2 mapping, contrast-enhanced T_1 mapping and diffusion-weighted imaging, and the development of isotropic 3D MRI allowing virtual arthroscopy. Sodium MR has recently shown promising results in cartilage imaging, based on the ability of sodium imaging to depict regions of glycosaminoglycan depletion. These latter techniques will be particularly useful in the assessment of cartilage grafts.

0855 Invited review: Imaging cartilage and drug development

Waterton, J.

AstraZeneca, Macclesfield, UK

PURPOSE: Osteoarthritis (OA) is a significant cause of disability. There is an urgent need for new therapies which prevent disease progression. Because of slow disease progression, pivotal Phase III clinical trials are usually large and protracted. The development of new drugs would be greatly assisted by biomarkers to provide preliminary evidence of pharmacological efficacy in early small-scale Phase II clinical trials. In this context, measures from imaging techniques such as MRI are now themselves regarded as biomarkers. Since OA is characterized by focal loss of articular cartilage, particularly in weight-bearing joints, the development and evaluation of MR techniques for assessing tiny morphologic changes in hip and knee cartilage is a priority. METHODS: Techniques based on 3D fat-suppressed gradient echo techniques have been developed and deployed at 1.5 T and 3 T. Extremely precise image segmentation methods have been deployed, with quantitative focal analyses (using, *e.g.* Statistical Shape Modelling). In addition to this clinical work, preclinical studies have been performed to permit evaluation of MRI biomarkers with candidate drugs before trialling in man. RESULTS: Following studies of reproducibility, and imaging-histopathology correlation, we and other investigators have measured rates of cartilage loss in the region of 4% per year, particularly with focal analyses in OA patients with risk factors for rapid progression. In pre-clinical studies the loss of cartilage was slowed following therapeutic intervention. CONCLUSION: When used appropriately, MRI analyses of cartilage thickness maps can be considered a qualified biomarker for the early evaluation of structure-modifying therapies in osteoarthritis.

0920 Surgical cartilage transplants and the role of imaging

Hirst, P.

Manchester Royal Infirmary, Manchester, UK

No abstract supplied.

0945 Discussion

0830–0950
Skill mix scientific session

0830 Development and audit of a nurse led hysterosalpingography service

Barter, S. J.•York, A.•Wallace, R.

Bedford Hospital NHS Trust, Bedford, UK

KEY LEARNING OBJECTIVES: Utilization of extended nursing role to fulfil NICE guidance on hysterosalpingography. DESCRIPTION: In 2004 NICE published guidance on infertility recommending hysterosalpingography (HSG) for assessment of tubal patency. Our department had a well developed HSG service led by a consultant radiologist, but the marked increase in referrals coupled with a shortfall in consultant staffing led to a dramatic increase in waiting times which was distressing to patients although not seen as a Trust priority. In order to resolve the issue, a radiology nursing sister was trained in the technique. After fulfilling competencies (including physiology of the menstrual cycle, anatomy, pathology and radiation protection) developed by the radiologist and gynaecologist, and undertaking 50 supervised cases, the sister now runs the service, performing a list of 6 patients on average per week. The radiologist is present in the department during the list, and reports the studies with the sister present. All cases performed to date have been audited, for the following: Rate of failure of cervical cannulation requiring consultant intervention. Rate of undiagnostic images. Complication rate. Radiation dose. Results showed that for most parameters the nursing sister's performance equalled that of the radiologist, apart from a small percentage of cases initially where there was a failure to obtain images showing convincing intraperitoneal spill. This was partially because the image intensification image in our unit is sub-optimal. CONCLUSION: Delegation of the hysterosalpingogram service to a Radiology nursing sister is a cost effective way of delivering the service.

0840 Barium enema reporting by radiographers: evaluation of work based learning

Howard, M. L.•Forsyth, L.

The Robert Gordon University, Aberdeen, UK

In 2005, NHS Education for Scotland commissioned development of a small number of postgraduate programmes for Radiographers, to be delivered utilizing an entirely work based learning format. The aim of this initiative is to provide access to development opportunities for Scotland's diverse geographical Radiography community, while minimizing the necessity for absence from the clinical department. PURPOSE: To evaluate the effectiveness of the first cohort studying barium enema reporting through work based learning delivery. METHODS: This work in progress evaluation is currently being undertaken by questionnaire to all students and employers across five clinical centres. Full data collection and analysis will be completed by April 2007. RESULTS: Statistical analysis of qualitative and quantitative data will identify the strengths and limitations of the image interpretation teaching approach. CONCLUSION: Wholly work based learning is a radically new delivery method for Radiographer Reporting but further development must be underpinned by evidence supporting its effectiveness. If successful, the work based learning format may create opportunities for other subjects to be taught across the multidisciplinary team using a similar delivery format.

0850 Is there a difference in accuracy between a 'hot' and 'cold' radiographer-led reporting system?

Barker, P. S.[1]•Mackay, S. J.[2]

[1]Pennine Acute Trust, Oldham, UK, [2]University of Salford, Salford, UK

PURPOSE: To compare the accuracy, sensitivity and specificity of radiographer-led "hot" and "cold" reporting systems. MATERIALS/METHODS: A random sample of 601 "cold" and 158 "hot" reported cases were collected over a 2 month period from an original population of 1439 "cold" and 158 "hot" reported cases. All cases were musculoskeletal, had been referred from the Accident and Emergency Department, and were reported on by a Clinical Specialist Radiographer. Both samples were re-reported on by a reference standard following agreed guidelines, and cases where there was a difference of opinion were examined by an independent arbiter. RESULTS: Results demonstrated that for the "hot" reporting system the sensitivity, specificity and accuracy were 100%, 100% and 100%, respectively. For the "cold" reporting system the same variables were 95.6%, 99.2% and 98.8%, respectively. There was no statistically significant difference (p=0.05) between the two systems. CONCLUSION: There was no difference in performance of the clinical specialist radiographer when "hot" and "cold" reporting the musculoskeletal system in the A&E setting.

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0900 How medical confidence in the ability of radiographers to hot report plain film trauma has been achieved using audit as a tool

Blower, C.•Field, S.•Hacking, L.

BFW NHS Trust, Blackpool, UK

INTRODUCTION: At the Blackpool Victoria Hospital in 2001 two plain film reporting radiographers were employed using monies identified to address the 4 h target in the accident and emergency department. The X-ray department changed to a CR, PACS and a filmless environment at this time. The radiographers were employed to, in the long term, provide hot reports for all skeletal and axial trauma on adult and paediatric patients. As a condition of this role and to give the radiologists, A/E consultants and referrers confidence in the radiographer's ability it was agreed that a Consultant Radiologist was to be responsible for auditing the accuracy of the radiographer's reports. PROCESS: This presentation is based on the consultant involvement in the audit process, training provided and the outcome that has seen radiographer's reporting competency improve from the initial combined error rate of 5% to 1.7%. The reporting radiographers are now responsible for approximately 30 000 trauma reports annually. The Radiologists and A&E consultants have acknowledged the reporting radiographer's competency as a direct consequence of the audit method. OUTCOME: The vision for the near future involves the reporting radiographers, A&E nurse practitioners and A&E physiotherapists working as a team assessing, diagnosing, treating and managing skeletal trauma.

0910 First hand experiences of MR Radiographer reporting

Vosper, R. C.

Hinchingbrooke Healthcare NHS Trust, Huntingdon, Cambs, UK

KEY LEARNING OBJECTIVES: The presentation will describe the first hand experiences of introducing radiographer MR reporting from the development of the business case through to the integration of autonomous radiographer led MRI lists onto the radiologist's rota. DESCRIPTION: During the presentation I will cover the ups and downs of studying for a PgC in MRI clinical reporting, mentoring issues, the pitfalls and prejudices which I encountered. Along the studying journey I will describe how I integrated my reporting sessions while maintaining my clinical scanning role, back fill, arranging double reporting and mentoring sessions with my radiologist mentor. The presentation will focus on the post qualification mentoring process to get my "wings", trust indemnity and the audit process we use at Hinchingbrooke Hospital. It will also cover the resultant increase in MRI scanning capacity and the reduction in the MRI waiting list as a result of autonomous radiographer MRI reporting. Figures will be presented to show the financial incentive for the trust and the cost pressures which were experienced, the percentage of MRI exams which are reported by a MR radiographer and the audit results of radiographer versus radiologist MRI reports. CONCLUSION: It will conclude with the departments aims for the future development of radiographer MRI reporting.

0920 Cranial computed tomography reporting by radiographers: the impact on service delivery and professional development

Clarkson, L. M.

University of Bradford, Bradford, UK

PURPOSE: Radiographer reporting of CT head scans has been a necessary evolution within radiology. It was a response to an acknowledged national shortage of radiologists and an increase in the number of cranial CT scans being requested due to introduction of new guidance. This study looks at the impact on local service delivery following the qualification of postgraduate radiographers from the University of Bradford. It also examines the radiographer's personal professional development. MATERIALS/METHODS: Four cohorts of students, (n=55), who undertook a Postgraduate certificate/diploma in Cranial CT reporting, from the University, were followed up post qualification, to determine if they were reporting and if this had impacted on service delivery/waiting times. They were also questioned on the effect on their personal development and in particular within Agenda for Change. A questionnaire was initially posted to the radiographers and followed up by a telephone interview. RESULTS: 75% were reporting in different areas of the UK. Improvements were seen in service delivery: reduction in outpatients waiting lists by working extended days, stroke and TIA clinic provision increased, immediate reports returned with inpatients and a more efficient use of radiologists time. Personal development: 50% had been given a reporting allowance, 46% had been upgraded during Agenda for Change, and 4% had no change in status. CONCLUSION: Radiographer reporting of cranial CT head scans can significantly improve service delivery and waiting times. It can also be of personal benefit to the individual radiographer in terms of professional recognition and development.

0930 Radiographer trauma reporting service within the South Tees Hospitals Trust

Whittam, K.•Cox, B.•Webster, J.

The James Cook University Hospital, Middlesbrough, UK

PURPOSE: The aim of the unique Radiographer led Accident & Emergency Musculo-Skeletal Reporting service at South Tees NHS Hospitals Trust was to increase productivity, accuracy and timeliness of the reporting service for two A&E and 5 minor injury units, where there are over 100 000 referrals per annum. All A&E MSK images (38 647 in 2005–2006) are now reported by radiographers. METHODS: The A&E Radiology Team has embraced the technological advances (of a fully integrated Radiology Information System, Computerized Radiography, Picture Archiving & Communication System and Voice Recognition) to help achieve successful compliance with the Government's 4 h A&E waiting time target. RESULTS: Audit of workload showed a large increase of 53% in work done year on year: 2004–2005 = 31 764 examinations; 2005–2006 = 38 647 examinations; 2006–2007 = 34 296 to date. The annual audit showed: Accuracy 99.2% Sensitivity 98.3% Specificity 99.6%; Independent audit of all MSK A&E examinations at JCUH showed an accuracy of 99.9%; Voice recognition accuracy audit showed a 1.4% minor wording discrepancy, with no significant discrepancies. CONCLUSION: The A&E MSK trauma reporting service provided by radiographers at the South Tees Hospitals NHS Trust has changed dramatically in the 3 years since merging of cross site district hospitals; incorporating technological advances; change in working practices and significant increase in workload. Within this changing environment a timely, accurate and efficient service has continued to be provided by a dedicated team. The team feel there are still areas to develop and are considering new working practices

0940 Reporting of chest radiographs by radiographers: too little, too late

Sonnex, E. P.•Coulden, R. A. R.

University Hospital of Leicester, Glenfield Hospital, UK

PURPOSE: Reporting by radiographers is a well established, well respected part of routine radiology practice. In the days of acute shortages of radiologists, radiographer reporting was embraced as a way of improving throughput and reaching targets. Many areas of radiology including axial and skeletal, mammography, gastrointestinal, ultrasound and more recently, plain chest radiographs have been reported by appropriately trained radiographers. While reporting by radiographers has been accepted on the whole, plain chest radiograph reporting by radiographers has been slow to get going and is not widely available. But now, with the advent of Radiology Academies and the increased numbers of junior radiologists in training, this shortage of radiologists has come to an end. Will this affect the new working practices of radiographers in radiology departments? METHOD: We examine working practices of radiographers trained in plain film reporting of chest radiographs and how these have been affected by the influx of radiologists and radiologists in training. CONCLUSION: Reporting of chest radiographs by radiographers lagged behind other reporting tasks by radiographers but, by this slow take-off, might now not be needed or every accepted as the norm.

0845–1015

Latest advances in MR imaging I

0845 Diffusion weighted imaging in the body (DWIBS)

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Until recently, diffusion weighted imaging (DWI) was almost exclusively used for neuro applications. More than 15 years ago, diffusion weighted imaging was introduced to detect the early onset of cytotoxic oedema in stroke based on changes in the cellular structure of infarcted tissue. Cellular densities and extracellular volume in malignant tumours also deviate from normal tissue. In particular, malignant tumours in the body tend to have a smaller extracellular space. Obviously, contrast based on changes in diffusivity of intracellular and extracellular water may contribute to detect or characterize malignant tumours. However, diffusion applications in the abdomen turned out to be impractical due to all kinds of distortions related to respiratory and peristaltic motion, air and other causes that render the area of interest less homogeneous than usually over a region confined to the brain. Parallel imaging techniques, such as SENSE (SENSitivity Encoding), changed this situation dramatically. Originally designed to reduce the scan time, SENSE can be used to shorten the length of the (single shot) data acquisition typically used in diffusion weighted imaging, with a concomitant benefit that distortion in these images becomes much less severe. Partially based on this principle, a totally new approach to diffusion weighted scans in the abdomen could be introduced: DWIBS (Diffusion weighted Whole body Imaging with Background Suppression). This new MRI sequence can obtain distortion free diffusion weighted images in the body even under free breathing conditions. Using a relatively long scan time, many thin slices over the region of interest can be obtained resulting in a three-dimensional "PET" like screening tool for (malignant) lesions. Recently, the technology has been combined with different values of diffusion weighting (b-factors) and new type of navigator that corrects for residual motion without prolonging the scan time. Principles of DWIBS, clinical applications and options for technical improvements will be discussed.

0915 Invited review: Applications for blood pool agents

Roditi, G.

Glasgow Royal Infirmary, Glasgow, UK

No abstract supplied.

0945 The use of diffusion weighted MRI in the detection and confirmation of residual tumour following cone biopsy in early stage cerival cancer

Charles-Edwards, E. M.[1]•De Silva, S. S.[1]•Morgan, V. A.[1]•McWhinney, N.[2]•Katesmark, M.[2]•deSouza, N. M.[1]

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PURPOSE: In early cervical cancer, patients are often referred following positive cone biopsies which makes detection of residual tumour on T_2W images difficult. This pilot study determines the apparent diffusion coefficients (ADCs) of tumour compared with non-malignant cervical epithelium and evaluates the diagnostic potential of diffusion-weighted MRI in detecting residual tumour in patients with 1a/1b1 disease. MATERIALS/METHODS: Initially, 6 patients with stage 1b2 cervical tumours and 8 patients with CIN were examined. Using an endovaginal coil, T_2W fast spin-echo 4500/80 ms [TR/TE] (0.4 mm × 0.4 mm × 3 mm resolution) and diffusion-weighted 2500/69 ms [TR/TE] (2 mm × 2 mm × 4 mm resolution) images of the cervix were acquired using 4 b-values: 0 s mm^{-2}, 300 s mm^{-2}, 500 s mm^{-2} and 800 s mm^{-2}. Regions of interest (10 mm^2) were drawn on the ADC maps that corresponded to tumour and normal-appearing epithelium on the T_2W images. Subsequently, 7 patients with stage 1a-1b1 disease detected by previous cone biopsy were scored for presence of residual tumour on T_2W images alone followed by T_2W plus ADC maps. RESULTS: In patients with Ib2 disease, tumour ADCs (784±98 s mm^{-2}) were lower than non-malignant epithelium (1399±179 s mm^{-2}, p<0.05). No significant difference was seen between ADC of normal-appearing epithelium adjacent to tumour and epithelium in CIN patients (1290±138 s mm^{-2}). In patients with 1a/1b1 disease, diagnostic confidence was greater when T_2W and ADC data were combined. In one case tumour was detected solely by addition of ADC maps. Radiological interpretation proved consistent with subsequent pathology. CONCLUSION: DW-MRI is potentially useful for detecting or confirming the absence of residual cervical tumour following cone biopsy.

0955 Diffusion weighted imaging of androgen deprivation hormone therapy prostate cancer patients

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Royal Marsden Foundation NHS Trust & Institute of Cancer Research, Sutton, UK

PURPOSE: To explore utility of diffusion-weighted MRI for monitoring treatment response in patients with prostate cancer by measuring the apparent diffusion coefficient (ADC) before and after 3 months of anti-androgen therapy. MATERIALS/METHODS: 13 men with biopsy-confirmed prostate cancer were scanned (Philips 1.5 T Intera) before and after 3 months of anti-androgen therapy. 12 axial diffusion-weighted images using 4 b-values were acquired on each occasion. ADCs were obtained for the peripheral zone (PZ), central gland (CG) and tumour (TU) and ADC ratios TU/PZ and CG/PZ calculated. RESULTS: PSA fell from 17±10 ng ml^{-1} (mean ± SD) to 0.9 ± 0.8 ng ml^{-1} after 3 months of anti-androgen therapy. Mean ADC was reduced after anti-androgen therapy in 9/13 CGs, 8/13 PZs and in both CG and PZ in 7/13 patients. Eight patients showed an increased TU ADC. The population averaged changes were not significant. However, TU/PZ ADC ratio was significantly increased after 3 months of anti-androgen therapy (p= 0.002) while CG/PZ ratio was not, indicating a greater effect of androgen deprivation on the tumour than on the rest of the gland, possibly due to greater structural changes within tumour tissue. CONCLUSION: Diffusion-weighted MRI shows differences in water diffusivity in non-malignant prostate as well as TU tissue before and after 3 months of anti-androgen therapy. The effects of androgen deprivation on the structure of tumour tissue is different to non-malignant tissue indicating that ADCs may prove a useful predictor of treatment response.

1005 Correlation of ADC values for areas of prostate cancer as defined by histopathology at prostatectomy

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PURPOSE: To determine the sensitivity and specificity of diffusion weighted magnetic resonance imaging (DW-MRI) for localizing prostate cancer when compared with histopathology at prostatectomy. METHOD: 10 patients imaged prior to prostatectomy underwent DW-MRI in addition to T_2W MRI. Patient characteristics were: age (57–76 years, mean 61.7 years), stage T1 (n=8)/T2 (n=2), Gleason Grade 3+3 (n=6), 4+3 (n=4), PSA 4.1–13.2 ng ml^{-1} (mean 8.0 ng ml^{-1}). A Philips Intera 1.5 T scanner and balloon endorectal coil was used to acquire T_2W FSE images in 3 orthogonal planes together with axial DW images with 4 b values (0s mm^{-2}, 300 s mm^{-2}, 500 s mm^{-2} and 800 s mm^{-2}). Following prostatectomy, histological sections with tumour regions of interest (ROIs) marked were morphed to the axial T_2W images which had whole gland and Central Gland (CG) outlined; these ROIs were then overlaid on the apparent diffusion coefficients (ADC) maps. ADCs from tumour regions, non-malignant Central Gland and non-malignant Peripheral Zone (PZ) were obtained. RESULTS: Isotropic ADCs were 1347.48 ± 147.63 for tumour regions, 1572.74 ± 83.86 for non-tumour PZ and 1454.60 ± 95.92 for non-tumour CG. There was significant difference in ADCs between groups (p=0.001) and between tumour and PZ (p=0.001) and between PZ and CG (p=0.009). CONCLUSION: The use of morphing techniques allows histologically defined tumour ROIs to be transferred to the MR data sets. We have shown that in agreement with previous findings, prostate cancer has a lower ADC than non-malignant PZ. This suggests that ADCs offer potential for increasing the sensitivity and specificity of MRI for detecting prostate cancers.

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1015–1145
Debate: Patients should not have the right to consent to digital storage of their data

1015 Speaking for the motion

Strickland, N.

Hammersmith Hospitals NHS Trust, London, UK

It will be argued that it is not appropriate for patients to have the right to consent to, or dissent from, the digital storage of their healthcare data (and in particular the digital storage of their imaging studies) within the setting of the NHS. Patients in the UK are fortunate to have access to free healthcare from the NHS. The aim of this service is to provide the best level of healthcare possible to the maximum number of people, balancing this with severe economic constraints which will inevitably be manifest in any public service. Digital storage of imaging data (if implemented properly!) is the most efficient modern means of storing and accessing such large quantities of data. It would be uneconomic and unnecessary to offer an "opt out" alternative in which the health data of dissenting patients is not stored digitally. There are numerous examples of other areas of our lives in which our personal data are stored digitally and we are given no choice in the matter: for example the records for our passports, personal banking and credit card data, council tax data, electoral role information, personal inland revenue income tax data, etc. It would be illegal to opt out of many such systems, especially the payment of income tax. Parallels will be drawn during this debate between the NHS

1035 Speaking against the motion

Videlo, D.

St Martin's College, Lancaster, UK

No abstract supplied.

1055 Seconding for the motion

Dubbins, P.

Plymouth Hospitals NHS Trust, Plymouth, UK

1105 Seconding against the motion

Challen, V.

Health information is data of a most sensitive and personal nature about a patient and its privacy is of paramount importance. Such data serves the patient's interests in that it provides the means for healthcare professionals to provide individual seamless care whilst enabling the retaining facility to carry out administrative and audit activities. The storage of such information raises many issues related to both patient confidentiality and data protection. If kept in an isolated separate sphere, such as a locked box or file protection can be maintained. Electronic data storage complicates these issues despite the uses of sophisticated methods of data protection including encryption and privacy enhancing technologies (PETs) the risks of wider access to personal information is inherent. Whilst the General Medical Council (GMC) has indicated that consent is not required for the recording of images such as X-rays and ultrasound with the UK Information Commissioner confirming that express consent for the processing of data is neither a legal or ethical requirement of the Data Protection Act (DPA) 1998 it would seem ethically prudent from a patients rights perspective that patents should know what the proposed uses and/or disclosures of personal data and to be informed of such. Consent to store data is likely to be required to meet common law requirements. Obtaining patient consent for the processing of data, which includes collection, use and disclosure, conforms with the four principles of medical ethics and should be recognized as a duty of confidence as well as good practice.

1115 Discussion

1015–1135
Service Redesign Scientific Session

1015 Can LEAN principles be used to improve turnaround and productivity in plain film reporting?

Wilson, P. R.•Jones, J. L.

County Hospital, Hereford, UK

PURPOSE: To demonstrate how LEAN principles can be used in a DGH Imaging Department to significantly reduce the turnaround time of plain film reporting and to increase overall productivity. MATERIALS/METHODS: Plain films still form the "bread and butter" work of all UK Imaging departments. There has of late been a focus on complex imaging modalities such as MRI and multislice CT. To some extent this has had a negative impact on plain film reporting. Over the past year we have applied LEAN principles to the whole process of plain film reporting. RESULTS: We have compared the turnaround times of reports and the number of films reported before LEAN principles were introduced with the current turnaround and productivity. We will show how fairly simple changes have improved the whole reporting process. CONCLUSION: Our results show that LEAN principles (which were first applied to industry) can genuinely be transferred to NHS Imaging departments with a very real improvement in turnaround times and productivity.

1025 The Redditch Radiology Re-design Project – project overview and mid-term results

Chui, S. L.

Worcestershire Acute Hospitals NHS Trust, Redditch, UK

KEY LEARNING OBJECTIVES: Successful change requires staff engagement at all levels; A better service need not cost more; How things are changed is as important as what is changed. DESCRIPTION: Prompted by long waiting-times, low staff morale and impending "Patient Choice" targets, the radiology staff initiated a medium-term service re-design project at the Alexandra Hospital, Redditch, in September 2005. Using opinions and ideas from all staff, a long-term departmental vision was formulated. Our strategy was to engage staff at all levels to transform the entire radiology service including all imaging modalities and the whole patient pathway from appointment booking to report typing. Increasing work flow and not pure utilisation was emphasised. We implemented real-time demand data collection for capacity planning. Small groups of staff, drawn from all corners of the department, were trained in the value of demand and capacity data and Lean methodology. They were then given the opportunity to apply these to their own work. We chose performance parameters to monitor workflow with feedback of results to staff. Workflows were re-designed when new technologies were introduced. By the end of 2006, despite a reduction in staff and reduced resources, waiting times for routine CT, ultrasound, barium enema, IVU and MRI examinations had fallen from 15, 32, 32, 32 and 23 weeks to 2, 3, 2, 1 and 10 weeks, respectively. Mean report (all reports) turnaround time fell from 14.5 days to 0.8 days. CONCLUSION: The greatest capacity for successful change comes not from new technology but from the staff.

1035 The Redditch Radiology Re-design Project – the fluoroscopist's tale

Hampton, J. D. J.•Chui, S. L.

The Alexandra Hospital, Redditch, UK

PURPOSE: In January 2006 waiting times for Barium Enemas and IVUs were 20 weeks and 15 weeks, respectively. We set up a sub-group to address this within the Redditch Radiology Redesign project. MATERIALS/METHODS: A radiologist with an interest in service delivery arranged monthly training meetings with lead radiographers on capacity and demand theory and Lean principles. Continuous appropriate data collection quantified the increase in capacity required to meet demand and clear the backlog. The radiologist covering a fluoroscopy list also covers IVUs. Cancelled lists due to consultant leave left unused capacity. Two barium enema trained advanced practitioners had potential spare capacity, but this was unused due to radiologists' concerns about the additional reporting workload. With directorate agreement, the introduction of PACS and careful distribution of examinations, this was easily absorbed. An advanced practitioner with an IVU PGC had not been utilized in this respect. The directorate agreed that this radiographer could supervise IVUs which were again equally distributed for reporting. The lead radiographer was given autonomy and flexibility to identify and utilise unused capacity. The appointments clerk filled cancellations immediately to avoid wasted slots. RESULTS: There was a dramatic fall in waiting

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times for both examination types over four months. There is no current waiting list at present. CONCLUSION: Teamwork is a fundamental factor. It is essential that all staff recognize they have a part to play in reducing waiting lists from reception staff to radiologist report. Spare capacity existed within the system but required teamwork to release.

1045 The Redditch Radiology Re-design Project – the sonographers tale

Hill, D.•Jenkins, F. H.•Chui, S. L.

Worcestershire Acute Hospitals NHS Trust, Redditch, UK

PURPOSE: A multidisciplinary group was set up to address long waiting times in ultrasound as part of a wider departmental whole service improvement project. MATERIALS/METHODS: The Alexandra Hospital and Princess of Wales Community Hospital provide a general ultrasound service as part of the Acute Trust. A number of actions have produced a positive effect on waiting times including: Engaging the staff as a group, defining a common goal and using real-time demand data for capacity planning. Ensuring any one stop carve out slots were always filled. The use of Lean techniques to develop a fast "green" stream service ensuring continuous flow of general work. The introduction of direct bookings on the community sites for GP and OPD patients. Asking patients to attend 5–10 min early to allow for parking etc thus keeping lists running on time. All staff were given opportunities to redesign their own lists ensuring efficient running. Continually targeting long waiters and weekly validating the waiting list. This combination of actions has seen a rise in activity and reduction in waiting times which is sustainable without putting undue pressure on the staff or the service. RESULTS: Waits for routine examinations fell from a peak of 32 weeks at the start of the project to 3 weeks by the end of 2006. Waiting times continue to fall. CONCLUSION: Fully involving staff in working towards clearly defined and well communicated goals encourages engagement making small changes and actions much more effective and sustainable.

1055 Chasing the goal posts – how we met the challenge

Vosper, R. C. Newman, P.

Hinchingbrooke Healthcare NHS Trust, Huntingdon, Cambs, UK

KEY LEARNING OBJECTIVES: Despite being faced with a constantly rising MRI & CT waiting list, pressures of government targets, a unique financial position within the East of England, multidisciplinary staffing issues and potential destabilisation of services we became one of the 8% who achieved "excellent" in the acute hospitals review. DESCRIPTION: In the summer of 2005 we had a MRI & CT waiting list of 26 weeks and 18 weeks, respectively. Discussions with the Hunts PCT developed a plan in which we were tasked with the objective of achieving a 1–2 week wait. The next stage was to work on a new appointments system along with a 6 week radiologist rota and develop the roles of the core MRI & CT radiographers. All this while being subjected to financial reviews, intense media pressure and identified as the smallest DGH in the east of England with one of the largest deficits relative to our annual turnover – a roller coaster of a year, with fear of redundancy a real threat, potential closure of the hospital and or transfer of major services elsewhere. CONCLUSION: We are now moving along the remodelling path, having survived the negative press it is business as usual, we have achieved the 1–2 week wait, and are attracting new business. A good position to be in as national tariff is just round the corner – but who knows what the future will bring, the goal posts are constantly moving, will we ever catch them up?

1105 Just how much can you squeeze out of an MRI unit

Griffin, K. M.•Griffiths, S.

Medway Maritime Hospital, Gillingham, UK

Whilst much has already been said of the throughput of NHS MRI scanners and of the provision of scanning capacity by the private sector, some complain that a lack of resource within the NHS is to blame. This may or may not be so, but how much of the potential capacity is utilized? Medway MRI looked at every available aspect to meet the ever tightening waiting time targets. Set this against the usual constraints of no money and an ageing scanner and it becomes a steep hill to climb. Mindful of the DOH estimate of 4000+ examinations p.a. being the benchmark of good practice per magnet, Medway have now moved up to 7200 examinations per annum using two Reporting Radiographers, two Specialist MRI Radiographers and two Assistant Practitioners. There has been no use of their private sector scanning quota for over a year – it would have increased the patient waiting time. The work schedule and hours were offered to the staff as a temporary experiment but no-one wishes to revert to the old system. Everyone is better off by doing more. Good for the Patient. Good for the Hospital.

1115 Effect of PACS (Picture Archiving and Communication System) on reporting times

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PURPOSE: To ascertain the time to report plain films and specialist modality films before and after the implementation of PACS at our institution in July 2003. MATERIALS/METHODS: Data was obtained from the Radiology Information System. Reporting times were obtained for the same 3 month period (February–April) each year for 5 years (2002–2006). Reporting time was defined as time elapsed (in days) between performing the imaging examination until a typed report is available to referring clinician. Plain films were divided into Inpatient (IP), Outpatient (OP), A&E and GP. Specialist modality films included CT, MRI, Ultrasound and Nuclear Medicine (NM). RESULTS: Comparisons are made between 2002 (pre-PACS) and 2006. Plain Films: An almost 2-fold increase was seen in IP films performed per month (2254 to 3879). OP films performed increased by 39% (2069 to 2885). GP (1350) and A&E (3000) remained stable. Significant reductions were seen in reporting times for OP (13.6 days to 8.7 days), IP (6.2 days to 2.6 days) and A&E (3.9 days to 3.3 days) (all $p<0.001$ Wilcoxon Rank). GP reporting times have remained stable at 1.3 days. Specialist Modality Films: Number performed has increased, especially CT (698 in 2002 to 1409/month in 2006). CT reporting times have remained stable at 2.0 days, MRI reporting times increased (4.6 days to 7.5 days) and both ultrasound and NM significantly decreased (2.2 days to 1.3 days and 6.4 days to 2.6 days, respectively; $p<0.001$). CONCLUSION: Despite the increase in workload between 2002 and 2006, reporting times have reduced since the advent of PACS.

1125 Advanced diagnostic ultrasound in microgravity (ADUM), onboard proficiency enhancer (OPE) and application to terrestrial situations

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PURPOSE: To examine the image quality of ADUM captured on the International Space Station (ISS). To assess OPE's utility in training astronauts and cosmonauts to scan with remote guidance from ground experts at the National Aeronautics and Space Administration (NASA). To demonstrate that ADUM and OPE technology can be applied to terrestrial situations. METHODS: ISS crews received ground-based training at NASA Johnson Space Center on ultrasound principles, remote guidance and equipment setup with hands-on ultrasound scanning prior to on-orbit scanning. On-orbit ultrasound images were interpreted by NASA radiology experts and independent consultants. Data are being reviewed to determine OPE's utility. RESULTS: ISS Expeditions 8–11 have completed comprehensive cardiothoracic, abdominal and musculoskeletal exams and limited scans of dental, sinus and eye structures. Crews with minimal training and audio guidance from experts produced ultrasound images of diagnostic quality. To date, 13 out of 18 OPE sessions have been analysed with crews stating that OPE is easy to use, intuitive and value added. CONCLUSION: OPE versions limited to musculoskeletal scans have already been used by trainers for the National Hockey League's Detroit Red Wings and by the United States Olympic Committee at the Torino 2006 Olympics to maintain their athletes' health. It is expected that ADUM and OPE can also be applied to telemedicine in rural and remote areas, disaster relief, developing countries and the military to save lives, decrease morbidity and reduce costs. A pilot project is in the works to apply ADUM and OPE to rural/remote areas in Southwestern Ontario.

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1030–1145
Neuroradiology SFG II

1030 Diagnosis of adult stroke and new clinical guidelines

White, P.

Western General Hospital, Edinburgh, UK

PURPOSE: to describe investigative pathways for stroke and emerging UK guidelines in this field. METHODS: Standard imaging protocols and modalities for stroke will be explored and some "atypical stroke" situations discussed. More advanced imaging techniques will also be covered concisely. The genesis behind and the progress of various "guideline" bodies will be summarized. CONCLUSION: Stroke is a government health priority. New guidelines will be emerging soon and they will affect virtually all UK Radiology Departments. Be prepared.

1100 Invited review: Paediatric stroke

Chong, W.

Great Ormond Street Hospital for Children, London, UK

Stroke is a clinical diagnosis, but radiology plays a key role in the initial diagnosis and on subsequent follow-up. Peer reviewed evidence-based clinical guidelines for the diagnosis and management of Stroke in Childhood have recently been published (Royal College of Physicians, Nov 2004). The risk factors and variety of underlying pathologies and aetiologies is very different from adult stroke. A large proportion have multiple pathologies and risk factors that act synergistically to result in stroke. Diagnostic imaging strategies need to be tailored accordingly. For the acute diagnosis of arterial ischaemic stroke in childhood, cross-sectional brain imaging is mandatory. Brain MRI should be undertaken as soon as possible, with CT as an acceptable initial alternative, if MRI is not available in the first 48 h. Supportive investigations for cause of stroke include imaging of the entire intracranial and extracranial cerebral vasculature and echocardiography. This should be undertaken within 48 h of presentation of arterial ischaemic stroke. There is currently no evidence to support the use of thrombolytic agents in children. However, diagnostic imaging is used to guide the use of aspirin, anticoagulation and other therapeutic interventions.

1130 Discussion

1030–1200
GI – Colorectal

1030 Invited review CT colonography for colorectal cancer screening: current status

Heiken, J.

Washington University School of Medicine, St Louis, Missouri, USA

CT colonography (CTC) ("virtual colonoscopy") is still evolving as an imaging test for evaluating the colon. Numerous studies have demonstrated that CTC can be performed effectively with radiation doses less than that for an air contrast barium enema. Stool and fluid tagging techniques have minimized previous problems of distinguishing residual stool from polyps or obscuring polyps within a pool of residual fluid. Although one multiinstitutional study has shown CTC to be equivalent to optical colonoscopy for detecting clinically significant polyps in a screening population, other multiinstitutional studies in non-screening populations have reported much poorer results for CTC compared with optical colonoscopy. Such discrepancies can be explained based on differences in study design and reader training. The results of clinical trials currently in progress will help clarify the role of CTC for colorectal cancer screening. A current obstacle to the use of CTC for colorectal cancer screening in the USA is lack of third-party reimbursement when the examination is done for screening. Additional issues include how to provide adequate CTC training for large numbers of radiologists (and possibly non-radiologists) and how to accommodate large numbers of additional CT studies into imaging practices that already are very busy. If CTC becomes widely available as a colorectal cancer screening test, how to ensure that the CTC studies performed are of high quality will emerge as another important patient care issue. Emerging technical directions in CTC include improved visualization techniques, use of computer assisted diagnosis, and performance of CTC without a cathartic bowel preparation.

1100 Invited review: MR assessment of response in rectal carcinoma

Brown, G.

Royal Marsden Hospital, Sutton, UK

Increasingly, chemoradiotherapy is offered to patients with locally advanced primary rectal cancer and in most centres, 20–30% of patients are offered this treatment prior to surgery, if the potential surgical resection margins are considered at risk. MR assessment of these tumours is essential, not only for the initial selection of patients, but also assessing response and potential resectability. An understanding of the relationship between post-chemoradiotherapy changes visible on MR and corresponding histology is important. Image assessment and careful comparison with baseline pre-treatment scans enables road-mapping of the planned resection for the surgeon and avoidance of areas that may be difficult to dissect, such as dense fibrosis. Post-treatment assessment should also include the potential resection margins and whether the surgery needs to be modified in order to ensure clear margins. For patients that have had an extremely good response to treatment, careful comparison with the baseline scans enables the relationship between the residual scar and the original tumour to be established ensuring that the correct segment of rectum is resected. The aim of this presentation will be to review the imaging assessment of rectal tumours after chemoradiotherapy.

1130 Invited review PET in colon cancer

Hughes, S.

Royal Victoria Hospital, Belfast, UK

No abstract supplied.

1030–1200
Lymphoma and Bone Marrow Imaging

1030 Invited review: Lymphoma: staging

Vinnicombe, S.

Radiology Department, London, UK

KEY LEARNING OBJECTIVES: The aims and importance of staging lymphoma and the role of imaging in staging; staging classifications in common usage; disease patterns in Hodgkin's lymphoma (HL) and non-Hodgkin's lymphoma (NHL) at presentation; common pitfalls and problem areas. In the last decade, imaging has assumed an increasingly important role in the staging and subsequent management of patients with lymphoma. The staging classification in common usage is the Cotswolds modification of the Ann Arbor classification. In Hodgkin's lymphoma (HL), staging directly affects choice of therapy, whereas in non-Hodgkin's lymphoma (NHL), other factors such as the histological subtype of NHL are more important. In both diseases, imaging provides crucial prognostic information which will help determine intensity of therapy in individual cases. The main aims of staging are: to define the precise local extent of clinically overt disease; to identify clinically occult disease elsewhere; to identify prognostic factors that will influence intensity of therapy; to give a baseline assessment of all nodal sites in the body; and to identify factors that might influence the delivery of therapy. The development of positron emission tomography (PET) and PET-CT has generated intense interest in functional imaging in the staging of lymphoma but currently, CT remains the modality of choice. It performs well in the detection of nodal enlargement and of most sites of extranodal disease. There are areas where CT is relatively insensitive and the role of other imaging modalities such as MRI will be discussed. Knowledge of the differences in the biological behaviour and mode of spread of HL and NHL, combined with recognition of the weaknesses of CT, will enable the radiologist too choose the most appropriate test for accurate patient-focused staging.

1100 Invited review: Bone marrow

Cavanagh, P.

Taunton & Somerset NHS Trust, Somerset, UK

The Key Learning points of this Review are to understand: (1) The

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optimal techniques for imaging bone marrow particularly focusing on MRI. (2) The common causes of bone marrow pathology and to what extent imaging can help differentiate. (3) The impact that imaging has on the clinical management and outcome. (4) The common pitfalls in diagnosis. MRI has revolutionized the imaging of bone marrow and there is now considerable evidence as to its effectiveness in imaging an area which was previously poorly understood. The presentation will use a combination of literature review and case studies to emphasise these points with a particular focus on the bone marrow changes in relation to acute and chronic trauma and how these can mimic other pathologies.

1130 PET in diagnosis and management of lymphoma

Barrington, S. F.

St Thomas's Hospital, London, UK

LEARNING OBJECTIVES: To understand the role of PET in staging and restaging; To assess the value of PET in early and late treatment response; To be aware of limitations of PET and practical issues for scanning. Successful treatment of lymphoma relies on accurate assessment of clinical stage (HD and NHL) and number of extranodal sites (NHL). PET using 18F-fluorodeoxyglucose (FDG) detects disease based on metabolic activity not lymph node size or organ architecture. Therefore PET (and now PET/CT) can detect disease in normal sized nodes and exclude disease in enlarged reactive nodes. PET is sensitive for extranodal disease and changes patient management by both up- and down-staging disease compared with combined clinical and CT staging. PET response early in chemotherapy is the most accurate predictor of prognosis in lymphoma. The high negative predictive value in HD is currently under evaluation in a national RCT of radiotherapy *vs.* no radiotherapy in patients with early stage HD and "PET negative" scans after 3 cycles. The high positive predictive value in NHL may permit selection of more aggressive treatment for candidates with poorer prognosis and future trials will address this. The use of PET in late response assessment of residual masses results in better discrimination of patients into IWC response categories. The limitations of PET include "false positive" physiological uptake and uptake in infection and inflammation. "False negative" uptake occurs in some low grade lymphomas and small volume disease. PET/CT is currently the most important imaging tool in the management of lymphoma.

1030–1200
Education and training II

1030 Invited review: Role extension in gastroenterology – educational issues

Nightingale, J. M.

University of Salford, Salford, UK

PURPOSE: This presentation will offer an insight into the current trends and future direction of education to support role extension in the gastroenterology and gastrointestinal imaging (GI) field. MATERIALS/METHODS: A range of literature was explored to identify the current educational opportunities, its effectiveness, and any issues that will impact on future educational provision. RESULTS: One of the fundamental requirements of a health-related educational programme is that the graduating student is fit for purpose, fit for practice, and fit for award. In-house training and short courses have been shown to satisfactorily support specific GI role extensions. The development of specialist and advanced practice, however, benefits from the wider perspective and quality assurance offered within postgraduate educational programmes. The demand for GI postgraduate education, whilst healthy, continues to represent small student numbers. Universities are under considerable pressure to develop new methods of course delivery to ensure financial viability. Examples of innovative educational models will be highlighted which can ensure viability whilst still continuing to support the postgraduate student to develop their skills and competencies. Service managers are only likely to support programmes if they offer tangible benefits not only to the student, but also to their department and the wider gastroenterology service. CONCLUSION: The future of education for advanced practice in gastroenterology lies, in the author's opinion, in the combination of a range of CPD short courses designed to facilitate specific role extension, coupled with multi-professional programmes which evaluate and improve whole service delivery.

1050 Role extension in gastroenterology – clinical issues

Bloor, C.

Royal Cornwall Hospital, Truro, UK

Over recent years there has been a continual development of Radiographer advanced practice in gastrointestinal radiology and gastroenterology. In the past radiographers were confined to performing barium contrast studies but more recently have moved towards performing and reporting complex diagnostic, therapeutic and interventional procedures as independent practitioners. This requires radiographers engaged in this level of practice to achieve a higher level of education and training in order to gain the necessary intellectual and clinical skills to perform procedures and make decisions at this level. This broad scope of clinical practice now undertaken by radiographers within this speciality allows them to work across imaging modalities and healthcare disciplines, and to be part of a much larger multidisciplinary team. The impact of these changes in practice include improved communication within the multidisciplinary team, better continuity of care for patients and a more cohesive approach to service delivery. This presentation will explore the clinical, education, training and operational issues involved in developing advanced practice in gastrointestinal imaging and the impact it has had on service delivery.

1110 Invited review: The 4 tier system – the Scottish approach

Cannon, J.[1] Lam, S.[2]

[1]Victoria Hospital, Fife, UK, [2]NHS Education for Scotland, Edinburgh, UK

No abstract supplied.

1135 Invited review: Radiographer consultant and advanced practitioner training

Hardy, M.[1] Snaith, B.[2]

[1]University of Bradford, Bradford, UK, [2]Mid Yorkshire Hospitals NHS Trust, Wakefield, UK

PURPOSE: The role of the advanced radiographer practitioner has been defined as autonomous with responsibility to reflect upon and develop clinical practice, and inform service developments, through effective teaching and leadership. Similarly consultant radiographer practitioners, although a more recent concept, are charged with the role of, and responsibility for, providing clinical leadership and strategic direction, and innovating and influencing practice through research and education. Although these definitions describe the generic ideals for the development and operation of these roles, specific development at the individual level to support progression and promotion to advanced or consultant radiographer positions remains vague. Specific areas of radiography practice have been identified as "advanced" and described within the professional literature. Furthermore, many Masters level radiography programmes provide training and education to support radiographers to undertake advanced practice tasks. However, ability and qualification to undertake a recognized advanced practice task does not automatically assume the radiographer performing the task is an advanced practitioner and this has created some professional confusion. In addition, as advanced practice, by definition, implies new and not generally accepted practice, the expectation that formally delivered education programmes can by themselves provide sufficient knowledge to meet the expectations of advanced and consultant practitioner roles is unreasonable. This presentation will discuss the personal and professional qualities expected of radiographers aspiring to advanced and consultant practitioner status and consider training and education opportunities, including those within formal Masters and Doctoral programmes, that are available to support such development.

1030–1200
Latest advances in MR imaging II

1030 Invited review Molecular MR

Hengerer, A.

Siemens Medical Systems, Erlangen, Germany

KEY LEARNING OBJECTIVES: The conceptual design of our first MRI-PET prototype, some unique technical features and first human brain images will be presented. DESCRIPTION: MR is some

TUESDAY

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magnitudes less sensitive than PET, SPECT or optical imaging and is not very well suited for the visualization of raw biological processes *in vivo*. CONCLUSION: In principle there are three concepts to improve the sensitivity of MRI. It is possible (i) to increase the lower detection limit of the MRI scanner by applying higher field strength, (ii) to use contrast agents, which yield a high signal deposition within the target tissue or (iii) to address targets with high copy numbers. Alternatively, molecular information can be acquired by MRI with hybrid imaging. We have shown and published results on the feasibility and development of a MR-PET system. The MR-PET solution is based on MR compatible Avalanche Photodiode Detectors rather than conventional photomultiplier tube. This system enables isocentric and simultaneous measurements without patient repositioning. It is much simpler than sequential MR-PET (one examination, three datasets, no patient repositioning) and two times faster than sequential MR-PET. MRI is not only adding precise anatomical information to PET; there are some unique advantages of an MRI combination (MRI navigator technique for PET, recurrent outcome studies, excellent soft tissue contrast, etc.).

1100 Invited review MR elasticity imaging

Sinkus, R.

ESPCI, 75005 Paris, France

PURPOSE: Elastography is a novel imaging modality which aims to measure locally the viscoelastic properties of tissue. Palpation has been used for millennia for the detection of potential pathologies and its clinical importance for instance in the domain of breast cancer detection is undisputed. The basic concept of elastography is presented and clinical data for breast, liver and brain are shown. MATERIALS/METHODS: The general idea of dynamic Elastography is to perform an acoustic experiment: the tissue under investigation is exposed to low-frequency acoustic waves (about 100 Hz) and the resulting displacement distribution is measured everywhere within the object by means of a motion-sensitized imaging technique. Reconstruction of viscoelastic parameters, such as shear-modulus and shear-viscosity, is done locally by solving the partial differential equation governing the propagation of sound within the material. RESULTS: MR-elastography for breast cancer detection is performed after contrast enhanced MR-mammography utilizing gadolinium as contrast agent. The diagnostic value of MRE as an adjunct to this established technique is presented and discussed. The addition of viscoelastic parameters improves the specificity for tumour characterization by ~20%. Initial clinical results for liver fibrosis using MR-elastography are presented. Results show that the stiffness of the liver rises with rising Metavir score and that differentiation between F1 and F2 becomes possible. In addition, first animal studies for the application of MRE to brain regarding Alzheimer's disease are shown. CONCLUSION: MR-elastography represents a novel technique which provides valuable new clinical information in the domain of breast cancer and liver fibrosis.

1130 Dynamic motion analysis of fetuses using magnetic resonance imaging

Wilding, L. J.[1]·Charles-Edwards, G.[1]·Materne, M. C.[2]·Jan, W.[1]

[1]Guy's and St Thomas' NHS Trust, London, UK, [2]Siemens Medical Solutions, Bracknell, UK

PURPOSE: A fetal biophysical profile using ultrasound monitoring of fetal movements, tone and breathing is used to predict adverse perinatal outcomes. Some CNS lesions can be identified by specific patterns of fetal movement, in particular those in the pons/medulla; while other more diffuse brain lesions cause abnormal fetal behaviour. The aim of this study is to assess the feasibility of dynamic motion analysis using fetal MRI. MATERIALS/METHODS: Imaging was performed on a Siemens Avanto 1.5 T MRI system, using a combination of body matrix and spine coil elements. In addition to routine single-shot HASTE sequences, multiple repeat images were acquired of a single thick slice and combined to form a cine loop. Two 400 mm FoV, single-shot cine sequences were explored – a HASTE (TR/TE = 4000/147 ms, matrix 448 × 448, GRAPPA speed up factor = 2) and a True-Fisp (matrix 320 × 320). RESULTS: The cine loops provided good quality resolution with adequate visualization of fetal actions such as stretching, flexion and rolling. Limb movement and even gastric peristalsis were easily demonstrated. CONCLUSION: Dynamic fetal MRI can be used to assess fetal movement. This could be a useful adjunct technique when fetal MRI is performed for CNS abnormalities.

1140 Rician noise reduction on magnetic resonance images

De Stefano, A.·Davis, A.

St Mary's Hospital, Portsmouth, UK

PURPOSE: To describe a present the results from a fast, denoising technique for MR images based on training of undecimated wavelet components. MATERIALS/METHODS: Reducing the noise on MR images improves quality and reduces scan time, nevertheless presents several difficulties. Denoising is constrained by the importance of preserving original information, the significance of the noise is related to the perception of the visual system, in MR the noise has complicated Rician spectral distribution, and denoising requires additional time. Wavelet analysis is efficient for noise reduction separating image from noise in frequency domain and matches the MR modality where images are generated in frequency domain and transformed. Undecimated filters considerably speed up the filtering. Parametric thresholding performs spatially adaptive denoising without assumptions for noise and signal spectral distributions. Training based on a human eye model adapts the scheme to different noise intensities and statistical distributions over different frequency bands. RESULTS: Training to minimize perceptually weighted mean square error has been performed on several artificially noise contaminated synthetic and clinical images. Different configurations have been considered in terms of noise realization and level, image size and orientation, scanning protocol and receiver coil. For synthetic images, the method achieved quantitative improvement for SNR between 8 dB and 12 dB. Qualitative performances have also been positively evaluated on temporal and spatial clinical sequences where the SNR improvement was between 10 dB and 15 dB. CONCLUSION: The technique demonstrates to improve MR image quality without losing information and to be suitable for a fast and automatic post-processing implementation.

1150 Audit of various MRI scanners using the ACR MRI phantom

Egan, P.[1]·Byrne, B.[2]·Martin-Rodriguez, Z.[2]·Kenny, P.[2]

[1]Beacon Hospital, Dublin, Ireland, [2]Mater Misericordiae University Hospital, Dublin, Ireland

PURPOSE: The ACR Magnetic Resonance Imaging phantom is used throughout the USA for the accreditation of MRI scanners by the American College of Radiology. This phantom, recently purchased by the Mater Misericordiae University Hospital, allows the quantification of many parameters including slice thickness, spatial resolution and slice position accuracy among others. These parameters are not quantifiable using phantoms provided by the scanner manufacturers, thus the ACR phantom provides independent testing of the vendor's equipment using a standard phantom. This work provides an analysis of different scanner performance including an intercomparison of different manufacturers and an intracomparison of certain models. MATERIALS/METHODS: The ACR MRI phantom is a short, hollow enclosed cylinder of acrylic plastic. It contains a solution of nickel chloride and sodium chloride. The phantom comprises several structures designed to facilitate a variety of tests of scanner performance. The phantom is accompanied by well established and reputable (ACR) protocol. This protocol was used to establish whether standards of MR image quality in Ireland match standards in the USA. Several MRI scanners on separate sites were tested including three different manufacturers and three similar machines. The data was analysed using imaging software called E-film. RESULTS & CONCLUSION: The results from this study show that the ACR MRI Phantom is a useful tool for thoroughly quantifying the performance of an MRI scanner. At the commissioning stage it allows the user to set baseline values. The performance of different scanners surveyed is consistent with a few variations in older units.

1200–1300

IPEM Eponymous Lecture

Physics, function and fusion – PET imaging developments, applications and opportunities

Jarritt, P.

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In his inaugural lecture in 1965, Professor Mallard stated that the then experimental technique of positron emission tomography (PET) would become one of the most powerful tools for studying human diseases. In this regard he demonstrated not only his understanding of the power that imaging would wield in the future of diagnostic medicine but also the power of a technique which was capable of imaging biological processes *in vivo*. The latter half of the 20th century saw unparalleled developments in imaging technology driven by the availability of computer technology as well as developments in radiation detectors and radiochemistry. The gestation of PET imaging technology has been long especially in the transition from research laboratory to clinical tool. A number of research groups sought to optimize PET scanner performance and effectively produced the concept of the ring detector seen in all current clinical systems. Some research avenues were aborted due to technological difficulties of which one of the most interesting was the application of time of flight measurements to the coincidence detectors. However, developments in scintillators and electronic technology have seen this technology developed into a commercial system. PET imaging, as a tool for imaging distributions of radiotracers governed by physiological processes often relied on anatomical imaging techniques such as CT or MRI to provide a method to locate distributions within the anatomy and indeed to provide a tool for segmenting the distributions to particular organs. The end of the 20th century saw the combination of a CT scanner and a PET scanner into a single imaging system thus providing the diagnostic clinic with the ability to acquire inherently aligned functional and anatomic data. This fusion of modalities is the basis of a modern diagnostic PET service utilizing PET/CT scanners with optimized display and reporting tools to permit the visualization of image volumes containing both functional and anatomical information. There is currently significant interest in extending the fusion of modalities to combine PET with MRI systems. Prototype systems exist and will clearly develop to provide a different combination of tools but perhaps more importantly the ability to reduce the overall radiation burden to the patient undergoing the diagnostic test. Whilst technological advances have been striking the power of PET is in the biological functions that can be studies and thus in the PET labelled radiotracers that are available to the researcher and the clinic alike. The PET radionuclides are, in the main, produced in a cyclotron and with the exception of ^{18}F cannot be used remotely from the cyclotron site. This infrastructure is expensive and in the UK has been slow to develop in support of a nationwide clinical service. The vast majority of clinical studies use ^{18}F-fluoro-deoxyglucose (FDG) for applications in oncology including the diagnosis and staging of disease and the monitoring of therapy. However, significant developments in ^{18}F chemistry will bring to the clinic a much wider range of radiotracers which can be manufactured and supplied under GMP conditions. PET/CT imaging has brought with it opportunities beyond those listed above. In particular considerable interest exists in the incorporation of a functional marker into radiotherapy treatments and in modifying treatments to better match the functional data. Advances in radiotherapy treatment methods, such as intensity modulated radiotherapy (IMRT), now permits the delivery of non-uniform doses to tumour volumes. It is not difficult to see that biological markers that highlight areas of hypoxia or increased cellular proliferation could be used to target increased doses whilst sparing normal tissues. Significant challenges remain in the development and applications of PET imaging. These include the ability to detect and correct for organ motion during extended acquisitions and to incorporate these effects into radiotherapy planning. PET is an inherently quantitative technique and yet in the limits of detection the robustness of such data becomes questionable. As a research tool in the development and investigation of novel therapeutic agents PET is almost unique the challenge is to take the methodology and incorporate it into a process aimed at tailoring therapies to each individual patient. Professor Mallard identified PET as a tool for studying human diseases. In the clinical research environment this has been realized. The power of the technique in routine clinical applications has yet to be fully realized.

1300–1400

RCR Eponymous Lecture

Improving health care through better evidence

McNeil, B.

Harvard Medical School, Boston, Massachussetts, USA

This talk will compare the USA with the UK in terms of total expenditures for healthcare as well as in rates of growth in healthcare costs. I will then focus on the role of imaging modalities, by type, in contributing to each of these, especially to cost growth. Because the USA is undertaking several initiatives to reduce rising costs of care of imaging (among other areas), these will be discussed in detail. The radiology based initiatives include: (1) increased use of evidence based practice centres, (2) "conditional" coverage and associated registries, (3) use of second opinions, and (4) system-wide evaluations of quality of care (including appropriate/inappropriate use of imaging). Each of these will be discussed with particular emphasis on the implications for utilization, clinical care and clinical research in the USA.

1415–1530

Neuroradiology SFG III

1415 Invited review: Imaging in investigation of dementia

Rich, P.

St George's Hospital, London, UK

I will give an overview of structural imaging in dementia. I will include a literature review and make some reference to advanced techniques. However, I will mainly direct my talk at the use of basic imaging in a general environment and include the important features that clinicians would like the reporting radiologist to mention.

1440 Radiation dose to the lens of the eye during cranial computed tomography: a comparison of the supra-orbital (SOB) *vs*. anthropological baseline (ABL) with and without bismuth eye shielding, on single and multidetector scanners

Arnold, P. M.

University of Leeds, Leeds, UK

PURPOSE: The wide availability and variation in multidetector CT (MDCT) scanners in the UK has led to differing practices being adopted in routine scanning of the head. This practice is often based on tradition and/or manufacturers recommendations. This may lead to differing dose levels, of particular importance when irradiating the lens of the eyes. This study examines differences in protocols adopted and effects on the dose to the eyes with/without bismuth shielding. MATERIALS/METHODS: Thermoluminescent dosemeters (TLDs) were applied to the "eye lenses" on the anthropomorphic phantom. The phantom was scanned using the Siemens single/16 slice, Philips 4 slice and GE 8/16/64 slice MDCT. Both baselines were scanned sequentially and helically. A constant slice thickness through the posterior fossa and cerebrum was selected, based on a national audit of practice. All scans were repeated using bismuth shielding to the eyes. Noise index remained unchanged throughout the study. RESULTS: (a) Radiation dose to the lens is reduced when the SOB is used (ABL 20.56 mSv, SOB 6.24 mSv). (b) Doses reduced by a third using Bismuth shielding on the ABL: no change with SOB. (c) Dose comparison between helical and sequential scanning. Work in progress. (d) Dose comparison between scanners Work in progress. CONCLUSION: SOB greatly reduces the dose to the lens of the eye. However, routine use of Bismuth shielding can reduce the dose when using the ABL. Images of acceptable and comparable diagnostic quality may be obtained by carefully selecting parameters without the need to increase dose between technologically different CT scanners.

1450 Transient corpus callosum lesions on diffusion-weighted MR images – a common pathway?

Lim, C.·Hwang, C.

National Neuroscience Institute, Singapore, Singapore

KEY LEARNING OBJECTIVES: To describe the diverse conditions associated with focal lesions of the splenium of the corpus callosum. To show the sensitivity of diffusion-weighted (DW) MR images to these changes. To review the follow up images to show reversibility of DW MR images. DESCRIPTION: The corpus callosum can be involved in various diseases such as neoplasms, traumatic injury, infarction, haemorrhage (from ruptured aneurysm or arteriovenous malformation), multiple sclerosis, microangiopathy (from infection or Susac syndrome), and Marchiafava-Bignami disease. However,

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focal abnormalities confined to the splenium may also be seen in rare but characteristic situations where well-circumscribed lesions are strikingly visualised by DW MR images and T_2 weighted images. These lesions are transient and disappear on follow-up study and clinical improvement. Conditions associated with these changes include withdrawal of anti-epileptic drugs, seizures, venous thrombosis, viral infections (in some cases with haemolytic uraemic syndrome) hypoglycaemia, high altitude cerebral oedema, and cytotoxic chemotherapy. Increased sensitivity of DW MR imaging to the bulk movement of water from the extracellular space into the intracellular space may be a unifying mechanism to explain these changes. CONCLUSION: A wide range of conditions can result in transient focal abnormalities confined to the splenium of the corpus callosum, especially on DW MR imaging. Radiologists should recognize this distinctive pattern and it may be a predictor of clinical outcome.

1500 Can functional MRI with an auditory stimulus be used clinically to test language lateralisation in temporal lobe epilepsy patients?

Peel, S. A.•Darekar, A. A.•Hoffmann, S. M. A.•Abbott, P.•Smith, M.

Southampton University Hospitals Trust, Southampton, UK

PURPOSE: Although surgery is often successful at reducing seizures in temporal lobe epilepsy patients, it can result in language problems if the seizure focus resides within the dominant language hemisphere. Whilst neuropsychological and neurophysiological testing is often deemed adequate to assess language lateralization, the WADA test has traditionally been used in equivocal cases. It is, however, costly, invasive and logistically demanding. Some studies have suggested it could be replaced by multiple-task fMRI. Our aim was to investigate whether an fMRI protocol using only an auditory stimulus could be used clinically to aid language lateralisation in temporal lobe patients. METHODS: Five volunteers and nine patients underwent imaging on a Siemens Symphony 1.5 T scanner. Subjects performed a 30 s language task (word generation or language comprehension) interleaved with 30 s rest periods. Data were processed using SPM software and statistical parameters were optimized. A laterality index was calculated. RESULTS: In all volunteers, the word generation task and the language comprehension tasks were consistent at highlighting Broca's and Wernicke's areas, respectively. All volunteers had a left-sided laterality index, which agreed with visual assessment of the images. The word generation task highlighted Broca's areas in six of the patients but the remainder had equivocal patterns of activation. CONCLUSION: Poor compliance with the task could account for the equivocal results in three of the patients. In some cases, pathology may make it difficult to adequately perform the task. It is also possible that pathology may itself lead to abnormal activation patterns if functional reorganisation has occurred.

1510 Myelography – do we still need it?

Goldstein, M. A.•Saklatvala, J.

University Hospital of North Staffordshire, Stoke-on-Trent, UK

PURPOSE: Myelography is an investigation performed to diagnose disorders of the spinal canal and cord. It is a technically difficult and infrequently performed investigation. It is both time consuming and invasive causing considerable discomfort to the patient. The aim of this project was to evaluate combined myelography and post-myelography CT of the spine as a complementary investigation to MRI of the spine. In addition the typical pathological imaging findings of myelography are reviewed. MATERIALS/METHODS: 64 patients were retrospectively evaluated over a 3.5 year period that underwent MRI initially followed by subsequent myelography and post-myelography CT. Comparison of the findings of spinal canal stenosis, intervertebral disc protrusion, nerve root compression, lateral recess stenosis and facet disease was made. The success of myelography in answering the clinical indication was also evaluated. RESULTS: Combined myelography and post-myelography CT successfully answered the clinical indication in 64% (n=41), provided additional findings in 66% (n=42). Most significantly myelography and post-myelography CT (n=29) diagnosed 2.6× more nerve root compressions than MRI (n=11) in this group of patients. In addition 9% (n=6) demonstrated dynamic changes on flexion/extension myelography. CONCLUSION: Combined myelography and post-myelography CT provides a valuable complementary investigation to MRI of the spine, and therefore continues to be of value for patients with contraindications to MRI, with spinal metallic implants in the region of clinical interest, and those with a non-diagnostic or inconclusive MRI.

1520 Gadolinium-enhanced MRI and nephrogenic systemic fibrosis – a retrospective case-control study

Roditi, G.[1]•Collidge, T. A.[1]•Thomson, P. C.[1]•Mark, P. B.[2]•Traynor, J. P.[2]•Jardine, A.[2]•Morris, S. T. W.[1]•Simpson, K.[1]

[1]Glasgow Royal Infirmary, Glasgow, UK, [2]Western Infirmary, Glasgow, UK

PURPOSE: Nephrogenic systemic fibrosis (NSF) is a disabling disease affecting patients with established renal failure (ERF). Gadolinium-enhanced MRI is increasingly used in ERF patients to avoid the risks of traditional, iodinated contrast. An association between NSF and gadolinium has been suggested but not established by case controlled series. We aimed to assess the relationship between the frequency and degree of exposure to gadolinium containing contrast used for MRI and the development of NSF in the ERF population by means of a case-control study. MATERIALS & METHODS: A retrospective analysis of all prevalent adult patients on dialysis was performed between 01/01/2000 and 01/07/2006 in the West of Scotland, UK. Diagnoses of NSF, episodes of gadolinium-enhanced MRI and cumulative gadolinium doses were recorded. RESULTS: 14/1826 patients had a diagnosis of NSF (prevalence of 0.77%). Mortality was similar for affected and non-affected patients. 92.9% NSF patients had undergone gadolinium-enhanced MRI compared with 22.7% non-affected patients (p<0.001). Patients with NSF received a higher median cumulative dose of gadodiamide (45 ml *vs.* 30 ml, p<0.001) and received more gadolinium-enhanced MRI (median 2 *vs.* 1 scans, p=0.04) than their non-affected, gadolinium-exposed counterparts. CONCLUSIONS: This is the first case-controlled series addressing the association between gadolinium administration and the development of NSF in the ERF population. Our data support a positive association. Additionally there is a positive association between the cumulative dose of gadodiamide used and dosing events. Potential risks need to be balanced against those of alternative contrast agents in ERF patients.

1415–1515
Nuclear Medicine SFG I

1415 Invited review: How radiology and nuclear medicine contributes to the management of neuroendocrine tumours

Caplin, M.

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Neuroendocrine tumours (NETs) are relatively rare tumours; however, the incidence has doubled over the last 20 years. They are classified according to their site of origin and whether they are functioning (hormone secreting) or non-functioning (non-hormone secreting). There are many types of neuroendocrine tumours including: medullary thyroid cancers, paragangliomas, phaeochromoctomas, bronchial carcinoids and the most common gastroenteropancreatic tumours which encompass pancreatic islet cell tumours (*e.g.* insulinoma, gastrinoma, VIPoma and non-functional tumours) as well as gastrointestinal carcinoid tumours originating in the foregut, midgut or hindgut. For the optimal management of NETs, the following strategy has been suggested: (i) suspect the diagnosis; (ii) perform appropriate biochemistry profile including urine 24 h 5HIAA and serum hormone including chomogranin A; (iii) assessment of histopathology to confirm diagnosis and features of aggressiveness; (iv) determine presence of inherited disorder such as MEN- or the Von Hippel-Lindau syndrome; (v) determine the site and extent of disease using *e.g.* contrast CT or MRI, as well as the most sensitive modality the Indium-111 Octreotide scan; (vi) treat the symptoms or excessive hormonal state; (vii) treat the disease if possible with curative surgery otherwise consider surgical debulking. Non-surgical treatments of metastatic disease (including somatostatin analogues, interferon alpha, chemotherapy, hepatic artery embolisation and radionuclide therapies such as I-131 MIBG and Yttrium-90 DOTA Octreotide); and (viii) all patients will require long term follow-up preferably within treatment protocols. The UK Neuroendocrine Tumour Society and European NET Society collaborate with ongoing/planned clinical and scientific trials to enable an increase in evidence based practice.

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1445 Invited review: Latest developments in the scintigraphic imaging of neuroendocrine tumours

Buscombe, J.

Royal Free Hospital, London, UK

Functional imaging of nuclear medicine has been an area of massive growth over the last 10 years. In many ways it has become the primary method by which such tumours are staged for 2 distinct reasons. First, there is evidence that tumour not seen on CT or MRI may be found on functional imaging and secondly functional imaging may lead to radiotargeted therapy of the patient's tumour. The standard methods for imaging include In-111 pentetreotide which is a somatostain receptor agent and positive in about 90% of all neuroendocrine tumours and the amine uptake agent I-123 mIBG which is positive in 60% of neuroendocrine tumours. The latter imaging being done not normally for staging but to determine if treatment with I-131 mIBG is possible. This imaging has been improved by the use of combined SPECT-CT imaging with these agents which improves specificity and localization. New agents are becoming available. $^{99}Tc^{m}$ depreotide has higher uptake for the SSR3 and SSR5 receptors than In-111 pentetreotide and is useful in some tumour types where In-111 pentetreotide uptake is reduced. As PET advances in nuclear imaging neuroendocrine tumours are beginning to imaged more frequently, though ^{18}F-FDG is only positive in about 15% of these tumours these tend to be the ones negative on In-111 pentetreotide imaging. A version of the DOTATATE peptide has been labelled with Ga-68 and shows promise as the best method of imaging SSR2 receptor positive tumours.

1415–1530
Managing the Digital Environment II

1415 An introduction to workstations for medical imaging

Horii, S.

Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania, USA

The workstation for medical imaging has the most difficult task to perform in a picture archiving and communications system (PACS); it has to serve as the interface between the system and the human user. Human-computer interaction has been the source of both major problems and brilliant solutions since the very first computers were built. This lecture will be directed at several aspects of workstations; their history, present status, and some prognostications about future developments. The present status of workstations will occupy the majority of the presentation since it is the frustration with current systems and some of the ways these difficulties have been eliminated or reduced that define the state of the art. Despite some 20 years of workstation developments, users still have complaints about the way workstations work (or do not work). This lecture will examine the known causes of some of these problems and how researchers and manufacturers are attempting to solve, or ameliorate, them. The talk will also include a discussion of the importance of the environment in which workstations are used. It is unfortunate that many reading rooms, originally designed for interpreting examinations on film, were converted for PACS simply by placing workstations in them. The talk will elaborate on the reasons why this is a bad idea and how to avoid making these mistakes.

1455 Managing PACS – keeping PACS clean

Strickland, N.

Hammersmith Hospitals NHS Trust, London, UK

PACS housekeeping, best performed by a team of trained radiographers (or "PACS cleaners and sweepers") is essential to maintain a tidy PACS database. This is an ongoing task which will last throughout the life of the PACS and it is essential that provision be made for such posts at the time of PACS implementation. Housekeeping tasks can be summarized according to the resultant problems visualised on the PACS, for each of which there may be several different causes: (1) There is a study entry on PACS but no images; (2) The study entry appears as "unspecified" (or similar nomenclature) on PACS; (3) The study has a dictated status on PACS but there is no associated report visible on the PACS; (4) The study has a non-dictated status on PACS and no report; (5) The study has a verified state on PACS but needs to be reopened to add more images to it; (6) The study is unretrievable from the long term archive; (7) CR (computed radiography)/DR (direct digital radiography) errors; (8) Burning imaging studies and their reports to CDs and uploading imaging studies from external CDs/digitizing external films. There will be a large amount of extra housekeeping work generated every time there is an upgrade to the PACS or to any of the IT systems integrated to PACS (such as the radiological information system RIS, speech recognition or the hospital information system HIS/electronic patient record EPR).

1520 Discussion

1415–1615
Latest developments in MDCT

1415 Invited review: The clinical role of multislice CT: a glance into the future

Prokop, M.

UMC Utrecht, Utrecht, The Netherlands

No abstract supplied.

1440 Invited review: Physics and techniques of volume computed tomography with 256 detector row CT

Blobel, J.[1]•Okumura, M.[2]•Kazama, M.[2]•Hall, J.[2]•Ota, T.[3]

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PURPOSE: A computer tomograph with an advanced cone beam reconstruction algorithm "eXact" for 256 × 0.5 mm detector rows has been developed for volume scans. MATERIALS/METHODS: The reconstruction of the volume data with an axial detector collimation of 12.8 cm allows dynamic and functional CT examinations of complex organ regions. High and low contrast resolution was determined by varying the phantom dose. RESULTS: The advanced cone beam reconstruction algorithm "eXact" achieves a homogeneous voxel resolution of 0.35 mm in the entire scan volume. Despite increased scatter radiation, the low contrast resolution with 5 mm object size and 0.3% contrast requires a phantom surface dose of only 7 mGy. Tube rotation times of less than 0.5 s allow functional examinations such as perfusion studies. Multisegment reconstruction is used for cardiac applications, as this method reduces temporal resolution in proportion of R–R heart cycle numbers. Within the breath hold time of 1–3 s, lowest within one heart beat, the entire heart is frozen using a volumetric temporal resolution down to 50 ms. Mis-registration in the z-axis is impossible. Heart function diagnostics can be performed using the same scan data. The short breath hold reduces the negative effects of arrhythmias and heart rate. CONCLUSION: The detector extension to 256 detector rows based on the solid state principle offers enhanced quality of volume scans with optimized high and low contrast resolution in relation to patient dose. Low exposure time and extremely low volume scan time open new possibilities for functional and heart studies.

1505 Invited review: Dual source CT

Flohr, T.

Siemens Medical Solutions, Forchheim, Germany

PURPOSE: We evaluate the potential of dual source CT (DSCT) for ECG-gated cardiovascular examinations and other applications such as dual-energy imaging. MATERIALS/METHODS: We investigate the performance of a DSCT system (SOMATOM Definition; Siemens, Germany) with two X-ray tubes and two corresponding detectors mounted onto the gantry with an angular offset of 90°. The gantry rotation time is 0.33 s, 32 × 0.6 mm collimation with double z-sampling is used for simultaneous acquisition of 64 overlapping 0.6 mm slices. In its ECG-gated mode, the DSCT provides 83 ms temporal resolution independent of the heart rate. ECG gated spiral data is acquired at pitch 0.2–0.46, depending on the heart rate. Temporal resolution was evaluated with a moving coronary artery phantom. Spatial resolution was evaluated by measuring spiral SSPs and by scanning a resolution phantom. A three-material decomposition algorithm was used with simultaneously acquired 80 kVp and 140 kVp data to create material-specific images. RESULTS: The coronary phantom was depicted with

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little or no motion artefacts up to 100 bpm. A 120 mm heart volume could be covered in 5–10 s, depending on the heart rate, with 0.4 mm through-plane resolution. Promising results for new applications, such as dual-energy bone removal or blood volume imaging, could be demonstrated. CONCLUSION: DSCT allows robust cardiac CTA with a temporal resolution of 83 ms in combination with sub-mm spatial resolution and examination times not longer than 10 s. The simultaneous acquisition of dual-energy CT data and novel material decomposition algorithms allow for new clinical applications.

1530 Invited review: Dose and image quality in MDCT

Huda, W.[1]•Smyth, J. M.[2]

[1]University Hospital, Syracuse, NY, USA, [2]Ninewells Hospital, Dundee, UK

CT, introduced into clinical practice in the 1970s, is characterized by a markedly improved imaging performance as well as a much higher radiation dose. In recent years, the clinical utilization of CT has dramatically increased, and this modality currently dominates medical radiation patient exposures. One important aspect of CT is that there is a direct relationship between the amount of radiation used, which is determined by the choice of X-ray tube voltage (kV) and current (mA), and the corresponding image quality that affects diagnostic performance. This talk will describe the inter-relationship between radiation doses and image quality, and also outline what is required to keep patient doses in CT As Low As Reasonably Achievable (ALARA).

1555 Multislice CT coronary angiography performed with different scanner generations: comparison of diagnostic performances

Pugliese, F.•Mollet, N. R.•Hunink, M. G.•Nieman, K.•Dijkshoorn, M. L.•de Feyter, P. J.•Krestin, G. P.

Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands

PURPOSE: To compare the diagnostic performance of 4 generations of multidetector CT scanners featuring 4, 16 and 64 slices per rotation in the assessment of coronary artery disease (CAD) with conventional coronary angiography as the reference standard. MATERIALS/METHODS: Four groups were formed including the first 51 patients undergoing CT coronary angiography after the installation of each of the 4 CT systems. All patients (n=204) were referred for conventional angiography. Subjects with previous percutaneous angioplasty, stent placement and CABG were excluded. RESULTS: Heart rates and prevalence of CAD were similar (mean HR=59 bpm, 1.3 lesion/patient). In the 4-slice group, 113/442 (26%) segments were excluded from analysis because of poor image quality. All segments >2 mm diameter were evaluable in the other groups. Sensitivity, specificity, PPV and NPV were 58%, 94%, 61% and 94% for 4-slice CT; 90%, 93%, 65% and 99% for first-generation 16-slice CT; 97%, 98%, 87% and 99% for second-generation 16-slice CT; 99%, 96%, 80% and 99% for 64-slice CT. In the 64-slice CT group, including the assessable <2 mm diameter coronary branches (26%), the respective values were 99%, 95%, 76% and 99%. CONCLUSION: Diagnostic accuracy of CT coronary angiography performed with 4-slice CT scanners is lower than that allowed for by newer generation systems. Among the latter, a trend increase in diagnostic accuracy is seen. 64-slice CT has high diagnostic accuracy even when smaller coronary branches are included.

1605 A decade of coronary CT imaging: evolution from EBT to dual source CT: impact on workflow, patient preparation, scan protocols and image quality

Dijkshoorn, M. L.•Pugliese, F.•Mollet, N. R.•Alberghina, F.•Nieman, K.•Krestin, G. P.

Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands

KEY LEARNING OBJECTIVES: (1) To review developments in coronary imaging with CT starting from EBT to the recently introduced Dual Source CT. (2) To understand the impact of different scanner generations on workflow, patient preparation, scan protocols and image quality. (3) To demonstrate current status with challenging clinical cases of a new state-of-art dual source CT scanner. DESCRIPTION: Introduction – Basics of coronary CT imaging – Technical overview of several scanners – Impact on workflow – Impact on patient preparation – Impact on scan protocols – Impact on image quality – Current status demonstrated with clinical cases – Strength and limitations. CONCLUSION: The major teaching points in this exhibit are: (1) For each scanner type a different approach is needed, what works well on certain scanner can work against you on a different system. (2) Recent developments have improved workflow and allow a wider spectrum of indications to be examined in a larger patient population. (3) Although performances of CT scanners is getting better and better, further developments are still essential to overcome current limitations.

1415–1545
History SFG

1415 Invited review: The current state of radiology history

Thomas, A.

Princess Royal University Hospital, Kent, UK

We are currently in an exciting time for the history of the radiological sciences. The British Society for the History of Radiology (BSHR) represents all of those in the UK who are interested in radiological history. The BSHR is affiliated to the British Society for the History of Medicine. We have an annual lecture and at UKRC we organize the history session and we also have a stand at the technical exhibition. We have relaunched our website at http://www.bshr.org.uk/ and twice a year we produce a journal "The Invisible Light". Contributions to both the journal and to the website are always welcomed. This presentation will review the past and current activities of the Society and will indicate future directions for research, study and investigation.

1445 The new Roentgen-X-Museum

Busch, U.

Deutsches Röntgen Museum, D-42897 Remscheid, Germany

Wilhelm Conrad Roentgen's work revolutionized medicine and paved the way for numerous technological applications in modern science and technology without which our modern world would be inconceivable. An extraordinary personal and historic achievement – and yet Roentgen's life and work represent much more: a timeless universal message for creative thinking, the positive driving force behind all cultural and social developments as well as behind technological progress and innovation. The freedom to integrate that which was already known using an interdisciplinary approach and to create something new, the ability to bundle his knowledge, *e.g.* assimilating ideas from photography and cathode rays in order to discover X-rays, qualifies him as a prototype for the modern innovator and makes him a leading figure in science and a synonym for creative thinking. It is on the foundations of this quality that the concept for the new Roentgen X Museum in Remscheid, Germany, are based. At the same time its potential will be increased in many respects by creating a museum which will foster Roentgen's spirit of discovery and enquiry, guiding the visitor through an exciting and at the same time easy to understand scientific experience. As a modern educational facility it will follow the hands-on-science approach thus allowing fun and interest to develop interactively along side investigation and experimentation and encourage potential creative and innovative skills on a long term basis. In addition the museum will serve as a cultural and social focal point offering a qualified platform for research, industry and the public.

1505 Invited review: Dr Samuel Stuart Pennington and the Battle of River Plate

Buzzi, A. E.

University of Buenos Aires, Ciudad de Buenos Aires, Argentina

Dr Samuel Stuart Pennington, born in 1910 in Quilmes (Province of Buenos Aires) the son of Dr Miles Stuart Pennington, who was born in Bolton, Lancashire, in 1884. He graduated in the School of Medicine, University of Buenos Aires, in 1936. He soon joined several radiological departments, and was appointed Chief of Radiology and Radium Therapy in the British Hospital. In Argentina he was a pioneer in contrast studies of the vena cavae. He was also an oncologist, and a practical surgeon. On 13 December 1939, took place the "Battle of the River Plate": the ships *Exeter*, *Achilles* and *Ajax* of the British fleet

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penned to the German battleship *Graf Spee* in the River Plate. The three British ships suffered mishaps. They went to Falkland's/Malvinas islands for medical treatment and reparation. The British Hospital of Buenos Aires sent a contingent in charge of Stuart Pennington. He registered in notebooks magnificent drawings of the obtained X-rays. When he returned to Buenos Aires the British community received him as a hero. In 1948 King George VI honoured him with the appointment of M.B.E. 43 years later Argentina was under a military dictatorship that invaded the Falkland/Malvinas islands. Stuart Pennington sent a note to the Chief Commander of the Navy offering his services as a doctor in the islands. His offer was not accepted because of his age. He decided then to return to Queen Elizabeth II the badge that her father had given him in 1948. He died in 1985.

1525 Invited review: Patient and staff radiation doses from early radiography (1899–1902)

Kotre, J.

Newcastle General Hospital, Newcastle-upon-Tyne, UK

PURPOSE: Patient and staff doses for early radiological examinations (1899–1902) were estimated from entries in a log-book of the time, together with additional information obtained from contemporary cold-cathode X-ray apparatus. MATERIALS/METHODS: Information on over 500 X-ray examinations performed between 1899 and 1902 at the Forth Banks Infirmary, Newcastle, UK was found in a log-book on display in a collection of historical artefacts. The book contained exposure times, distances and examination type. Additional information was obtained from contemporary X-ray apparatus and operation of a contemporary induction coil to allow estimates to be made of patient entrance skin dose using X-ray beam spectral simulation software. One radiographer undertook all of the examinations in the record and his occupational dose is estimated using modern dose–area product to scatter dose conversion factors. RESULTS: Entrance surface doses in the region of 150 mGy for abdomen/pelvis examinations, 75 mGy for AP chest examinations and 300 mGy for lateral/penetrated chest examinations were estimated. The distribution of examination types shows a predominance of fracture examinations for radiography and foreign body investigations for fluoroscopy. The annual staff dose is estimated at 47 times the UK annual dose limit. CONCLUSION: The results show very high patient and staff doses from these early examinations, but are consistent with what is known about the techniques and image receptors used at the time.

TUESDAY

1415–1535
Quantitative imaging applications in medicine

1415 Invited review: Future role of quantitative image data in patient management

Todd-Pokropek, A.

University College London, London, UK

No abstract supplied.

1445 Invited review: Distributed clinical studies using the internet

Davies, A.

University of Leeds, Leeds, UK

The internet offers several appealing possibilities of time and efficiency savings for running multicentre imaging trials. Communication of image and other data over the internet could reduce the time taken to gather data and process results. Moreover, standards based interactive web pages can be used to assess qualitative and quantitative aspects of the image data by observers within the centres in a time and resource efficient manner. The main considerations are: patient confidentiality, convenient and compact image acquisition and distribution, assurance of image quality, remote monitoring of viewing conditions, a suitable and user friendly image scoring system, minimal hardware demands and software which is widely available. This presentation details our experience in designing and running a multi-centre trial assessing requirements of ultrasound scanners for use in measurement of Nuchal Translucency (NT) in Down's Syndrome screening. In this presentation we describe our response to each of the above challenges.

1515 Quantitative measurement of absolute bone mineral content via single-energy computed radiography

McCann, A. J.

Northern Ireland Regional Medical Physics Agency, Belfast, UK

PURPOSE: Reliable *in vivo* measurement of the quantity and morphology of bone offers support in many areas of clinical practice, including the assessment of fracture healing. Image analysis techniques have been developed to allow decomposition of single-energy computed radiography (CR) images into absolute bone and soft tissue content. MATERIALS/METHODS: 10-bit digital images were acquired via CR. Normalization of beam intensity was achieved within an image using an "empty field" exposure, and between images via the inclusion of a hydroxyapatite stepwedge. The detrimental effect of scattered photons was minimized via deconvolution using a customized, analytically generated point spread function. Regions of the radiograph containing soft tissue only were identified, and converted to absolute thickness using Monte Carlo-generated data on soft tissue attenuation. The total thickness in other regions was calculated via polynomial interpolation of these values. Monte Carlo code was again employed to model cumulative attenuation of various bone/soft tissue combinations. This data was used to identify the unique bone and soft tissue contributions necessary to meet both attenuation and total thickness criteria at any location. RESULTS: A tissue-equivalent, anthropomorphic forearm phantom was irradiated and the image subjected to the steps described. Measurements of bone content in pixel bins were compared with those derived from geometric analysis of a volume acquired via CT scanning the phantom. Repeated irradiation at various air gap thicknesses yielded a systematic error of less than 5% in all cases. CONCLUSION: Image processing software has been developed which allows the measurement of absolute bone content from CR images.

1515 Quantitative vertebral fracture detection on DXA images using shape and appearance models

Roberts, M. G.·Cootes, T. F.·Pacheco, E.·Adams, J. E.

University of Manchester, Manchester, UK

PURPOSE: Current quantitative morphometric methods of vertebral fracture detection lack specificity, particularly with mild fractures. We used more detailed shape and texture information to develop quantitative classifiers. MATERIALS/METHODS: The detailed shape and appearance of vertebrae on 250 lateral dual energy X-ray absorptiometry (DXA) scans were statistically modelled, using Principal Components Analysis. The vertebrae were given a "gold standard" classification using a consensus reading by two radiologists. Relevant shape and appearance parameters were then selected using stepwise regression, and linear discriminants were trained on these shape and appearance parameters. RESULTS: The appearance-based classifiers gave better specificity than shape-based methods in the lumbar and mid-thoracic spine. The specificity was 94% at a sensitivity of 95%, representing a sensitivity of 84% on grade 1 fractures (*vs*. 71% for height ratio classifier), and 100% on grade 2 or 3. Using the full shape parameters improved specificity in the upper thoracic spine compared to using three standard height ratios when operating at high sensitivity (>95%). The main improvement was in the detection of mild fractures. In the thoracic spine, a linear discriminant classifier trained using three height ratios also out-performed a more standard morphometric approach in which height ratios were individually thresholded (90% specificity *vs*. 83% specificity at 95% sensitivity). CONCLUSION: The shape and appearance parameters of statistical models of vertebrae could provide more powerful quantitative classifiers of osteoporotic vertebral fracture. A standard morphometric approach using three height ratios could also be improved by using a linear discriminant classifier instead of thresholding each ratio individually.

1400–1330
Hepato-biliary

1400 Invite review: Optimizing contrast enhancement for MDCT: 4 to 64 row

Heiken, J.

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Washington University School of Medicine, St Louis, Missouri, USA

The reduced image acquisition times of MDCT have made scan timing more critical than for single detector CT, but have provided radiologists with an opportunity to improve CT contrast enhancement. It is therefore important for radiologists to understand (1) the factors that determine the magnitude and timing of arterial and parenchymal contrast enhancement for CT, and (2) identify the modifications needed to optimize contrast enhancement for 4-row to 64-row MDCT. The magnitude of arterial enhancement is dependent on the rate of iodine delivery and the total iodine dose, whereas that of hepatic parenchymal enhancement is dependent on iodine dose. Thus for CTA performed with MDCT, contrast medium volume can be decreased. However, contrast dose for liver imaging cannot be decreased, even with rapid MDCT acquisition. The most important patient-related factor that affects the magnitude of aortic or hepatic enhancement is body weight. Enhancement magnitude is inversely proportional to body weight. Therefore, very large patients require higher iodine dose. The technical factor that determines the timing of peak aortic and hepatic enhancement is injection duration (the longer the injection duration, the longer the time to peak enhancement). Peak enhancement is delayed in patients with reduced cardiac output. For CTA, scan delay should be individualized with bolus tracking or test bolus. The greater the number of detector rows, the shorter the acquisition time for a particular MDCT examination. As the acquisition time decreases, the scan delay for a particular examination must be increased. Thus scan delays should be longer for faster scanners

1500 Invited review: Uncommon manifestations of liver lesions

Karani, J.

King's Healthcare NHS Trust, London, UK

No abstract supplied.

1530 Invited review: Imaging of cystic lesions of the Pancreas

Kane, P.

King's College Hospital, London, UK

No abstract supplied.

1415–1540
Radiology Service Improvement

1415 Invited review: The clinical assessment and treatment (CAT) service

Rafferty, J.

Cumbria and Lancashire SHA, Manchester, UK

No abstract supplied.

1440 Invited review: The role of the imaging professional in the CAT service

Hoadley, G.

Blackpool Victoria Hospital, Lancashire, UK

OBJECTIVE: This presentation will explore the currently undefined role of the imaging professional in a "CATS" service. DESCRIPTION: Government policy is "plurality" of providers to meet the challenge of expanding diagnostic services capacity to meet the 18 week target. NHS independent sector treatment centres will be part of this initiative. The roles and responsibilities of imaging professionals in this arena are uncertain, and in many areas it is unclear exactly who will be providing the service. It is certain that there will be many challenges facing such individuals. Staff will be recruited from overseas, and from local existing services, resulting in varied medical perspectives within the local health economy. Innovative roles are likely to be developed within these new organizations. Lines of accountability will be different from current posts, and funding issues will change with unbundling of diagnostics under Payment by Results. Continuity of care as patients move on to secondary care providers will be a major issue, especially for cancer sufferers, requiring good local linkages and agreed pathways across local health communities. Near patient testing will inevitably lead to new pathways and processes, and the health professional working in this new environment will have major responsibilities for ensuring the correct functioning of the whole local health system if patients are to benefit. CONCLUSION: The role imaging professionals in this new environment will be challenging, with new organisational and professional issues to be addressed. Continuing debate on these issues will be important as the centres become operational.

1505 Invited review: Eliminating carve out

Garvey, C.

Royal Liverpool & Broadgreen University Hospital, Liverpool, UK

Most services desire "improvement" and, most departments will show improvement in one or more areas. In this talk, the term "Service Improvement" is more conceptual and refers to those departments which have emphasised the concept of service improvement to the extent that it informs most of the decisions that are made and the way that department conducts its business. A department that is actively pursuing a "Service Improvement" model will show certain characteristics: Resources, both financial and monetary will be allocated to S! An increasing number of modalities will be reviewed. This will usually involve extensive redesigning of the service. Basic processes such as booking of patients will be redesigned and the direction of travel will be towards a full-booking model. The service will be patient- rather than department-focused. The entire process including what happens after the test is done will be undergoing constant review and redesign. Many departments undergoing SI find that their efficiency improves and throughput increases. The stumbling block is often that the radiologists can't cope with the increased number of examinations for which a report is required. Carve out is a phenomenon that has bedevilled the NHS leading to inefficiencies and radiology departments are no exception. The lecture will highlight common examples of where carve-out occurs in the radiology department. Some of these examples may be obvious but some will come as a surprise. Worked-up solutions will be offered on how to tackle some of these examples.

1530 Discussion

1530–1730
Nuclear Medicine SFG II

1530 Invited review: Radiotargeted therapy in neuroendocrine tumours

Baum, R.

Zentralklinik Bad Berka, Bad Berka, Germany

PURPOSE: Combined use of Yttrium-90 and Lutetium-177 labelled somatostatin analogues (mainly DOTA-TATE) for PRRT of progressive neuroendocrine tumours. MATERIAL/METHODS: Over the last 5 years, 352 patients (age 19–81 years, mean 59.2 years) received 1100 administrations (mean activity 3.74 GBq, max. 7.4 GBq per cycle, time between cycles 3–6 months). 1.5 l of an AA solution containing arginine and lysine were infused IV over 3.5 h to reduce kidney dose. Patients were selected based on high SSTR expression (determined by Ga-68 receptor PET/CT). Before each new cycle, restaging was performed by morphologic (CT/MRI) and molecular imaging (receptor PET/CT using Ga-68 DOTA-NOC, in selected cases also FDG or fluoride PET/CT), and tumour markers. Renal function was serially determined (TER and GFR). Tumour dosimetry was performed under treatment by serial scintigraphy. All data were entered in a database. RESULTS: Bone marrow toxicity WHO grade 2 or 3 occurred in <15% of the administrations. Thrombocytopenia/anaemia were seen mainly in patients pre-treated with chemotherapy and in patients with widespread skeletal metastases. In none of the patients with normal kidney function before treatment, renal insuffiency developed, in most patients receiving Lu-177 DOTA-TATE serum creatinine and TER/GFR did not change significantly. 9 of the patients had complete remission, 39% had partial remission (PR), 50% had stable disease (SD – progressive disease before), and 11% had PD. 25 patients with advanced disease died of tumour progression. Objective tumour responses (including improvement of clinical symptoms) were seen in 85% of the pts. CONCLUSIONS: PRRT is well tolerated with low toxicity and few adverse effects and shows significant therapeutic efficacy in patients with progressive neuroendocrine tumours even after octreotide treatment, interferon or chemotherapy.

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1600 Invited review: Advances in interventional radiological treatments of NETs

Yu, D.

Royal Free Hospital, London, UK

Neuroendocrine tumours (NETs) are tumours that have the capacity to secrete polypeptide products with hormonal activity. NETs are relatively rare with incidence of 3 per 100 000, but as they tend to be slow growing tumours, the prevalence is much higher. As a result, a significant proportion of patients will have hepatic metastases at presentation, and it is in the management of hepatic metastases that interventional radiology plays an important role. Portal vein embolisation is increasingly performed to facilitate liver resection. Arterial embolisation, chemoembolisation and selective internal radiation therapy are used in many centres along with local ablative techniques such as radiofrequency ablation. The evidence for these treatment options are discussed in this presentation.

1630 Sentinel node imaging in breast cancer: is there any correlation with intradermal injection depth, number of nodes seen and pathology?

Szyszko, T.•Muthu, S.•Meades, R.•Frank, J.•Svensson, W.

The Hammersmith Hospitals NHS Trust, London, UK

PURPOSE: Sentinel lymph node (SLN) biopsy following lymphoscintigraphy is routinely used in many centres in the management of patients with breast cancer. This study looked at two techniques: a standard intradermal injection and a more superficial technique, to assess if this affected the speed of tracer uptake by the sentinel node, the number of additional axillary lymph nodes seen and the pathology. MATERIALS/METHODS: 64 patients underwent SLN lymphoscintigraphy at Charing Cross Hospital from January to September 2006. 32 patients had imaging with the standard intradermal injection technique and 32 had imaging with the new more superficial technique. SLN uptake time was categorised as <15 min, <1 h or <3 h. SLN and additional axillary nodal uptake was correlated with pathology. RESULTS: Using the standard intradermal injection technique sentinel node uptake was seen in 25/32 patients within 15 min; 3/32 within 1 h and 4/32 within 3 h. With the more superficial technique uptake was seen in 30/32 patients within 15 min, 1/32 within 1 h and 1/32 within 3 h, demonstrating increased speed in SLN uptake. 17/32 and 20/32 patients in the two groups, respectively, showed additional axillary lymph node uptake. There was no correlation between speed of uptake and pathology. CONCLUSION: Our superficial intradermal injection technique expedited tracer uptake within SLN and axillary lymph nodes, decreasing camera time. There was no significant difference in the number of additional lymph nodes seen and no correlation with pathology.

1640 Do lower count DMSA renal scans in children allow the acquisition of diagnostic quality images?

Saha, A.[1]•Lloyd, J. J.[2]

[1]James Cook University Hospital, Middlesbrough, UK, [2]Royal Victoria Infirmary, Newcastle upon Tyne, UK

PURPOSE: Guidelines state that DMSA renal scintigraphic images should be acquired for 5 min or 3000 kcounts; this guidance is expert opinion rather than evidence based. We compared renal scar detectability using low and high count images. MATERIALS/METHODS: During normal clinical imaging we acquired images as 7 min dynamics. These were then reformatted as 2 min statics (without motion correction) ["low count"] and 7 min statics (with motion correction) ["high count"]. The high count images were in keeping with guidelines. We selected 40 abnormal and 28 normal cases covering a spectrum of appearance from normal to obviously scarred. Three expert observers reported the high count images and their consensus opinion taken as the gold standard. Six observers then independently reported all images viewed in a random order. ROC curve analysis was used to assess the difference between the techniques. The number of images and observers gave the study adequate power to detect clinically important differences. RESULTS: The mean areas under the ROC curves were 0.930 and 0.913 for the high and low count images, respectively. The mean difference was 0.0163; the 95% confidence interval was (-0.0382, 0.0707), *i.e.* this difference is not significant. CONCLUSION: This study indicates that adequate scar detection in DMSA renal scintigraphy can be obtained with considerable lower counts than conventionally recommended. This implies that either imaging time or radiation dose could be significantly reduced. Either of these strategies has important benefits as this technique is typically used in young children.

1650 Optimizing MIBG protocols: new for old?

Turner, P. J.•Collins, M. A.•Strouhal, P. D.

Royal Wolverhampton Hospitals Trust, Wolverhampton, UK

INTRODUCTION: Some local clinicians doubt the reproducibility of results and report standardization of MIBG scans. The utility of 48 h images is also questionable, though currently our standard practice, but these reduce scheduling flexibility. Scrutinizing our data might optimize protocols of these expensive, time-consuming studies. METHODS: Retrospectively, 2 independent observers' reviewed MIBG images over a 5 year period. Scans were interpreted without and then with 48 h images, and compared with concurrent CT/MRI. Uptake in regions of interest over abnormalities and liver (as background) were quantified and interobserver variations recorded. RESULTS: 22 scans were identified in all: 12 were positive with 100% observer agreement, 10 negative. CT/MRI correlated in 21 cases, one patient refused CT; histology correlated in all positives. SPECT images proved most helpful, especially in positives; 48 h images were felt to add little/nothing. Ratio of adrenal/abnormal uptake to liver uptake of >1.333 was observed in all positives. CONCLUSION: SPECT images done early and late correlate best with cross-sectional imaging. 48 h images were deemed futile, dropping them eases scheduling also. Uptake ratios aid reporter confidence but don't alter findings.

1700 Actual versus predicted usage of an off-site PET.CT service

Jones, C.•Strouhal, P. D.

Royal Wolverhampton Hospitals Trust, Wolverhampton, UK

BACKGROUND: Using the DoH framework, an out-of-region PET.CT referral service was established for the Black Country Cancer Network (BCCN). This audit compares actual PET.CT usage with predicted demand, correlated against National figures and locally agreed referral patterns. METHODS: All PET.CT referrals from within the BCCN (population approx. 952 000) were identified over 17 months since service commencement in July '05. This was compared with the total number of scans for the same period with funding pre-allocated by the PCTs within the Network and pro rata National predicted figures. Original requests were reviewed: cancer type and clinical indications documented. RESULTS: 148 referrals for PET.CT were identified, representing 14% (148/1079) of National predicted and 42% (148/350) of potentially funded scans. Only oncological referrals were received: Indications included lung (28%), lymphoma (12%), colorectal (20%), oesophageal (10%) and head/neck (11%) malignancies. With predicted referral percentages of 25%, 37.5%, 12.5%, 5% and 7.5%, respectively, only lung cancer approximated the estimated proportion of referrals. Lymphoma was under-represented despite numerous educational meetings about PET with lead Haematologists; the other cancer groups including those with level "C" evidence were over-represented. CONCLUSION: Despite limited PET.CT provision in the UK compared with Western Europe and locally allocated funding, PET.CT remains overall underutilized. Education and encouragement of Clinicians may increase referrals, as the lack of familiarity with the technology especially amongst our Haematologists seemed the biggest barrier. Allaying concerns regarding scanning delays with an off-site service despite purely e-mail requesting may need addressing also.

1545–1700
Managing the Digital Environment III

1545 Invited review: Speech recognition, theory, practice and demonstration

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,

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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 Speech Recognition. It is not entirely a happy story, and there are advantages and disadvantages which must be recognized if this technology is to be introduced without unexpected disappointments. Why should we consider Speech Recognition at all? What are the alternatives? What Speech Recognition 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 Speech Recognition system.

1630 Implementing National Programme PACS and speech recognition – does it deliver the benefit?

Etherington, R. J.•Cosens, M.

Countess of Chester Hospital, Chester, UK

PURPOSE: to assess the impact of National Programme PACS and speech recognition on report turnaround time in a DGH setting. MATERIALS/METHODS: RIS database evaluation before and after implementation of PACS and before and after implementation of speech recognition software, evaluating time taken from examination ordered electronically, taken by radiographer, put into draft form and electronically signed off. RESULTS: Average time from ordered to signed for all examinations fell from 16 days pre-PACS to 11 days post-PACS. For specific CR groups of examinations, taken to signed time fell from an average of 20 days to 4 days for inpatient studies, 10 days to 4 days for A+E studies, 10 days to 4 days for outpatient studies and 5 days to 4 days for GP studies. Preliminary data from the implementation of speech recognition indicate an average further reduction in turnaround time of 1 day. CONCLUSION: PACS and SR have had a very significant positive impact on turnaround times for radiological reports.

1640 Voice Recognition: Are we there yet?

Kakani, N.•Hollings, N.•Thorogood, S. Chellamuthu, S.

Royal Cornwall NHS Hospital Trust, Truro, UK

INTRODUCTION: Voice recognition for medical transcription has improved significantly through the years. As transcription forms a major part of radiological services, it is only fair that such a system be audited for its reliability, usability and impact on service delivery. OBJECTIVE: To assess the error rate of use of voice recognition soft ware in radiology department. METHODS AND RESULTS: A random sample of 480 reports generated by 16 radiologists between September and December 2006 were selected and appraised by two independent observers for errors and consensus opinion was obtained. The reports were appraised for minor (grammatical), major (significant implication to the final report) or IT errors. 22.5% (range 0–53%) of the total reports had minor errors, 2.5% (range 0–10%) had major errors and (0.625%) were considered to be due to software. Over all the error free rate of the reports using voice recognition was 97.5% excluding major errors only and 77% excluding all errors. CONCLUSION: When voice recognition was introduced it was greeted with scepticism due to the general technophobic culture and impact on secretarial staffing levels. Literature has shown that there is an adverse impact on report productivity and reporting time per session. Following initial outlay of time and resource, the benefits of such a system are difficult to ignore. These include: rapid availability of report, decrease number of lost reports and better use of secretarial time. Our audit has demonstrated that voice recognition is generally regarded as being a reasonable alternative to stream line radiology service.

1650 "Computer says know" – the trouble with speech recognition

Pathak, S.

King's College Hospital, London, UK

The advantages of incorporating picture archiving communication systems (PACS), speech recognition software (SRS) and a hospital wide radiological information system (RIS) are numerous and well documented. When radiological information is crucial to the management of a patient, the instant availability of images with reports expedites the clinical decision making process. This is beneficial to the patient and economically advantageous to the hospital being associated with reduced hospital stay. These benefits should not be taken for granted but are conditional on reducing the time taken for an image on PACS to be reported and the verified report to be distributed to the clinical team. This process is dependent on the optimal functioning and integration of PACS, RIS and SRS. The latter, by combining the dictation, transcription and verification processes is ideally designed to reduce the report turnaround time (RTT). We describe our first 2 years experience of SRS, the impact it has made on report turnaround times, problems encountered and possible solutions. We also attempt to identify design issues which may need to be addressed in the continuing evolution of SRS.

1600–1700
Neuroradiology SFG IV

1600 Facial pain

Connor, S.

King's College Hospital, London, UK

There are numerous causes of facial pain and clinical classifications are often unhelpful in guiding imaging protocols. This presentation will categorize facial pain as neuralgia, facial pain with cranial nerve signs, pure facial pain and other clinical facial pain syndromes. For each category, the need for imaging, appropriate imaging modalities and protocols, available data on diagnostic yield, pertinent imaging anatomy and potential pathologies will be addressed. Although all aetiologies will be covered, the focus will be on neurological aspects of facial pain.

1620 Diplopia

Miszkiel, K.

The National Hospital for Neurology & Neurosurgery, London, UK

No abstract supplied.

1640 Vertigo

Yousry, T.

The National Hospital for Neurology & Neurosurgery, London, UK

In general, vestibular disorders can be divided into peripheral, central and mixed disorders. This subdivision determines the imaging strategy to be chosen. Peripheral disorders are imaged by CT or MR sequences which best display the vestibular nerves and the labyrinth (CISS, DRIVE, FIESTA). Central disorders are imaged by MR sequences which best display the brainstem, cerebellum and cerebrum. The most frequent peripheral disorders are vestibular neuritis, perilymph fistulae, Menière's disease, and peripheral vestibular paroxysmia (disabling positional vertigo). They involve the vestibular nerve and the labyrinth. The main role of imaging is to assess the rare pathologies that occur with an unusual presentation of a vestibular syndrome such as intracanalicular acoustic neuromas, Cogan's syndrome, zoster oticus or to assess the extent of lesions that led to the presentation with vertigo such as cholesteatomas, acoustic neuromas, otitis media. The clinical classification of central vestibular syndromes is determined according to the 3 major planes of action of the VOR (yaw, roll, pitch) which is helpful in determining the location of the lesion. These lesions are most often the result of stroke, or demyelinating processes (MS), but occasionally, tumours, hydrocephalus, or Chiari I malformation can be the causative process. MRI is important in confirming the diagnosis and the location of the lesion.

1500–1700
Audit

1500 Invited review: Imaging 2011

Gray, M.

Institute of Health Sciences, Oxford, UK

No abstract supplied.

1630 Invited review: Patient care pathways and protocols

Bacon, A.

South Manchester PCT, Manchester, UK

No abstract supplied.

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1615–1715

Future provision of diagnostic imaging

1415 Invited review: A strategy for diagnostics – an update from the National Clinical Lead

Denton, E.

Norfolk & Norwich University Hospital NHS Trust, Norwich, UK

I will give an update of the current diagnostic imaging strategy at the Department of Health and also describe the Department of Health's views on the future of diagnostic imaging provision in England. The talk will also include some of my personal views as to how diagnostic imaging will change in coming years.

1630–1730

Hepato-biliary Scientific Session

1630 Comparison of using the Balthazar Score and the Modified Balthazar Score in the follow up of patients with acute pancreatatis

Santana, P. R.[1]·Hochhegger, B.[2]·Martignoni, F. V.[2]·Irion, K.[3]·Berni, R. B.[2]·Haygert, C. J. P.[2]

[1]IRION RADIOLOGIA, Porto Alegre, Brazil, [2]Universidade Federal de Santa Maria, Porto Alegre, Brazil, [3]Cadiothoracic Centre, Liverpool, UK

PURPOSE: To evaluate prognostic differences when using the Balthazar score or the modified Balthazar score in patients with acute pancreatitis. MATERIALS/METHODS: Files of 27 patients with the diagnosis of acute pancreatitis were retrospectively reviewed. All patients were submitted to abdominal CT and these examinations were reviewed by an expertise radiologist, blinded for the patient's outcome, who applied the Balthazar score and the modified Balthazar score, obtaining two prognostic analysis. For both scores the correlation between the severity of pancreatitis and the patient outcome was done using the Pearson coefficient of correlation using the *t*-test. The primary outcomes were defined as morbidity (hospitalization time or surgical intervention) and mortality. RESULTS: Among the patients who survived (62%), the correlations of the modified Balthazar score with morbidity (72.5% p=0.0075) and mortality (80% p=0.0031) were inferior when compared to the classic Balthazar score (92.5% p<0.001 and 89.4% p=0.002, respectively). Among those who died, the correlations of the modified Balthazar score with the morbidity (25.8%) and mortality (14.1%) outcomes were inferior as well, compared with the classic Balthazar score (93.6% and 51.3%), with p-value of 0.0019. The analysis of the whole group has shown that the modified Balthazar score presented correlation of 68.1% with mortality (p=0.0019) and 67.6% with morbidity (p=0.002), while for the classic Balthazar score the correlation was of 80.5% (p<0.0001) and of 90.2% (p<0.0001), respectively. CONCLUSION: The classic Balthazar score has shown, in this study, a stronger correlation with both the morbidity and mortality outcomes than the modified Balthazar score.

1640 Complementary effect of breath hold T_1 and T_2 spin echo sequences with high resolution 3D respiratory triggered Fast recovery MRCP sequences in evaluation of pancreato-biliary pathology

Jacob, A. D. C.·Rajashanker, B.

Manchester Royal Infirmary, Manchester, UK

Although high resolution 3D spin echo sequences offer superior MRCP images, there is poor visualization of the parenchymal morphology due to high level of background suppression, The purpose of this study was to evaluate additional benefits of using breath hold T_1 and T_2 weighted spin echo, along side high resolution 3D MRCP fast recovery fast spin echo sequences. MATERIAL AND METHODS: 50 consecutive patients with suspected biliary and/or pancreatic disease underwent MRI applying high resolution 3D respiratory-triggered FRFSE (Fast Recovery Fast Spin Echo) MRCP sequence. Complementary sequences included axial T_1 Dual echo, 2D T_2 breath hold axial and coronal FIESTA (Fast Imaging Employing Steadystate Acquisition). Assessment included ductal visualization, morphology and extra pathology identified on the additional sequences that significantly affected patient management. The additional findings were classified according to the organ and significance (High=require prompt medical or surgical treatment. Moderate=benign findings that may require medical or surgical intervention or significant negative finding. Low= unlikely to require treatment). RESULTS: Mean acquisition time was 48 s for the breath hold sequences. There were a total of 19 findings of High and 36 findings of Moderate significance. These included metastatic lesions in the liver, spine, metastatic lymphnodes and pancreatic head masses. In 29 of 50 patients the breath hold sequence added significant value to the management. CONCLUSION: The respiratory-triggered FRFSE 3D multislice MRCP sequence is an excellent sequence to diagnose ductal pathology in pancreato-biliary disease. The addition of a breath hold Dual echo and FIESTA sequence does not substantially increase acquisition time, however, significantly improves overall diagnostic accuracy.

1650 Beyond dual-echo imaging – measuring liver fat content and T_2* with multiecho MRI

O'Regan, D. P.·Callaghan, M. F.·Wylezinska-Arridge, M.·Fitzpatrick, J.·Naoumova, R. P.·Hajnal, J. V.·Schmitz, S. A.

Imperial College, Hammersmith Hospital, London, UK

PURPOSE: To design a breath-hold multiecho sequence to measure hepatic lipid content and model T_2* decay for both the fat and water components. MATERIALS/METHODS: Imaging was performed with a spoiled gradient echo sequence with 7 readouts on a 3.0 Tesla system. Each echo time was alternately in-phase or out-of-phase with respect to the signals from fat and water. Imaging was performed on 5 healthy volunteers (all males; mean age 37 years) and 5 patients with diabetes (4 males, 1 female; mean age 53 years). A biexponential curve-fitting model derived the relative signal contributions due to fat and water, as well as their respective T_2* decay constants. Comparison was made with point-resolved proton spectroscopy without water-suppression. Data were analysed with Pearson's correlation coefficient and Bland-Altman's limits of agreement. RESULTS: There was a significant correlation between multiecho and spectroscopic measurement of hepatic lipid (r^2=0.99, p<0.0001). The 95% limit of agreement in humans was 2.4%. If the T_2* of water is assumed to be longer than that of lipid the signal components from each could be correctly assigned throughout the clinical range of steatosis. CONCLUSION: Multiecho imaging provides a rapid method of quantifying liver fat content that is highly correlated to proton spectroscopy. In contrast to dual-echo methods a single multiecho sequence overcomes the potential error due to differential T_2* decay of fat and water; and enables the correct assignment of the fat and water signal components. Multiecho imaging provides an accurate and efficient method for spatially-resolved fat quantification and T_2* characterization of liver tissue.

1700 Systematic use of ultrasound contrast in a district general hospital – 2½ years experience

Moshy, R.

Peterborough & Stamford Hospitals NHS Foundation Trust, Peterborough, UK

AIMS: Contrast enhanced ultrasound (CEUS) should be part of routine normal practice. This short presentation aims to demonstrate its' current use at a busy district general hospital. DISCUSSION: The range of use of ultrasound contrast within our normal day to day practice will be discussed. The results of the outcome audit of the first 1½ years of routine use will be given – this encompasses a total of 182 patients. This audit demonstrated the following: 75 patients had other investigations before or after CEUS of which the results concurred in 67 patients. The nature of the 8 discrepancies will be explained. Overall CEUS was as accurate as CT in liver investigations. A brief résumé of the practicalities of the practice will be included. CONCLUSION: Audit has shown that in our unit ultrasound contrast use in the liver is as good as CT. All ultrasound units are encouraged to incorporate CEUS into their daily day-to-day routine.

1710 MRCP in biliary obstruction: what do you need to know?

Kandathil Chacko, J.·Shetty, S.·Beale, A.

Great Western Hospital, Swindon, Wiltshire, UK

KEY LEARNING OBJECTIVES: (1) To demonstrate the role of MRCP in evaluation of biliary obstruction. (2) To illustrate the imaging spectrum in benign and malignant disease. (3) Identify

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common imaging pitfalls. (4) Develop strategies for recognising and avoiding these pitfalls. DESCRIPTION: MRCP is increasingly used in biliary obstruction, providing a non invasive alternative to ERCP. A broad range of benign and malignant abnormalities can be detected and characterized using this technique. However various diagnostic pitfalls have been observed not previously encountered in conventional pancreatic and biliary imaging. MATERIALS AND METHOD: Retrospective review of images in 65 patients with biliary obstruction who had MRCP in our institution; comparison made with ERCP findings. CONCLUSION: MRCP is an excellent diagnostic tool in detecting and characterising intra and extrahepatic biliary obstruction. Familiarity with the spectrum of imaging findings and knowledge of the potential strengths and weaknesses of the technique would help in tailoring the imaging and increasing diagnostic efficacy.

1720 Liver tumours: treatment with transarterial chemoembolisation

Bent, C. L.·Matson, M.·Renfrew, I.·Hutchins, R.·Bhattacharya, S.·Fotheringam, T. Suaris, T.

Barts and the London NHS Trust, London, UK

PURPOSE: TACE is a recognized treatment option for patients with unresectable liver tumours, but there is conflicting literature regarding efficacy. This study was performed to audit practice at our institution. METHODS: 18 patients (M:F 16:2, age 30–81 years, mean 63 years) underwent 23 TACEs with epirubicin, lipiodol and PVA particles for hepatocellular carcinoma. RESULTS: 16 patients had cirrhosis: (13 Child-Pugh class A and 3 class B) and two patients had non-cirrhotic liver disease. Seven patients had positive viral serology. All patients underwent triphasic CT before TACE, demonstrating portal vein patency and tumours confined to the liver but unresectable due to size (n=3), location (n=4) or multicentricity (n=11). Procedural success was 91% (n=21). Mean survival following TACE was 263 days (range 4–740 days). 1 year survival rate was 43% (n=10). Post procedure deaths (<30 days) were seen in 26% (n=6). Of these, half were due to comorbidity (n=3). CONCLUSION: Previous literature has reported significant survival advantage following TACE in specific subgroups but standardized patient selection criteria have not yet been established. Consequently, many patients have significant co-morbidities, which may result in early death. Robust patient selection criteria may provide opportunities to improve overall outcomes.

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Notes

Scientific programme abstracts Tuesday 12 June

0830–1000

Neuroradiology SFG I

0830 Invited review: Update on imaging potential brain tumours NICE guidelines

Britton, J.

St George's Hospital, London, UK

Improving outcomes for people with brain and other CNS tumours was published in June 2006 by the NICEH. The guidance is aimed at improving care for all patients with brain and other CNS tumours. This should be independent of the hospital or clinician to which they present. Most patients will have their surgical management at a Neuroscience unit and they may or may not require radiotherapy or chemotherapy but they most commonly present to a wide range of different clinical disciplines at the acute Trust. Patient subsequently have either CT or MR imaging and this is the test which initially confirms the patient has a brain tumour. Access to appropriate clinical care is therefore dependent on interpretation of the imaging by the district radiologist prior to the patient's referral to the Neuroscience unit MDT. Not all intracranial masses are tumours and the lecture will cover the common pit falls in imaging masses in the head. Although it may be possible to suggest a histological diagnosis for a brain tumour it is just as important to exclude the possibility of an abscess or an infarct which may give a similar appearance on CT and MR imaging. There will be some discussion of modern imaging techniques such as spectroscopy, functional imaging and other advanced MRI techniques and the place of these techniques in the routine assessment of patients with brain tumours.

0900 Retrospective audit of nasolacrimal stent insertion: technical success, short term patency and procedural learning curve

Speirs, A. J. D.•Anderson, H. J.

District General Hospital, Eastbourne, UK

PURPOSE: To evaluate the technical and short-term patency rates for nasolacrimal duct stent insertion in the treatment of epiphora in a non-specialised centre. To identify the presence and discuss the relevance of a learning curve for this procedure. METHODS: A retrospective audit of all nasolacrimal stents inserted over a 10 year period by a single interventional radiologist (17/12/96–26/9/06). 112 nasolacrimal stents were inserted into 110 patients. The mean age was 70.1 years (24–93 years). 78 were female and 32 male. The majority suffered with longstanding idiopathic epiphora. 6 weeks post-insertion dacrocystography was performed to establish stent patency. RESULTS: Technical success was achieved in 99 stents (88.4%). 8 of the 13 failed stent insertions occurred in the first 31 patients whereas only 5 failed in the subsequent 81 (93.75%). Per quartile failures were 7, 2, 4, 0, respectively. Dacrocystography was performed in 77 patients (77.7%) at 6 weeks of which 44 (57.1%) were patent, 2 (2.6%) partially patent and 5 (6.49%) were initially occluded, but became patent post lacrimal system irrigation. A further 24 (31%) stents were completely occluded. CONCLUSION: The technical success rate was slightly inferior to some large published trials that used interventional radiologists previously experienced at nasolacrimal stent insertion. If, however, the first 31 patients are excluded then our success rate is comparable, suggesting a small but significant learning curve. Patency rates at 6 weeks were also marginally reduced compared with the literature, although there is little direct evidence for comparison. This is probably related to the lack of regular lacrimal system irrigation.

0910 The role of fetal MRI in assessing posterior fossa abnormalities detected by prenatal ultrasound

Wilding, L. J.•Fink, K.•Jan, W.•Lin, J.•Fox, G.•To, M.•Maxwell, D.

Guy's and St Thomas' NHS Trust, London, UK

PURPOSE: The antenatal ultrasound diagnosis of posterior fossa abnormalities is difficult and shows poor correlation with post mortem neuropathology. The aim of this study is to assess the role of fetal MRI in the further diagnosis of such abnormalities suggested by prenatal ultrasound. MATERIALS/METHODS: Between 2000 and 2003, 9 fetuses with the antenatal ultrasound diagnosis of a posterior fossa abnormality at Guy's and St Thomas' NHS Trust tertiary level obstetric unit were referred for fetal MRI. Neurodevelopmental assessment was performed at birth, 12 months and 24 months with postnatal imaging where clinically indicated. RESULTS: Within the 9 referred cases, antenatal MRI confirmed Dandy Walker Malformation in one case. Of the remainder, 2 cases were normal, 3 had abnormalities of the cerebellar vermis, 1 an enlarged cisterna magna, 1 an arachnoid cyst and 1 an enlarged fourth ventricle. Neurodevelopmental prognosis was generally good, the 2 cases with delay having associated congenital syndromes. CONCLUSION: Fetal MRI is useful in diagnosing posterior fossa abnormalities, allowing for more accurate prenatal counselling.

0920 Audit of CT head scans for patients on warfarin investigated for spontaneous intracranial haemorrhage

Popuri, R.[1]•Turnbull, I.[2]

[1]Manchester Radiology Training Scheme, Manchester, UK, [2]Hope Hospital, Manchester, UK

PURPOSE: CT head scanning is one of the most common special imaging procedures performed in any Radiology department. Of importance are those patients on warfarin where there is a request to perform CT head scans, often as an emergency investigation, to rule out spontaneous intracranial haemorrhage. The aims of our study are to determine if there is an increased incidence of spontaneous intracranial haemorrhage in patients on warfarin as compared with patients not receiving anticoagulants, and if yes, the level of INR below which anticoagulation doesn't pose an additional risk of ICH? MATERIALS/METHODS: The study group comprised of 160 patients on warfarin, being investigated for spontaneous intracranial haemorrhage (January 2000 to May 2006). A randomly selected group of 203 consecutive patients, not receiving anticoagulants, were selected as controls. The incidence of intracranial haemorrhage was calculated as a percentage of the respective total number from both groups. RESULTS: The incidence of spontaneous intracranial haemorrhage in the study group and control group was 6.40% and 6.25%, respectively. Of the patients with an INR $\leq$3.0; 4.8% had spontaneous ICH. The figure was 8.3% for patients with INR >3.0. Percentage of "out of hours" scans done in study group and control group was 29% and 37%, respectively. CONCLUSION: No appreciable difference was seen in the overall incidence of spontaneous intracranial haemorrhage between anticoagulated and non-anticoagulated patients. In particular there appears to be no increased incidence of spontaneous ICH in patients with an INR $\leq$3.0 and a slightly increased probability of bleeding in patients with INR>3.

0830–1010

Investigating the acute abdomen

0830 Invited review: Appendicitis/bowel obstruction

Krestin, G.

Erasmus MC, NL - 3000 Rotterdam, The Netherlands

KEY LEARNING OBJECTIVES: To discuss the imaging diagnosis of acute abdominal disorders focusing particularly on appendicitis, bowel obstruction and their differential diagnoses. DESCRIPTION: In its broadest sense, the acute abdomen refers to various disorders associated with more or less severe abdominal pain of rapid onset. The fact that emergency surgery is necessary in only one fourth of all patients hospitalized with an acute abdomen proves that the term "acute abdomen" is broadly defined and is used as a preliminary definition for acute abdominal pain until a definite diagnosis can be established. The leading symptoms of acute abdomen may direct the attention and determine the imaging modality that yields maximum of information. Acute appendicitis accounts for the majority of surgical cases of acute abdominal pain presenting to an emergency room. Overall sensitivity of unenhanced CT for the diagnosis of acute appendicitis has been reported to range between 93% and 98%, and

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specificity between 85% and 98%. Alternative diagnoses that should be differentiated from appendicitis are terminal ileitis, mesenteric lymphadenitis, ileo-cecal tuberculosis, perforated cecal diverticulitis and perforated Meckel's diverticulum. In bowel obstruction, CT not only allows localizing the level of obstruction but in many cases it also provides information on its aetiology. CONCLUSION: Multislice helical CT provides the combined advantages of speed and seamless coverage of the abdomen with outstanding spatial resolution. In many circumstances CT has become the gold standard and is even cost-effective as compared with other more time consuming and less accurate diagnostic modalities.

0900 Invited review: Trauma

Shanmuganathan, K.

University of Maryland Medical Center, Baltimore, MD, USA

Blunt bowel & mesenteric injuries are diagnostic challenge to the emergency radiologist and trauma surgeon. This lecture will demonstrate the various MDCT findings seen in patients with blunt bowel and mesenteric injury. Discuss the relevance of these findings to management. Discuss also the importance of communication of MDCT findings to the surgeon.

0930 Assessment of the effect of double reporting of minimal-preparation CT colons

Murphy, R. C.•Bungay, H.•Ferrett, C.•Slater, A.•Uberoi, R.

Department of Radiology, John Radcliffe Hospital, Oxford, UK

PURPOSE: Double reporting has been shown to reduce perception errors in a variety of radiological investigations. Minimal-preparation CT colon is a useful test for the frail elderly who tolerate full bowel preparation poorly. It is better tolerated by patients and identifies extracolonic pathology. This study quantifies the perception error reduction found by double reporting. MATERIALS/METHODS: A prospective cohort of 186 patients undergoing minimal-preparation CT colon in a single unit for lower gastrointestinal symptoms was double reported. Radiologists were blinded to each report. Reports were recorded on a standardized proforma. Data for each report was divided into clinically significant and clinically insignificant information. Each study was analysed for discrepancies. A significant colonic lesion was defined as one where direct endoscopic visualization was recommended. A clinically significant lesion was one where the finding could impact on future patient management. RESULTS: Differences were seen in 67% (124/186) reports. 13% (24/186) of patients had a significant colonic lesion – 7 of these lesions were missed on single reporting. 21% (39/186) of patients had at least one clinically significant finding absent on a report. Some reports had more than one significant extracolonic finding missed (range 1–3). CONCLUSION: A high number of abnormalities with the potential to affect patient care were not reported. These included colonic lesions. This study suggests the need for double reporting of minimal-preparation CT colons. We found that double reporting improved pick up of significant pathology. However, achieving this increase in patient care has impact on manpower and delivery of service.

0940 Experience of MRI of the bowel in Sandwell District General Hospital

Slaney, C. J.•Donovan, R.

Sandwell and West Birmingham NHS Trust, Birmingham, UK

PURPOSE: To review the effectiveness of MRI of the bowel with minimal preparation. MRI of the bowel is normally performed with enteroclysis. In this department, MRI of the abdomen was performed after encouraging an increased fluid intake for 6–8 h prior to the examination, with no oral contrast agent. METHODS: 43 patients underwent abdominal MRI for investigation of bowel symptoms or follow up of bowel disease. T_1 VIBE and gradient echo sequences, T_2 HASTE and HASTE fat saturated images were obtained. 19 patients also had a comparative barium study. The results of the barium studies and MRI examinations were reviewed. RESULTS: 12 MRI studies were reported as demonstrating no pathological features. 18 patients had changes within the small or large bowel using minimal preparation. 9 patients had mesenteric changes including lymphadenopathy and 6 patients had free fluid or collections. Of the 19 patients who additionally underwent a barium investigation, the diagnosis remained the same in 11 patients. 5 patients had additional findings on the MRI study and in 3 patients additional features were visible only on the barium study. CONCLUSIONS: MRI with minimal preparation offers a viable alternative to barium examination without the radiation dose or discomfort involved with a barium study. It also allows improved evaluation of the surrounding mesentery and other intra-abdominal organs.

0950 Shocking behaviour of the intestine!! The mechanism of intussusception exposed

Arun, C.

Diagnostic Imaging, Oxford University, Oxford, UK

PURPOSE: Nowadays, the preferred and needless to say, ideal treatment for pre-operatively diagnosed intussusception is hydrostatic reduction by the radiologist. Following on from our previous work presented elsewhere,(http://www.dfd2005.northwestern.edu/PosterEntries.pdf), in order to unravel the nature of this curious behaviour of hollow smooth muscle viscera, we undertook this simulation study. MATERIALS/METHODS: In the past, it has correctly been recognized (Reymond RD. Br J Radiol 1972;45:1–7) that experimental investigation of intussusception in technically infeasible. We computationally modelled intestinal peristaltic contractions as linear waves that are capable of nonlinear steepening upon encountering an obstacle. A modified form of the Burgers equation for this purpose. RESULTS: We find that from thermodynamic considerations, only circular waves (not longitudinal waves) of peristalsis can lead to intussusception. We find that intussusception is the end result of non-linear steepening of a linear wave in soft matter. Whereas with notional continua such as gases and liquids, a wave will break after overtopping due to its surface tension force being exceeded, in the case of soft matter, the shock is followed by an overlap of contiguous portions of hollow viscera. The soft matter analogue of the typical *N*-wave of gas-dynamic shock can be demonstrated as well. CONCLUSION: Intussusception is the consequence of a shock wave phenomenon in automotive soft matter. While this finding may come as a shock to many, the privilege of preventing the horror of intestinal gangrene and septic shock now rests with the radiologist!

0830–1000

Update on contrast medium

0830 Invited review: Contrast nephrotoxicity

Morcos, S.

Northern General Hospital, Sheffield, UK

Contrast media nephrotoxicity (CMN) remains an important complication of intravascular administration of contrast media (CM). Risk factors for CMN include raised creatinine levels, particularly due to diabetic nephropathy, dehydration, congestive cardiac failure, age over 70 years and concurrent administration of nephrotoxic drugs, such as non-steroidal anti-inflammatory drugs. Patients at risk of CMN should be identified prior to CM adminstration. If the administration of CM is deemed necessary in patients at high risk of CMN, volume expansion should be offered and the smallest possible dose of either non ionic iso-osmolar dimeric or non ionic low osmmolar monomeric CM should be used. Prophylactic administration of fenoldopam or acetylcysteine has not offered consistent protection against CMN. Sodium bicarbonate infusion has been shown to reduce the risk of CMN in one study. Haemofiltration for several hours before and after CM injection may offer good protection against CMN in patients with advanced renal disease requiring angiographic procedures. Prophylactic haemodialysis does not offer any protection against CMN. The use of gadolinium CM for radiographic examinations in preference to iodinated CM to reduce the risk of CMN is not advised. Gadolinium CM are more nephrotoxic than iodinated CM at equivalent X-ray attenuating doses.

0850 MRI contrast agents: mechanisms, chemistry, future

Dawson, P.

University College Hospital, London, UK

The chemistry, pharmacology and mechanisms of action of MRI agents will be comprehensively reviewed. Likely future developments will be surveyed.

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0910 Invited review: Ultrasound contrast

Sidhu, P.

King's College Hospital, London, UK

From the introduction of microbubble ultrasound contrast in the early 90s, there has been tremendous development in the technical aspects and clinical use of ultrasound contrast agents. The initial use was "Doppler rescue", particularly useful in the depiction of the abdominal vasculature, intracranial vessels and intraventricular lumen delineation in echocardiography. Attempts at characterizing focal liver lesions were dependent upon the vessel distribution in the lesions; a highly subjective method. In the late 90s, technical developments with ultrasound wave propagation and detection led to the development of pulse inversion techniques allowing for low mechanical index imaging. First generation microbubble contrast agents were not suitable for this technique, but the second generation more stable microbubble contrast agents allowed for continuous low mechanical index imaging of focal liver lesions. This allowed for characterization of focal liver lesions in the arterial, portal-venous and late portal phases. This is now well established and has proved to be extremely accurate. In addition, microbubble contrast agents continue to be used in Doppler rescue techniques, particularly in echocardiography and intracranial Doppler imaging. However, there are many other clinical uses for microbubble contrast agents, particularly in the assessment of renal and splenic lesions and also increasingly in the assessment of blunt abdominal trauma. The unique properties of microbubble contrast agents also allow for more esoteric imaging to be performed. There is a niche use in the treatment of vascular thrombus, in targeted gene therapy and drug delivery. Microbubble contrast agents are also finding a role in molecular imaging.

0930 Invited review: Contrast reactions – current thinking

Dawson, P.

University College Hospital, London, UK

The chemistry, pharmacology and mechanisms of action of MRI agents will be comprehensively reviewed. Likely future developments will be surveyed.

0950 Discussion

0830–1020
Target Delivery

0830 Invited review: Reducing elective waits – delivering 18 week pathways for patients

Robinson, P.

Department of Health, London, UK

PURPOSE: To present the latest news and views of the national 18 weeks Delivery Programme. MATERIALS/METHODS: Presentation will cover: Understanding the background to 18 Weeks and what it will mean for patients, the NHS and the public; Assessing the scale of the challenge nationally for delivery – sharing outcomes of Referral to Treatment data collection; Updating from the national programme and national projects to support local strategies; Highlighting priority areas of work for 07/08 and beyond.

0855 Invited review: The role of imaging in achieving cancer targets

Kershaw, M.

East Kent Hospitals Trust, Canterbury, UK

No abstract supplied.

0920 Invited review: Knowing your capacity

Shouls, S.

NHS Institute for Motivation and Improvement, Coventry, UK

No abstract supplied.

0945 Invited review: Achieving targets while improving quality

Cavanagh, P.

Taunton & Somerset NHS Trust, Somerset, UK

There are three key components in delivering healthcare: quality, access and efficiency. There is a strong feeling amongst the clinical staff that there has been too much focus on waiting times (access) and financial balance (efficiency) and not enough concern on quality (especially patient safety). It has often been said that if you want quality you have to pay for it. However, when we look beyond healthcare there is evidence that quality and efficiency are not competing agendas. In addition, there is further evidence from patient safety initiatives that high quality systems actually save money whilst enhancing the reputation of the organization. Quality is now becoming a key driver in healthcare service improvement now that access times are no longer the major concern of the public. This presentation discusses how we can improve quality whilst achieving access and efficiency targets with reference to evidence-based literature and case studies.

1010 Discussion

0830–1000
Managing the Digital Environment I

0830 Invited review: National Programme user's story I: Experience of the first wave

McGee, S.

Salisbury District Hospital, Salisbury, UK

KEY LEARNING OBJECTIVES: The requirements for a successful PACS/RIS implementation under the national programme are enormously complex, not only because of the fundamental process and work culture changes it demands of an organization, but also because of the number of different agencies involved in delivering the technology. DESCRIPTION: How was it for you? A frank and unexpurgated account of the pains and gains of a "big bang" simultaneous PACS/RIS implementation in the earliest stages of the national programme. With the dust starting to settle, a look to the hopes and fears of the future. CONCLUSION: Be afraid, be very afraid... but it can be made to work?

0900 Invited review: National Programme user's story II: Implementation across a cluster

Blanchard, T.

South West Peninsula Strategic Health Authority, East Exeter, UK

DESCRIPTION: An anecdotal account of some of the highs and lows of the LSP PACS and RIS deployments across the South West. The main challenges faced by both the trusts and CfH in deploying such a large project, *e.g.* resources and domain working. The key lessons learned and those that can be applied to other NPfIT projects. The relationship with the LSP and the subcontractors; how it developed on the ground from the start of deployment through service management. What worked well, *e.g.* clinical involvement, issue resolution, experience sharing, multidisciplinary project teams and service support. Why it has not fulfilled what it intended in image sharing and bundled applications. Future directions and why the story does not finish at the end of the deployment phase. When and how PACS will integrate with the rest of the NPfIT. How the success of PACS has raised expectations in the wider health community. How the scope of PACS functionality has already started to extend into other "ologies". SUMMARY: Was it worth it? Despite the struggles, the projects were all successfully implemented and the SW is now almost "filmless". Virtually all sites in the SW going live on time or even earlier than planned. Clinical feedback has been very good, with a considerable improvements to the radiology service locally, and soon regionally and beyond.

0930 National PACS Team "lessons learned and next steps forward"

Barber, M. Jennings, D.

NHS Connecting for Health, Leeds, UK

No abstract supplied.

0830–1000
Advances in cartilage imaging

0830 Invited review: Latest developments in cartilage imaging techniques

Jenkins, J.

Manchester Royal Infirmary, Manchester, UK

Imaging of articular cartilage has assumed an increase in importance

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with the advent of new surgical and pharmaceutical treatments for osteoarthritis and cartilage injury. It is important to have a clear understanding of the structure and function of articular cartilage and subchondral bone in order to detect early changes. Whilst the plain radiograph is useful in demonstrating advanced osteoarthritis, its early detection requires the use of more complex imaging techniques. The pre-treatment evaluation of traumatic, degenerative and inflammatory articular cartilage changes requires the use of MRI or CT arthrography, with ultrasound (+ Doppler) used to assess the peripheral small joints. There is an array of MR techniques available for imaging articular cartilage. Standard techniques using spin echo and gradient echo sequences, which require optimization, with newer methods including faster data acquisition and higher resolution provide detailed review of cartilage in the clinical setting. Further advances have been achieved with higher field strength magnet systems (3 T), the use of physiological and quantitative imaging with T_2 mapping, contrast-enhanced T_1 mapping and diffusion-weighted imaging, and the development of isotropic 3D MRI allowing virtual arthroscopy. Sodium MR has recently shown promising results in cartilage imaging, based on the ability of sodium imaging to depict regions of glycosaminoglycan depletion. These latter techniques will be particularly useful in the assessment of cartilage grafts.

0855 Invited review: Imaging cartilage and drug development

Waterton, J.

AstraZeneca, Macclesfield, UK

PURPOSE: Osteoarthritis (OA) is a significant cause of disability. There is an urgent need for new therapies which prevent disease progression. Because of slow disease progression, pivotal Phase III clinical trials are usually large and protracted. The development of new drugs would be greatly assisted by biomarkers to provide preliminary evidence of pharmacological efficacy in early small-scale Phase II clinical trials. In this context, measures from imaging techniques such as MRI are now themselves regarded as biomarkers. Since OA is characterized by focal loss of articular cartilage, particularly in weight-bearing joints, the development and evaluation of MR techniques for assessing tiny morphologic changes in hip and knee cartilage is a priority. METHODS: Techniques based on 3D fat-suppressed gradient echo techniques have been developed and deployed at 1.5 T and 3 T. Extremely precise image segmentation methods have been deployed, with quantitative focal analyses (using, *e.g.* Statistical Shape Modelling). In addition to this clinical work, preclinical studies have been performed to permit evaluation of MRI biomarkers with candidate drugs before trialling in man. RESULTS: Following studies of reproducibility, and imaging-histopathology correlation, we and other investigators have measured rates of cartilage loss in the region of 4% per year, particularly with focal analyses in OA patients with risk factors for rapid progression. In pre-clinical studies the loss of cartilage was slowed following therapeutic intervention. CONCLUSION: When used appropriately, MRI analyses of cartilage thickness maps can be considered a qualified biomarker for the early evaluation of structure-modifying therapies in osteoarthritis.

0920 Surgical cartilage transplants and the role of imaging

Hirst, P.

Manchester Royal Infirmary, Manchester, UK

No abstract supplied.

0945 Discussion

0830–0950
Skill mix scientific session

0830 Development and audit of a nurse led hysterosalpingography service

Barter, S. J.•York, A.•Wallace, R.

Bedford Hospital NHS Trust, Bedford, UK

KEY LEARNING OBJECTIVES: Utilization of extended nursing role to fulfil NICE guidance on hysterosalpingography. DESCRIPTION: In 2004 NICE published guidance on infertility recommending hysterosalpingography (HSG) for assessment of tubal patency. Our department had a well developed HSG service led by a consultant radiologist, but the marked increase in referrals coupled with a shortfall in consultant staffing led to a dramatic increase in waiting times which was distressing to patients although not seen as a Trust priority. In order to resolve the issue, a radiology nursing sister was trained in the technique. After fulfilling competencies (including physiology of the menstrual cycle, anatomy, pathology and radiation protection) developed by the radiologist and gynaecologist, and undertaking 50 supervised cases, the sister now runs the service, performing a list of 6 patients on average per week. The radiologist is present in the department during the list, and reports the studies with the sister present. All cases performed to date have been audited, for the following: Rate of failure of cervical cannulation requiring consultant intervention. Rate of undiagnostic images. Complication rate. Radiation dose. Results showed that for most parameters the nursing sister's performance equalled that of the radiologist, apart from a small percentage of cases initially where there was a failure to obtain images showing convincing intraperitoneal spill. This was partially because the image intensification image in our unit is sub-optimal. CONCLUSION: Delegation of the hysterosalpingogram service to a Radiology nursing sister is a cost effective way of delivering the service.

0840 Barium enema reporting by radiographers: evaluation of work based learning

Howard, M. L.•Forsyth, L.

The Robert Gordon University, Aberdeen, UK

In 2005, NHS Education for Scotland commissioned development of a small number of postgraduate programmes for Radiographers, to be delivered utilizing an entirely work based learning format. The aim of this initiative is to provide access to development opportunities for Scotland's diverse geographical Radiography community, while minimizing the necessity for absence from the clinical department. PURPOSE: To evaluate the effectiveness of the first cohort studying barium enema reporting through work based learning delivery. METHODS: This work in progress evaluation is currently being undertaken by questionnaire to all students and employers across five clinical centres. Full data collection and analysis will be completed by April 2007. RESULTS: Statistical analysis of qualitative and quantitative data will identify the strengths and limitations of the image interpretation teaching approach. CONCLUSION: Wholly work based learning is a radically new delivery method for Radiographer Reporting but further development must be underpinned by evidence supporting its effectiveness. If successful, the work based learning format may create opportunities for other subjects to be taught across the multidisciplinary team using a similar delivery format.

0850 Is there a difference in accuracy between a 'hot' and 'cold' radiographer-led reporting system?

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PURPOSE: To compare the accuracy, sensitivity and specificity of radiographer-led "hot" and "cold" reporting systems. MATERIALS/METHODS: A random sample of 601 "cold" and 158 "hot" reported cases were collected over a 2 month period from an original population of 1439 "cold" and 158 "hot" reported cases. All cases were musculoskeletal, had been referred from the Accident and Emergency Department, and were reported on by a Clinical Specialist Radiographer. Both samples were re-reported on by a reference standard following agreed guidelines, and cases where there was a difference of opinion were examined by an independent arbiter. RESULTS: Results demonstrated that for the "hot" reporting system the sensitivity, specificity and accuracy were 100%, 100% and 100%, respectively. For the "cold" reporting system the same variables were 95.6%, 99.2% and 98.8%, respectively. There was no statistically significant difference (p=0.05) between the two systems. CONCLUSION: There was no difference in performance of the clinical specialist radiographer when "hot" and "cold" reporting the musculoskeletal system in the A&E setting.

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0900 How medical confidence in the ability of radiographers to hot report plain film trauma has been achieved using audit as a tool

Blower, C.•Field, S.•Hacking, L.

BFW NHS Trust, Blackpool, UK

INTRODUCTION: At the Blackpool Victoria Hospital in 2001 two plain film reporting radiographers were employed using monies identified to address the 4 h target in the accident and emergency department. The X-ray department changed to a CR, PACS and a filmless environment at this time. The radiographers were employed to, in the long term, provide hot reports for all skeletal and axial trauma on adult and paediatric patients. As a condition of this role and to give the radiologists, A/E consultants and referrers confidence in the radiographer's ability it was agreed that a Consultant Radiologist was to be responsible for auditing the accuracy of the radiographer's reports. PROCESS: This presentation is based on the consultant involvement in the audit process, training provided and the outcome that has seen radiographer's reporting competency improve from the initial combined error rate of 5% to 1.7%. The reporting radiographers are now responsible for approximately 30 000 trauma reports annually. The Radiologists and A&E consultants have acknowledged the reporting radiographer's competency as a direct consequence of the audit method. OUTCOME: The vision for the near future involves the reporting radiographers, A&E nurse practitioners and A&E physiotherapists working as a team assessing, diagnosing, treating and managing skeletal trauma.

0910 First hand experiences of MR Radiographer reporting

Vosper, R. C.

Hinchingbrooke Healthcare NHS Trust, Huntingdon, Cambs, UK

KEY LEARNING OBJECTIVES: The presentation will describe the first hand experiences of introducing radiographer MR reporting from the development of the business case through to the integration of autonomous radiographer led MRI lists onto the radiologist's rota. DESCRIPTION: During the presentation I will cover the ups and downs of studying for a PgC in MRI clinical reporting, mentoring issues, the pitfalls and prejudices which I encountered. Along the studying journey I will describe how I integrated my reporting sessions while maintaining my clinical scanning role, back fill, arranging double reporting and mentoring sessions with my radiologist mentor. The presentation will focus on the post qualification mentoring process to get my "wings", trust indemnity and the audit process we use at Hinchingbrooke Hospital. It will also cover the resultant increase in MRI scanning capacity and the reduction in the MRI waiting list as a result of autonomous radiographer MRI reporting. Figures will be presented to show the financial incentive for the trust and the cost pressures which were experienced, the percentage of MRI exams which are reported by a MR radiographer and the audit results of radiographer versus radiologist MRI reports. CONCLUSION: It will conclude with the departments aims for the future development of radiographer MRI reporting.

0920 Cranial computed tomography reporting by radiographers: the impact on service delivery and professional development

Clarkson, L. M.

University of Bradford, Bradford, UK

PURPOSE: Radiographer reporting of CT head scans has been a necessary evolution within radiology. It was a response to an acknowledged national shortage of radiologists and an increase in the number of cranial CT scans being requested due to introduction of new guidance. This study looks at the impact on local service delivery following the qualification of postgraduate radiographers from the University of Bradford. It also examines the radiographer's personal professional development. MATERIALS/METHODS: Four cohorts of students, (n=55), who undertook a Postgraduate certificate/diploma in Cranial CT reporting, from the University, were followed up post qualification, to determine if they were reporting and if this had impacted on service delivery/waiting times. They were also questioned on the effect on their personal development and in particular within Agenda for Change. A questionnaire was initially posted to the radiographers and followed up by a telephone interview. RESULTS: 75% were reporting in different areas of the UK. Improvements were seen in service delivery: reduction in outpatients waiting lists by working extended days, stroke and TIA clinic provision increased, immediate reports returned with inpatients and a more efficient use of radiologists time. Personal development: 50% had been given a reporting allowance, 46% had been upgraded during Agenda for Change, and 4% had no change in status. CONCLUSION: Radiographer reporting of cranial CT head scans can significantly improve service delivery and waiting times. It can also be of personal benefit to the individual radiographer in terms of professional recognition and development.

0930 Radiographer trauma reporting service within the South Tees Hospitals Trust

Whittam, K.•Cox, B.•Webster, J.

The James Cook University Hospital, Middlesbrough, UK

PURPOSE: The aim of the unique Radiographer led Accident & Emergency Musculo-Skeletal Reporting service at South Tees NHS Hospitals Trust was to increase productivity, accuracy and timeliness of the reporting service for two A&E and 5 minor injury units, where there are over 100 000 referrals per annum. All A&E MSK images (38 647 in 2005–2006) are now reported by radiographers. METHODS: The A&E Radiology Team has embraced the technological advances (of a fully integrated Radiology Information System, Computerized Radiography, Picture Archiving & Communication System and Voice Recognition) to help achieve successful compliance with the Government's 4 h A&E waiting time target. RESULTS: Audit of workload showed a large increase of 53% in work done year on year: 2004–2005 = 31 764 examinations; 2005–2006 = 38 647 examinations; 2006–2007 = 34 296 to date. The annual audit showed: Accuracy 99.2% Sensitivity 98.3% Specificity 99.6%; Independent audit of all MSK A&E examinations at JCUH showed an accuracy of 99.9%; Voice recognition accuracy audit showed a 1.4% minor wording discrepancy, with no significant discrepancies. CONCLUSION: The A&E MSK trauma reporting service provided by radiographers at the South Tees Hospitals NHS Trust has changed dramatically in the 3 years since merging of cross site district hospitals; incorporating technological advances; change in working practices and significant increase in workload. Within this changing environment a timely, accurate and efficient service has continued to be provided by a dedicated team. The team feel there are still areas to develop and are considering new working practices

0940 Reporting of chest radiographs by radiographers: too little, too late

Sonnex, E. P.•Coulden, R. A. R.

University Hospital of Leicester, Glenfield Hospital, UK

PURPOSE: Reporting by radiographers is a well established, well respected part of routine radiology practice. In the days of acute shortages of radiologists, radiographer reporting was embraced as a way of improving throughput and reaching targets. Many areas of radiology including axial and skeletal, mammography, gastrointestinal, ultrasound and more recently, plain chest radiographs have been reported by appropriately trained radiographers. While reporting by radiographers has been accepted on the whole, plain chest radiograph reporting by radiographers has been slow to get going and is not widely available. But now, with the advent of Radiology Academies and the increased numbers of junior radiologists in training, this shortage of radiologists has come to an end. Will this affect the new working practices of radiographers in radiology departments? METHOD: We examine working practices of radiographers trained in plain film reporting of chest radiographs and how these have been affected by the influx of radiologists and radiologists in training. CONCLUSION: Reporting of chest radiographs by radiographers lagged behind other reporting tasks by radiographers but, by this slow take-off, might now not be needed or every accepted as the norm.

0845–1015

Latest advances in MR imaging I

0845 Diffusion weighted imaging in the body (DWIBS)

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Until recently, diffusion weighted imaging (DWI) was almost exclusively used for neuro applications. More than 15 years ago, diffusion weighted imaging was introduced to detect the early onset of cytotoxic oedema in stroke based on changes in the cellular structure of infarcted tissue. Cellular densities and extracellular volume in malignant tumours also deviate from normal tissue. In particular, malignant tumours in the body tend to have a smaller extracellular space. Obviously, contrast based on changes in diffusivity of intracellular and extracellular water may contribute to detect or characterize malignant tumours. However, diffusion applications in the abdomen turned out to be impractical due to all kinds of distortions related to respiratory and peristaltic motion, air and other causes that render the area of interest less homogeneous than usually over a region confined to the brain. Parallel imaging techniques, such as SENSE (SENSitivity Encoding), changed this situation dramatically. Originally designed to reduce the scan time, SENSE can be used to shorten the length of the (single shot) data acquisition typically used in diffusion weighted imaging, with a concomitant benefit that distortion in these images becomes much less severe. Partially based on this principle, a totally new approach to diffusion weighted scans in the abdomen could be introduced: DWIBS (Diffusion weighted Whole body Imaging with Background Suppression). This new MRI sequence can obtain distortion free diffusion weighted images in the body even under free breathing conditions. Using a relatively long scan time, many thin slices over the region of interest can be obtained resulting in a three-dimensional "PET" like screening tool for (malignant) lesions. Recently, the technology has been combined with different values of diffusion weighting (b-factors) and new type of navigator that corrects for residual motion without prolonging the scan time. Principles of DWIBS, clinical applications and options for technical improvements will be discussed.

0915 Invited review: Applications for blood pool agents

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Glasgow Royal Infirmary, Glasgow, UK

No abstract supplied.

0945 The use of diffusion weighted MRI in the detection and confirmation of residual tumour following cone biopsy in early stage cerival cancer

Charles-Edwards, E. M.[1]•De Silva, S. S.[1]•Morgan, V. A.[1]•McWhinney, N.[2]•Katesmark, M.[2]•deSouza, N. M.[1]

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PURPOSE: In early cervical cancer, patients are often referred following positive cone biopsies which makes detection of residual tumour on T_2W images difficult. This pilot study determines the apparent diffusion coefficients (ADCs) of tumour compared with non-malignant cervical epithelium and evaluates the diagnostic potential of diffusion-weighted MRI in detecting residual tumour in patients with 1a/1b1 disease. MATERIALS/METHODS: Initially, 6 patients with stage 1b2 cervical tumours and 8 patients with CIN were examined. Using an endovaginal coil, T_2W fast spin-echo 4500/80 ms [TR/TE] (0.4 mm × 0.4 mm × 3 mm resolution) and diffusion-weighted 2500/69 ms [TR/TE] (2 mm × 2 mm × 4 mm resolution) images of the cervix were acquired using 4 b-values: 0 s mm^{-2}, 300 s mm^{-2}, 500 s mm^{-2} and 800 s mm^{-2}. Regions of interest (10 mm^2) were drawn on the ADC maps that corresponded to tumour and normal-appearing epithelium on the T_2W images. Subsequently, 7 patients with stage 1a-1b1 disease detected by previous cone biopsy were scored for presence of residual tumour on T_2W images alone followed by T_2W plus ADC maps. RESULTS: In patients with Ib2 disease, tumour ADCs (784±98 s mm^{-2}) were lower than non-malignant epithelium (1399±179 s mm^{-2}, p<0.05). No significant difference was seen between ADC of normal-appearing epithelium adjacent to tumour and epithelium in CIN patients (1290±138 s mm^{-2}). In patients with 1a/1b1 disease, diagnostic confidence was greater when T_2W and ADC data were combined. In one case tumour was detected solely by addition of ADC maps. Radiological interpretation proved consistent with subsequent pathology. CONCLUSION: DW-MRI is potentially useful for detecting or confirming the absence of residual cervical tumour following cone biopsy.

0955 Diffusion weighted imaging of androgen deprivation hormone therapy prostate cancer patients

Riches, S. F.•Morgan, V. A.•Payne, G. S.•Dearnaley, D.•deSouza, N. M.

Royal Marsden Foundation NHS Trust & Institute of Cancer Research, Sutton, UK

PURPOSE: To explore utility of diffusion-weighted MRI for monitoring treatment response in patients with prostate cancer by measuring the apparent diffusion coefficient (ADC) before and after 3 months of anti-androgen therapy. MATERIALS/METHODS: 13 men with biopsy-confirmed prostate cancer were scanned (Philips 1.5 T Intera) before and after 3 months of anti-androgen therapy. 12 axial diffusion-weighted images using 4 b-values were acquired on each occasion. ADCs were obtained for the peripheral zone (PZ), central gland (CG) and tumour (TU) and ADC ratios TU/PZ and CG/PZ calculated. RESULTS: PSA fell from 17±10 ng ml^{-1} (mean ± SD) to 0.9 ± 0.8 ng ml^{-1} after 3 months of anti-androgen therapy. Mean ADC was reduced after anti-androgen therapy in 9/13 CGs, 8/13 PZs and in both CG and PZ in 7/13 patients. Eight patients showed an increased TU ADC. The population averaged changes were not significant. However, TU/PZ ADC ratio was significantly increased after 3 months of anti-androgen therapy (p= 0.002) while CG/PZ ratio was not, indicating a greater effect of androgen deprivation on the tumour than on the rest of the gland, possibly due to greater structural changes within tumour tissue. CONCLUSION: Diffusion-weighted MRI shows differences in water diffusivity in non-malignant prostate as well as TU tissue before and after 3 months of anti-androgen therapy. The effects of androgen deprivation on the structure of tumour tissue is different to non-malignant tissue indicating that ADCs may prove a useful predictor of treatment response.

1005 Correlation of ADC values for areas of prostate cancer as defined by histopathology at prostatectomy

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PURPOSE: To determine the sensitivity and specificity of diffusion weighted magnetic resonance imaging (DW-MRI) for localizing prostate cancer when compared with histopathology at prostatectomy. METHOD: 10 patients imaged prior to prostatectomy underwent DW-MRI in addition to T_2W MRI. Patient characteristics were: age (57–76 years, mean 61.7 years), stage T1 (n=8)/T2 (n=2), Gleason Grade 3+3 (n=6), 4+3 (n=4), PSA 4.1–13.2 ng ml^{-1} (mean 8.0 ng ml^{-1}). A Philips Intera 1.5 T scanner and balloon endorectal coil was used to acquire T_2W FSE images in 3 orthogonal planes together with axial DW images with 4 b values (0s mm^{-2}, 300 s mm^{-2}, 500 s mm^{-2} and 800 s mm^{-2}). Following prostatectomy, histological sections with tumour regions of interest (ROIs) marked were morphed to the axial T_2W images which had whole gland and Central Gland (CG) outlined; these ROIs were then overlaid on the apparent diffusion coefficients (ADC) maps. ADCs from tumour regions, non-malignant Central Gland and non-malignant Peripheral Zone (PZ) were obtained. RESULTS: Isotropic ADCs were 1347.48 ± 147.63 for tumour regions, 1572.74 ± 83.86 for non-tumour PZ and 1454.60 ± 95.92 for non-tumour CG. There was significant difference in ADCs between groups (p=0.001) and between tumour and PZ (p=0.001) and between PZ and CG (p=0.009). CONCLUSION: The use of morphing techniques allows histologically defined tumour ROIs to be transferred to the MR data sets. We have shown that in agreement with previous findings, prostate cancer has a lower ADC than non-malignant PZ. This suggests that ADCs offer potential for increasing the sensitivity and specificity of MRI for detecting prostate cancers.

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1015–1145
Debate: Patients should not have the right to consent to digital storage of their data

1015 Speaking for the motion

Strickland, N.

Hammersmith Hospitals NHS Trust, London, UK

It will be argued that it is not appropriate for patients to have the right to consent to, or dissent from, the digital storage of their healthcare data (and in particular the digital storage of their imaging studies) within the setting of the NHS. Patients in the UK are fortunate to have access to free healthcare from the NHS. The aim of this service is to provide the best level of healthcare possible to the maximum number of people, balancing this with severe economic constraints which will inevitably be manifest in any public service. Digital storage of imaging data (if implemented properly!) is the most efficient modern means of storing and accessing such large quantities of data. It would be uneconomic and unnecessary to offer an "opt out" alternative in which the health data of dissenting patients is not stored digitally. There are numerous examples of other areas of our lives in which our personal data are stored digitally and we are given no choice in the matter: for example the records for our passports, personal banking and credit card data, council tax data, electoral role information, personal inland revenue income tax data, etc. It would be illegal to opt out of many such systems, especially the payment of income tax. Parallels will be drawn during this debate between the NHS

1035 Speaking against the motion

Videlo, D.

St Martin's College, Lancaster, UK

No abstract supplied.

1055 Seconding for the motion

Dubbins, P.

Plymouth Hospitals NHS Trust, Plymouth, UK

1105 Seconding against the motion

Challen, V.

Health information is data of a most sensitive and personal nature about a patient and its privacy is of paramount importance. Such data serves the patient's interests in that it provides the means for healthcare professionals to provide individual seamless care whilst enabling the retaining facility to carry out administrative and audit activities. The storage of such information raises many issues related to both patient confidentiality and data protection. If kept in an isolated separate sphere, such as a locked box or file protection can be maintained. Electronic data storage complicates these issues despite the uses of sophisticated methods of data protection including encryption and privacy enhancing technologies (PETs) the risks of wider access to personal information is inherent. Whilst the General Medical Council (GMC) has indicated that consent is not required for the recording of images such as X-rays and ultrasound with the UK Information Commissioner confirming that express consent for the processing of data is neither a legal or ethical requirement of the Data Protection Act (DPA) 1998 it would seem ethically prudent from a patients rights perspective that patents should know what the proposed uses and/or disclosures of personal data and to be informed of such. Consent to store data is likely to be required to meet common law requirements. Obtaining patient consent for the processing of data, which includes collection, use and disclosure, conforms with the four principles of medical ethics and should be recognized as a duty of confidence as well as good practice.

1115 Discussion

1015–1135
Service Redesign Scientific Session

1015 Can LEAN principles be used to improve turnaround and productivity in plain film reporting?

Wilson, P. R.•Jones, J. L.

County Hospital, Hereford, UK

PURPOSE: To demonstrate how LEAN principles can be used in a DGH Imaging Department to significantly reduce the turnaround time of plain film reporting and to increase overall productivity. MATERIALS/METHODS: Plain films still form the "bread and butter" work of all UK Imaging departments. There has of late been a focus on complex imaging modalities such as MRI and multislice CT. To some extent this has had a negative impact on plain film reporting. Over the past year we have applied LEAN principles to the whole process of plain film reporting. RESULTS: We have compared the turnaround times of reports and the number of films reported before LEAN principles were introduced with the current turnaround and productivity. We will show how fairly simple changes have improved the whole reporting process. CONCLUSION: Our results show that LEAN principles (which were first applied to industry) can genuinely be transferred to NHS Imaging departments with a very real improvement in turnaround times and productivity.

1025 The Redditch Radiology Re-design Project – project overview and mid-term results

Chui, S. L.

Worcestershire Acute Hospitals NHS Trust, Redditch, UK

KEY LEARNING OBJECTIVES: Successful change requires staff engagement at all levels; A better service need not cost more; How things are changed is as important as what is changed. DESCRIPTION: Prompted by long waiting-times, low staff morale and impending "Patient Choice" targets, the radiology staff initiated a medium-term service re-design project at the Alexandra Hospital, Redditch, in September 2005. Using opinions and ideas from all staff, a long-term departmental vision was formulated. Our strategy was to engage staff at all levels to transform the entire radiology service including all imaging modalities and the whole patient pathway from appointment booking to report typing. Increasing work flow and not pure utilisation was emphasised. We implemented real-time demand data collection for capacity planning. Small groups of staff, drawn from all corners of the department, were trained in the value of demand and capacity data and Lean methodology. They were then given the opportunity to apply these to their own work. We chose performance parameters to monitor workflow with feedback of results to staff. Workflows were re-designed when new technologies were introduced. By the end of 2006, despite a reduction in staff and reduced resources, waiting times for routine CT, ultrasound, barium enema, IVU and MRI examinations had fallen from 15, 32, 32, 32 and 23 weeks to 2, 3, 2, 1 and 10 weeks, respectively. Mean report (all reports) turnaround time fell from 14.5 days to 0.8 days. CONCLUSION: The greatest capacity for successful change comes not from new technology but from the staff.

1035 The Redditch Radiology Re-design Project – the fluoroscopist's tale

Hampton, J. D. J.•Chui, S. L.

The Alexandra Hospital, Redditch, UK

PURPOSE: In January 2006 waiting times for Barium Enemas and IVUs were 20 weeks and 15 weeks, respectively. We set up a sub-group to address this within the Redditch Radiology Redesign project. MATERIALS/METHODS: A radiologist with an interest in service delivery arranged monthly training meetings with lead radiographers on capacity and demand theory and Lean principles. Continuous appropriate data collection quantified the increase in capacity required to meet demand and clear the backlog. The radiologist covering a fluoroscopy list also covers IVUs. Cancelled lists due to consultant leave left unused capacity. Two barium enema trained advanced practitioners had potential spare capacity, but this was unused due to radiologists' concerns about the additional reporting workload. With directorate agreement, the introduction of PACS and careful distribution of examinations, this was easily absorbed. An advanced practitioner with an IVU PGC had not been utilized in this respect. The directorate agreed that this radiographer could supervise IVUs which were again equally distributed for reporting. The lead radiographer was given autonomy and flexibility to identify and utilise unused capacity. The appointments clerk filled cancellations immediately to avoid wasted slots. RESULTS: There was a dramatic fall in waiting

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times for both examination types over four months. There is no current waiting list at present. CONCLUSION: Teamwork is a fundamental factor. It is essential that all staff recognize they have a part to play in reducing waiting lists from reception staff to radiologist report. Spare capacity existed within the system but required teamwork to release.

1045 The Redditch Radiology Re-design Project – the sonographers tale

Hill, D.•Jenkins, F. H.•Chui, S. L.

Worcestershire Acute Hospitals NHS Trust, Redditch, UK

PURPOSE: A multidisciplinary group was set up to address long waiting times in ultrasound as part of a wider departmental whole service improvement project. MATERIALS/METHODS: The Alexandra Hospital and Princess of Wales Community Hospital provide a general ultrasound service as part of the Acute Trust. A number of actions have produced a positive effect on waiting times including: Engaging the staff as a group, defining a common goal and using real-time demand data for capacity planning. Ensuring any one stop carve out slots were always filled. The use of Lean techniques to develop a fast "green" stream service ensuring continuous flow of general work. The introduction of direct bookings on the community sites for GP and OPD patients. Asking patients to attend 5–10 min early to allow for parking etc thus keeping lists running on time. All staff were given opportunities to redesign their own lists ensuring efficient running. Continually targeting long waiters and weekly validating the waiting list. This combination of actions has seen a rise in activity and reduction in waiting times which is sustainable without putting undue pressure on the staff or the service. RESULTS: Waits for routine examinations fell from a peak of 32 weeks at the start of the project to 3 weeks by the end of 2006. Waiting times continue to fall. CONCLUSION: Fully involving staff in working towards clearly defined and well communicated goals encourages engagement making small changes and actions much more effective and sustainable.

1055 Chasing the goal posts – how we met the challenge

Vosper, R. C. Newman, P.

Hinchingbrooke Healthcare NHS Trust, Huntingdon, Cambs, UK

KEY LEARNING OBJECTIVES: Despite being faced with a constantly rising MRI & CT waiting list, pressures of government targets, a unique financial position within the East of England, multidisciplinary staffing issues and potential destabilisation of services we became one of the 8% who achieved "excellent" in the acute hospitals review. DESCRIPTION: In the summer of 2005 we had a MRI & CT waiting list of 26 weeks and 18 weeks, respectively. Discussions with the Hunts PCT developed a plan in which we were tasked with the objective of achieving a 1–2 week wait. The next stage was to work on a new appointments system along with a 6 week radiologist rota and develop the roles of the core MRI & CT radiographers. All this while being subjected to financial reviews, intense media pressure and identified as the smallest DGH in the east of England with one of the largest deficits relative to our annual turnover – a roller coaster of a year, with fear of redundancy a real threat, potential closure of the hospital and or transfer of major services elsewhere. CONCLUSION: We are now moving along the remodelling path, having survived the negative press it is business as usual, we have achieved the 1–2 week wait, and are attracting new business. A good position to be in as national tariff is just round the corner – but who knows what the future will bring, the goal posts are constantly moving, will we ever catch them up?

1105 Just how much can you squeeze out of an MRI unit

Griffin, K. M.•Griffiths, S.

Medway Maritime Hospital, Gillingham, UK

Whilst much has already been said of the throughput of NHS MRI scanners and of the provision of scanning capacity by the private sector, some complain that a lack of resource within the NHS is to blame. This may or may not be so, but how much of the potential capacity is utilized? Medway MRI looked at every available aspect to meet the ever tightening waiting time targets. Set this against the usual constraints of no money and an ageing scanner and it becomes a steep hill to climb. Mindful of the DOH estimate of 4000+ examinations p.a. being the benchmark of good practice per magnet, Medway have now moved up to 7200 examinations per annum using two Reporting Radiographers, two Specialist MRI Radiographers and two Assistant Practitioners. There has been no use of their private sector scanning quota for over a year – it would have increased the patient waiting time. The work schedule and hours were offered to the staff as a temporary experiment but no-one wishes to revert to the old system. Everyone is better off by doing more. Good for the Patient. Good for the Hospital.

1115 Effect of PACS (Picture Archiving and Communication System) on reporting times

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PURPOSE: To ascertain the time to report plain films and specialist modality films before and after the implementation of PACS at our institution in July 2003. MATERIALS/METHODS: Data was obtained from the Radiology Information System. Reporting times were obtained for the same 3 month period (February–April) each year for 5 years (2002–2006). Reporting time was defined as time elapsed (in days) between performing the imaging examination until a typed report is available to referring clinician. Plain films were divided into Inpatient (IP), Outpatient (OP), A&E and GP. Specialist modality films included CT, MRI, Ultrasound and Nuclear Medicine (NM). RESULTS: Comparisons are made between 2002 (pre-PACS) and 2006. Plain Films: An almost 2-fold increase was seen in IP films performed per month (2254 to 3879). OP films performed increased by 39% (2069 to 2885). GP (1350) and A&E (3000) remained stable. Significant reductions were seen in reporting times for OP (13.6 days to 8.7 days), IP (6.2 days to 2.6 days) and A&E (3.9 days to 3.3 days) (all $p<0.001$ Wilcoxon Rank). GP reporting times have remained stable at 1.3 days. Specialist Modality Films: Number performed has increased, especially CT (698 in 2002 to 1409/month in 2006). CT reporting times have remained stable at 2.0 days, MRI reporting times increased (4.6 days to 7.5 days) and both ultrasound and NM significantly decreased (2.2 days to 1.3 days and 6.4 days to 2.6 days, respectively; $p<0.001$). CONCLUSION: Despite the increase in workload between 2002 and 2006, reporting times have reduced since the advent of PACS.

1125 Advanced diagnostic ultrasound in microgravity (ADUM), onboard proficiency enhancer (OPE) and application to terrestrial situations

Tran, L.[1]•Hamilton, D.[2]•Dulchavsky, S.[3]•Melton, S.[2]•Sargsyan, A.[2]

[1]Schulich School of Medicine, University of Western Ontario, London, ON, Canada, [2]NASA Johnson Space Center, Houston, TX, USA, [3]Henry Ford Hospital, Detroit, MI, USA

PURPOSE: To examine the image quality of ADUM captured on the International Space Station (ISS). To assess OPE's utility in training astronauts and cosmonauts to scan with remote guidance from ground experts at the National Aeronautics and Space Administration (NASA). To demonstrate that ADUM and OPE technology can be applied to terrestrial situations. METHODS: ISS crews received ground-based training at NASA Johnson Space Center on ultrasound principles, remote guidance and equipment setup with hands-on ultrasound scanning prior to on-orbit scanning. On-orbit ultrasound images were interpreted by NASA radiology experts and independent consultants. Data are being reviewed to determine OPE's utility. RESULTS: ISS Expeditions 8–11 have completed comprehensive cardiothoracic, abdominal and musculoskeletal exams and limited scans of dental, sinus and eye structures. Crews with minimal training and audio guidance from experts produced ultrasound images of diagnostic quality. To date, 13 out of 18 OPE sessions have been analysed with crews stating that OPE is easy to use, intuitive and value added. CONCLUSION: OPE versions limited to musculoskeletal scans have already been used by trainers for the National Hockey League's Detroit Red Wings and by the United States Olympic Committee at the Torino 2006 Olympics to maintain their athletes' health. It is expected that ADUM and OPE can also be applied to telemedicine in rural and remote areas, disaster relief, developing countries and the military to save lives, decrease morbidity and reduce costs. A pilot project is in the works to apply ADUM and OPE to rural/remote areas in Southwestern Ontario.

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1030–1145
Neuroradiology SFG II

1030 Diagnosis of adult stroke and new clinical guidelines

White, P.

Western General Hospital, Edinburgh, UK

PURPOSE: to describe investigative pathways for stroke and emerging UK guidelines in this field. METHODS: Standard imaging protocols and modalities for stroke will be explored and some "atypical stroke" situations discussed. More advanced imaging techniques will also be covered concisely. The genesis behind and the progress of various "guideline" bodies will be summarized. CONCLUSION: Stroke is a government health priority. New guidelines will be emerging soon and they will affect virtually all UK Radiology Departments. Be prepared.

1100 Invited review: Paediatric stroke

Chong, W.

Great Ormond Street Hospital for Children, London, UK

Stroke is a clinical diagnosis, but radiology plays a key role in the initial diagnosis and on subsequent follow-up. Peer reviewed evidence-based clinical guidelines for the diagnosis and management of Stroke in Childhood have recently been published (Royal College of Physicians, Nov 2004). The risk factors and variety of underlying pathologies and aetiologies is very different from adult stroke. A large proportion have multiple pathologies and risk factors that act synergistically to result in stroke. Diagnostic imaging strategies need to be tailored accordingly. For the acute diagnosis of arterial ischaemic stroke in childhood, cross-sectional brain imaging is mandatory. Brain MRI should be undertaken as soon as possible, with CT as an acceptable initial alternative, if MRI is not available in the first 48 h. Supportive investigations for cause of stroke include imaging of the entire intracranial and extracranial cerebral vasculature and echocardiography. This should be undertaken within 48 h of presentation of arterial ischaemic stroke. There is currently no evidence to support the use of thrombolytic agents in children. However, diagnostic imaging is used to guide the use of aspirin, anticoagulation and other therapeutic interventions.

1130 Discussion

1030–1200
GI – Colorectal

1030 Invited review CT colonography for colorectal cancer screening: current status

Heiken, J.

Washington University School of Medicine, St Louis, Missouri, USA

CT colonography (CTC) ("virtual colonoscopy") is still evolving as an imaging test for evaluating the colon. Numerous studies have demonstrated that CTC can be performed effectively with radiation doses less than that for an air contrast barium enema. Stool and fluid tagging techniques have minimized previous problems of distinguishing residual stool from polyps or obscuring polyps within a pool of residual fluid. Although one multiinstitutional study has shown CTC to be equivalent to optical colonoscopy for detecting clinically significant polyps in a screening population, other multiinstitutional studies in non-screening populations have reported much poorer results for CTC compared with optical colonoscopy. Such discrepancies can be explained based on differences in study design and reader training. The results of clinical trials currently in progress will help clarify the role of CTC for colorectal cancer screening. A current obstacle to the use of CTC for colorectal cancer screening in the USA is lack of third-party reimbursement when the examination is done for screening. Additional issues include how to provide adequate CTC training for large numbers of radiologists (and possibly non-radiologists) and how to accommodate large numbers of additional CT studies into imaging practices that already are very busy. If CTC becomes widely available as a colorectal cancer screening test, how to ensure that the CTC studies performed are of high quality will emerge as another important patient care issue. Emerging technical directions in CTC include improved visualization techniques, use of computer assisted diagnosis, and performance of CTC without a cathartic bowel preparation.

1100 Invited review: MR assessment of response in rectal carcinoma

Brown, G.

Royal Marsden Hospital, Sutton, UK

Increasingly, chemoradiotherapy is offered to patients with locally advanced primary rectal cancer and in most centres, 20–30% of patients are offered this treatment prior to surgery, if the potential surgical resection margins are considered at risk. MR assessment of these tumours is essential, not only for the initial selection of patients, but also assessing response and potential resectability. An understanding of the relationship between post-chemoradiotherapy changes visible on MR and corresponding histology is important. Image assessment and careful comparison with baseline pre-treatment scans enables road-mapping of the planned resection for the surgeon and avoidance of areas that may be difficult to dissect, such as dense fibrosis. Post-treatment assessment should also include the potential resection margins and whether the surgery needs to be modified in order to ensure clear margins. For patients that have had an extremely good response to treatment, careful comparison with the baseline scans enables the relationship between the residual scar and the original tumour to be established ensuring that the correct segment of rectum is resected. The aim of this presentation will be to review the imaging assessment of rectal tumours after chemoradiotherapy.

1130 Invited review PET in colon cancer

Hughes, S.

Royal Victoria Hospital, Belfast, UK

No abstract supplied.

1030–1200
Lymphoma and Bone Marrow Imaging

1030 Invited review: Lymphoma: staging

Vinnicombe, S.

Radiology Department, London, UK

KEY LEARNING OBJECTIVES: The aims and importance of staging lymphoma and the role of imaging in staging; staging classifications in common usage; disease patterns in Hodgkin's lymphoma (HL) and non-Hodgkin's lymphoma (NHL) at presentation; common pitfalls and problem areas. In the last decade, imaging has assumed an increasingly important role in the staging and subsequent management of patients with lymphoma. The staging classification in common usage is the Cotswolds modification of the Ann Arbor classification. In Hodgkin's lymphoma (HL), staging directly affects choice of therapy, whereas in non-Hodgkin's lymphoma (NHL), other factors such as the histological subtype of NHL are more important. In both diseases, imaging provides crucial prognostic information which will help determine intensity of therapy in individual cases. The main aims of staging are: to define the precise local extent of clinically overt disease; to identify clinically occult disease elsewhere; to identify prognostic factors that will influence intensity of therapy; to give a baseline assessment of all nodal sites in the body; and to identify factors that might influence the delivery of therapy. The development of positron emission tomography (PET) and PET-CT has generated intense interest in functional imaging in the staging of lymphoma but currently, CT remains the modality of choice. It performs well in the detection of nodal enlargement and of most sites of extranodal disease. There are areas where CT is relatively insensitive and the role of other imaging modalities such as MRI will be discussed. Knowledge of the differences in the biological behaviour and mode of spread of HL and NHL, combined with recognition of the weaknesses of CT, will enable the radiologist too choose the most appropriate test for accurate patient-focused staging.

1100 Invited review: Bone marrow

Cavanagh, P.

Taunton & Somerset NHS Trust, Somerset, UK

The Key Learning points of this Review are to understand: (1) The

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optimal techniques for imaging bone marrow particularly focusing on MRI. (2) The common causes of bone marrow pathology and to what extent imaging can help differentiate. (3) The impact that imaging has on the clinical management and outcome. (4) The common pitfalls in diagnosis. MRI has revolutionized the imaging of bone marrow and there is now considerable evidence as to its effectiveness in imaging an area which was previously poorly understood. The presentation will use a combination of literature review and case studies to emphasise these points with a particular focus on the bone marrow changes in relation to acute and chronic trauma and how these can mimic other pathologies.

1130 PET in diagnosis and management of lymphoma

Barrington, S. F.

St Thomas's Hospital, London, UK

LEARNING OBJECTIVES: To understand the role of PET in staging and restaging; To assess the value of PET in early and late treatment response; To be aware of limitations of PET and practical issues for scanning. Successful treatment of lymphoma relies on accurate assessment of clinical stage (HD and NHL) and number of extranodal sites (NHL). PET using 18F-fluorodeoxyglucose (FDG) detects disease based on metabolic activity not lymph node size or organ architecture. Therefore PET (and now PET/CT) can detect disease in normal sized nodes and exclude disease in enlarged reactive nodes. PET is sensitive for extranodal disease and changes patient management by both up- and down-staging disease compared with combined clinical and CT staging. PET response early in chemotherapy is the most accurate predictor of prognosis in lymphoma. The high negative predictive value in HD is currently under evaluation in a national RCT of radiotherapy *vs.* no radiotherapy in patients with early stage HD and "PET negative" scans after 3 cycles. The high positive predictive value in NHL may permit selection of more aggressive treatment for candidates with poorer prognosis and future trials will address this. The use of PET in late response assessment of residual masses results in better discrimination of patients into IWC response categories. The limitations of PET include "false positive" physiological uptake and uptake in infection and inflammation. "False negative" uptake occurs in some low grade lymphomas and small volume disease. PET/CT is currently the most important imaging tool in the management of lymphoma.

1030–1200
Education and training II

1030 Invited review: Role extension in gastroenterology – educational issues

Nightingale, J. M.

University of Salford, Salford, UK

PURPOSE: This presentation will offer an insight into the current trends and future direction of education to support role extension in the gastroenterology and gastrointestinal imaging (GI) field. MATERIALS/METHODS: A range of literature was explored to identify the current educational opportunities, its effectiveness, and any issues that will impact on future educational provision. RESULTS: One of the fundamental requirements of a health-related educational programme is that the graduating student is fit for purpose, fit for practice, and fit for award. In-house training and short courses have been shown to satisfactorily support specific GI role extensions. The development of specialist and advanced practice, however, benefits from the wider perspective and quality assurance offered within postgraduate educational programmes. The demand for GI postgraduate education, whilst healthy, continues to represent small student numbers. Universities are under considerable pressure to develop new methods of course delivery to ensure financial viability. Examples of innovative educational models will be highlighted which can ensure viability whilst still continuing to support the postgraduate student to develop their skills and competencies. Service managers are only likely to support programmes if they offer tangible benefits not only to the student, but also to their department and the wider gastroenterology service. CONCLUSION: The future of education for advanced practice in gastroenterology lies, in the author's opinion, in the combination of a range of CPD short courses designed to facilitate specific role extension, coupled with multi-professional programmes which evaluate and improve whole service delivery.

1050 Role extension in gastroenterology – clinical issues

Bloor, C.

Royal Cornwall Hospital, Truro, UK

Over recent years there has been a continual development of Radiographer advanced practice in gastrointestinal radiology and gastroenterology. In the past radiographers were confined to performing barium contrast studies but more recently have moved towards performing and reporting complex diagnostic, therapeutic and interventional procedures as independent practitioners. This requires radiographers engaged in this level of practice to achieve a higher level of education and training in order to gain the necessary intellectual and clinical skills to perform procedures and make decisions at this level. This broad scope of clinical practice now undertaken by radiographers within this speciality allows them to work across imaging modalities and healthcare disciplines, and to be part of a much larger multidisciplinary team. The impact of these changes in practice include improved communication within the multidisciplinary team, better continuity of care for patients and a more cohesive approach to service delivery. This presentation will explore the clinical, education, training and operational issues involved in developing advanced practice in gastrointestinal imaging and the impact it has had on service delivery.

1110 Invited review: The 4 tier system – the Scottish approach

Cannon, J.[1] Lam, S.[2]

[1]Victoria Hospital, Fife, UK, [2]NHS Education for Scotland, Edinburgh, UK

No abstract supplied.

1135 Invited review: Radiographer consultant and advanced practitioner training

Hardy, M.[1] Snaith, B.[2]

[1]University of Bradford, Bradford, UK, [2]Mid Yorkshire Hospitals NHS Trust, Wakefield, UK

PURPOSE: The role of the advanced radiographer practitioner has been defined as autonomous with responsibility to reflect upon and develop clinical practice, and inform service developments, through effective teaching and leadership. Similarly consultant radiographer practitioners, although a more recent concept, are charged with the role of, and responsibility for, providing clinical leadership and strategic direction, and innovating and influencing practice through research and education. Although these definitions describe the generic ideals for the development and operation of these roles, specific development at the individual level to support progression and promotion to advanced or consultant radiographer positions remains vague. Specific areas of radiography practice have been identified as "advanced" and described within the professional literature. Furthermore, many Masters level radiography programmes provide training and education to support radiographers to undertake advanced practice tasks. However, ability and qualification to undertake a recognized advanced practice task does not automatically assume the radiographer performing the task is an advanced practitioner and this has created some professional confusion. In addition, as advanced practice, by definition, implies new and not generally accepted practice, the expectation that formally delivered education programmes can by themselves provide sufficient knowledge to meet the expectations of advanced and consultant practitioner roles is unreasonable. This presentation will discuss the personal and professional qualities expected of radiographers aspiring to advanced and consultant practitioner status and consider training and education opportunities, including those within formal Masters and Doctoral programmes, that are available to support such development.

1030–1200
Latest advances in MR imaging II

1030 Invited review Molecular MR

Hengerer, A.

Siemens Medical Systems, Erlangen, Germany

KEY LEARNING OBJECTIVES: The conceptual design of our first MRI-PET prototype, some unique technical features and first human brain images will be presented. DESCRIPTION: MR is some

TUESDAY

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magnitudes less sensitive than PET, SPECT or optical imaging and is not very well suited for the visualization of raw biological processes *in vivo*. CONCLUSION: In principle there are three concepts to improve the sensitivity of MRI. It is possible (i) to increase the lower detection limit of the MRI scanner by applying higher field strength, (ii) to use contrast agents, which yield a high signal deposition within the target tissue or (iii) to address targets with high copy numbers. Alternatively, molecular information can be acquired by MRI with hybrid imaging. We have shown and published results on the feasibility and development of a MR-PET system. The MR-PET solution is based on MR compatible Avalanche Photodiode Detectors rather than conventional photomultiplier tube. This system enables isocentric and simultaneous measurements without patient repositioning. It is much simpler than sequential MR-PET (one examination, three datasets, no patient repositioning) and two times faster than sequential MR-PET. MRI is not only adding precise anatomical information to PET; there are some unique advantages of an MRI combination (MRI navigator technique for PET, recurrent outcome studies, excellent soft tissue contrast, etc.).

1100 Invited review MR elasticity imaging

Sinkus, R.

ESPCI, 75005 Paris, France

PURPOSE: Elastography is a novel imaging modality which aims to measure locally the viscoelastic properties of tissue. Palpation has been used for millennia for the detection of potential pathologies and its clinical importance for instance in the domain of breast cancer detection is undisputed. The basic concept of elastography is presented and clinical data for breast, liver and brain are shown. MATERIALS/METHODS: The general idea of dynamic Elastography is to perform an acoustic experiment: the tissue under investigation is exposed to low-frequency acoustic waves (about 100 Hz) and the resulting displacement distribution is measured everywhere within the object by means of a motion-sensitized imaging technique. Reconstruction of viscoelastic parameters, such as shear-modulus and shear-viscosity, is done locally by solving the partial differential equation governing the propagation of sound within the material. RESULTS: MR-elastography for breast cancer detection is performed after contrast enhanced MR-mammography utilizing gadolinium as contrast agent. The diagnostic value of MRE as an adjunct to this established technique is presented and discussed. The addition of viscoelastic parameters improves the specificity for tumour characterization by ~20%. Initial clinical results for liver fibrosis using MR-elastography are presented. Results show that the stiffness of the liver rises with rising Metavir score and that differentiation between F1 and F2 becomes possible. In addition, first animal studies for the application of MRE to brain regarding Alzheimer's disease are shown. CONCLUSION: MR-elastography represents a novel technique which provides valuable new clinical information in the domain of breast cancer and liver fibrosis.

1130 Dynamic motion analysis of fetuses using magnetic resonance imaging

Wilding, L. J.[1]·Charles-Edwards, G.[1]·Materne, M. C.[2]·Jan, W.[1]

[1]Guy's and St Thomas' NHS Trust, London, UK, [2]Siemens Medical Solutions, Bracknell, UK

PURPOSE: A fetal biophysical profile using ultrasound monitoring of fetal movements, tone and breathing is used to predict adverse perinatal outcomes. Some CNS lesions can be identified by specific patterns of fetal movement, in particular those in the pons/medulla; while other more diffuse brain lesions cause abnormal fetal behaviour. The aim of this study is to assess the feasibility of dynamic motion analysis using fetal MRI. MATERIALS/METHODS: Imaging was performed on a Siemens Avanto 1.5 T MRI system, using a combination of body matrix and spine coil elements. In addition to routine single-shot HASTE sequences, multiple repeat images were acquired of a single thick slice and combined to form a cine loop. Two 400 mm FoV, single-shot cine sequences were explored – a HASTE (TR/TE = 4000/147 ms, matrix 448 × 448, GRAPPA speed up factor = 2) and a True-Fisp (matrix 320 × 320). RESULTS: The cine loops provided good quality resolution with adequate visualization of fetal actions such as stretching, flexion and rolling. Limb movement and even gastric peristalsis were easily demonstrated. CONCLUSION: Dynamic fetal MRI can be used to assess fetal movement. This could be a useful adjunct technique when fetal MRI is performed for CNS abnormalities.

1140 Rician noise reduction on magnetic resonance images

De Stefano, A.·Davis, A.

St Mary's Hospital, Portsmouth, UK

PURPOSE: To describe a present the results from a fast, denoising technique for MR images based on training of undecimated wavelet components. MATERIALS/METHODS: Reducing the noise on MR images improves quality and reduces scan time, nevertheless presents several difficulties. Denoising is constrained by the importance of preserving original information, the significance of the noise is related to the perception of the visual system, in MR the noise has complicated Rician spectral distribution, and denoising requires additional time. Wavelet analysis is efficient for noise reduction separating image from noise in frequency domain and matches the MR modality where images are generated in frequency domain and transformed. Undecimated filters considerably speed up the filtering. Parametric thresholding performs spatially adaptive denoising without assumptions for noise and signal spectral distributions. Training based on a human eye model adapts the scheme to different noise intensities and statistical distributions over different frequency bands. RESULTS: Training to minimize perceptually weighted mean square error has been performed on several artificially noise contaminated synthetic and clinical images. Different configurations have been considered in terms of noise realization and level, image size and orientation, scanning protocol and receiver coil. For synthetic images, the method achieved quantitative improvement for SNR between 8 dB and 12 dB. Qualitative performances have also been positively evaluated on temporal and spatial clinical sequences where the SNR improvement was between 10 dB and 15 dB. CONCLUSION: The technique demonstrates to improve MR image quality without losing information and to be suitable for a fast and automatic post-processing implementation.

1150 Audit of various MRI scanners using the ACR MRI phantom

Egan, P.[1]·Byrne, B.[2]·Martin-Rodriguez, Z.[2]·Kenny, P.[2]

[1]Beacon Hospital, Dublin, Ireland, [2]Mater Misericordiae University Hospital, Dublin, Ireland

PURPOSE: The ACR Magnetic Resonance Imaging phantom is used throughout the USA for the accreditation of MRI scanners by the American College of Radiology. This phantom, recently purchased by the Mater Misericordiae University Hospital, allows the quantification of many parameters including slice thickness, spatial resolution and slice position accuracy among others. These parameters are not quantifiable using phantoms provided by the scanner manufacturers, thus the ACR phantom provides independent testing of the vendor's equipment using a standard phantom. This work provides an analysis of different scanner performance including an intercomparison of different manufacturers and an intracomparison of certain models. MATERIALS/METHODS: The ACR MRI phantom is a short, hollow enclosed cylinder of acrylic plastic. It contains a solution of nickel chloride and sodium chloride. The phantom comprises several structures designed to facilitate a variety of tests of scanner performance. The phantom is accompanied by well established and reputable (ACR) protocol. This protocol was used to establish whether standards of MR image quality in Ireland match standards in the USA. Several MRI scanners on separate sites were tested including three different manufacturers and three similar machines. The data was analysed using imaging software called E-film. RESULTS & CONCLUSION: The results from this study show that the ACR MRI Phantom is a useful tool for thoroughly quantifying the performance of an MRI scanner. At the commissioning stage it allows the user to set baseline values. The performance of different scanners surveyed is consistent with a few variations in older units.

1200–1300

IPEM Eponymous Lecture

Physics, function and fusion – PET imaging developments, applications and opportunities

Jarritt, P.

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Royal Victoria Hospital, Belfast, UK

In his inaugural lecture in 1965, Professor Mallard stated that the then experimental technique of positron emission tomography (PET) would become one of the most powerful tools for studying human diseases. In this regard he demonstrated not only his understanding of the power that imaging would wield in the future of diagnostic medicine but also the power of a technique which was capable of imaging biological processes *in vivo*. The latter half of the 20th century saw unparalleled developments in imaging technology driven by the availability of computer technology as well as developments in radiation detectors and radiochemistry. The gestation of PET imaging technology has been long especially in the transition from research laboratory to clinical tool. A number of research groups sought to optimize PET scanner performance and effectively produced the concept of the ring detector seen in all current clinical systems. Some research avenues were aborted due to technological difficulties of which one of the most interesting was the application of time of flight measurements to the coincidence detectors. However, developments in scintillators and electronic technology have seen this technology developed into a commercial system. PET imaging, as a tool for imaging distributions of radiotracers governed by physiological processes often relied on anatomical imaging techniques such as CT or MRI to provide a method to locate distributions within the anatomy and indeed to provide a tool for segmenting the distributions to particular organs. The end of the 20th century saw the combination of a CT scanner and a PET scanner into a single imaging system thus providing the diagnostic clinic with the ability to acquire inherently aligned functional and anatomic data. This fusion of modalities is the basis of a modern diagnostic PET service utilizing PET/CT scanners with optimized display and reporting tools to permit the visualization of image volumes containing both functional and anatomical information. There is currently significant interest in extending the fusion of modalities to combine PET with MRI systems. Prototype systems exist and will clearly develop to provide a different combination of tools but perhaps more importantly the ability to reduce the overall radiation burden to the patient undergoing the diagnostic test. Whilst technological advances have been striking the power of PET is in the biological functions that can be studies and thus in the PET labelled radiotracers that are available to the researcher and the clinic alike. The PET radionuclides are, in the main, produced in a cyclotron and with the exception of ^{18}F cannot be used remotely from the cyclotron site. This infrastructure is expensive and in the UK has been slow to develop in support of a nationwide clinical service. The vast majority of clinical studies use ^{18}F-fluoro-deoxyglucose (FDG) for applications in oncology including the diagnosis and staging of disease and the monitoring of therapy. However, significant developments in ^{18}F chemistry will bring to the clinic a much wider range of radiotracers which can be manufactured and supplied under GMP conditions. PET/CT imaging has brought with it opportunities beyond those listed above. In particular considerable interest exists in the incorporation of a functional marker into radiotherapy treatments and in modifying treatments to better match the functional data. Advances in radiotherapy treatment methods, such as intensity modulated radiotherapy (IMRT), now permits the delivery of non-uniform doses to tumour volumes. It is not difficult to see that biological markers that highlight areas of hypoxia or increased cellular proliferation could be used to target increased doses whilst sparing normal tissues. Significant challenges remain in the development and applications of PET imaging. These include the ability to detect and correct for organ motion during extended acquisitions and to incorporate these effects into radiotherapy planning. PET is an inherently quantitative technique and yet in the limits of detection the robustness of such data becomes questionable. As a research tool in the development and investigation of novel therapeutic agents PET is almost unique the challenge is to take the methodology and incorporate it into a process aimed at tailoring therapies to each individual patient. Professor Mallard identified PET as a tool for studying human diseases. In the clinical research environment this has been realized. The power of the technique in routine clinical applications has yet to be fully realized.

1300–1400

RCR Eponymous Lecture

Improving health care through better evidence

McNeil, B.

Harvard Medical School, Boston, Massachussetts, USA

This talk will compare the USA with the UK in terms of total expenditures for healthcare as well as in rates of growth in healthcare costs. I will then focus on the role of imaging modalities, by type, in contributing to each of these, especially to cost growth. Because the USA is undertaking several initiatives to reduce rising costs of care of imaging (among other areas), these will be discussed in detail. The radiology based initiatives include: (1) increased use of evidence based practice centres, (2) "conditional" coverage and associated registries, (3) use of second opinions, and (4) system-wide evaluations of quality of care (including appropriate/inappropriate use of imaging). Each of these will be discussed with particular emphasis on the implications for utilization, clinical care and clinical research in the USA.

1415–1530

Neuroradiology SFG III

1415 Invited review: Imaging in investigation of dementia

Rich, P.

St George's Hospital, London, UK

I will give an overview of structural imaging in dementia. I will include a literature review and make some reference to advanced techniques. However, I will mainly direct my talk at the use of basic imaging in a general environment and include the important features that clinicians would like the reporting radiologist to mention.

1440 Radiation dose to the lens of the eye during cranial computed tomography: a comparison of the supra-orbital (SOB) *vs*. anthropological baseline (ABL) with and without bismuth eye shielding, on single and multidetector scanners

Arnold, P. M.

University of Leeds, Leeds, UK

PURPOSE: The wide availability and variation in multidetector CT (MDCT) scanners in the UK has led to differing practices being adopted in routine scanning of the head. This practice is often based on tradition and/or manufacturers recommendations. This may lead to differing dose levels, of particular importance when irradiating the lens of the eyes. This study examines differences in protocols adopted and effects on the dose to the eyes with/without bismuth shielding. MATERIALS/METHODS: Thermoluminescent dosemeters (TLDs) were applied to the "eye lenses" on the anthropomorphic phantom. The phantom was scanned using the Siemens single/16 slice, Philips 4 slice and GE 8/16/64 slice MDCT. Both baselines were scanned sequentially and helically. A constant slice thickness through the posterior fossa and cerebrum was selected, based on a national audit of practice. All scans were repeated using bismuth shielding to the eyes. Noise index remained unchanged throughout the study. RESULTS: (a) Radiation dose to the lens is reduced when the SOB is used (ABL 20.56 mSv, SOB 6.24 mSv). (b) Doses reduced by a third using Bismuth shielding on the ABL: no change with SOB. (c) Dose comparison between helical and sequential scanning. Work in progress. (d) Dose comparison between scanners Work in progress. CONCLUSION: SOB greatly reduces the dose to the lens of the eye. However, routine use of Bismuth shielding can reduce the dose when using the ABL. Images of acceptable and comparable diagnostic quality may be obtained by carefully selecting parameters without the need to increase dose between technologically different CT scanners.

1450 Transient corpus callosum lesions on diffusion-weighted MR images – a common pathway?

Lim, C.·Hwang, C.

National Neuroscience Institute, Singapore, Singapore

KEY LEARNING OBJECTIVES: To describe the diverse conditions associated with focal lesions of the splenium of the corpus callosum. To show the sensitivity of diffusion-weighted (DW) MR images to these changes. To review the follow up images to show reversibility of DW MR images. DESCRIPTION: The corpus callosum can be involved in various diseases such as neoplasms, traumatic injury, infarction, haemorrhage (from ruptured aneurysm or arteriovenous malformation), multiple sclerosis, microangiopathy (from infection or Susac syndrome), and Marchiafava-Bignami disease. However,

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focal abnormalities confined to the splenium may also be seen in rare but characteristic situations where well-circumscribed lesions are strikingly visualised by DW MR images and T_2 weighted images. These lesions are transient and disappear on follow-up study and clinical improvement. Conditions associated with these changes include withdrawal of anti-epileptic drugs, seizures, venous thrombosis, viral infections (in some cases with haemolytic uraemic syndrome) hypoglycaemia, high altitude cerebral oedema, and cytotoxic chemotherapy. Increased sensitivity of DW MR imaging to the bulk movement of water from the extracellular space into the intracellular space may be a unifying mechanism to explain these changes. CONCLUSION: A wide range of conditions can result in transient focal abnormalities confined to the splenium of the corpus callosum, especially on DW MR imaging. Radiologists should recognize this distinctive pattern and it may be a predictor of clinical outcome.

1500 Can functional MRI with an auditory stimulus be used clinically to test language lateralisation in temporal lobe epilepsy patients?

Peel, S. A.•Darekar, A. A.•Hoffmann, S. M. A.•Abbott, P.•Smith, M.

Southampton University Hospitals Trust, Southampton, UK

PURPOSE: Although surgery is often successful at reducing seizures in temporal lobe epilepsy patients, it can result in language problems if the seizure focus resides within the dominant language hemisphere. Whilst neuropsychological and neurophysiological testing is often deemed adequate to assess language lateralization, the WADA test has traditionally been used in equivocal cases. It is, however, costly, invasive and logistically demanding. Some studies have suggested it could be replaced by multiple-task fMRI. Our aim was to investigate whether an fMRI protocol using only an auditory stimulus could be used clinically to aid language lateralisation in temporal lobe patients. METHODS: Five volunteers and nine patients underwent imaging on a Siemens Symphony 1.5 T scanner. Subjects performed a 30 s language task (word generation or language comprehension) interleaved with 30 s rest periods. Data were processed using SPM software and statistical parameters were optimized. A laterality index was calculated. RESULTS: In all volunteers, the word generation task and the language comprehension tasks were consistent at highlighting Broca's and Wernicke's areas, respectively. All volunteers had a left-sided laterality index, which agreed with visual assessment of the images. The word generation task highlighted Broca's areas in six of the patients but the remainder had equivocal patterns of activation. CONCLUSION: Poor compliance with the task could account for the equivocal results in three of the patients. In some cases, pathology may make it difficult to adequately perform the task. It is also possible that pathology may itself lead to abnormal activation patterns if functional reorganisation has occurred.

1510 Myelography – do we still need it?

Goldstein, M. A.•Saklatvala, J.

University Hospital of North Staffordshire, Stoke-on-Trent, UK

PURPOSE: Myelography is an investigation performed to diagnose disorders of the spinal canal and cord. It is a technically difficult and infrequently performed investigation. It is both time consuming and invasive causing considerable discomfort to the patient. The aim of this project was to evaluate combined myelography and post-myelography CT of the spine as a complementary investigation to MRI of the spine. In addition the typical pathological imaging findings of myelography are reviewed. MATERIALS/METHODS: 64 patients were retrospectively evaluated over a 3.5 year period that underwent MRI initially followed by subsequent myelography and post-myelography CT. Comparison of the findings of spinal canal stenosis, intervertebral disc protrusion, nerve root compression, lateral recess stenosis and facet disease was made. The success of myelography in answering the clinical indication was also evaluated. RESULTS: Combined myelography and post-myelography CT successfully answered the clinical indication in 64% (n=41), provided additional findings in 66% (n=42). Most significantly myelography and post-myelography CT (n=29) diagnosed 2.6× more nerve root compressions than MRI (n=11) in this group of patients. In addition 9% (n=6) demonstrated dynamic changes on flexion/extension myelography. CONCLUSION: Combined myelography and post-myelography CT provides a valuable complementary investigation to MRI of the spine, and therefore continues to be of value for patients with contraindications to MRI, with spinal metallic implants in the region of clinical interest, and those with a non-diagnostic or inconclusive MRI.

1520 Gadolinium-enhanced MRI and nephrogenic systemic fibrosis – a retrospective case-control study

Roditi, G.[1]•Collidge, T. A.[1]•Thomson, P. C.[1]•Mark, P. B.[2]•Traynor, J. P.[2]•Jardine, A.[2]•Morris, S. T. W.[1]•Simpson, K.[1]

[1]Glasgow Royal Infirmary, Glasgow, UK, [2]Western Infirmary, Glasgow, UK

PURPOSE: Nephrogenic systemic fibrosis (NSF) is a disabling disease affecting patients with established renal failure (ERF). Gadolinium-enhanced MRI is increasingly used in ERF patients to avoid the risks of traditional, iodinated contrast. An association between NSF and gadolinium has been suggested but not established by case controlled series. We aimed to assess the relationship between the frequency and degree of exposure to gadolinium containing contrast used for MRI and the development of NSF in the ERF population by means of a case-control study. MATERIALS & METHODS: A retrospective analysis of all prevalent adult patients on dialysis was performed between 01/01/2000 and 01/07/2006 in the West of Scotland, UK. Diagnoses of NSF, episodes of gadolinium-enhanced MRI and cumulative gadolinium doses were recorded. RESULTS: 14/1826 patients had a diagnosis of NSF (prevalence of 0.77%). Mortality was similar for affected and non-affected patients. 92.9% NSF patients had undergone gadolinium-enhanced MRI compared with 22.7% non-affected patients (p<0.001). Patients with NSF received a higher median cumulative dose of gadodiamide (45 ml *vs.* 30 ml, p<0.001) and received more gadolinium-enhanced MRI (median 2 *vs.* 1 scans, p=0.04) than their non-affected, gadolinium-exposed counterparts. CONCLUSIONS: This is the first case-controlled series addressing the association between gadolinium administration and the development of NSF in the ERF population. Our data support a positive association. Additionally there is a positive association between the cumulative dose of gadodiamide used and dosing events. Potential risks need to be balanced against those of alternative contrast agents in ERF patients.

1415–1515
Nuclear Medicine SFG I

1415 Invited review: How radiology and nuclear medicine contributes to the management of neuroendocrine tumours

Caplin, M.

Royal Free Hospital, London, UK

Neuroendocrine tumours (NETs) are relatively rare tumours; however, the incidence has doubled over the last 20 years. They are classified according to their site of origin and whether they are functioning (hormone secreting) or non-functioning (non-hormone secreting). There are many types of neuroendocrine tumours including: medullary thyroid cancers, paragangliomas, phaeochromoctomas, bronchial carcinoids and the most common gastroenteropancreatic tumours which encompass pancreatic islet cell tumours (*e.g.* insulinoma, gastrinoma, VIPoma and non-functional tumours) as well as gastrointestinal carcinoid tumours originating in the foregut, midgut or hindgut. For the optimal management of NETs, the following strategy has been suggested: (i) suspect the diagnosis; (ii) perform appropriate biochemistry profile including urine 24 h 5HIAA and serum hormone including chomogranin A; (iii) assessment of histopathology to confirm diagnosis and features of aggressiveness; (iv) determine presence of inherited disorder such as MEN- or the Von Hippel-Lindau syndrome; (v) determine the site and extent of disease using *e.g.* contrast CT or MRI, as well as the most sensitive modality the Indium-111 Octreotide scan; (vi) treat the symptoms or excessive hormonal state; (vii) treat the disease if possible with curative surgery otherwise consider surgical debulking. Non-surgical treatments of metastatic disease (including somatostatin analogues, interferon alpha, chemotherapy, hepatic artery embolisation and radionuclide therapies such as I-131 MIBG and Yttrium-90 DOTA Octreotide); and (viii) all patients will require long term follow-up preferably within treatment protocols. The UK Neuroendocrine Tumour Society and European NET Society collaborate with ongoing/planned clinical and scientific trials to enable an increase in evidence based practice.

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1445 Invited review: Latest developments in the scintigraphic imaging of neuroendocrine tumours

Buscombe, J.

Royal Free Hospital, London, UK

Functional imaging of nuclear medicine has been an area of massive growth over the last 10 years. In many ways it has become the primary method by which such tumours are staged for 2 distinct reasons. First, there is evidence that tumour not seen on CT or MRI may be found on functional imaging and secondly functional imaging may lead to radiotargeted therapy of the patient's tumour. The standard methods for imaging include In-111 pentetreotide which is a somatostain receptor agent and positive in about 90% of all neuroendocrine tumours and the amine uptake agent I-123 mIBG which is positive in 60% of neuroendocrine tumours. The latter imaging being done not normally for staging but to determine if treatment with I-131 mIBG is possible. This imaging has been improved by the use of combined SPECT-CT imaging with these agents which improves specificity and localization. New agents are becoming available. $^{99}Tc^{m}$ depreotide has higher uptake for the SSR3 and SSR5 receptors than In-111 pentetreotide and is useful in some tumour types where In-111 pentetreotide uptake is reduced. As PET advances in nuclear imaging neuroendocrine tumours are beginning to imaged more frequently, though ^{18}F-FDG is only positive in about 15% of these tumours these tend to be the ones negative on In-111 pentetreotide imaging. A version of the DOTATATE peptide has been labelled with Ga-68 and shows promise as the best method of imaging SSR2 receptor positive tumours.

1415–1530
Managing the Digital Environment II

1415 An introduction to workstations for medical imaging

Horii, S.

Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania, USA

The workstation for medical imaging has the most difficult task to perform in a picture archiving and communications system (PACS); it has to serve as the interface between the system and the human user. Human-computer interaction has been the source of both major problems and brilliant solutions since the very first computers were built. This lecture will be directed at several aspects of workstations; their history, present status, and some prognostications about future developments. The present status of workstations will occupy the majority of the presentation since it is the frustration with current systems and some of the ways these difficulties have been eliminated or reduced that define the state of the art. Despite some 20 years of workstation developments, users still have complaints about the way workstations work (or do not work). This lecture will examine the known causes of some of these problems and how researchers and manufacturers are attempting to solve, or ameliorate, them. The talk will also include a discussion of the importance of the environment in which workstations are used. It is unfortunate that many reading rooms, originally designed for interpreting examinations on film, were converted for PACS simply by placing workstations in them. The talk will elaborate on the reasons why this is a bad idea and how to avoid making these mistakes.

1455 Managing PACS – keeping PACS clean

Strickland, N.

Hammersmith Hospitals NHS Trust, London, UK

PACS housekeeping, best performed by a team of trained radiographers (or "PACS cleaners and sweepers") is essential to maintain a tidy PACS database. This is an ongoing task which will last throughout the life of the PACS and it is essential that provision be made for such posts at the time of PACS implementation. Housekeeping tasks can be summarized according to the resultant problems visualised on the PACS, for each of which there may be several different causes: (1) There is a study entry on PACS but no images; (2) The study entry appears as "unspecified" (or similar nomenclature) on PACS; (3) The study has a dictated status on PACS but there is no associated report visible on the PACS; (4) The study has a non-dictated status on PACS and no report; (5) The study has a verified state on PACS but needs to be reopened to add more images to it; (6) The study is unretrievable from the long term archive; (7) CR (computed radiography)/DR (direct digital radiography) errors; (8) Burning imaging studies and their reports to CDs and uploading imaging studies from external CDs/digitizing external films. There will be a large amount of extra housekeeping work generated every time there is an upgrade to the PACS or to any of the IT systems integrated to PACS (such as the radiological information system RIS, speech recognition or the hospital information system HIS/electronic patient record EPR).

1520 Discussion

1415–1615
Latest developments in MDCT

1415 Invited review: The clinical role of multislice CT: a glance into the future

Prokop, M.

UMC Utrecht, Utrecht, The Netherlands

No abstract supplied.

1440 Invited review: Physics and techniques of volume computed tomography with 256 detector row CT

Blobel, J.[1]•Okumura, M.[2]•Kazama, M.[2]•Hall, J.[2]•Ota, T.[3]

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PURPOSE: A computer tomograph with an advanced cone beam reconstruction algorithm "eXact" for 256 × 0.5 mm detector rows has been developed for volume scans. MATERIALS/METHODS: The reconstruction of the volume data with an axial detector collimation of 12.8 cm allows dynamic and functional CT examinations of complex organ regions. High and low contrast resolution was determined by varying the phantom dose. RESULTS: The advanced cone beam reconstruction algorithm "eXact" achieves a homogeneous voxel resolution of 0.35 mm in the entire scan volume. Despite increased scatter radiation, the low contrast resolution with 5 mm object size and 0.3% contrast requires a phantom surface dose of only 7 mGy. Tube rotation times of less than 0.5 s allow functional examinations such as perfusion studies. Multisegment reconstruction is used for cardiac applications, as this method reduces temporal resolution in proportion of R–R heart cycle numbers. Within the breath hold time of 1–3 s, lowest within one heart beat, the entire heart is frozen using a volumetric temporal resolution down to 50 ms. Mis-registration in the z-axis is impossible. Heart function diagnostics can be performed using the same scan data. The short breath hold reduces the negative effects of arrhythmias and heart rate. CONCLUSION: The detector extension to 256 detector rows based on the solid state principle offers enhanced quality of volume scans with optimized high and low contrast resolution in relation to patient dose. Low exposure time and extremely low volume scan time open new possibilities for functional and heart studies.

1505 Invited review: Dual source CT

Flohr, T.

Siemens Medical Solutions, Forchheim, Germany

PURPOSE: We evaluate the potential of dual source CT (DSCT) for ECG-gated cardiovascular examinations and other applications such as dual-energy imaging. MATERIALS/METHODS: We investigate the performance of a DSCT system (SOMATOM Definition; Siemens, Germany) with two X-ray tubes and two corresponding detectors mounted onto the gantry with an angular offset of 90°. The gantry rotation time is 0.33 s, 32 × 0.6 mm collimation with double z-sampling is used for simultaneous acquisition of 64 overlapping 0.6 mm slices. In its ECG-gated mode, the DSCT provides 83 ms temporal resolution independent of the heart rate. ECG gated spiral data is acquired at pitch 0.2–0.46, depending on the heart rate. Temporal resolution was evaluated with a moving coronary artery phantom. Spatial resolution was evaluated by measuring spiral SSPs and by scanning a resolution phantom. A three-material decomposition algorithm was used with simultaneously acquired 80 kVp and 140 kVp data to create material-specific images. RESULTS: The coronary phantom was depicted with

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little or no motion artefacts up to 100 bpm. A 120 mm heart volume could be covered in 5–10 s, depending on the heart rate, with 0.4 mm through-plane resolution. Promising results for new applications, such as dual-energy bone removal or blood volume imaging, could be demonstrated. CONCLUSION: DSCT allows robust cardiac CTA with a temporal resolution of 83 ms in combination with sub-mm spatial resolution and examination times not longer than 10 s. The simultaneous acquisition of dual-energy CT data and novel material decomposition algorithms allow for new clinical applications.

1530 Invited review: Dose and image quality in MDCT

Huda, W.[1]•Smyth, J. M.[2]

[1]University Hospital, Syracuse, NY, USA, [2]Ninewells Hospital, Dundee, UK

CT, introduced into clinical practice in the 1970s, is characterized by a markedly improved imaging performance as well as a much higher radiation dose. In recent years, the clinical utilization of CT has dramatically increased, and this modality currently dominates medical radiation patient exposures. One important aspect of CT is that there is a direct relationship between the amount of radiation used, which is determined by the choice of X-ray tube voltage (kV) and current (mA), and the corresponding image quality that affects diagnostic performance. This talk will describe the inter-relationship between radiation doses and image quality, and also outline what is required to keep patient doses in CT As Low As Reasonably Achievable (ALARA).

1555 Multislice CT coronary angiography performed with different scanner generations: comparison of diagnostic performances

Pugliese, F.•Mollet, N. R.•Hunink, M. G.•Nieman, K.•Dijkshoorn, M. L.•de Feyter, P. J.•Krestin, G. P.

Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands

PURPOSE: To compare the diagnostic performance of 4 generations of multidetector CT scanners featuring 4, 16 and 64 slices per rotation in the assessment of coronary artery disease (CAD) with conventional coronary angiography as the reference standard. MATERIALS/METHODS: Four groups were formed including the first 51 patients undergoing CT coronary angiography after the installation of each of the 4 CT systems. All patients (n=204) were referred for conventional angiography. Subjects with previous percutaneous angioplasty, stent placement and CABG were excluded. RESULTS: Heart rates and prevalence of CAD were similar (mean HR=59 bpm, 1.3 lesion/patient). In the 4-slice group, 113/442 (26%) segments were excluded from analysis because of poor image quality. All segments >2 mm diameter were evaluable in the other groups. Sensitivity, specificity, PPV and NPV were 58%, 94%, 61% and 94% for 4-slice CT; 90%, 93%, 65% and 99% for first-generation 16-slice CT; 97%, 98%, 87% and 99% for second-generation 16-slice CT; 99%, 96%, 80% and 99% for 64-slice CT. In the 64-slice CT group, including the assessable <2 mm diameter coronary branches (26%), the respective values were 99%, 95%, 76% and 99%. CONCLUSION: Diagnostic accuracy of CT coronary angiography performed with 4-slice CT scanners is lower than that allowed for by newer generation systems. Among the latter, a trend increase in diagnostic accuracy is seen. 64-slice CT has high diagnostic accuracy even when smaller coronary branches are included.

1605 A decade of coronary CT imaging: evolution from EBT to dual source CT: impact on workflow, patient preparation, scan protocols and image quality

Dijkshoorn, M. L.•Pugliese, F.•Mollet, N. R.•Alberghina, F.•Nieman, K.•Krestin, G. P.

Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands

KEY LEARNING OBJECTIVES: (1) To review developments in coronary imaging with CT starting from EBT to the recently introduced Dual Source CT. (2) To understand the impact of different scanner generations on workflow, patient preparation, scan protocols and image quality. (3) To demonstrate current status with challenging clinical cases of a new state-of-art dual source CT scanner. DESCRIPTION: Introduction – Basics of coronary CT imaging – Technical overview of several scanners – Impact on workflow – Impact on patient preparation – Impact on scan protocols – Impact on image quality – Current status demonstrated with clinical cases – Strength and limitations. CONCLUSION: The major teaching points in this exhibit are: (1) For each scanner type a different approach is needed, what works well on certain scanner can work against you on a different system. (2) Recent developments have improved workflow and allow a wider spectrum of indications to be examined in a larger patient population. (3) Although performances of CT scanners is getting better and better, further developments are still essential to overcome current limitations.

1415–1545
History SFG

1415 Invited review: The current state of radiology history

Thomas, A.

Princess Royal University Hospital, Kent, UK

We are currently in an exciting time for the history of the radiological sciences. The British Society for the History of Radiology (BSHR) represents all of those in the UK who are interested in radiological history. The BSHR is affiliated to the British Society for the History of Medicine. We have an annual lecture and at UKRC we organize the history session and we also have a stand at the technical exhibition. We have relaunched our website at http://www.bshr.org.uk/ and twice a year we produce a journal "The Invisible Light". Contributions to both the journal and to the website are always welcomed. This presentation will review the past and current activities of the Society and will indicate future directions for research, study and investigation.

1445 The new Roentgen-X-Museum

Busch, U.

Deutsches Röntgen Museum, D-42897 Remscheid, Germany

Wilhelm Conrad Roentgen's work revolutionized medicine and paved the way for numerous technological applications in modern science and technology without which our modern world would be inconceivable. An extraordinary personal and historic achievement – and yet Roentgen's life and work represent much more: a timeless universal message for creative thinking, the positive driving force behind all cultural and social developments as well as behind technological progress and innovation. The freedom to integrate that which was already known using an interdisciplinary approach and to create something new, the ability to bundle his knowledge, *e.g.* assimilating ideas from photography and cathode rays in order to discover X-rays, qualifies him as a prototype for the modern innovator and makes him a leading figure in science and a synonym for creative thinking. It is on the foundations of this quality that the concept for the new Roentgen X Museum in Remscheid, Germany, are based. At the same time its potential will be increased in many respects by creating a museum which will foster Roentgen's spirit of discovery and enquiry, guiding the visitor through an exciting and at the same time easy to understand scientific experience. As a modern educational facility it will follow the hands-on-science approach thus allowing fun and interest to develop interactively along side investigation and experimentation and encourage potential creative and innovative skills on a long term basis. In addition the museum will serve as a cultural and social focal point offering a qualified platform for research, industry and the public.

1505 Invited review: Dr Samuel Stuart Pennington and the Battle of River Plate

Buzzi, A. E.

University of Buenos Aires, Ciudad de Buenos Aires, Argentina

Dr Samuel Stuart Pennington, born in 1910 in Quilmes (Province of Buenos Aires) the son of Dr Miles Stuart Pennington, who was born in Bolton, Lancashire, in 1884. He graduated in the School of Medicine, University of Buenos Aires, in 1936. He soon joined several radiological departments, and was appointed Chief of Radiology and Radium Therapy in the British Hospital. In Argentina he was a pioneer in contrast studies of the vena cavae. He was also an oncologist, and a practical surgeon. On 13 December 1939, took place the "Battle of the River Plate": the ships *Exeter*, *Achilles* and *Ajax* of the British fleet

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penned to the German battleship *Graf Spee* in the River Plate. The three British ships suffered mishaps. They went to Falkland's/Malvinas islands for medical treatment and reparation. The British Hospital of Buenos Aires sent a contingent in charge of Stuart Pennington. He registered in notebooks magnificent drawings of the obtained X-rays. When he returned to Buenos Aires the British community received him as a hero. In 1948 King George VI honoured him with the appointment of M.B.E. 43 years later Argentina was under a military dictatorship that invaded the Falkland/Malvinas islands. Stuart Pennington sent a note to the Chief Commander of the Navy offering his services as a doctor in the islands. His offer was not accepted because of his age. He decided then to return to Queen Elizabeth II the badge that her father had given him in 1948. He died in 1985.

1525 Invited review: Patient and staff radiation doses from early radiography (1899–1902)

Kotre, J.

Newcastle General Hospital, Newcastle-upon-Tyne, UK

PURPOSE: Patient and staff doses for early radiological examinations (1899–1902) were estimated from entries in a log-book of the time, together with additional information obtained from contemporary cold-cathode X-ray apparatus. MATERIALS/METHODS: Information on over 500 X-ray examinations performed between 1899 and 1902 at the Forth Banks Infirmary, Newcastle, UK was found in a log-book on display in a collection of historical artefacts. The book contained exposure times, distances and examination type. Additional information was obtained from contemporary X-ray apparatus and operation of a contemporary induction coil to allow estimates to be made of patient entrance skin dose using X-ray beam spectral simulation software. One radiographer undertook all of the examinations in the record and his occupational dose is estimated using modern dose–area product to scatter dose conversion factors. RESULTS: Entrance surface doses in the region of 150 mGy for abdomen/pelvis examinations, 75 mGy for AP chest examinations and 300 mGy for lateral/penetrated chest examinations were estimated. The distribution of examination types shows a predominance of fracture examinations for radiography and foreign body investigations for fluoroscopy. The annual staff dose is estimated at 47 times the UK annual dose limit. CONCLUSION: The results show very high patient and staff doses from these early examinations, but are consistent with what is known about the techniques and image receptors used at the time.

TUESDAY

1415–1535
Quantitative imaging applications in medicine

1415 Invited review: Future role of quantitative image data in patient management

Todd-Pokropek, A.

University College London, London, UK

No abstract supplied.

1445 Invited review: Distributed clinical studies using the internet

Davies, A.

University of Leeds, Leeds, UK

The internet offers several appealing possibilities of time and efficiency savings for running multicentre imaging trials. Communication of image and other data over the internet could reduce the time taken to gather data and process results. Moreover, standards based interactive web pages can be used to assess qualitative and quantitative aspects of the image data by observers within the centres in a time and resource efficient manner. The main considerations are: patient confidentiality, convenient and compact image acquisition and distribution, assurance of image quality, remote monitoring of viewing conditions, a suitable and user friendly image scoring system, minimal hardware demands and software which is widely available. This presentation details our experience in designing and running a multi-centre trial assessing requirements of ultrasound scanners for use in measurement of Nuchal Translucency (NT) in Down's Syndrome screening. In this presentation we describe our response to each of the above challenges.

1515 Quantitative measurement of absolute bone mineral content via single-energy computed radiography

McCann, A. J.

Northern Ireland Regional Medical Physics Agency, Belfast, UK

PURPOSE: Reliable *in vivo* measurement of the quantity and morphology of bone offers support in many areas of clinical practice, including the assessment of fracture healing. Image analysis techniques have been developed to allow decomposition of single-energy computed radiography (CR) images into absolute bone and soft tissue content. MATERIALS/METHODS: 10-bit digital images were acquired via CR. Normalization of beam intensity was achieved within an image using an "empty field" exposure, and between images via the inclusion of a hydroxyapatite stepwedge. The detrimental effect of scattered photons was minimized via deconvolution using a customized, analytically generated point spread function. Regions of the radiograph containing soft tissue only were identified, and converted to absolute thickness using Monte Carlo-generated data on soft tissue attenuation. The total thickness in other regions was calculated via polynomial interpolation of these values. Monte Carlo code was again employed to model cumulative attenuation of various bone/soft tissue combinations. This data was used to identify the unique bone and soft tissue contributions necessary to meet both attenuation and total thickness criteria at any location. RESULTS: A tissue-equivalent, anthropomorphic forearm phantom was irradiated and the image subjected to the steps described. Measurements of bone content in pixel bins were compared with those derived from geometric analysis of a volume acquired via CT scanning the phantom. Repeated irradiation at various air gap thicknesses yielded a systematic error of less than 5% in all cases. CONCLUSION: Image processing software has been developed which allows the measurement of absolute bone content from CR images.

1515 Quantitative vertebral fracture detection on DXA images using shape and appearance models

Roberts, M. G.·Cootes, T. F.·Pacheco, E.·Adams, J. E.

University of Manchester, Manchester, UK

PURPOSE: Current quantitative morphometric methods of vertebral fracture detection lack specificity, particularly with mild fractures. We used more detailed shape and texture information to develop quantitative classifiers. MATERIALS/METHODS: The detailed shape and appearance of vertebrae on 250 lateral dual energy X-ray absorptiometry (DXA) scans were statistically modelled, using Principal Components Analysis. The vertebrae were given a "gold standard" classification using a consensus reading by two radiologists. Relevant shape and appearance parameters were then selected using stepwise regression, and linear discriminants were trained on these shape and appearance parameters. RESULTS: The appearance-based classifiers gave better specificity than shape-based methods in the lumbar and mid-thoracic spine. The specificity was 94% at a sensitivity of 95%, representing a sensitivity of 84% on grade 1 fractures (*vs*. 71% for height ratio classifier), and 100% on grade 2 or 3. Using the full shape parameters improved specificity in the upper thoracic spine compared to using three standard height ratios when operating at high sensitivity (>95%). The main improvement was in the detection of mild fractures. In the thoracic spine, a linear discriminant classifier trained using three height ratios also out-performed a more standard morphometric approach in which height ratios were individually thresholded (90% specificity *vs*. 83% specificity at 95% sensitivity). CONCLUSION: The shape and appearance parameters of statistical models of vertebrae could provide more powerful quantitative classifiers of osteoporotic vertebral fracture. A standard morphometric approach using three height ratios could also be improved by using a linear discriminant classifier instead of thresholding each ratio individually.

1400–1330
Hepato-biliary

1400 Invite review: Optimizing contrast enhancement for MDCT: 4 to 64 row

Heiken, J.

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Washington University School of Medicine, St Louis, Missouri, USA

The reduced image acquisition times of MDCT have made scan timing more critical than for single detector CT, but have provided radiologists with an opportunity to improve CT contrast enhancement. It is therefore important for radiologists to understand (1) the factors that determine the magnitude and timing of arterial and parenchymal contrast enhancement for CT, and (2) identify the modifications needed to optimize contrast enhancement for 4-row to 64-row MDCT. The magnitude of arterial enhancement is dependent on the rate of iodine delivery and the total iodine dose, whereas that of hepatic parenchymal enhancement is dependent on iodine dose. Thus for CTA performed with MDCT, contrast medium volume can be decreased. However, contrast dose for liver imaging cannot be decreased, even with rapid MDCT acquisition. The most important patient-related factor that affects the magnitude of aortic or hepatic enhancement is body weight. Enhancement magnitude is inversely proportional to body weight. Therefore, very large patients require higher iodine dose. The technical factor that determines the timing of peak aortic and hepatic enhancement is injection duration (the longer the injection duration, the longer the time to peak enhancement). Peak enhancement is delayed in patients with reduced cardiac output. For CTA, scan delay should be individualized with bolus tracking or test bolus. The greater the number of detector rows, the shorter the acquisition time for a particular MDCT examination. As the acquisition time decreases, the scan delay for a particular examination must be increased. Thus scan delays should be longer for faster scanners

1500 Invited review: Uncommon manifestations of liver lesions

Karani, J.

King's Healthcare NHS Trust, London, UK

No abstract supplied.

1530 Invited review: Imaging of cystic lesions of the Pancreas

Kane, P.

King's College Hospital, London, UK

No abstract supplied.

1415–1540
Radiology Service Improvement

1415 Invited review: The clinical assessment and treatment (CAT) service

Rafferty, J.

Cumbria and Lancashire SHA, Manchester, UK

No abstract supplied.

1440 Invited review: The role of the imaging professional in the CAT service

Hoadley, G.

Blackpool Victoria Hospital, Lancashire, UK

OBJECTIVE: This presentation will explore the currently undefined role of the imaging professional in a "CATS" service. DESCRIPTION: Government policy is "plurality" of providers to meet the challenge of expanding diagnostic services capacity to meet the 18 week target. NHS independent sector treatment centres will be part of this initiative. The roles and responsibilities of imaging professionals in this arena are uncertain, and in many areas it is unclear exactly who will be providing the service. It is certain that there will be many challenges facing such individuals. Staff will be recruited from overseas, and from local existing services, resulting in varied medical perspectives within the local health economy. Innovative roles are likely to be developed within these new organizations. Lines of accountability will be different from current posts, and funding issues will change with unbundling of diagnostics under Payment by Results. Continuity of care as patients move on to secondary care providers will be a major issue, especially for cancer sufferers, requiring good local linkages and agreed pathways across local health communities. Near patient testing will inevitably lead to new pathways and processes, and the health professional working in this new environment will have major responsibilities for ensuring the correct functioning of the whole local health system if patients are to benefit. CONCLUSION: The role imaging professionals in this new environment will be challenging, with new organisational and professional issues to be addressed. Continuing debate on these issues will be important as the centres become operational.

1505 Invited review: Eliminating carve out

Garvey, C.

Royal Liverpool & Broadgreen University Hospital, Liverpool, UK

Most services desire "improvement" and, most departments will show improvement in one or more areas. In this talk, the term "Service Improvement" is more conceptual and refers to those departments which have emphasised the concept of service improvement to the extent that it informs most of the decisions that are made and the way that department conducts its business. A department that is actively pursuing a "Service Improvement" model will show certain characteristics: Resources, both financial and monetary will be allocated to S! An increasing number of modalities will be reviewed. This will usually involve extensive redesigning of the service. Basic processes such as booking of patients will be redesigned and the direction of travel will be towards a full-booking model. The service will be patient- rather than department-focused. The entire process including what happens after the test is done will be undergoing constant review and redesign. Many departments undergoing SI find that their efficiency improves and throughput increases. The stumbling block is often that the radiologists can't cope with the increased number of examinations for which a report is required. Carve out is a phenomenon that has bedevilled the NHS leading to inefficiencies and radiology departments are no exception. The lecture will highlight common examples of where carve-out occurs in the radiology department. Some of these examples may be obvious but some will come as a surprise. Worked-up solutions will be offered on how to tackle some of these examples.

1530 Discussion

1530–1730
Nuclear Medicine SFG II

1530 Invited review: Radiotargeted therapy in neuroendocrine tumours

Baum, R.

Zentralklinik Bad Berka, Bad Berka, Germany

PURPOSE: Combined use of Yttrium-90 and Lutetium-177 labelled somatostatin analogues (mainly DOTA-TATE) for PRRT of progressive neuroendocrine tumours. MATERIAL/METHODS: Over the last 5 years, 352 patients (age 19–81 years, mean 59.2 years) received 1100 administrations (mean activity 3.74 GBq, max. 7.4 GBq per cycle, time between cycles 3–6 months). 1.5 l of an AA solution containing arginine and lysine were infused IV over 3.5 h to reduce kidney dose. Patients were selected based on high SSTR expression (determined by Ga-68 receptor PET/CT). Before each new cycle, restaging was performed by morphologic (CT/MRI) and molecular imaging (receptor PET/CT using Ga-68 DOTA-NOC, in selected cases also FDG or fluoride PET/CT), and tumour markers. Renal function was serially determined (TER and GFR). Tumour dosimetry was performed under treatment by serial scintigraphy. All data were entered in a database. RESULTS: Bone marrow toxicity WHO grade 2 or 3 occurred in <15% of the administrations. Thrombocytopenia/anaemia were seen mainly in patients pre-treated with chemotherapy and in patients with widespread skeletal metastases. In none of the patients with normal kidney function before treatment, renal insuffiency developed, in most patients receiving Lu-177 DOTA-TATE serum creatinine and TER/GFR did not change significantly. 9 of the patients had complete remission, 39% had partial remission (PR), 50% had stable disease (SD – progressive disease before), and 11% had PD. 25 patients with advanced disease died of tumour progression. Objective tumour responses (including improvement of clinical symptoms) were seen in 85% of the pts. CONCLUSIONS: PRRT is well tolerated with low toxicity and few adverse effects and shows significant therapeutic efficacy in patients with progressive neuroendocrine tumours even after octreotide treatment, interferon or chemotherapy.

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1600 Invited review: Advances in interventional radiological treatments of NETs

Yu, D.

Royal Free Hospital, London, UK

Neuroendocrine tumours (NETs) are tumours that have the capacity to secrete polypeptide products with hormonal activity. NETs are relatively rare with incidence of 3 per 100 000, but as they tend to be slow growing tumours, the prevalence is much higher. As a result, a significant proportion of patients will have hepatic metastases at presentation, and it is in the management of hepatic metastases that interventional radiology plays an important role. Portal vein embolisation is increasingly performed to facilitate liver resection. Arterial embolisation, chemoembolisation and selective internal radiation therapy are used in many centres along with local ablative techniques such as radiofrequency ablation. The evidence for these treatment options are discussed in this presentation.

1630 Sentinel node imaging in breast cancer: is there any correlation with intradermal injection depth, number of nodes seen and pathology?

Szyszko, T.•Muthu, S.•Meades, R.•Frank, J.•Svensson, W.

The Hammersmith Hospitals NHS Trust, London, UK

PURPOSE: Sentinel lymph node (SLN) biopsy following lymphoscintigraphy is routinely used in many centres in the management of patients with breast cancer. This study looked at two techniques: a standard intradermal injection and a more superficial technique, to assess if this affected the speed of tracer uptake by the sentinel node, the number of additional axillary lymph nodes seen and the pathology. MATERIALS/METHODS: 64 patients underwent SLN lymphoscintigraphy at Charing Cross Hospital from January to September 2006. 32 patients had imaging with the standard intradermal injection technique and 32 had imaging with the new more superficial technique. SLN uptake time was categorised as <15 min, <1 h or <3 h. SLN and additional axillary nodal uptake was correlated with pathology. RESULTS: Using the standard intradermal injection technique sentinel node uptake was seen in 25/32 patients within 15 min; 3/32 within 1 h and 4/32 within 3 h. With the more superficial technique uptake was seen in 30/32 patients within 15 min, 1/32 within 1 h and 1/32 within 3 h, demonstrating increased speed in SLN uptake. 17/32 and 20/32 patients in the two groups, respectively, showed additional axillary lymph node uptake. There was no correlation between speed of uptake and pathology. CONCLUSION: Our superficial intradermal injection technique expedited tracer uptake within SLN and axillary lymph nodes, decreasing camera time. There was no significant difference in the number of additional lymph nodes seen and no correlation with pathology.

1640 Do lower count DMSA renal scans in children allow the acquisition of diagnostic quality images?

Saha, A.[1]•Lloyd, J. J.[2]

[1]James Cook University Hospital, Middlesbrough, UK, [2]Royal Victoria Infirmary, Newcastle upon Tyne, UK

PURPOSE: Guidelines state that DMSA renal scintigraphic images should be acquired for 5 min or 3000 kcounts; this guidance is expert opinion rather than evidence based. We compared renal scar detectability using low and high count images. MATERIALS/METHODS: During normal clinical imaging we acquired images as 7 min dynamics. These were then reformatted as 2 min statics (without motion correction) ["low count"] and 7 min statics (with motion correction) ["high count"]. The high count images were in keeping with guidelines. We selected 40 abnormal and 28 normal cases covering a spectrum of appearance from normal to obviously scarred. Three expert observers reported the high count images and their consensus opinion taken as the gold standard. Six observers then independently reported all images viewed in a random order. ROC curve analysis was used to assess the difference between the techniques. The number of images and observers gave the study adequate power to detect clinically important differences. RESULTS: The mean areas under the ROC curves were 0.930 and 0.913 for the high and low count images, respectively. The mean difference was 0.0163; the 95% confidence interval was (-0.0382, 0.0707), *i.e.* this difference is not significant. CONCLUSION: This study indicates that adequate scar detection in DMSA renal scintigraphy can be obtained with considerable lower counts than conventionally recommended. This implies that either imaging time or radiation dose could be significantly reduced. Either of these strategies has important benefits as this technique is typically used in young children.

1650 Optimizing MIBG protocols: new for old?

Turner, P. J.•Collins, M. A.•Strouhal, P. D.

Royal Wolverhampton Hospitals Trust, Wolverhampton, UK

INTRODUCTION: Some local clinicians doubt the reproducibility of results and report standardization of MIBG scans. The utility of 48 h images is also questionable, though currently our standard practice, but these reduce scheduling flexibility. Scrutinizing our data might optimize protocols of these expensive, time-consuming studies. METHODS: Retrospectively, 2 independent observers' reviewed MIBG images over a 5 year period. Scans were interpreted without and then with 48 h images, and compared with concurrent CT/MRI. Uptake in regions of interest over abnormalities and liver (as background) were quantified and interobserver variations recorded. RESULTS: 22 scans were identified in all: 12 were positive with 100% observer agreement, 10 negative. CT/MRI correlated in 21 cases, one patient refused CT; histology correlated in all positives. SPECT images proved most helpful, especially in positives; 48 h images were felt to add little/nothing. Ratio of adrenal/abnormal uptake to liver uptake of >1.333 was observed in all positives. CONCLUSION: SPECT images done early and late correlate best with cross-sectional imaging. 48 h images were deemed futile, dropping them eases scheduling also. Uptake ratios aid reporter confidence but don't alter findings.

1700 Actual versus predicted usage of an off-site PET.CT service

Jones, C.•Strouhal, P. D.

Royal Wolverhampton Hospitals Trust, Wolverhampton, UK

BACKGROUND: Using the DoH framework, an out-of-region PET.CT referral service was established for the Black Country Cancer Network (BCCN). This audit compares actual PET.CT usage with predicted demand, correlated against National figures and locally agreed referral patterns. METHODS: All PET.CT referrals from within the BCCN (population approx. 952 000) were identified over 17 months since service commencement in July '05. This was compared with the total number of scans for the same period with funding pre-allocated by the PCTs within the Network and pro rata National predicted figures. Original requests were reviewed: cancer type and clinical indications documented. RESULTS: 148 referrals for PET.CT were identified, representing 14% (148/1079) of National predicted and 42% (148/350) of potentially funded scans. Only oncological referrals were received: Indications included lung (28%), lymphoma (12%), colorectal (20%), oesophageal (10%) and head/neck (11%) malignancies. With predicted referral percentages of 25%, 37.5%, 12.5%, 5% and 7.5%, respectively, only lung cancer approximated the estimated proportion of referrals. Lymphoma was under-represented despite numerous educational meetings about PET with lead Haematologists; the other cancer groups including those with level "C" evidence were over-represented. CONCLUSION: Despite limited PET.CT provision in the UK compared with Western Europe and locally allocated funding, PET.CT remains overall underutilized. Education and encouragement of Clinicians may increase referrals, as the lack of familiarity with the technology especially amongst our Haematologists seemed the biggest barrier. Allaying concerns regarding scanning delays with an off-site service despite purely e-mail requesting may need addressing also.

1545–1700
Managing the Digital Environment III

1545 Invited review: Speech recognition, theory, practice and demonstration

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,

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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 Speech Recognition. It is not entirely a happy story, and there are advantages and disadvantages which must be recognized if this technology is to be introduced without unexpected disappointments. Why should we consider Speech Recognition at all? What are the alternatives? What Speech Recognition 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 Speech Recognition system.

1630 Implementing National Programme PACS and speech recognition – does it deliver the benefit?

Etherington, R. J.•Cosens, M.

Countess of Chester Hospital, Chester, UK

PURPOSE: to assess the impact of National Programme PACS and speech recognition on report turnaround time in a DGH setting. MATERIALS/METHODS: RIS database evaluation before and after implementation of PACS and before and after implementation of speech recognition software, evaluating time taken from examination ordered electronically, taken by radiographer, put into draft form and electronically signed off. RESULTS: Average time from ordered to signed for all examinations fell from 16 days pre-PACS to 11 days post-PACS. For specific CR groups of examinations, taken to signed time fell from an average of 20 days to 4 days for inpatient studies, 10 days to 4 days for A+E studies, 10 days to 4 days for outpatient studies and 5 days to 4 days for GP studies. Preliminary data from the implementation of speech recognition indicate an average further reduction in turnaround time of 1 day. CONCLUSION: PACS and SR have had a very significant positive impact on turnaround times for radiological reports.

1640 Voice Recognition: Are we there yet?

Kakani, N.•Hollings, N.•Thorogood, S. Chellamuthu, S.

Royal Cornwall NHS Hospital Trust, Truro, UK

INTRODUCTION: Voice recognition for medical transcription has improved significantly through the years. As transcription forms a major part of radiological services, it is only fair that such a system be audited for its reliability, usability and impact on service delivery. OBJECTIVE: To assess the error rate of use of voice recognition soft ware in radiology department. METHODS AND RESULTS: A random sample of 480 reports generated by 16 radiologists between September and December 2006 were selected and appraised by two independent observers for errors and consensus opinion was obtained. The reports were appraised for minor (grammatical), major (significant implication to the final report) or IT errors. 22.5% (range 0–53%) of the total reports had minor errors, 2.5% (range 0–10%) had major errors and (0.625%) were considered to be due to software. Over all the error free rate of the reports using voice recognition was 97.5% excluding major errors only and 77% excluding all errors. CONCLUSION: When voice recognition was introduced it was greeted with scepticism due to the general technophobic culture and impact on secretarial staffing levels. Literature has shown that there is an adverse impact on report productivity and reporting time per session. Following initial outlay of time and resource, the benefits of such a system are difficult to ignore. These include: rapid availability of report, decrease number of lost reports and better use of secretarial time. Our audit has demonstrated that voice recognition is generally regarded as being a reasonable alternative to stream line radiology service.

1650 "Computer says know" – the trouble with speech recognition

Pathak, S.

King's College Hospital, London, UK

The advantages of incorporating picture archiving communication systems (PACS), speech recognition software (SRS) and a hospital wide radiological information system (RIS) are numerous and well documented. When radiological information is crucial to the management of a patient, the instant availability of images with reports expedites the clinical decision making process. This is beneficial to the patient and economically advantageous to the hospital being associated with reduced hospital stay. These benefits should not be taken for granted but are conditional on reducing the time taken for an image on PACS to be reported and the verified report to be distributed to the clinical team. This process is dependent on the optimal functioning and integration of PACS, RIS and SRS. The latter, by combining the dictation, transcription and verification processes is ideally designed to reduce the report turnaround time (RTT). We describe our first 2 years experience of SRS, the impact it has made on report turnaround times, problems encountered and possible solutions. We also attempt to identify design issues which may need to be addressed in the continuing evolution of SRS.

1600–1700
Neuroradiology SFG IV

1600 Facial pain

Connor, S.

King's College Hospital, London, UK

There are numerous causes of facial pain and clinical classifications are often unhelpful in guiding imaging protocols. This presentation will categorize facial pain as neuralgia, facial pain with cranial nerve signs, pure facial pain and other clinical facial pain syndromes. For each category, the need for imaging, appropriate imaging modalities and protocols, available data on diagnostic yield, pertinent imaging anatomy and potential pathologies will be addressed. Although all aetiologies will be covered, the focus will be on neurological aspects of facial pain.

1620 Diplopia

Miszkiel, K.

The National Hospital for Neurology & Neurosurgery, London, UK

No abstract supplied.

1640 Vertigo

Yousry, T.

The National Hospital for Neurology & Neurosurgery, London, UK

In general, vestibular disorders can be divided into peripheral, central and mixed disorders. This subdivision determines the imaging strategy to be chosen. Peripheral disorders are imaged by CT or MR sequences which best display the vestibular nerves and the labyrinth (CISS, DRIVE, FIESTA). Central disorders are imaged by MR sequences which best display the brainstem, cerebellum and cerebrum. The most frequent peripheral disorders are vestibular neuritis, perilymph fistulae, Menière's disease, and peripheral vestibular paroxysmia (disabling positional vertigo). They involve the vestibular nerve and the labyrinth. The main role of imaging is to assess the rare pathologies that occur with an unusual presentation of a vestibular syndrome such as intracanalicular acoustic neuromas, Cogan's syndrome, zoster oticus or to assess the extent of lesions that led to the presentation with vertigo such as cholesteatomas, acoustic neuromas, otitis media. The clinical classification of central vestibular syndromes is determined according to the 3 major planes of action of the VOR (yaw, roll, pitch) which is helpful in determining the location of the lesion. These lesions are most often the result of stroke, or demyelinating processes (MS), but occasionally, tumours, hydrocephalus, or Chiari I malformation can be the causative process. MRI is important in confirming the diagnosis and the location of the lesion.

1500–1700
Audit

1500 Invited review: Imaging 2011

Gray, M.

Institute of Health Sciences, Oxford, UK

No abstract supplied.

1630 Invited review: Patient care pathways and protocols

Bacon, A.

South Manchester PCT, Manchester, UK

No abstract supplied.

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1615–1715

Future provision of diagnostic imaging

1415 Invited review: A strategy for diagnostics – an update from the National Clinical Lead

Denton, E.

Norfolk & Norwich University Hospital NHS Trust, Norwich, UK

I will give an update of the current diagnostic imaging strategy at the Department of Health and also describe the Department of Health's views on the future of diagnostic imaging provision in England. The talk will also include some of my personal views as to how diagnostic imaging will change in coming years.

1630–1730

Hepato-biliary Scientific Session

1630 Comparison of using the Balthazar Score and the Modified Balthazar Score in the follow up of patients with acute pancreatatis

Santana, P. R.[1]·Hochhegger, B.[2]·Martignoni, F. V.[2]·Irion, K.[3]·Berni, R. B.[2]·Haygert, C. J. P.[2]

[1]IRION RADIOLOGIA, Porto Alegre, Brazil, [2]Universidade Federal de Santa Maria, Porto Alegre, Brazil, [3]Cadiothoracic Centre, Liverpool, UK

PURPOSE: To evaluate prognostic differences when using the Balthazar score or the modified Balthazar score in patients with acute pancreatitis. MATERIALS/METHODS: Files of 27 patients with the diagnosis of acute pancreatitis were retrospectively reviewed. All patients were submitted to abdominal CT and these examinations were reviewed by an expertise radiologist, blinded for the patient's outcome, who applied the Balthazar score and the modified Balthazar score, obtaining two prognostic analysis. For both scores the correlation between the severity of pancreatitis and the patient outcome was done using the Pearson coefficient of correlation using the *t*-test. The primary outcomes were defined as morbidity (hospitalization time or surgical intervention) and mortality. RESULTS: Among the patients who survived (62%), the correlations of the modified Balthazar score with morbidity (72.5% p=0.0075) and mortality (80% p=0.0031) were inferior when compared to the classic Balthazar score (92.5% p<0.001 and 89.4% p=0.002, respectively). Among those who died, the correlations of the modified Balthazar score with the morbidity (25.8%) and mortality (14.1%) outcomes were inferior as well, compared with the classic Balthazar score (93.6% and 51.3%), with p-value of 0.0019. The analysis of the whole group has shown that the modified Balthazar score presented correlation of 68.1% with mortality (p=0.0019) and 67.6% with morbidity (p=0.002), while for the classic Balthazar score the correlation was of 80.5% (p<0.0001) and of 90.2% (p<0.0001), respectively. CONCLUSION: The classic Balthazar score has shown, in this study, a stronger correlation with both the morbidity and mortality outcomes than the modified Balthazar score.

1640 Complementary effect of breath hold T_1 and T_2 spin echo sequences with high resolution 3D respiratory triggered Fast recovery MRCP sequences in evaluation of pancreato-biliary pathology

Jacob, A. D. C.·Rajashanker, B.

Manchester Royal Infirmary, Manchester, UK

Although high resolution 3D spin echo sequences offer superior MRCP images, there is poor visualization of the parenchymal morphology due to high level of background suppression, The purpose of this study was to evaluate additional benefits of using breath hold T_1 and T_2 weighted spin echo, along side high resolution 3D MRCP fast recovery fast spin echo sequences. MATERIAL AND METHODS: 50 consecutive patients with suspected biliary and/or pancreatic disease underwent MRI applying high resolution 3D respiratory-triggered FRFSE (Fast Recovery Fast Spin Echo) MRCP sequence. Complementary sequences included axial T_1 Dual echo, 2D T_2 breath hold axial and coronal FIESTA (Fast Imaging Employing Steadystate Acquisition). Assessment included ductal visualization, morphology and extra pathology identified on the additional sequences that significantly affected patient management. The additional findings were classified according to the organ and significance (High=require prompt medical or surgical treatment. Moderate=benign findings that may require medical or surgical intervention or significant negative finding. Low= unlikely to require treatment). RESULTS: Mean acquisition time was 48 s for the breath hold sequences. There were a total of 19 findings of High and 36 findings of Moderate significance. These included metastatic lesions in the liver, spine, metastatic lymphnodes and pancreatic head masses. In 29 of 50 patients the breath hold sequence added significant value to the management. CONCLUSION: The respiratory-triggered FRFSE 3D multislice MRCP sequence is an excellent sequence to diagnose ductal pathology in pancreato-biliary disease. The addition of a breath hold Dual echo and FIESTA sequence does not substantially increase acquisition time, however, significantly improves overall diagnostic accuracy.

1650 Beyond dual-echo imaging – measuring liver fat content and T_2* with multiecho MRI

O'Regan, D. P.·Callaghan, M. F.·Wylezinska-Arridge, M.·Fitzpatrick, J.·Naoumova, R. P.·Hajnal, J. V.·Schmitz, S. A.

Imperial College, Hammersmith Hospital, London, UK

PURPOSE: To design a breath-hold multiecho sequence to measure hepatic lipid content and model T_2* decay for both the fat and water components. MATERIALS/METHODS: Imaging was performed with a spoiled gradient echo sequence with 7 readouts on a 3.0 Tesla system. Each echo time was alternately in-phase or out-of-phase with respect to the signals from fat and water. Imaging was performed on 5 healthy volunteers (all males; mean age 37 years) and 5 patients with diabetes (4 males, 1 female; mean age 53 years). A biexponential curve-fitting model derived the relative signal contributions due to fat and water, as well as their respective T_2* decay constants. Comparison was made with point-resolved proton spectroscopy without water-suppression. Data were analysed with Pearson's correlation coefficient and Bland-Altman's limits of agreement. RESULTS: There was a significant correlation between multiecho and spectroscopic measurement of hepatic lipid (r^2=0.99, p<0.0001). The 95% limit of agreement in humans was 2.4%. If the T_2* of water is assumed to be longer than that of lipid the signal components from each could be correctly assigned throughout the clinical range of steatosis. CONCLUSION: Multiecho imaging provides a rapid method of quantifying liver fat content that is highly correlated to proton spectroscopy. In contrast to dual-echo methods a single multiecho sequence overcomes the potential error due to differential T_2* decay of fat and water; and enables the correct assignment of the fat and water signal components. Multiecho imaging provides an accurate and efficient method for spatially-resolved fat quantification and T_2* characterization of liver tissue.

1700 Systematic use of ultrasound contrast in a district general hospital – 2½ years experience

Moshy, R.

Peterborough & Stamford Hospitals NHS Foundation Trust, Peterborough, UK

AIMS: Contrast enhanced ultrasound (CEUS) should be part of routine normal practice. This short presentation aims to demonstrate its' current use at a busy district general hospital. DISCUSSION: The range of use of ultrasound contrast within our normal day to day practice will be discussed. The results of the outcome audit of the first 1½ years of routine use will be given – this encompasses a total of 182 patients. This audit demonstrated the following: 75 patients had other investigations before or after CEUS of which the results concurred in 67 patients. The nature of the 8 discrepancies will be explained. Overall CEUS was as accurate as CT in liver investigations. A brief résumé of the practicalities of the practice will be included. CONCLUSION: Audit has shown that in our unit ultrasound contrast use in the liver is as good as CT. All ultrasound units are encouraged to incorporate CEUS into their daily day-to-day routine.

1710 MRCP in biliary obstruction: what do you need to know?

Kandathil Chacko, J.·Shetty, S.·Beale, A.

Great Western Hospital, Swindon, Wiltshire, UK

KEY LEARNING OBJECTIVES: (1) To demonstrate the role of MRCP in evaluation of biliary obstruction. (2) To illustrate the imaging spectrum in benign and malignant disease. (3) Identify

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common imaging pitfalls. (4) Develop strategies for recognising and avoiding these pitfalls. DESCRIPTION: MRCP is increasingly used in biliary obstruction, providing a non invasive alternative to ERCP. A broad range of benign and malignant abnormalities can be detected and characterized using this technique. However various diagnostic pitfalls have been observed not previously encountered in conventional pancreatic and biliary imaging. MATERIALS AND METHOD: Retrospective review of images in 65 patients with biliary obstruction who had MRCP in our institution; comparison made with ERCP findings. CONCLUSION: MRCP is an excellent diagnostic tool in detecting and characterising intra and extrahepatic biliary obstruction. Familiarity with the spectrum of imaging findings and knowledge of the potential strengths and weaknesses of the technique would help in tailoring the imaging and increasing diagnostic efficacy.

1720 Liver tumours: treatment with transarterial chemoembolisation

Bent, C. L.·Matson, M.·Renfrew, I.·Hutchins, R.·Bhattacharya, S.·Fotheringam, T. Suaris, T.

Barts and the London NHS Trust, London, UK

PURPOSE: TACE is a recognized treatment option for patients with unresectable liver tumours, but there is conflicting literature regarding efficacy. This study was performed to audit practice at our institution. METHODS: 18 patients (M:F 16:2, age 30–81 years, mean 63 years) underwent 23 TACEs with epirubicin, lipiodol and PVA particles for hepatocellular carcinoma. RESULTS: 16 patients had cirrhosis: (13 Child-Pugh class A and 3 class B) and two patients had non-cirrhotic liver disease. Seven patients had positive viral serology. All patients underwent triphasic CT before TACE, demonstrating portal vein patency and tumours confined to the liver but unresectable due to size (n=3), location (n=4) or multicentricity (n=11). Procedural success was 91% (n=21). Mean survival following TACE was 263 days (range 4–740 days). 1 year survival rate was 43% (n=10). Post procedure deaths (<30 days) were seen in 26% (n=6). Of these, half were due to comorbidity (n=3). CONCLUSION: Previous literature has reported significant survival advantage following TACE in specific subgroups but standardized patient selection criteria have not yet been established. Consequently, many patients have significant co-morbidities, which may result in early death. Robust patient selection criteria may provide opportunities to improve overall outcomes.

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Notes

Scientific programme abstracts Wednesday 13 June

0830–1010

Chest/Cardiac I

0830 Invited review: CTA coronary arteries

Krestin, G.

Erasmus MC, NL - 3000 Rotterdam, The Netherlands

KEY LEARNING OBJECTIVES: To discuss the technical advancements, the benefits, and the limitations of CT coronary angiography and to present the results of 1 year experience with DSCT technology. DESCRIPTION: CT coronary angiography (CT-CA) is emerging as a non-invasive clinically reliable diagnostic tool to detect significant (luminal diameter > 50%) coronary stenosis. Early studies using 4- and 16-slice CT-scanners reported moderate diagnostic accuracy to detect significant coronary lesions, but the technique was seriously limited by the presence of unevaluable segments. The introduction of 64-slice CT scanners has been a significant improvement in image quality and robustness of CT coronary angiography. In 2006, a new dual-source CT (DSCT) system was introduced with a heart rate independent temporal resolution of 83 ms, allowing CT-CA without the use of pre-scan β-blockers. Early clinical studies report a high diagnostic accuracy of DSCT coronary angiography in a high pre-test probability population. Limitations remain persistent arrhythmias (atrial fibrillation), frequent extrasystoles and severe calcifications. CONCLUSION: CT coronary angiography has emerged as a powerful non-invasive technique that in near future will mature into a clinically applicable diagnostic imaging technique in a selected group of patients.

0900 Invited review: Pericardial/myocardial disease

Roobottom, C.

Derriford Hospital NHS Trust, Plymouth, UK

No abstract supplied.

0930 Dual-source computed tomography angiography for the assessment of in-stent restenosis in coronary arteries

Pugliese, F.·Alberghina, F.·Weustink, A. C.·Otsuka, M.·de Feyter, P. J.·Krestin, G. P.

Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands

PURPOSE: To evaluate the efficacy of dual-source computed tomography coronary angiography (DSCT-CA) for the detection of in-stent restenosis (≥50% stenosis) in a prospective cohort of patients referred for conventional angiography. MATERIALS/METHODS: 45 patients (34 males) with previous percutaneous stent implantation underwent prospectively ECG-gated DSCT-CA (Somatom Definition; Siemens, Germany). Subjects in stable haemodynamic status and sinus heart rhythm and were included. Exclusion criteria were renal insufficiency, irregular heart rhythm and contrast allergy. The patients did not receive premedication with beta-blockers. RESULTS: The average heart rate was 67±13 beats per minute (range 47–107 bpm). 81 stents were present (diameter range 2.25–5 mm). Nine stents were occluded and 15 had in-stent restenosis at quantitative coronary angiography (prevalence of disease 24/81=30%). The accuracy of DSCT-CA for the detection of stent occlusion resulted absolute (area under ROC curve=0.99). For the assessment of in-stent restenosis, we found a sensitivity of 92%, specificity of 82%, PPV of 61% and NPV of 98% when the B46f dataset was analysed (area under ROC curve=0.81). CONCLUSIONS: DSCT-CA reliably detects coronary stent occlusion at all heart-rates.

0940 Functional cardiac analysis by 64-MDCT: beyond the coronary arteries

Nicol, E. D.·Stirrup, J. E.·Padley, S. P. G.·Rubens, M. B.

Royal Brompton Hospital, London, UK

KEY LEARNING OBJECTIVES: To demonstrate the clinical utility of 64-MDCT coronary angiography data in evaluating biventricular function, regional wall motion abnormality, systolic wall thickening and assessment of myocardial perfusion. DESCRIPTION: Whilst high quality angiographic data allows assessment of coronary lumen, the dataset acquired for 64-MDCT coronary angiography also allows the possibility of further functional assessment of the heart. CONCLUSION: This oral presentation will highlight the "added value" of 64-MDCT coronary angiographic data in allowing a more comprehensive cardiac assessment. The additional functional cardiac data that is gained when acquiring a MDCT coronary angiogram can be used to assess the clinical impact of any underlying coronary artery disease or other cardiac abnormality.

0950 Multislice computed tomography and intravascular ultrasound for risk stratification in non ST-elevation myocadial infarction and unstable angina

Pugliese, F.·Vourvouri, E. C.·Mollet, N. R.·Ligthart, J.·de Feyter, P. J.·Krestin, G. P.

Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands

PURPOSE: To evaluate the safety and capability of MSCT-CA to determine: (1) location of culprit lesions; (2) extent of coronary artery disease, i.e. number of obstructed vessels (marker of long term risk); (3) attenuation of atheromas (attenuation <70 HU considered as marker of long term risk); (4) wall remodelling (marker of long term risk) in patients with non-ST elevation myocardial infarction (NSTEMI) and unstable angina (UA). Conventional angiography and intravascular ultrasound (IVUS) were reference methods. MATERIALS/METHODS: 48 patients (32 males; age 57±8 years) underwent MSCT-CA <78 h after symptoms onset. Major arrhythmias, renal insufficiency and contrast allergy were exclusion criteria. A 64-slice scanner (Somatom Sensation; Siemens, Germany) was used in 25 patients. A dual-source scanner (Somatom Definition; Siemens) in 23 patients. We obtained IVUS pullbacks in 1–3 vessels per patient depending on clinical indication. Proximal plaque, low attenuation and positive wall remodelling were assessed as dichotomous variables. Agreement between MSCT-CA and IVUS was analysed by K-statistics. RESULTS: Eight patients had normal coronary arteries. Sensitivity in detecting stenoses was 95%, specificity 93%, PPV 72% and NPV 97%. For lesion location, agreement between MSCT-CA and IVUS was excellent (K=1.0). For vessel wall remodelling, agreement was very good (K=0.91) For low-attenuation plaque, agreement was moderate (K=0.57). CONCLUSIONS: MSCT-CA is safe for risk stratification in patients with NSTEMI and UA. Plaque location and positive wall remodelling can be assessed as dichotomous variables in a cost-effective way.

1000 Complex lesion stenting techniques in coronary arteries. Non-invasive imaging with dual-source CT coronary angiography

Pugliese, F.·Alberghina, F.·Mollet, N. R.·Van Mieghem, C.·de Feyter, P. J.·Krestin, G. P.

Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands

KEY LEARNING OBJECTIVES: To review the major complex lesion stenting techniques by means of their appearance at CT coronary angiography. DESCRIPTION: Restenosis occurs in up to 20% of patients with complex lesion characteristics in the drug eluting stent era. The assessment with CT of in-stent restenosis or more subtle degrees of neo-intimal hyperplasia requires knowledge of the stent configurations at bifurcation sites. CT examples of provisional stenting technique, T, Y, culotte and crush stenting are provided with schematic drawings to explain the reshaped bifurcation anatomy and allow evaluation of the technical outcome of the procedure. CONCLUSION: An accurate non-invasive coronary imaging tool is highly desirable for the follow-up of patients after percutaneous coronary revascularization with stent placement. However, imaging the in-stent coronary lumen with CT is more challenging than imaging the native coronary artery lumen. The increased restenosis rates associated with complex lesions compared with simple lesions makes the knowledge of the stenting technique used and subsequent CT imaging issues mandatory.

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0830–1000
Paediatrics I

0830 Invited review: Investigating paediatric deafness

Wright, N.

Royal Manchester Children's Hospital, Manchester, UK

KEY LEARNING OBJECTIVES: To demonstrate the imaging techniques available and illustrate the spectrum of common abnormalities encountered when investigating paediatric deafness. DESCRIPTION: A retrospective review of cases based on a systematic approach and, where relevant, the literature pertaining to the investigation of deafness in children. Distinguishing between conductive and sensorineural deafness is an important first step when selecting an imaging modality. In general, conductive deafness should be imaged using CT and sensorineural deafness using MRI in the first instance. In young children, when sedation or anaesthesia is required, it may be prudent to perform both techniques to maximize the imaging opportunities. Knowledge of the normal anatomy of the middle and inner ear is clearly vital and there will be a brief overview. A range of abnormalities will then be reviewed illustrating pertinent imaging features relevant to the congenital and acquired conditions commonly encountered. CONCLUSION: At the end of the session, the audience should understand the important role imaging has in identifying a cause and assessing treatment options for children with hearing problems.

0900 Invited review: Investigating NAI

Johnson, K. J.

Birmingham Children's Hospital, Birmingham, UK

Non-accidental injury (NAI) is an emotive and challenging area of paediatric practice. Radiology forms a small but vital and integral part of the investigation of children with suspected known non-accidental injury. As a consequence of the important role radiology has in the investigation of NAI, there has been an ongoing working group between the Royal College of Radiologists and the Royal College of Paediatrics and Child Health to provide guidelines on the imaging of NAI. Some of the conclusions and recommendations from this group will be presented. This presentation will deal with the skeletal aspects of NAI and highlight the type of injuries that are commonly seen. It will detail the timing and types of imaging that should be undertaken to detect any fractures or skeletal injuries. It will discuss the advantages and limitations of radiographs, scintigraphy, ultrasound and MR imaging in detecting skeletal injuries. It will highlight the role of the radiologist and the importance of good communication with paediatricians. There will be discussion on (a) the identification of suspicious lesions, (b) differentiating normal growth patterns in the skeletal immature child from abnormal pathological changes, (c) differentiating traumatic injury from other medical conditions, (d) estimating the age of a lesion, (e) suggesting a mechanism for the injury, (f) identifying possible predisposing causes for fractures and (g) correlating the radiological findings with the clinical history.

0930 Invited review: Investigating paediatric head injury

Jaspan, T.

Queens Medical Centre, Nottingham, UK

The spectrum of paediatric head injury from birth to late childhood will be reviewed. The major causes of head injury that will be considered are (1) birth, (2) accidental and (3) non-accidental. Particular reference will be made to the appropriate imaging modality for each age group, the types of trauma involved and the radiological patterns of head injury encountered. Whilst CT scanning remains the mainstay for the routine investigation of traumatic head injury, the increasing impact of MRI particularly supplemented by diffusion weighted imaging (DWI) as well as more novel techniques such as MR spectroscopy will be discussed. Emphasis will be made on the need for imaging protocols, including the need for delayed imaging to evaluate the late sequela of traumatic brain injury, which account for significant long term morbidity (physical, developmental, behavioural and intellectual).

0830–1000
Independent Sector Diagnostics

0830 Invited review: Wave 2 independent sector's diagnostic facilities – the challenges to mobilization

Wilson, S.

Netcare Healthcare Ltd, London, UK

PURPOSE: To describe the challenges of the Independent Sector Diagnostics Procurement. MATERIALS/METHODS: The challenge of treating all NHS patients within 18 weeks of presenting to their GP is considerable. In 2003 SHAs and PCTs identified that access to diagnostic tests was a particular "bottleneck", with availability of MRI, ultrasound, endoscopy and physiological measurement a particular problem. The English Department of Health led a procurement process to introduce Independent Sector providers into the NHS. The resulting process encouraged providers to design services which allowed direct access from primary care, and demonstrated efficiency, innovation and patient centred care. In Health Netcare was awarded the contract for the East and London. Not only was there a need to provide a very wide range of tests in many community and hospital settings but as the new PCTs and SHAs emerged in 2006, ideas about what was needed changed, and frequent requests to change the service model were made. The challenge of setting up facilities, obtaining equipment, establishing a call centre and recruiting new staff, as well as designing and delivering the technical solution will be described. CONCLUSION: The increased capacity for diagnostics tests should, if used by GPs and PCTs, allow patients to be diagnosed and treated within 18 weeks of visiting their GP.

0855 Invited review: Wave 2 independent sector's diagnostic facilities

Bourne, M.

Alliance Medical, Oxford, UK

No abstract supplied.

0920 Invited review: Innovative ways of joint working

Webster, P.

Department of Health, London, UK

Independent Sector diagnostics – Its role and developing innovative ways of joint working. The wave 2 Independent Sector Diagnostic Programme is the largest single investment in Imagining services in the world providing an additional 900 000 examinations per year. Delivered through nine schemes the programme will operate across the NHS. Building on the initial Independent Sector diagnostic procurement, which focused on MRI access the Wave 2, services have been established to increase activity across all imaging modalities. As part of the national strategy for reducing overall waiting times and specifically supporting the 18 week target from referral to treatment the majority of additional activity is focussed at increasing Primary Care access to Diagnostics. This has required significant development of local imaging pathways with Primary care organizations and the independent Sector Providers.

0945 Discussion

0830–1000
Service Delivery I: Scientific Session

0830 Invited review: Patient and public involvement in radiology

Greggains, B.

Ex RCR Patient Liaison Group, London, UK

This paper examines the ways in which patients and the public can become involved in improving radiology services. It looks at the role of national and local organizations and considers the areas in which contributions can be made. It examines the patient/lay contribution to the work of the Royal College of Radiologists. Recently, the national Radiology Accreditation Project has sought patient input into standard setting for radiology departments and the outcome of this process is described. The patient contribution to the development of the R-ITI is also outlined. The issue of how patients and the public can contribute to on-going clinical audit is explored. Other current issues and developments are discussed.

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0900 Evaluation of efficiency of patient information before fluoroscopic examinations

Subramanian, K.[1]•Huq, N.[2]

[1]Royal Blackburn Hospital, Chorley, Lancashire, UK, [2]Royal Blackburn Hospital, Blackburn, Lancashire, UK

PURPOSE: Informed patient consent is a prerequisite for any procedure. Different sources of information are currently available. Evaluation of adequacy of patient information is fundamental to service provision and patient satisfaction. MATERIALS/METHODS: An ongoing prospective study of 100 patients undergoing elective fluoroscopic examinations. A mini mental state examination was conducted in every patient. Patients lacking the capacity to understand information were excluded. A questionnaire was completed by the patients before the procedure. Information from fellow professionals, information sheets and other resources (internet) were included. Self assessment of understanding of the indications, procedure and plans for further action was carried out on a scale of one to 10 by the patients. Patient co-operation and comfort during the study was graded. Radiation dose was recorded. The quality of the examination was assessed by an independent radiologist. Statistical analysis comparing patient understanding from different sources and the bearing on the quality of the study, comfort and radiation doses were performed. RESULTS: Initial results – one third of the patients had a poor understanding (fewer than 4/10) of the indications, procedure and physical requirements to undertake the test. In 90% of these patients, cooperation and quality of the study was suboptimal. Higher radiation doses were observed in 80% with all of them being referred for alternative tests. CONCLUSION: These results indicate that optimization of patient information should be focused upon. The quality of fluoroscopic examinations depends greatly on patient understanding, comfort during these tests. Higher radiation doses and higher referral rates to further radiological assessment were seen when patient information was sub optimal.

0910 Forging Radiology & Primary Care partnerships with tailored GP departmental visits

Beale, A. M.• Shetty, S.• Powell, G.

Great Western Hospital, Swindon, UK

PURPOSE: To improve Primary Care/Radiology partnerships using tailored GP departmental visits: BACKGROUND: There have been widespread changes in the way the health service has been funded with a shift away from Health authorities to PCTs. This has altered funding and referral patterns from GPs. Inevitably primary care want (and likely will have) more open access to radiology departments and will, through patient choice, have the means to significantly influence radiology funding. In addition, unlike most hospitals, our PACS links directly to all local surgeries meaning that GPs can now view radiographs or scans themselves. In consequence a greater understanding of the way the radiology department functions will be needed by GPs. MATERIALS/METHODS: Study days for individual GPs in the Radiology department were organized. The days are individually tailored to each doctor. Any sub-speciality interests are taken into account and by using PACS the referring practice of each GP can be discussed and benchmarked against colleagues. Typically the day includes attending an MDT meeting, plain film reporting with a consultant radiologist, and visits to all the imaging modalities. We then ask for e-mail feedback. RESULTS: Feedback has been excellent in all cases, *e.g.* "MDT a real eye opener, CT 3D so cool, Referral mini-audit great, Radiology changed so much" etc. CONCLUSION: The study days have provided an excellent opportunity for 360° feedback and have been fruitful in establishing a healthy relationship between the hospital and GPs. We have, in turn, been able to discuss our concerns regarding outsourcing and patient choice.

0920 Analgesia prior to hysterosalpingography – yes or no?

Pearson, R. H.

Kingston Hospital, London, UK

PURPOSE/MATERIALS: To ascertain whether information sheets should advise analgesia prior to hysterosalpingography or whether this causes unnecessary apprehension. Information sheets should inform, prepare and reassure patients prior to procedures. Hysterosalpingography is perceived by patients and doctors to be a painful procedure. Anxiety is known to lower pain threshold and should be minimized. MATERIALS/METHODS: 120 consecutive patients undergoing hysterosalpingography at two centres (A+B) completed a questionnaire after the procedure about their perception of the need for analgesia and whether prior mention of analgesia had increased their level of apprehension about the procedure. Both centres provide information leaflets. Centre A specifically advises prophylactic analgesia. Centre B does not. RESULTS: The majority of patients (Centre A 79%, centre B 84%) considered prophylactic analgesia unnecessary and the majority (Centre A 74%, Centre B 92%) considered analgesia instruction an anxiety provoking factor. CONCLUSION: Prophylactic analgesia is considered unnecessary and anxiety provoking by the majority of patients and should not be recommended in information leaflets at centres using experienced staff and non-invasive catheter techniques.

0930 The preparation methods of women before their first obstetric ultrasound examination – implications for training

Nicol, M. W.

St Martin's College, Lancaster, UK

KEY LEARNING OBJECTIVES: First time expectant women's knowledge of obstetric ultrasound capabilities is seriously compromised by their selective use of preparatory information. This lack of preparation is influenced by a number of factors driven primarily by the social need for visual proof of pregnancy. DESCRIPTION: By using a feminist perspective and data generated from qualitative methods it has been established that the social part of the first obstetric scan is important to a woman's "right of passage" to becoming a mother. The visual image is used by the women as proof of pregnancy and as such replaces intuitive knowledge, therefore the first obstetric scan serves as an important social milestone and women's expectations are high. In order to achieve this vital visual proof, expectant women have to cope with a number of issues. These include the acceptance of the medicalization and medical surveillance of pregnancy, together with an acceptance of the cultural rules of hospital maternity care. The result of this is that women comply for a healthy outcome. To remain optimistic in their approach to obstetric scans women engage in a number of coping strategies when using written information. A consequence of this is a lack of understanding and knowledge of ultrasound capabilities. CONCLUSION: The causes of women's lack of preparation before their ultrasound examination partly explains why many pregnant women may not be prepared for converse news concerning their pregnancy. This has implications for ultrasound practitioners and their training needs.

0940 Radiation exposure of technical staff operating mobile & static PET/CT scanners

Alsafi, K.[1] Grootoonk, S.[2] Roberts, F.[2] Spyrou, N.[1]

[1]Department of Physics, University of Surrey, Guildford, UK,

[2]Alliance Medical Limited, Upton, Oxon, UK

PURPOSE: Static PET/CT facilities in the UK are limited (<20 scanners in England) which has resulted in unfavourable patient waiting lists. Mobile PET/CT units can be considered as a helpful solution because they can offer access to a large number of locations. However, the unit design, workload and staffing patterns are different from those used in static sites, often resulting in higher dose levels for technical staff operating mobile scanners. In this study we investigated radiation exposure doses to technical staff involved in the various phases of patient scanning with particular emphasis on high radiation exposure phases like patient injection. METHODS: The PET/CT patient scanning episodes were divided into six phases to allow for more detailed analysis of technical staff dose and exposure time. 118 patient episodes were observed (56 and 62 in mobile and static units, respectively). Radiation dose and exposure time were recorded using well calibrated electronic personal dosemeters (EPDs). The data was then analysed to attain the significance of the various activities and recommendations were made to help in reducing technical staff doses per episode. RESULTS: The average staff dose per patient during the injection phase was comparable (2.3±1.1 μSv and 2.79±0.9 μSv in mobile and static facilities, respectively). However, journey to the W.C. in mobile unit contribute significantly to the increase in staff doses resulting in 20% increase in the overall dose burden.

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CONCLUSIONS: More staff dose awareness and training, as well as the use of domestic helpers in escorting patients for the W.C. can reduce technical staff doses significantly and keep them below the level of classification (6 mSv year^{-1}). Technical staffing levels and the location of the W.C. can also play a significant role in maintaining lower radiation exposure levels.

0950 Operator dose monitoring at a clinical PET facility

Watt, M. J.

NHS Grampian, Aberdeen, UK

PURPOSE: The John Mallard Scottish PET Centre in Aberdeen operates the only clinical Positron Emission Tomography service in Scotland, and consists of a cyclotron, radiochemical laboratory and a PET-CT scanner. This presentation will report on the radiation doses received by staff involved in the preparation and use of PET radionuclides. MATERIALS/METHODS: Both laboratory staff involved in the preparation of radionuclides and nuclear medicine technologists responsible for administering injections and performing scans have been monitored, using a combination of thermoluminescent dosemeter (TLD) badges and finger rings, electronic personal dosemeters (EPDs) (Global Dosimetry DMC2000X) and an AEGIS electronic finger dose probe (John Caunt Scientific). The electronic dosemeters produce a temporal dose record which can be matched to the operations carried out. RESULTS: The whole-body and finger doses received by staff will be presented, together with corresponding patient numbers and radionuclide activities. A comparison of the different monitoring methods will be made, considering both monitoring results and experiences of the different technologies. Initial results indicate an average difference between TLD badges and EPDs of 12%, which can largely be explained by positioning differences. Doses measured by the AEGIS finger probe during individual sessions will be compared with monthly doses measured on TLD rings; initial results indicate a difference of up to 25%, which may be explained by factors including device positioning and the encumbering presence of the AEGIS probe. CONCLUSION: Optimal positions for monitoring will be determined. The highest dosing parts of procedures will be identified and methods suggested for dose reduction.

0830–1000
RCR PACS and Teleradiology Group I

0830 Invited review: Introduction: Where are we 1 year on?

Bramley, R.

Christie Hospital NHS Trust, Manchester, UK

No abstract supplied.

0845 Invited review: Update from the National PACS team

Norman, J.

NHS Connecting for Health, Leeds, UK

No abstract supplied.

0915 Discussion

0930 Invited review: How PACS changes inter-healthcare organizational patient management

Horii, S.

University of Pennsylvania Medical Centre, Philadelphia, PA, USA

A great promise of PACS has been that these systems could facilitate the sharing of patient information across healthcare systems. Despite great enthusiasm, and a demonstrated need, for this idea, it has not (at least in the USA) evolved nearly as rapidly as might be expected. With the evolution of healthcare systems from separate hospitals and the large-scale abandonment of film, methods for interchanging images and associated information have become more important. This talk will explain some of the barriers to inter-institutional patient information interchange seen in the USA, the reasons for those barriers, and how healthcare systems are working to overcome these barriers while continuing to support the principles behind the needs for privacy and confidentiality. The Institute of Medicine reports that were so critical of patient safety in the USA have also resulted in efforts at reducing the types of preventable errors the reports described. The potential for errors increases when patients move between healthcare systems, so any consideration of information interchange also includes ways of assuring proper patient identification. The speaker will describe efforts his institution and others have taken at developing both intra-institutional (between separate facilities within the same system) and inter-institutional information interchange. The problems faced include technical, political, and social concerns and are complicated by regulatory statutes (as promulgated by the Health Insurance Portability and Accountability ACT – HIPAA – in the USA).

0830–1000
Junior Forum I

0830 Invited review: Consultant contract

Ellis, J.

Milton Keynes General Hospital, Milton Keynes, UK.

No abstract supplied.

0900 Invited review: Preparing for consultant interview

Connolly, D.

The Royal Hallamshire Hospital, Sheffield, UK

PURPOSE: Enable radiology SpRs currently in training to evaluate the measures they can take to ensure they are successful in obtaining the consultant job they deserve. MATERIALS/METHODS: Review the process of SpR training and the consultant job application process. Review of application forms and attempt at shortlisting. RESULTS: Insight into what it takes to be the successful candidate from the perspective of the consultant body and the perspective of the candidate. CONCLUSION: Start preparing before you enter radiology!

0930 Invited review: Organizing fellowships abroad

Taylor, B.

Christie Hospital, Manchester, UK

No abstract supplied.

0830–1000
Interactive imaging for surgery

0830 Invited review: Interventional MR

Muthurangu, V.

UCL Institute of Child Health and Great Ormond Street Hospital for Sick Children NHS Trust, London, UK

Interventional MR offers the benefits of reduced X-ray exposure, better soft tissue visualization and access to more accurate physiological information. It is therefore a desirable technology, particularly in cardiology. The ability to perform real-time MR imaging has made it possible to perform interventional MR procedures. Several groups worldwide have demonstrated the feasibility of MR guided cardiac catheterisation with X-ray backup. Currently, it is possible to perform purely MR guided cardiac catheterization for diagnostic procedures. However, interventional procedures must be performed using a hybrid approach, as device delivery systems are not MR compatible. An important issue in interventional MR is catheter visualization. Passive catheter visualization relies on intrinsic properties of the catheter (*i.e.* carbon dioxide filled balloon) and is inherently MR safe. Active catheter visualization relies on signal reception by a catheter electrically connected to the MR scanner. It has many benefits over passive catheter visualization. However, there are safety concerns due to the possibility of heating. Areas of future research include improved catheter visualization, faster real-time imaging and the development of MR compatible delivery systems. These developments should make interventional MR more applicable in the clinical environment.

0900 Invited review: Future directions in stereotactic neurosurgery

Golash, A.

Royal Preston Hospital, Preston, UK

No abstract supplied.

0930 Invited review: Interactive imaging for surgical robotics

Bello, F.

Imperial College, London, UK

No abstract supplied.

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0845–1015
Intervention I: Embolisation Therapy

0845 Invited review: Lung

Jackson, J.

Hammersmith Hospital, London, UK

Bronchial angiography and embolisation. KEY LEARNING OBJECTIVES: To understand the indications for bronchial arteriography and embolisation. To understand the reasons for bronchial and non-bronchial systemic artery hypertrophy in chronic inflammatory diseases of the lung. To recognize the common angiographic signs in patients with chronic inflammatory disease of the lungs complicated by haemoptysis. To recognize that the purpose of bronchial and non-bronchial systemic artery embolisation is to reduce perfusion pressure to areas of diseased lung and, thereby, reduce the risk of further haemoptysis. To recognize that pseudo-aneurysmal disease of the pulmonary arteries is relatively common and that its recognition is important, as its successful treatment usually requires both systemic and pulmonary artery embolisation. To understand that recurrent haemoptysis occurs in a significant proportion of patients and that repeat bronchial artery embolisation is usually helpful. To recognize the potential complications of bronchial artery embolisation. DESCRIPTION: Massive haemoptysis, which is best defined as bleeding into the bronchial tree at a rate that poses a threat to life, is associated with considerable mortality unless treated aggressively. The majority of patients are not surgical candidates because of the presence of severe bilateral pulmonary disease and/or the presence of large transpleural vessels and these individuals are best managed by bronchial artery embolisation. This presentation will discuss technique and the angiographic findings commonly seen in patients with chronic inflammatory disease of the lungs as well as the results and complications of bronchial arterial embolisation.

0915 Invited review: Trauma

Reidy, J.

Guy's & St Thomas' NHS Trust, London, UK

Embolisation for severe bleeding can involve any part of the body and may be associated with multiple aetiologies. Embolisation related to trauma is particularly important as the bleeding may be severe and as an alternative treatment surgery is often major and in complex patients. Though these cases are rare the results can be both dramatic and lifesaving. Good imaging is essential and X-sectional imaging may localize lesions prior to arteriography. Arteriography then allows embolisation to be effected precisely at the bleeding point so that adjacent tissues or normal vessels are unaffected. Trauma may often involve iatrogenic trauma related to biopsies, drainage procedures or surgery. The main areas embolisation can be effective in liver, spleen and kidneys and the musculoskeletal system. Where small vessels are the source of bleeding selective embolisation after detailed arteriography is very effective and a variety of embolisation materials need to be readily available. Trauma may affect large arteries such as the thoracic aorta, iliac arteries, carotid and subclavians. The development of stent grafts has enabled false aneurysms perforations to be treated as an alternative to surgical repair. CONCLUSION: It is important that non-interventional radiologists are aware of the need to localize bleeding and are then aware of the potential of embolisation and stent-grafting procedures. Interventionalists need to be able to respond 24/7 to emergency cases and have a complete range of embolisation materials and stent grafts available if they are to offer an effective service.

0945 Invited review: Female pelvis

Belli, A.

St George's Hospital, London, UK

Embolisation therapy in the female pelvis. Arterial and venous embolisation procedures play an important role in the management of symptomatic uterine fibroids, life threatening postpartum haemorrhage and ovarian varices causing pelvic congestion syndrome. Other less common indications are in the management of ectopic and molar pregnancies. Uterine fibroid embolisation (UFE) is a successful alternative to the traditional surgical management of fibroids. The results of randomized trials and large registries have shown this to be safe and cost effective. The advantages of the technique are an early return to work and preservation of the uterus. The main disadvantage is that 23% of women may require further fibroid treatment. Postpartum haemorrhage is a leading cause of maternal death worldwide. Risk factors may be recognized before delivery and such patients warrant delivery in maternity units, with protocols and resources available to deal promptly with massive haemorrhage. Embolisation of the uterine arteries or anterior division of the internal iliac arteries is effective in stopping haemorrhage. Prophylactic placement of catheters into the internal iliac arteries in readiness for embolisation avoids delay in patients known to be at risk. Pelvic congestion syndrome secondary to pelvic varices typically affects young, multiparous women. The pain can be cyclic with dysfunctional bleeding, dysmenorrhoea or dyspareunia. Venographic evaluation and embolisation can achieve significant improvement in pain. The technique is similar to that used in male varicocoeles with the difference that embolisation of the internal iliac veins is required as well as both ovarian veins.

0900–1000
Ultrasound on-call: an introduction I

0900 Invited review: Introduction – the Saturday morning list

Baxter, G.

The Western Infirmary, Glasgow, UK

This introductory lecture will essentially encompass a brief overview of the type and range of clinical cases and presentations, routine and esoteric, that are likely to be encountered on any ultrasound list. This will range from abdominal and pelvic problems to lumps, bumps and vascular related pathology. There are a wide range of ultrasound applications. These are not confined to weekday lists but also occur at the weekend which traditionally covered emergencies only. Such work is now regarded by many institutions as a necessary requirement in a move towards 24/7 cover. Specific detailed applications of the technique will be reviewed in subsequent lectures. This short introductory talk is intended to set the scene and to give a flavour of more detailed discussion to follow.

0915 Invited review: Abdominal ultrasound – I

Bates, J. A.

St James's University Hospital, Leeds, UK

This talk is directed at trainees learning ultrasound and preparing to do on-call duties. The session will cover basic abdominal techniques to evaluate and demonstrate the major upper abdominal organs. It will address basic equipment settings, artefacts and pitfalls, helping trainees to be aware of the limitations of technique and equipment, and preparing them to answer basic clinical questions using ultrasound as a first line imaging modality.

1030–1215
Chest I

1030 Invited review: Interstitial pneumonias

Padley, S.

Chelsea and Westminster Hospital, London, UK

No abstract supplied.

1100 Invited review: Lung cancer staging

Gleeson, F.

Churchill Hospital, Oxford, UK

No abstract supplied.

1130 Invited review: Lung nodules in patients with extrathoracic malignancy

Desai, S.

King's College Hospital, London, UK

In patients with a known primary extrathoracic malignancy staging investigations will commonly include an examination of the chest. Whilst, most patients will be referred for a plain chest radiograph, there is a limit to the size (typically around 1 cm diameter) of pulmonary nodules detectable by conventional radiography. Because the contrast resolution of CT is higher and there is no anatomical superimposition, small intrapulmonary nodules will frequently

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be identified; this is particularly true since the advent of spiral and now multidetector row CT machines. However, the determining the significance of focal intrapulmonary nodules, in patients with a known malignancy, remains a vexing problem for the radiologist and clinician. The significance of imaging findings (specifically at CT) in patients with underlying malignancy will be discussed. The potential importance of the clinical data, multiplicity and size of pulmonary nodules will be reviewed. Take home points: (1) Incidental lung nodules are commonly seen in patients undergoing staging tests for extrathoracic malignancy. (2) Determining the significance and best management of such nodules is problematic. (3) The multiplicity of nodules, knowledge of the biological behaviour of the underlying malignancy and a smoking history are amongst the important factors in determining the clinical significance of such nodules.

1200 Discussion

1030–1230
Paediatrics II

1030 Invited review: An approach to paediatric neck masses

Williams, H.

Birmingham Children's Hospital, Birmingham, UK

Neck masses are common in children and many present to radiologists along the diagnostic pathway. Congenital cystic masses are seen at all ages but some, such as branchial cleft cysts may have different appearances in children compared with adults. For cystic masses the best clue to diagnosis is the location. Vascular lesions are usually recognizable from their clinical behaviour but imaging has a role in determining the nature and extent of the lesion particularly if treatment is being considered. Unlike adults, the majority of solid or nodal neck masses in children are benign but it is important to be aware of "worrying features" that indicate possible malignancy so that biopsy can secure a definitive diagnosis without delay. Ultrasound is the primary imaging modality for children as it is quick, inexpensive, and provides immediate information about the location and nature of a lesion without using ionizing radiation, sedation or anaesthesia. Ultrasound can also be used to guide needle aspiration or biopsy. The main disadvantages of ultrasound are that it provides poor information about deep structures and cannot determine the craniocaudal extent of a mass if there is skull base or mediastinal involvement. Also ultrasound findings are non-specific. MRI and CT can address some of these issues but may require sedation or GA in young children. Most importantly, all imaging must be interpreted in conjunction with the clinical history and examination findings including the patient's age.

1100 Invited review: An approach to lung lesions

Paterson, A.

Royal Belfast Hospital for Sick Children, Belfast, UK

Congenital lung abnormalities include a wide spectrum of conditions and are an important cause of morbidity and even mortality in infants and children. During this lecture, the imaging evaluation and appearances of a diverse range of both focal lung anomalies (congenital lobar emphysema, congenital cystic adenomatoid malformation and bronchopulmonary foregut malformations) and the dysmorphic lung will be discussed. Reference will be made to the post-natal follow up of lung abnormalities discovered on antenatal ultrasound examinations.

1130 Evaluation of complications of paediatric renal transplantation using ultrasound and MR imaging – 5 year experiences from Leeds, UK

Mankad, K.•Hoey, E.•Fitzpatrick, M.

St. James' University Hospital, Leeds, UK

PURPOSE: The complications of paediatric renal transplantation can be classified as parenchymal (ATN, acute/chronic rejection, drug nephrotoxicity), collections (haematoma, seroma, lymphocoele, urinoma), vascular (arterial/venous stenosis or thrombosis, pseudoaneurysm, infarction) and collecting system abnormalities (ureteric obstruction). In this pictorial review we present the spectrum of complications seen in our centre over 5 years with their ultrasound and MRI features. METHODS: A retrospective analysis of the data between 2000 and 2006 was carried out using the Proton database. Each clinical event in a patient with advanced kidney disease is recorded in our centre by specially trained nurses on the Proton system. The imaging for each complication recorded was reviewed by an experienced paediatric radiologist. RESULTS: 84 renal transplants were carried out during this period. 72 cadaveric, 12 live-related donor, recipient age range 3–15 years (median 9.5 years), M:F 2.7:1, average follow-up period from date of transplant 2.6 years. 13 patients had a complication identified on imaging (15.5%). Parenchymal complications were seen in 5, symptomatic collections in 2, vascular complications in 5 and ureteric obstruction in 1. No mortality was reported. CONCLUSION: Ultrasound and MR are radiation friendly, non-nephrotoxic imaging modalities that play a key role in the management of paediatric renal transplant complications.

1140 Paediatric perianal Crohn's disease: does magnetic resonance imaging (MRI) help the subsequent treatment decision making process?

Natarajan, R.•Miller, C.•Protheroe, S.

Birmingham Children's Hospital, Birmingham, UK

PURPOSE: The use of newer agents such as infliximab in the management of complicated Crohn's disease requires exclusion of significant abscess formation prior to commencing therapy. We have reviewed the MRI, clinical management and outcome in a group of children with perianal Crohn's disease at a regional gastroenterology unit of a paediatric teaching hospital. MATERIALS/METHODS: 17 patients were identified who had MRI performed for suspected perianal disease during the time period 1/9/00 to 17/10/06. The group comprised 10 females and 4 males with mean age of 14 years. Retrospective review of a total of 21 MR examinations (4 patients had follow up scans) and clinical details was performed. MRI was performed at 1.5 T with routine coronal and axial T_1, T_2 and STIR sequences and post contrast fat saturated imaging if appropriate. RESULTS: Fistulating disease was present in 15 patients: 7 intersphincteric, 4 trans-sphincteric, and a combination of inter, trans and extrasphincteric in 4. 2 patients with complex fistulating disease were referred for consideration of seton placement. 6 patients were commenced on infliximab treatment, 3 with complex disease. 2 patients had no fistulae and were maintained on medical therapy. 4 patients with intersphincteric disease improved with antibiotic therapy. CONCLUSION: MRI is a practical and useful technique in the paediatric population and can help identify otherwise clinically occult collections and fistulae. Proper mapping of the fistula helps to plan surgical management and guide the safe use of treatments such as infliximab.

1150 Who should report skeletal surveys in non-accidental injury-generalist or specialist?

Summerfield, O. J.[1]•Gay, D.[1]•Shirley, J.[2]•Thorogood, S.[3]

[1]Royal Devon & Exeter NHS Foundation Trust, Exeter, Devon, UK, [2]Derriford Hospital, Plymouth, Devon, UK, [3]Royal Cornwall Hospital, Truro, Cornwall, UK

PURPOSE: To asses if general radiologists can report skeletal surveys as accurately as a paediatric specialist radiologist in the setting of suspected non-accidental injury (NAI). To our knowledge this is the first comparison described in the literature. METHODS: 6 cases comprising clinical history and radiographs were classified by a paediatric specialist radiologist into four categories: Definite NAI, Probable NAI, Abnormalities but unlikely NAI (*e.g.* with a compatible history) or Normal with no fractures. All cases were anonymized and given to 14 radiologists including two post FRCR registrars for reporting using a standardized data collection form. RESULTS: (1 case) Not suspicious: 93% correct and 7% overcall. (2 cases) Abnormal unlikely NAI: 68% correct and 32% overcall. (1 case) Abnormal probable NAI: 79% correct and 21% undercall. (2 cases) Definite NAI: 64% Correct and 36% undercall. CONCLUSION: Radiologists should not miss a potential NAI case; it is preferable to overcall cases initially as they can be reviewed later with no increase in risk to a child. From this study a specialist paediatric opinion seems important as up to a third of NAI cases may be missed by the generalist. Many hospitals have only one specialist paediatric radiologist – who reports the skeletal surveys when the specialist is away?

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1200 Measurement of regional body fat composition with dual X-ray absorptiometer (DXA) in children with cystic fibrosis compared with controls

Bansal, G. J.

Leeds General Infirmary, Leeds, UK

PURPOSE: The aim of this study was to work out any difference between children with cystic fibrosis (CF) and controls with respect to number of variables viz. weight, height, body mass Index (BMI), per cent body fat, fat mass index (FMI), fat free mass index (FFMI), pubertal development and regional analysis of fat distribution. It is also the purpose of this study to work out the correlation between forced expiratory volume in 1 s (FEV1) and FFMI and FMI. MATERIALS/METHODS: 130 controls were compared with 108 cases. Cases and controls were matched with respect to age, sex and ethnicity. A non-parametric test (Mann-Whitney U) was used to work out the difference between the groups. Partial correlation was used to work out the correlation between FEV1 and FFMI and FMI. SPSS version 13 and Microsoft excel was used for all statistical and data analysis. RESULTS: Children with CF had lower weight, height, BMI, percent fat and FMI. Boys also had lower FFMI. Boys and girls with CF also had lower android to gynoid fat ratio. There was no difference in the clinical pubertal development between the two groups. Partial correlation found significant correlation between FEV1 and FFMI but not between FEV1 and FMI. CONCLUSION: Children with CF had lower weight, height, BMI, FMI, percent fat and android to gynoid fat. FFMI was lower only in males. FEV1 correlated significantly with FFMI.

1210 Investigation of non accidental injury: changes in local policy

Gunatunga, I. P.•Evans, A.•Harrison, S.

University Hospital of Wales, Cardiff, UK

PURPOSE: Prior to July 2004 local policy was to perform bone scans within 48 h as a primary investigation, in addition to skeletal survey and CT brain. This policy was revised and routine bone scans were replaced with follow up imaging at 2 weeks with CXR and coned metaphysis. The audit findings following this policy change is presented here. METHOD: Data were collected prospectively over 10 months from July 2004 to April 2005. During this period 26 children presented with suspected abuse/NAI. We looked at what primary investigations they had on admission and whether they had any new findings on follow up imaging. RESULTS: All cases had a skeletal survey within 48 h. 25/26 cases had CT or MR. Follow up imaging was performed in only 15/26 cases. 9/26 cases failed to attend for follow up imaging. 2/26 cases did not require follow up. There was 1 case with new findings of the 15/26 who attended for follow up imaging. Only 10/15 cases attended during the required 2 week period. 5/15 were delayed between 21–39 days, thereby delaying a decision on care and outcome. CONCLUSION: Follow up imaging was poorly attended, leaving the investigation of NAI incomplete. This compromised child safety and delayed a decision on care. This was in spite of every effort being made by authorities to help carers and parents attend the follow up appointment. Since the audit we have reverted back to performing bone scans routinely as part of the primary investigations for NAI.

1220 Does double voiding increase the detection of reflux in micturating cystourethrography?

Seah, M.[1]•Kenney, I. J.[2]

[1]King's College Hospital, London, UK, [2]Royal Alexandra Hospital, Brighton, UK

PURPOSE: To test the hypothesis that a second voiding cycle may increase the detection of vesico-ureteric reflux (VUR). A comparison of single and double voiding micturating cystourethrography (MCUG). MATERIALS/METHODS: Data were collected retrospectively from 61 patients between November 2004 and August 2005. Comparisons were made between single and double voiding MCUGs regarding the detection of reflux and radiation exposure. Results of patients under 1 year of age were interrogated separately. RESULTS: The median age at the time of the procedure was 11.6 months. 71 % of the patients were referred for a UTI. The mean radiation dose was 13.7 cGycm^{-2} from a mean exposure time of 13.9 s. Overall, abnormalities were detected in 33.3% of cases when double voiding was implemented, compared with 35% when a single void was studied. In children less than 1 year, double voiding yielded 18.5% abnormal results whereas 25% of cases examined with a single void were considered abnormal. Double voiding did not significantly increase the radiation exposure for children less than 1 year (7.19 cGycm^{-2} versus 7.4 cGycm^{-2} for single and double voiding respectively, p= 0.888). CONCLUSION: We have not shown that cyclical voiding improves the detection of VUR but equally it did not significantly increase radiation exposure. The failure to mirror previous studies may be in part due to practical differences between those patients who were examined with a second void and those who were not (for example children who were unable to tolerate a second bladder fill).

1030–1200
Radiology Service Improvement: New Ways of Working II

1030 Invited review: Working smarter not harder

Griffiths, S.

The Medway Maritime Hospital, Gillingham, UK

The Medway Maritime Hospital Imaging Department was suffering with poor recruitment and retention of staff and waiting times were increasing week on week. Action needed to be taken to stem the flow of staff away from the department and good staff needed to be attracted. The departmental culture needed to be changed so that all staff felt they were working in a hospital where the managers cared and where the staff felt valued and knew that their careers could develop positively. A new Clinical Director and Manager were appointed and the department has made many service improvement changes. Long waiting lists are a thing of the past and staff development in all areas has been fully established. The Department can now boast of a waiting list for staff wishing to join our team.

1055 Invited review: LEAN thinking

Schenk, A. Walsh, C.

Royal Bolton Hospital, Bolton, UK

PURPOSE: Bolton Hospital NHS Trust began its Lean journey in July 2005 as a participating hospital in the Institute for Health Improvement Save 100k Lives campaign. Radiology Department was chosen as one of the first areas to experience "Lean in Action". Two areas were identified: Plain Film reporting and Orthopaedic Outpatients. Both of these areas had similar problems of long waits, chaotic organization and unacceptable service to our patients. It was clear that staff were working in cumbersome and broken processes, which did not support best possible care. MATERIALS/METHODS: Lean Rapid Improvement events using such tools as Value Stream Analysis, creation of a reporting cell, production control board and staff and patient representatives' involvement. RESULTS: Noted change in staff behaviour and attitude such as improved staff morale and ownership of process demonstrated by daily monitoring of process and actioning of issues by staff. Same day reporting for urgent films, and reports to GPs within 7 days as opposed to weeks. Radiology as a source of learning about lean methods in the wider organization. Breaking down the "silos". Orthopaedic outpatients and Radiology development of Standard Work, creation of appointments for X-ray on arrival patients, increase in nurse requesters and future relocation of equipment to improve flow in both departments. CONCLUSION: Lean Methodology has truly touched the hearts and minds of staff and patients leading to improvement of care and admin processes. However, these results are not the endpoint but only the start of an ongoing process of improvement.

1120 Invited review: The theory of constraints – achieving a breakthrough in performance

Knight, A.

Goldratt Group, Oxford, UK

No abstract supplied.

1145 Discussion

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1030–1200
Debate: International Recruitment Provides an Essential Resource to deliver targets

1030 Invited review: Speaking for the motion

Stanberry, B. A.

Avienda Limited, Cardiff, UK
No abstract supplied.

1050 Invited review: Speaking against the motion

Gishen, P.

Hammersmith Hospitals NHS Trust, London, UK
No abstract supplied.

1110 Invited review: Seconding for the motion

Speaker TBA
No abstract supplied.

1120 Invited review: Seconding against the motion

Davis, J.

The Whittington Hospital, London, UK
No abstract supplied.

1130 Discussion

1030–1215
RCR PACS and Teleradiology Group II

1030 Invited review: Technical options for data sharing between organizations

Harvey, D.

Medical Connection, Swansea, UK
Traditionally, the electronic handling of clinical data has been divided into 2 distinct types: (1) Internal generation and usage (routine); (2) Cross-enterprise transmission (occasional). This distinction is common to all electronic healthcare records (EHR) but has been particularly well seen in imaging, with the division between PACS and teleradiology. Recently, however, there have been moves in many countries to unite these types of use, to give seamless access to data across healthcare and related organizations. In many schemes, including the National Programme for IT in England, both image and non-image data require sharing, requiring the cooperation of multiple vendors. There are many different possible approaches to the integration problems required to enable data sharing, including: (1) Single regional/national databases (regarding everything as local); (2) Passing responsibility to one or more "integrators" leaving them to integrate as they see fit; (3) Using a standards-based solution. Until a few years ago, (3) would not have been possible, but there is now a profile published by Integrating the Healthcare Enterprise (IHE), called "Cross-enterprise Document Sharing" (XDS) which aims to provide such a standardised, yet flexible and pragmatic approach to this problem. There are now several specializations of this profile, including one optimized for image sharing (XDS-I). It is already in use in Italy, and is being mandated in many other countries, notably Canada, for their national EPR schemes.

1045 Invited review: Panel Forum: 4 short presentations and discussion topic: Have the current solutions for Large Regional PACS Implementations worked?

Horii, S.

University of Pennsylvania, Philadelphia, PA, USA
The speaker will describe the efforts at regional PACS in the USA that have worked (or, are beginning to work), why there are problems with regional PACS in the USA, and what some of his institution's work has been to support regional PACS. The speaker's colleagues and industry collaborators have developed systems that identify patients across different healthcare systems in the absence of a national medical identifier. Exploratory work on interchanging "teaching file" information has been one aspect of testing these identification algorithms.

1045 Invited review: Panel Forum: 4 short presentations and discussion topic: Have the current solutions for Large Regional PACS Implementations worked?

Corkett, T. P.

South East Coast CIO Office, Kent, UK
PURPOSE: To share the practical experiences for a multiple trust PACS deployment under the Connecting for Health Programme. METHOD: Five trusts in Kent and Medway have successfully deployed a single RIS and PACS system under the CfH programme. The question of its success in an operational mode has been measured on multiple levels, benefits released, user acceptability and future developments. These areas can be assessed through benefits monitoring, system usage and fault calls and development plans and their delivery. RESULTS: Benefits have been realised in both cash and non cash terms although detailed capture and measuring is limited. The benefits are clear to see within a trust and there is anecdotal evidence of domain wide benefits. However, a full review has yet to take place. The system is used in all care settings and is acceptable; however, there was a number of fault calls initially and there are still some outstanding issues which require resolution. For future plans these have been slower to implement that anticipated but work is continuing. CONCLUSION: Multiple trust PACS deployments do work and can deliver benefits, the challenge is to keep the momentum going after the deployment phase into operational mode.

1045 Invited review: Panel Forum: 4 short presentations and discussion topic: Have the current solutions for Large Regional PACS Implementations worked?

Bramley, R.

Christie Hospital NHS Trust, Manchester, UK
No abstract supplied.

1045 Invited review: Panel Forum: 4 short presentations and discussion topic: Have the current solutions for Large Regional PACS Implementations worked?

Harvey, D.

Medical Connection, Swansea, UK
No abstract supplied.

1130 Discussion

1140 Invited review: Maintaining image quality in the clinical environment

Bramley, R.

Christie Hospital NHS Trust, Manchester, UK
The national role out of Picture Archive and Communications Systems (PACS) has highlighted the need for standards and quality assurance of diagnostic display devices. This presentation will review the national guidance on Quality Assurance (QA) of PACS image display, the acceptable use of web clients and image compression, requirements for diagnostic and review workstations, display device selection for A&E, clinics, wards, theatres etc., and responsibility for the QA of PACS display devices. A clinical risk assessment approach is advocated to guide those specifying, purchasing and deploying PACS display devices in clinical environments.

1030–1130
Junior Forum II

1030 Invited review: Emergency neuroradiology

Macdonald, J. H. M.

Southampton General Hospital, Southampton, UK
KEY LEARNING OBJECTIVES: To review the optimal use of CT and MR techniques in the diagnosis of neuroradiological emergencies. To appreciate the characteristic imaging findings encountered with common and uncommon neurological and neurosurgical emergencies. To be aware of the crucial but often subtle key radiological findings, as well as potential imaging pit-falls that are encountered when interpreting emergency neuroradiological imaging. DESCRIPTION: Cross-sectional imaging has a central role in the diagnosis and management of neurological and neurosurgical

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emergencies. These emergencies may be associated with high morbidity or mortality. The nature of the underlying pathology often provides the attending clinicians with limited or no history with which to formulate a diagnosis. The reporting radiologist consequently plays a key role and may be the first to suggest the correct diagnosis. The crucial radiological findings may be subtle in these emergency cases. Emphasis will be made of cases where a delayed or incorrect radiological diagnosis may have a devastating effect on the patient's prognosis. These cases will be particularly pertinent for the junior radiologist providing out of hours emergency cover. CONCLUSION: This presentation will provide a systematic approach to the imaging and interpretation of neuroradiological emergencies. Imaging examples of important cases, including real on-call examples will be discussed.

1100 Invited review: Radiology of common non-trauma paediatric emergencies

Chakraborty, A.

John Radcliffe Hospital, Oxford, UK

Paediatric emergencies are very different from adults as the clinical problems which bring children to the emergency department are rather unique. This talk will review the common causes of paediatric emergencies not related to trauma. This will include neonates with surgical emergencies as well as older children with chest, gastrointestinal, genitourinary and other problems. Along with the characteristic imaging findings of these conditions, an appropriate imaging strategy will also be discussed. Neurological emergencies will not be covered in this talk.

1030–1230

The changing face of cardiac imaging

1030 Invited review: Perfusion and viability (role of NM and MR)

Coulden, R.

University Hospitals of Leicester, Leicester, UK

No abstract supplied.

1100 Invited review: Assessment of valve function

Peebles, C.

Southampton University Hospitals, Southampton, UK

No abstract supplied.

1130 Invited review: Identification of the vulnerable plaque

Mittal, T.

Harefield Hospital, Harefield, UK

KEY LEARNING OBJECTIVE: Understanding the need for identifying the vulnerable plaques that are responsible for myocardial infarction and sudden death, and the role of imaging techniques in their detection. DESCRIPTION: There has been a growing interest in assessment of the vulnerable plaque that causes acute myocardial infarction and sudden death. It is now well recognized that it is not the stenotic plaques, but rather the non-stenotic ones that result in acute coronary syndromes. This has resulted in development of techniques that directly access the atherosclerotic plaque and the vessel wall rather then the just the lumen itself. By far the most investigated but invasive technique is the intravascular ultrasound (IVUS), but with increasing resolution, multislice CT (MSCT) and MRI are showing greater promise. Besides, FDG-PET has been shown to demonstrate plaque inflammation and hence vulnerability in carotid system. Other novel techniques are also emerging to facilitate the detection of vulnerable plaque. CONCLUSION: Imaging techniques are playing an increasing role in the identification of the vulnerable plaque which may be the key for early treatment and prevention of acute coronary syndromes.

1200 Invited review: Effects of changing technology on cardiac imaging

Roobottom, C.

Derriford Hospital NHS Trust, Plymouth, UK

No abstract supplied.

1030–1200

Ultrasound on-call: an introduction II

1030 Invited review: Abdominal ultrasound II

Elliott, S. T.

Freeman Hospital, Newcastle-Upon-Tyne, UK

KEY LEARNING OBJECTIVES: to learn the role of abdominal ultrasound in the out-of-hours situation, and the ultrasound appearances of common pathologies. DESCRIPTION: SpRs and other ultrasound practitioners working out-of-hours often feel under extra pressure – they may be working without direct supervision and feel that their diagnostic decisions could have a more immediate influence on clinical management. However, there is no reason to suppose that the clinical conditions seen on-call are any different from those seen in normal working hours. This presentation will discuss the role of ultrasound in a range of acute abdominal conditions, and describe their ultrasound appearances.

1115 Invited review: The acute abdomen, trauma and ITU – ultrasound and its role *vs* CT

Baxter, G.

The Western Infirmary, Glasgow, UK

The acute abdomen is a common clinical presentation to imaging departments which after basic plain film radiology normally requires further investigation, routinely ultrasound, CT or both. The advent of multislice CT has made it a routine, robust, reproducible technique in the investigation of abdominal problems and pelvis and undoubtedly more patients are being channelled down this pathway. Radiation dosage, however, is now a significant consideration particularly in patients with clinical conditions that may result in multiple repeat studies within a relatively short time period. The applications of ultrasound in this context will be reviewed, in particular with applications related to the liver and biliary tree, the upper abdominal viscera including the pancreas and kidney and non specific iliac fossa problems. Investigation of abdominal masses will also be discussed. Further discussion will centre on the patient with abdominal and pelvic trauma and when ultrasound, including the potential use of ultrasound contrast agents is more appropriate than abdominal CT or vice versa. The talk will conclude with an overview of the ultrasound applications in ITU.

1045–1215

Intervention II: Scientific Session

1045 Coverage of the left subclavian artery (LSA) during endovascular repair of the thoracic aorta: complications and outcome

Bent, C. L.·Matson, M.·Renfrew, I.·Uppal, R.·Walsh, M.·Sobeh, M.·Kyriakides, C.

Barts and the London NHS Trust, London, UK

PURPOSE: Recent years have seen a trend towards treating pathology of the descending thoracic aorta by endovascular means because of a favourable complication rate when compared with open surgery. A short proximal neck distal to the LSA or a tight aortic curve as seen in younger patients may necessitate coverage of the LSA origin to allow adequate stent-graft apposition to the vessel wall and formation of an adequate seal. The aim of this study was to assess whether coverage of the LSA origin causes significant complications. METHODS: From May 2001 to March 2006, 30 patients underwent endovascular repair for thoracic aortic pathology. All patients undergoing follow up were sent postal questionnaires regarding symptoms experienced following endovascular repair. RESULTS: The 30 day mortality was 2/30, one myocardial infarct and one probable cerebrovascular accident. There was one late death secondary to the patient's co-morbidities. Of the remaining 27 patients sent a questionnaire, 24 (88.9%) responded. 15 patients had left subclavian artery origin coverage, including 2 patients who also had left carotid artery cover following a right to left carotid bypass. Of the 15 patients requiring LSA coverage, 3 reported occasional discolouration and paraesthesia in their left arm but did not complain of significant upper limb claudication. CONCLUSION: Selective coverage of the left subclavian artery during thoracic stenting appears to be generally well tolerated with no significant complications.

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1055 How accurate is sixteen-row multidetector computed tomography angiography for imaging of peripheral arteries?

Mishra, A.

NOTP, New Delhi, India

PURPOSE: To evaluate the sensitivity and specificity of 16-row multidetector CT angiography (MDCTA) in imaging the upper and lower limb arterial tree in trauma and peripheral vascular disease (PVD) and to compare the results with digital subtraction angiography (DSA). MATERIALS/METHODS: 110 patients (75 males, 35 females) underwent MDCTA and DSA of the upper or the lower limb between November 2004 and May 2006, of which 73 patients had PVD. Two independent trained radiologists, blinded to the DSA results, interpreted the MDCTA findings which were then compared with the DSA findings. Interobserver agreement between the two reviewers and between MDCTA and DSA findings was quantified by using weighted κ statistics. The sensitivity and specificity of MDCTA was also calculated. RESULTS: MDCTA allowed a comprehensive diagnostic work-up in all trauma cases with suspected arterial injuries. The complete arterial tree was demonstrable in 105 patients by MDCTA. In the 73 patients of peripheral vascular diseases, MDCTA adequately demonstrated the presence of stenosis or occlusion, its degree and extent, the presence of collaterals and distal reformation, if any, as well the presence of plaques. Correlation between MDCTA and DSA findings was good for peripheral arteries ($\kappa = 0.640$). The MDCTA had a sensitivity of 99.8% and a specificity of 82% in detecting peripheral arterial stenosis. CONCLUSION: MDCTA is a useful diagnostic tool in diagnosis of peripheral vascular disease and in grading the severity of stenosis and seems to be on its way to become the new gold standard diagnostic tool for peripheral angiography.

1105 Extracorporeal high intensity focused ultrasound for the treatment of renal tumours. Phase II clinical trials

Illing, R. O.[1]·Leslie, T. A.[1]·Kennedy, J. E.[1]·Wu, F.[2]·ter Haar, G. R.[3]·Phillips, R. R.[1]·Protheroe, A. S.[1]·Cranston, D. W.[1]

[1]Churchill Hospital, Oxford, UK, [2]Chongqing University of Medical Sciences, Chongqing, China, [3]Royal Marsden Hospital, Sutton, UK

PURPOSE: High-intensity focused ultrasound (HIFU) provides a potential non-invasive alternative to conventional therapies. We have used the extracorporeal ultrasound-guided Model-JC Tumor Therapy System (HAIFU™ Technology Company, China) to evaluate the safety and feasibility of treating renal tumours. METHODS: Patients with renal tumours were entered into one of two arms of the trial. Those with less than 4 cm diameter were treated with HIFU and received radiological follow up. Those with tumours larger than 4 cm were treated, had an MRI at 12 days, then proceeded to surgical resection. The therapy transducers operated at 0.8 MHz, with lens diameter 12–15 cm, focal length 15 cm and I_{sp} (*in situ*) of 3–17 $KWcm^{-2}$. Tumours were targeted using a coaxial 3.5 MHz diagnostic ultrasound probe. RESULTS: 20 patients have been treated to date, 14 in the radiology arm and 6 in the histology arm. MRI changes suggestive of kidney tumour response have been seen in 11/20 cases. Within the radiology group complete ablation has been seen in 5 cases and partial ablation in 2 cases. Mild transient discomfort was reported by 12/20 patients, and moderate discomfort in 4/20. There have been no adverse effects on renal, haematological or hepatic function. CONCLUSIONS: Extracorporeal HIFU has the ability to completely ablate small renal tumours. Our early clinical experience suggests that HIFU treatment of kidney tumours is safe and extremely well tolerated. The reasons for the variability in observed response are unclear, and reliability of tumour ablation will need to improve before extracorporeal HIFU can be proposed for wider clinical use.

1115 Massive haemoptysis: indications and outcome

Bent, C. L.·Renfrew, I.·Matson, M.·Runi, A.·Barnes, N.·Fotheringham, T.

Suaris, T.

Barts and the London NHS Trust, London, UK

PURPOSE: Massive haemoptysis carries a high mortality rate despite best medical therapy. Bronchial artery embolisation (BAE) offers a minimally invasive option to control the actively bleeding site. This study describes the results of BAE in the treatment of massive haemoptysis at the authors' institution. METHODS: Retrospective medical records review from November 2000 to July 2005. RESULTS: 25 patients (M:F 19:6) presented with massive haemoptysis (31 episodes). Mean age 45 years (20–77 years). Underlying pathology included: active pulmonary tuberculosis (*n*=2), bronchiectasis (*n*=4), cystic fibrosis (*n*=4), aspergilloma (*n*=7), pneumonia (*n*=1), Rasmussen aneurysm (*n*=1), bronchial artery trauma (*n*=2) and non-specific (*n*=4). CXR, CT ± bronchoscopy were performed to localise bleeding. Haemoptysis amenable to BAE was demonstrated in 61% (*n*=19), with immediate success in all (100%). Embolisation was not performed due to technical difficulties or requirement of definitive surgery in 19% (*n*=6). No bleeding site was identified in 19% (*n*=6). On average, 3 vessels were embolised with PVA. 20% (*n*=5) presented with recurrent haemoptysis requiring further BAE. 24% (*n*=6) patients died as a direct result of severe haemoptysis. One patient experienced spinal artery occlusion and paralysis. CONCLUSION: BAE is an effective treatment of massive haemoptysis, irrespective of underlying cause. However, recurrent haemoptysis commonly occurs even after initial successful embolisation.

1125 Percutaneous radiofrequency ablation of malignant hepatic tumours: a three year experience

Huang, D.·Fernando, R.·Maischner, L.·Peddu, P.·Ryan, S.·Kane, P. A.·Karani, J. B.

King's College Hospital, London, UK

PURPOSE: To evaluate the efficacy and safety of CT-guided percutaneous radiofrequency ablation (RFA) in the treatment of primary and metastatic liver malignancies. MATERIALS/METHODS: In a 3 year period (August 2003 and August 2006), 96 episodes of radiofrequqency ablations were performed on 85 patients (56 male, 29 female; age range 42–80 years; mean age 67±9.8 years). Of the treated lesions, 61 were hepatocellular carcinomas (HCC) and 35 were metastatic lesions. All procedures were performed under general anaesthesia and CT guidance. Initial follow up were performed with triphasic CT 6 weeks post procedure. The primary success rate and adverse events were recorded and analysed. RESULTS: 96 lesions were treated by RFA in 85 patients. The maximal tumour diameters immediately prior to the treatment were between 0.8 cm and 5 cm, with an mean size of 2.7±1.4 cm. Effective treatment were observed in 81% (50/61) of patients with HCC and 73.7% (25/35) of patient with metastatic lesions at the 6-week follow up scan. Adverse events occurred in 8.3 % (8/96) of the cases, including pneumothoraces, subcapsular and haematoma and hepatic vascular injuries. CONCLUSION: We observed comparable rates of primary success and complication to the published data in the treatment of hepatocellular carcinoma and hepatic metastasis with RFA. We conclude that in our experience RFA is a safe and effective tool for local control of hepatic malignancies.

1135 Percutaneous aortic stent-graft insertion using a femoral artery closure device

Bent, C. L.·Renfrew, I.·Matson, M.

Barts and the London NHS Trust, London, UK

PURPOSE: Femoral artery closure devices aim to minimize femoral puncture complications and allow earlier ambulation and hospital discharge following endovascular procedures. The purpose of this study is to describe our experience using the Perclose closure device (Perclose; Redwood City, CA) during aortic stent graft insertion. METHODS: 16 patients underwent endovascular stent-graft insertion for thoracic aortic (*n*=8) or abdominal aortic (*n*=8) pathology. Following introduction of the Perclose sutures (bilateral in all abdominal aortic procedures), dilation of puncture site was performed (18–24F) for stent-graft delivery. All patients were anticoagulated during the procedure. Femoral puncture sites were subsequently followed up with physical examination, ultrasound or CT. RESULTS: Perclose deployment was successful in 92% of femoral punctures. Haemostasis was achieved within a mean time of 5.6 min (range 4–12 min). 8% of patients required conversion to surgical arteriotomy. Adjunctive manual compression was applied in 29% cases. Follow-up ranged from 3 months to 30 months (mean 15 months). No complications were experienced during the follow-up period. Discharge ranged from 4 days to 58 days post procedure (median 8 days). CONCLUSION: Haemostasis following femoral puncture using the Perclose closure device appears to be an effective alternative to surgical arteriotomy

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allowing early ambulation and hospital discharge. Long term effects on femoral artery calibre, in addition to its role in recurrent punctures require further investigation.

1145 A comparative analysis of endovascular stenting and surgical repair of the descending thoracic aorta in risk-matched patients at a tertiary centre

Alex, J.·Sudigali, V.·Tan, K.·Hamilton, M.·Bryan, A. J.·Wilde, P.

Bristol Royal Infirmary, Bristol, UK

OBJECTIVE: Compare outcome following endovascular stenting to surgical repair of descending thoracic aorta in risk-matched patients. MATERIALS AND METHODS: Retrospective analysis – validated PATS database, case notes, radiology reports, follow up clinic letters. Stenting was deemed successful when there was satisfactory deployment without surgical conversion, no endoleak, morbidity or mortality within 30 days post-procedure. While both groups had daily clinical evaluation, the stent group also had angiography and CT assessment for endoleaks and stent position. RESULTS: Between 1993 and 2006, 52 patients underwent either endovascular (n=21) or surgical (n=31) repair of descending thoracic aorta. Both groups were comparable in terms of aortic pathology, emergency cases, age, gender ratio, operative risks and EuroSCORE mortality risk. There was 1 surgical conversion where iliac atherosclerosis and tortuosity precluded stent deployment. Post-operative renal impairment, paraparesis and GI bleed were comparable. A greater number of surgical patients had postoperative AF (p=0.004), tracheostomy (p=0.05) and prolonged ventilation (p=0.003). The duration of ITU stay (p=0.03) total stay and 30 day mortality were also higher in the surgical group. Surgical patients also needed significantly higher amounts of blood products – packed cells (p=0.001), FFP (p=0.001) and platelet (p=0.001). CONCLUSION: Compared with surgical repair endovascular stenting is more cost-effective and has lesser associated morbidity and mortality.

1155 Outcome of blind embolisations in high risk surgical patients with acute non-variceal GI bleeding

Saraswat, L.[1]·Boardman, P.[2]·Hughes, J.[2]·Uberoi, R.[2]

[1]Hull Royal Infirmary, Hull, UK, [2]John Radcliffe Hospital, Oxford, UK

PURPOSE: To study the outcome of blind embolisations in high risk surgical patients with non-variceal acute GI bleeding. MATERIALS/METHODS: Embolisation was called "blind" when no active bleeding was noted on initial angiography but embolisation was still carried out, based on clinical, endoscopic, operative and radiological findings. Retrospective review of all patients who underwent blind embolisation for GI bleeding between January 2000 to August 2005 was carried out. Variables studied include cause of bleeding, clinical condition, blood transfusion requirements, site of bleeding and any post procedure complications. RESULTS: 14 patients underwent blind embolisation for acute non-variceal GI bleeding. 5 had post-operative GI bleeding, 4 had bleeding from pancreatic pseudocysts, 3 had bleeding from liver tumours and 2 underwent embolisation for other causes of GI bleeding. Mean age was 63 years (9 males, 5 females). The vessel embolised included pancreaticoduodenal artery, hepatic artery, gastroduodenal artery, splenic artery, left gastric artery, right colic artery and right renal artery. The procedure was technically successful in all patients. Following the procedure re-bleeding occurred in 1 patient, 1 patient died (severe sepsis). 4 patients developed post-embolisation syndrome (all recovered fully), 1 patient developed pancreatitis (managed conservatively) and 1 had minor renal parenchymal damage due to inadvertent deployment of coil in renal artery. CONCLUSION: Blind embolisation based on clinical, radiological, operative and endoscopic information about the likely bleeding area should be considered in the management of high risk surgical patients with acute GI bleeding when conservative medical management and endoscopic therapy has failed.

1205 Surgical cutdowns: can radiologists perform them adequately?

Bent, C. L.·Matson, M.·Brohi, K.·Walsh, M.·Kyriakides, C.·Renfrew, I.

Barts and the London NHS Trust, London, UK

OBJECTIVES: To assess whether femoral artery access via surgical cutdown could be safely performed by an IR with supervision from a Vascular Surgeon. METHODS: During a 1 year period, 28 surgical cutdowns have been performed by the IR Consultant or Specialist Registrar with Consultant Vascular Surgeon supervision, during elective endovascular repair for abdominal, thoracic and popliteal pathology. Follow up of femoral access involved clinical examination, with appropriate supplementary ultrasound and post procedural CT scanning. RESULTS: Adequate femoral exposure with haemostasis and successful stent-graft deployment was achieved in all procedures. 21 arteriotomies were closed by the operating IR, again under supervision. Three were closed by the attending Vascular Surgeon due to the arterial closure being deemed technically difficult in these patients. The remaining four arteriotomies were closed by the attending Vascular Surgeon due to logistical reasons. Haemostasis was achieved in all patients. During in hospital follow-up, two patients experienced small haematomas which were managed conservatively. One patient required re-exploration to ligate a collateral vessel but no femoral anastomotic bleeds were observed. In addition, no nerve injury or wound infections were seen. CONCLUSION: Continued skill development could offer the opportunity for IRs to independently perform surgical cutdowns in preparation for endovascular procedures. Conversion to surgical cutdown would also be advantageous when percutaneous techniques are unsuccessful.

1230–1330

COR Eponymous Lecture

1230 Invited review: The bone detectives

Viner, M. D.[1,2]

[1]St Bartholomew's and The Royal London Hospital/Association of Forensic Radiographers, London, UK, [2]The Inforce Foundation, University of Bournemouth, Bournemouth, UK

PURPOSE: A review of the role of radiology in the examination of human skeletal remains. MATERIALS/METHODS: Since 1896, radiology has been used as a tool of forensic science and specifically as a tool of forensic medicine. The non-invasive nature of radiological examination allows the skeleton and internal organs to be examined in both live and deceased subjects yielding information on mechanisms of injury, cause of death and identity through determination of age, sex, stature and comparison with previous records. The durability of the skeletal and dental structures allows them to survive the destructive forces of fire and decomposition, outlasting the soft tissues by tens, hundreds and even thousands of years. In many cases, the surviving skeletal and dental material represents the only available source of information about the individual, their life and the events surrounding their death. In such circumstances, radiology can be employed as a valuable tool to assist the pathologist, physical anthropologist, archaeologist and odontologist in their investigation. This presentation will examine the role of radiology in such investigations using a series of case studies from around the world covering archaeological studies, investigation of suspicious death, determination of identity and large scale investigation of atrocity crimes and human rights abuses. RESULTS: The cases studies presented will demonstrate that radiology is an important and often essential tool in such investigations. However, it is clear from the literature reviewed that its utilization is variable and often dependent upon the previous experience of the investigator, the availability of suitable equipment and trained and interested practitioners. In some cases, investigators continue to use radiological imaging equipment in ignorance of basic radiation safety procedures, the fundamentals of imaging or basic radiographic technique. Little of the research in the field of physical anthropology and forensic science to date has taken cognisance of the opportunities offered by even simple radiographic examination and there appears to be a generalized lack of awareness amongst investigators of the rapidly developing field of medical imaging and the enormous opportunities offered for non-invasive imaging using modern cross sectional imaging techniques. CONCLUSION: Radiographers and radiologists can play a pivotal role in forensic and archaeological investigation of skeletal material in conjunction with archaeologists, anthropologists, pathologists and odontologists. Modern imaging techniques have enormous potential for application within these fields and far greater collaboration between the sciences is to be encouraged.

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1330–1500
Paediatrics III

1330 Invited review: Update on paediatric MDCT

Owens, C.

Great Ormond Street Hospital, London, UK

The introduction of multidetector row CT scanners has altered the approach to imaging the paediatric thorax. In an age when the rapid acquisition of CT data allows general hospitals to image children rather than refer them to specialist paediatric centres, it is particularly important that general radiologists have access to appropriate protocols optimized for paediatric application. In this way a dramatic reduction of the radiation dose delivered is ensured with optimal contrast bolus delivery and timing, hence inappropriate repetition of scans can be avoided. This lecture focuses on the main principals of volumetric CT imaging applying generically to all MDCT scanners. The lecture will describe reconstruction techniques for imaging the paediatric thorax and the use of low-dose imaging protocols optimised for 16-slice detector CT scanners. The lecture will illustrate the common clinical applications for chest imaging in paediatric population including congenital vascular tracheobronchial abnormalities and infections in the normal and immunocompromised host.

1400 Invited review: Update on paediatric body MRI

Olsen, O. E.

Great Ormond Street Hospital for Sick Children, London, UK

IMAGE OPTIMIZATION: Body MRI in children is particularly challenging due to smaller anatomy (fewer spins – lower SNR), less cooperation (motion artefact), and different histopathological characteristics, *e.g.* in tumours (altered CNR). The first part of this review will focus on the principles of image optimisation; what are the building blocks of SNR, CNR and artefact reduction, and how do these factors interact? How can we use this knowledge in practical clinical work? IMAGE MANIPULATION: Volumetric data sets (*e.g.* 3D-FLASH, 3D-T2W-FSE) are valuable parts of many MRI protocols. The second part will show examples of reconstruction techniques, and also demonstrate image fusion, which may aid interpretation. QUANTITATIVE TECHNIQUES: Currently our knowledge about quantitative techniques in body MRI is minimal. Particular properties of childhood tumours, *i.e.* their high cellularity, may provide a window of opportunity for diffusion-weighted imaging and application of the apparent diffusion coefficient (ADC) as an adjunct to evaluate therapy response. The third part of the review will deal with quantitative techniques with a particular focus on ADC.

1430 Invited review: Vascular imaging

Watt, A.

Royal Hospital for Sick Children, Glasgow, UK

No abstract supplied.

1330–1500
Radiology department accreditation

1330 Invited review: Introduction and overview

Husband, J.

Royal Marsden Hospital, London, UK

The Royal College of Radiologists together with the Society and College of Radiographers is launching the Radiology Service Accreditation Scheme. The Scheme is patient focused and aims to improve quality of care by measuring clinical outcomes, patient safety, patient experience and resource efficiency against clearly defined standards. Continuous improvement is also built into this model for Accreditation. The aim of the presentations within this session is to share our experience in developing proposals for Accreditation and to discuss the advantages and limitations of the scheme. The challenges of rolling out the programme beyond the pilot stage will also be discussed.

1340 Invited review: Project progress – challenges and opportunities

Garvey, C.

Royal Liverpool & Broadgreen University Hospital, Liverpool, UK

Initially conceived in the autumn of 2005, the RCR, in conjunction with the ScoR have been developing an accreditation programme for radiology services across the UK. The scheme is undergoing pilot site testing in a number of different service providers between April and August 2007 with an intention to go to national rollout in 2008. This is an enormously ambitious programme which is quite unique in the world. The aims of the programme are to accredit departments that offer a safe, patient-focused service and which are willing to develop. Alongside the programme, a development unit will be available to assist departments in areas that they find challenging. Such a programme comes with many challenges and opportunities. These include the ambitious timescale, securing appropriate funding, seeking national and international recognition of the accreditation programme and convincing the radiological community that such a programme is valuable. The purpose of the lecture is to review the progress of the programme to date whilst indicating the various challenges and opportunities that have been identified and what action is been taken to deal with these as they arise.

1430 Discussion

1345–1515
Chest/Cardiac II

1345 Invited review: Chest trauma

Shanmuganathan, K.

University of Maryland Hospital, Baltimore, Maryland, USA

MDCT is the imaging modality of choice to evaluate haemodynamically stable patients with blunt trauma. This lecture will demonstrate the various MDCT findings seen in patients with blunt aortic and diaphragm injuries. Discuss the relevance of these findings to management.

1415 Invited review: Pulmonary hypertension

Coulden, R.

University Hospitals of Leicester, Leicester, UK

No abstract supplied.

1445 Invited review: Thromboembolic disease

Gleeson, F.

Churchill Hospital, Oxford, UK

No abstract supplied.

1345–1435
Forensic SFG I

1345 Invited review: The use of CT in forensic practice

Rutty, G.[1] Robinson, C.[2]

[1]*University of Leicester, Leicester, UK,* [2]*Leicester Royal Infirmary, Leicester, UK*

No abstract supplied.

1415 Whole body magnetic resonance imaging in forensic pathology: a preliminary feasibility study

Bolliger, S. A.[1]·Ross, S.[1]·Oesterhelweg, L.[1]·Brodhage, R.[2]·Thali, M. J.[1]

[1]*Institute of Forensic Medicine, Berne, Switzerland,* [2]*MR Diagnostik AG, Thun, Switzerland*

PURPOSE: Post-mortem multislice computed tomography (MSCT) has undoubtedly set a milestone in forensic imaging with different project groups all over the world currently evaluating and implementing this technology in everyday forensic practice. However, post-mortem MRI, which is better suited for the imaging of soft tissue injuries, seems to lag behind this revolution, possibly also due to unacceptably long examination times. As the Virtopsy® project is dedicated to the implementation of modern imaging techniques for forensic medicine in order to improve or even replace current examination techniques, we therefore implemented a novel, more rapid MR technique to overcome this problem. MATERIAL/METHODS: Five corpses which were brought to our Institute for forensic autopsy underwent a whole body MR and MSCT scan prior to autopsy. The MR scan was performed using a Total Imaging Matrix (TIM) System, in which 76 seamlessly integrated coil elements with up to 32 RF channels allowed for an

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examination of the entire body in about 60 min. The MR findings were then compared with the autopsy findings. RESULTS: In four of the cases, TIM could detect the relevant findings seen at autopsy and determine the cause of death accurately. In the fifth case, neither TIM nor the autopsy could determine a cause of death. CONCLUSION: TIM is a promising new tool in forensic imaging.

1425 The use of forensic radiology in an air accident investigation

Edwards, H. M.

University of Hertfordshire, Hatfield, UK

KEY LEARNING OBJECTIVES: To explain the value of X-rays in this unusual example of forensic radiology. To share methods of good practice to minimize the development of post-traumatic stress in staff. DESCRIPTION: On a warm, windless, summer evening in 2002 eleven men lost their lives when a helicopter ditched in the North Sea just a few miles off the Norfolk coast. The bodies of five men were recovered immediately. Five more were recovered later when the wreck of the helicopter was raised. Sadly, the eleventh man is still missing. As part of the investigation into the cause of the accident, radiographers were required to X-ray the bodies of the victims. Although the identities of the victims were known already, radiographs were needed to identify common patterns of injury and to exclude the possibility of explosives on board. Such information is also used to improve the safety of helicopter design in the future. This presentation will describe the strategy employed, and the value of the radiographs within the framework of the investigation. Methods implemented for minimizing after event stress in the staff, including a group debriefing session and the availability of one-to-one counselling will also be highlighted. CONCLUSION: Forensic radiology is most often utilized to assist in the identification of human remains and to establish cause of death. However, this case explores less common uses including causation of crash and the influencing of aircraft design.

1345–1515

Ultrasound on-call: an introduction III

1345 Invited review: Intervention on call – vascular access and needling

Evans, R.

Morriston Hospital, Swansea, UK

No abstract supplied.

1415 Invited review: Ultrasound in gynaecological emergencies

McHugo, J.

Birmingham Women's Hospital, Birmingham, UK

Pelvic pain is a common presenting symptom to primary care often necessitating referral into hospital. Ultrasound is the first line of imaging investigation in this clinical situation. For all radiologist providing emergency care it is essential to provide best care. Transvaginal ultrasound due to its inherent better image quality should therefore be available to all women presenting in an emergency. This lecture will provide a practical and structured approach. Educational aims: The attendee will have an understanding of the role and technique of transvaginal ultrasound. Understand the role of ultrasound hard and soft signs. Be able to integrate these findings into clinical care with particular reference to the emergency situation. Be able to assess prior risk of disease and how the ultrasound findings will modify the risk of a disease post test.

1445 Invited review: The acute scrotum

Sidhu, P.

King's College Hospital, London, UK

Ultrasound assessment of the testes is the first line imaging modality for scrotal disease. This is well established in the non-acute patient, where depiction of hydroceles, varicoceles, testicular tumour and cysts are well established. There is also a well-established role for the assessment of the acute scrotum in radiological practice. Where obvious open trauma does not need the skills of the radiologist and immediate surgery is indicated, closed trauma benefits from an ultrasound examination. The presence of a testicular rupture, when the tunica albuginea is breached, indicates that surgery is needed. Fractures and haematomas are also clearly depicted on ultrasound, with confidence of the findings allowing conservative management. The presence of a haematocele is also clearly identified, and may be serially assessed to ascertain resolution. The acutely painful scrotum in the adolescent boys, may be due to spermatic cord torsion or epididymo-orchitis. Ultrasound is useful in depicting the presence of inflammatory change, but there are many pitfalls associated with the ultrasound assessment of testicular torsion. Severe epididymo-orchitis can be assessed, and the development of an abscess detected early. Although rare, testicular tumours may present with acute testicular pain and may be easily assessed with ultrasound. There are clear indications for the use of ultrasound in the acutely painful scrotum, and assessment will give useful information for the clinical management of the condition.

1400–1530

Intervention III

1400 Invited review: Update on carotid stenting

Cleveland, T.

Sheffield Teaching Hospitals NHSFT, Sheffield, UK

KEY LEARNING OBJECTIVES: Understand the relevance of carotid artery disease. Appreciate the main goals of imaging. Understand the techniques and technlogy available for CAS. Understand the role of CAS, and the areas of controversy related to its application. DESCRIPTION: Stroke is a major cause of mortality and morbidity in modern societies. A high proportion of strokes are attributable to embolic disease originating at the carotid artery bifurcation. Such disease may be detected following symptoms or may become apparent following investigation for disease in other regions. Depending upon the degree of disease at the carotid bifurcation, different treatment strategies may be appropriate. It is essential that carotid artery, and associated, disease is accurately imaged in order that the patient may receive optimal therapy. Duplex ultrasound, CTA, MRA and catheter angiography may all be useful in the assessment of carotid disease. Carotid stenting (CAS) has become a sophisticated technique for treatment of carotid disease, used widely worldwide. There remains significant controversy regarding the role of CAS, with recent trials failing to resolve many of these uncertainties. The UK has generally been slow in adopting this technique either in addition to, or instead of CEA. NICE has issued guidance on its use, and further information is being published continuously. CONCLUSION: CAS is potentially useful for some, if not many patients with symptomatic carotid artery disease. The techniques and the current data will be reviewed and discussed.

1430 Invited review: Thoracic outlet syndrome

Cowling, M.

University Hospital of North Staffordshire, Stoke-on-Trent, UK

KEY LEARNING OBJECTIVES: To understand the anatomy and mechanisms of thoracic outlet syndrome. To understand the techniques, limitations and results of CTA and MRA in the evaluation of the thoracic inlet. To understand the merits and limitations of the various imaging strategies in the diagnosis of thoracic outlet syndrome. DESCRIPTION: The presentation of Thoracic Outlet Compression Syndrome (TOCS) is variable due to a combination of neural, arterial or venous symptoms. As the brachial plexus and subclavian vessels traverse the root of the neck, they may be compressed by a number of abnormal anatomical structures, such as cervical ribs and fibrous bands. A number of imaging modalities may be of value, and each has merits depending on the clinical presentation. Plain films may show an abnormal bony structure such as a cervical rib. Doppler ultrasound may show associated arterial or venous abnormalities. CT angiography may show the vascular abnormalities as well, but gives little advantage over Doppler ultrasound, and will not demonstrate the abnormal soft tissue structures responsible for compression. MRI can be extremely valuable. First, MRA may be used to examine the arterial tree to look for compression damage or other causative lesions. Similarly, MR venography may be performed. MRI can also be used to examine the brachial plexus, and to look for compressive structures such as fibromuscular bands. CONCLUSION: TOCS is difficult to diagnose, but where there is clinical suspicion MRI scanning currently represents the most valuable imaging tool.

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1500 Invited review: Thermal ablation of liver tumours

Rose, J.

Freeman Hospital, Newcastle-Upon-Tyne, UK

Thermal ablation techniques for primary and secondary liver tumour, applied percutaneously or by laparoscopic or open surgical procedures, have undergone significant developments over the last decade. The improved outcomes for RFA of primary liver tumours under 5 cm in diameter, particularly when combined with chemoembolisation, mandate that this form of treatment is considered for all patients that are unsuitable for tumour resection and is part of the staged management of those on the liver transplant waiting list. The role of thermal ablation in the treatment of secondary liver tumour is rather less well defined. The tried and tested applications include the ablation of small lesions in the residual lobe during hepatectomy for colorectal liver metastases and the percutaneous treatment of small recurrences following hepatectomy. The debulking of symptomatic neuroendocrine liver metastases appears to be another increasing application. Newer devices have enabled treatment of larger lesions and adjunctive techniques have been developed to facilitate adequate tumour free margins adjacent to blood vessels. Radiofrequency ablation currently leads the way for thermal ablation although increased application of microwave and laser energy may well occur in the future.

1400–1620
RCR Clinical Management SFG: Radiologists for Sale – Meeting the New Realpolitik

1400 Invited review: GMC registration and revalidation in the teleradiology era

Fitzgerald, R.

Royal Wolverhampton Hospitals NHS Trust, Wolverhampton, UK

PURPOSE: There should be no lottery as to which British patients have their images reported by a Radiologist regulated to one standard, as opposed to being regulated to another standard or not regulated at all. Sampling of reports/double reporting is no substitute for a comprehensive regulatory framework that should be of an equivalent nature for all doctors who care for British patients. RESULTS: The Chief Medical Officer's report on the future regulation of doctors, *Good Doctors, Safer Patients*, contains recommendations for the regulation of locum doctors that would logically be applicable to teleradiologists. He also recommends English Language testing. Article 53 of the 2005 European Union Qualifications Directive and the European Court of Justice ruling in the Haim case would permit this. Teleradiologists, like all doctors, should satisfy the GMC at the point of entry to the register, that their fitness to practice is not impaired. Such a *Certificate of Current Professional Status* is recommended by the 2005 EU Healthcare Professionals Crossing Borders Agreement. Teleradiologists should be required by law to have individual insurance/indemnity cover. All Radiologists, wherever their location, who report imaging of British patients, should be subject to equivalent regulation and re-licensure/re-certification/revalidation. CONCLUSION: Patient safety considerations require equivalent regulation and revalidation of all radiologists who report imaging of British patients.

1430 Invited review: The underperforming radiologist in the teleradiology era

Scotland, A.

NCAS, London, UK

The emergence of a series of high profile clinical failures in the UK in the 1990s revealed a "governance gap" between local and national arrangements for assuring the quality of care. This gap existed across the whole range of healthcare: in system performance, individual performance and the ability of healthcare in the UK to learn from its mistakes. The response to this challenge was a set of broadly-based reforms to governance in healthcare and in clinical practice. These reforms included the creation of the National Clinical Assessment Service, whose purpose is to respond to concerns about the performance of individual practitioners, clarify those concerns, get behind them to understand what is leading to them, and make recommendations about how they may be resolved. At the same time, accelerating technology in medicine offered major opportunities for bringing the most advanced diagnosis and care to the most remote places on earth – described as among "the ten forces that flattened the world". These technologies, however, pose major challenges to those responsible for clinical governance and quality wherever they work. This paper will explore the particular challenges to predicting, identifying and handling poor practitioner performance posed by the emerging techologies and the logistics of teleradiology and telemedicine.

1500 Invited review: New contracts under ISP procurements – navigating the multiprovider environment

Miller, P.

Cherry Knowle Hospital, Sunderland, UK

No abstract supplied.

1530 Invited review: A view from a private provider of radiology services

Walker, J.

The Global Diagnostics Group, London, UK

We as a profession find ourselves in challenging times. The pressure on our collective human, capital and commercial resources to manage the ever mounting clinical demands placed upon us all will be the pervading challenge confronting all stakeholders within the health economy for the foreseeable future. How can the historically divergent agendas of the Public and Independent Sectors be structured so as to address these challenges together in a fair and equitable manner with an open and frank approach in a culture of "shared pain – shared gain"? This presentation endeavours to share a methodology for matching capacity to demand and adding value across the 6 Key Pillars of: Clinical excellence; Operational excellence; Relationships; Mentorship & Training; Innovation & Creativity; Commercial governance & Value for Money. The key fundamentals of a successful 12 year public-private "Proof of Concept" and now a 5 year old internationally established working model will be shared as a possible solution and path forward for health communities within the UK and around the world.

1600 Discussion

1400–1600
Mini CARS Symposium: image guided medicine – images, simulated models and visualization

1400 Invited review: Intraoperative imaging – where are we now?

Hawkes, D.

University College London, London, UK

No abstract supplied.

1430 Invited review: Specification and design of a therapy imaging and model management system (TIMMS)

Lemke, H. U.

Universtiy of Southern California, Los Angeles, USA

PURPOSE/MATERIALS: Appropriate use of information and communication technology (IT) and mechatronic systems is considered by many experts as a significant contribution to improve workflow and quality of care in the Operating Room (OR). This requires an appropriate IT infrastructure as well as communication and interface standards, such as DICOM and suitable extensions, to allow imaging, model and visual data interchange between surgical system components in the OR. A conceptual design and partial implementation of such an infrastructure, *i.e.* a therapy imaging and model management system (TIMMS) will be introduced in this presentation. METHODS: At the Innovation Center for Computer Assisted Surgery (ICCAS), Leipzig, a TIMMS is being designed with a highly modular structure. Modules may be defined on different granulation levels. A first set of components (*e.g.* high and low level modules) comprising engines and repositories of a Surgical Assist System (SAS) is in the process of being implemented. RESULTS: A proper design of a TIMMS, taking into account modern software engineering principles, will clarify the right position of interfaces and relevant standards for a SAS in general and their components

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specifically. CONCLUSION: Imaging information systems and standards need to be complemented with modelling and visualization technologies. Such a view is founded in the special modelling needs of an increasing number of modern surgical interventions as compared to the imaging intensive working mode of diagnostic radiology, for which PACS was originally conceptualized and developed.

1500 Invited review: Model for organ preserving surgery

Berliner, L.

New York Methodist Hospital, New York, USA

KEY LEARNING OBJECTIVES: To gain insights into current developments in information guided therapies and to elucidate the kind of benefits that patient-specific model guided therapies can be expected to provide. DESCRIPTION: As the approach to Interventional Radiology and Surgical therapies move from an Image-Centric World View to a Model-Centric World View there will be a trend toward "image guided therapies" expanding and evolving into more comprehensive "information guided therapies". By analysing the workflow processes of a representative procedure, such as radiofrequency ablation procedure for hepatic tumour, we may be able to demonstrate those aspects of the pre-procedural planning and procedural performance that will be most impacted by this new approach. The key features of a Therapy Imaging and Model Management System (TIMMS) will be demonstrated. CONCLUSION: The transition from image guided therapies into more comprehensive patient-specific model guided therapies will provide a wide variety of benefits in the realm of improved efficiency, accuracy, safety, and outcomes.

1530 Invited review: Technical implications and reality of IMV

Beckmann, L.

Lanmark,, Beaconsfield, UK

Organizational implications of IT infrastructures in the OR. The objective is to look at the reality, and challenges in trying to create an information model consisting of the complete set of information, whether images or data, and from whatever source that is required by the surgeon, or therapist when preparing to treat and manage the patient. To achieve this the classic image centric view of the patient information has to be complemented by an IT model-centric view. The challenge becomes the need to link and integrate the information from different sources and to create a Surgical PACS or more specifically a "Therapy Imaging and Model Management System" (TIMMS). In order to achieve this we need a degree of standardization in the interfacing between systems, and in fact need to define the interfacing requirements and standards and ensure that all systems "buy in" to the interfacing standard. The current standards of DICOM, HL7, IHE etc. do not fully cover the requirements or the areas which will be encompassed by the TIMMS requirement. In conclusion, there is a need to develop standards and interfaces to integrate seamlessly information, communication or mechatronic systems, into the surgical and therapy environment, by taking into account the special needs for imaging and modelling tools within the surgical workflow environment.

1400–1530

CT Teaching Course

1400 Invited review: Physics and technology of multislice CT

Weston, J. D. W.

ImPACT, London, UK

LEARNING OBJECTIVES: To understand: modern scanner designs; detector configuration options; cone-beam and related issues; approaches to reconstruction; artefacts. DESCRIPTION: Multislice CT (MSCT) introduces new areas of physics that need wider understanding by all users. Key principles behind CT scanning and reconstruction are reviewed and extended to multidetector systems. Various detector array design options are illustrated and their acquisition modes explained. The issues of wide beam helical scanning are identified and some approaches to dealing with these outlined. Related artefacts are shown and explained. Some widely held misunderstandings are identified, and rectified. CONCLUSION: MSCT scanning with 16 slices and more is becoming common. It enables the potential for fast isotropic scanning. This talk explains the principles behind the design of the scanners and issues involved in image reconstruction.

1430 Invited review: Image quality and dose issues in multislice CT

Edyvean, S.

ImPACT, London, UK

LEARNING OBJECTIVES: To review the effect of scan and reconstruction parameters on image quality and patient dose in multislice CT scanning, and to understand the trade-off occurring between these performance parameters. To also explore the effect of perceived image noise on minimum diagnostic requirements. DESCRIPTION: Image quality and dose are affected by many fundamental scanner design characteristics, such as the X-ray tube, detectors and beam filtration, as well as by scanning and reconstruction parameters such as tube current, kV, beam width and pitch. This talk will explain the effect of many of these parameters on the resultant image quality and dose, with particular reference to multislice CT scanners. The trade-off that occurs between image quality and dose will also be explored. Image quality is generally described in terms of image noise (or speckle), and scan plane and *z*-axis spatial resolution. Image contrast and the effect of kV is also considered, as well as noise correlation. CONCLUSION: The effect on image quality and dose resulting from different multislice scanner characteristics and scanning parameters will have been reviewed. An understanding of the relationship between image quality and dose will have been discussed. In addition to standard performance parameters, image contrast and noise correlation will have been addressed, as well as the subjective effect on perception and the noise requirement for a diagnostic image.

1500 Invited review: Clinical use of CT automatic exposure control systems

Lewis, M.

ImPACT, London, UK

KEY LEARNING OBJECTIVES: To understand: the aims of automatic exposure control (AEC) in CT; the principles underlying the operation of AEC; the differences in approach between various AEC systems. DESCRIPTION: The aim of CT AEC systems is to maintain the required level of image quality from patient to patient and also throughout a scan. This is achieved by compensating for variations in patient thickness and density by the adjustment of tube current. If used properly AEC should assist in patient dose optimization. In theory AEC can be applied at three levels. The tube current can be adjusted to compensate for: overall patient size, *i.e.* from one patient to the next; attenuation along the long axis of the patient, *i.e.* between subsequent tube rotations; attenuation from different angular directions, *i.e.* throughout a rotation. In practice all three levels are often used simultaneously. The principles behind the operation of AEC can be divided into three areas: how the attenuation information is obtained; what assumptions are made when adjusting the tube current for the measured attenuation; how the desired image quality is specified. CONCLUSIONS: The aims, theory and principles of operation of CT AEC will be described with reference to existing systems from the four main CT manufacturers.

1530–1630

Chest Scientific Session

1530 CT-guided percutaneous fine needle aspiration biopsy (FNAB) of small (≤10 mm) pulmonary nodules

Ng, Y.·Patsios, D.·Walsham, A.·Roberts, H.·Paul, N.·Chung, T.·Weisbrod, G.

University Health Network, Toronto, ON, Canada

PURPOSE: To determine the value of CT-guided FNAB of small pulmonary nodules that would not be considered suitable for assessment with positron emission tomography. MATERIALS/METHODS: CT-guided FNAB of 55 nodules, measuring 10 mm or less, were performed between January 2003 and February 2006. A coaxial technique was used, with an outer 19 G Bard Truguide needle and inner 22 G disposable Greene Biopsy needle. Adequacy of the specimens was assessed on-site by a cytology technologist. We recorded

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the sizes of nodules, their distance from pleura, number of pleural punctures and aspirates, complications encountered, cytological diagnosis and outcome. RESULTS: 14 nodules measured 5–8 mm and 41 were 9–10 mm. The average distance from the pleura was 31 mm (range 0–88 mm). In 50 of the 55 cases, the pleura was crossed once. An average of 4 aspirates was performed per case. 29 (52.7%) had a pneumothorax with 5 (9%) requiring chest drain. 22 FNABs (40%) were adequate for diagnosis (21 malignant and 1 tuberculosis). In 16 cases, where no definite diagnosis was made following FNAB, the outcome has not been affected. In 10 cases, samples were insufficient for diagnosis and were diagnosed as neoplastic subsequently. Eight cases were excluded in the final analysis as the follow-up details were unavailable. The sensitivity for malignancy and overall accuracy was 67.7% and 78.8%, respectively. CONCLUSION: CT-guided FNAB is a useful tool in the diagnosis and management of small pulmonary nodules, even though the sensitivity and overall accuracy are lower than that of larger pulmonary lesions.

1540 Negative predictive value of F18-FDG-PET in patients with suspected pulmonary neoplasia

Wieshmann, H.•Jayan, R.•Vinjamuri, S.

Royal Liverpool University Hospital, Liverpool, UK

PURPOSE: To establish the negative predictive value of whole body Fluoro-18-Deoxyglucose Positron Emission Tomography (FDG-PET) scanning for evaluation of indeterminate lung lesions detected on CT. MATERIALS/METHODS: Between September 2004 and July 2005 73 patients (38 F; 35 M; mean age 70 years) with a pulmonary lesion detected on contrast enhanced 2.5 mm thickness spiral CT underwent whole body FDG-PET after discussion at the multidisciplinary team meeting. Initial CT, FDG-PET scans and follow up CT scans were retrospectively reviewed. The gold standard was clinical, radiological or histological evidence for lung cancer on follow-up (minimum 18 months). RESULTS: 12 of 73 patients had negative FDG-PET scans, and 2 of these developed lung cancer on follow up CT up to 18 months. 61 were FDG-PET positive and 60 had cancer. The resulting positive and negative predictive values were 98% and 83%, respectively. CONCLUSION: In our cohort of patients with a high prevalence of lung cancer, FDG-PET showed a high negative predictive value in the evaluation of solitary pulmonary lesions. This resulted in reduced need for further surgery, associated surgery risks for the patient and costs for the hospital.

1550 How does pregnancy influence CTPA and perfusion scanning when imaging patients with suspected PE?

Thomson, R. E. D.•Patel, D.•Murchison, J. T.

Royal Infirmary of Edinburgh, Edinburgh, UK

PURPOSE: To review our experience of imaging of PE by CTPA and Q-scan during pregnancy and compare results with a control population. MATERIALS/METHODS: Retrospective review of CTPA and Q-scan reports for all females of child-bearing age (15–45 years) investigated between January 2001 and May 2006. Females were identified as pregnant from information in the report or obstetric records. Non-pregnant age-matched patients formed the control groups. CTPAs were categorised as positive, negative or indeterminate. Note was taken when the report mentioned poor opacification or multiple runs. Q-scans were categorised as high probability, low probability or indeterminate. RESULTS: CTPA – Pregnant 102 *vs*. non-pregnant 541. Positive 9 (8.8%) *vs*. 92 (17.0%). Negative 89 (87.3%) *vs*. 444 (82.1%). Indeterminate 4 (3.9%) *vs*. 5 (0.9%). Poor opacifiaction 12 (11.8%) *vs*. 37 (6.8%). Multiple runs 3 (2.9%) *vs*. 6 (1.1%). Q-SCAN – Pregnant 44 *vs*. non-pregnant 286. High probability 1 (2.3%) *vs*. 23 (8.0%). Low probability 39 (90.8%) *vs*. 206 (72.0%). Indeterminate 3 (6.9%) *vs*. 5 (19.9%). CONCLUSION: During pregnancy the vast majority of investigations for suspected PE by either CTPA and Q-scans are negative. When CTPA is used, the pregnant group showed a higher percentage of indeterminate results with higher rates of multiple runs and documented poor opacification compared with controls. We suggest that the hyperdynamic circulation of pregnancy affects contrast quality. There are less indeterminate results and more diagnosic studies with Q-scans in pregnant patients than in controls. Therefore, during pregnancy, CTPA has more and Q-scans, less non-diagnostic studies compared with controls. These findings support the opinion that Q-scans remains valuable for diagnosis of PE in pregnancy.

1600 Non small cell lung cancer – comparison of TNM staging at CT and PET-CT with histopathological correlation

Ganti, S.[1]•Papagiannopolis, K.[1]•Thorpe, A.[1]•Anikin, V.[1]•Bhartia, B.[1]•Darby, M. J.[2]•Scarsbrook, A.[1]

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PURPOSE: To compare the accuracy of CT and PET-CT staging of non small cell lung cancer (NSCLC) and review the contribution of PET-CT to patient management. MATERIALS/METHODS: Patients with histologically-proven NSCLC being considered for radical treatment were identified retrospectively from MDT meeting records. All patients underwent CT and PET-CT. The TNM staging on both studies was reviewed and compared with final post-surgical histology when available. Additional findings at PET-CT were also analysed. RESULTS: 60 patients were evaluated. CT and PET-CT staging was concordant in 29 (48%) patients. PET-CT upstaged 27 (45%) patients; increased T stage (n=1, 4%), increased N stage (n=14, 52%), increased M stage (n=12, 44%). PET-CT down-staged 4 patients (7%). 8 (of 14) patients with increased N stage had a biopsy prior to further management. 5 were negative (63%) and 3 confirmed nodal spread (37%). 32 patients (53%) had comparative post-surgical histology. PET-CT and post-surgical TNM staging was concordant in 21 patients (66%). 5 patients (16%) with N2 disease on PET-CT had N0 final histology. 4 (of 5) patients with N2 disease on CT and PET-CT had N2 final histology (80%). 7 patients (12%) had additional findings on PET-CT, 3 had extra-thoracic malignancy. CONCLUSION: PET-CT upstages a significant number of patients. N2 disease on PET -CT needs confirmation because of a high false positive rate. Incidental findings on PET-CT require further evaluation.

1610 Does multiplanar reformatting affect the accuracy of interpretation of CT pulmonary angiography?

Harding, J.•Collin, N.•Hughes, J. L.

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PURPOSE: The introduction of soft copy reporting and the adoption of workstations to review imaging investigations have revolutionized the work patterns of radiologists. The degree to which multiplanar reformatting (MPR) has improved the reporting of radiological investigations has not been fully investigated. In particular, there have been no studies investigating the effect of MPR on the interpretation of CT pulmonary angiography (CTPA). The aim of this project is to quantify the effect of MPR on the accuracy of CTPA interpretation. MATERIALS/METHODS: 103 archived CTPA examinations made up the study cohort (Siemens 4-slice MDCT; examination initiated with bolus tracking: 2.5 mm collimation, 3 mm recon). The report of the original radiologist at our institution was taken as the reference standard (30 positive examinations, 73 negative). Two investigators read the examinations on a workstation using full MPR images or only axial images (AquariusNET, TeraRecon) grading the probability of pulmonary embolus on a five point scale. Agreement with the original report was used as a surrogate for accuracy. ROC curves were constructed and compared using standard statistical software (MedCalc, Belgium). Interobserver variability was assessed using κ-statistics on a sub-set of the cohort. RESULTS: Using only axial images AUC = 0.793 [95% CI 0.702 to 0.867]; Using full MPR AUC = 0.817 [95% CI 0.729 to 0.886]: (not significant p = 0.63). The investigators demonstrated good interobserver variability (Weighted κ 0.63). CONCLUSION: Axial images are sufficient for diagnosis. MPR has a negligible effect on the accuracy of reporting of CTPA.

1620 Role of pre-clinic staging CT scan in the lung cancer setting

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PURPOSE: In present NHS, there is emphasis on reducing waiting times by rapid diagnosis and treatment. In helping to attain the 31 day and 62 day targets, our practice is to perform a staging CT scan (based on CXR report and symptoms) prior to the lung cancer clinic appointment. This study is to assess the effectiveness of such

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practice and to ascertain its role on a national basis. MATERIALS/METHODS: Retrospective review of 170 patients who had pre clinic staging scan, over a period of 4 months (Aug to Nov 06). RESULTS: Of the 170 patients, 75 (44%) had lung malignancy, 66 (39%) had other relevant lung findings, 24 (14%) had normal CT scan and 5 (3%) had other incidental malignancies. In the malignant group, mean age was 69 years (range 41–85 years) and 50 (66.6%) patients had suspicious symptoms. The most common CXR finding was parenchymal mass or opacity (52%) and none of the CXR were normal. In the normal CT scan group, the mean age was 64 years (range 32–81 years) and majority (54.1%) had non-specific symptoms (13). The CXR finding included equal numbers (n=6) of bulky hilum, parenchymal opacity and normal. In the benign group, infective changes and lung nodules were the major findings (52%). CONCLUSION: It is obvious that only a minority (14%) of patients had a normal CT scan while the majority (83%) of pre clinic staging CT showed some pathology (either benign or malignant). Hence, we advocate the use of CT prior to clinic in selected patients with suspected thoracic malignancy.

1530–1630
Paediatrics IV

1530 CT brain scans in suspected non accidental injury – a national survey

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PURPOSE: National survey on whether Consultant Radiologists with interest in paediatric imaging feel that CT brain scans should be routinely included in the survey of all suspected cases of non accidental injury (NAI). METHODS: First round Delphi questionnaires were sent to Consultant Radiologists with interest in paediatric imaging in 12 children's and 80 teaching/general hospitals. The stem questions were: (1) Years of experience in imaging for NAI; (2) Should CT brain be done routinely for every case of NAI? (3) In your current practice do you perform a CT brain in all suspected cases of NAI? RESULTS: 66 responses received from 52 hospitals (hospital response rate 57.8%). 48.5% of responders had over 10 years of experience. 43.9% agreed with question 2. 68.2% responded in the negative to question 3. 45% of those disagreeing with question 2 stated radiation risk as their reason, 25.8% stated that the decision should be based on clinical suspicion. The main reason stated by those who agreed with question 2 was exclusion of occult injury. Of the responders from specialist children's hospitals, 62.1% agreed with question 2. CONCLUSIONS: Early results suggest that opinion is divided. This data and reflected suggestions will be used to plan future studies aiming to achieve a national consensus on the use of CT brain in suspected cases of NAI.

1540 The upper gastrointestinal contrast study in the diagnosis of small bowel malrotation and volvulus

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PURPOSE: To assess the accuracy of the upper gastrointestinal (UGI) contrast study in the diagnosis of small bowel malrotation. MATERIALS/METHODS: During an 8 year period 47 cases (35 male, 12 female, age range 1 day to 9 years) of malrotation, with or without volvulus, were diagnosed by UGI contrast study. The imaging was reviewed with attention to 9 diagnostic imaging criteria associated with malrotation, as described by Katz el al, and the results correlated with findings at laparotomy. RESULTS: Malrotation was confirmed at surgery in 89% of cases (n=42). Diagnosis of volvulus (n=9) was uncomplicated (corkscrew jejunum n=8, obstruction n=1). Malrotation (n=28) had classical imaging findings (duodenojejunal flexure sited low and to the right) in 75% (n=21); the remaining cases fulfilled at least 2 of the imaging criteria whereas the false positive cases (n=5), with one exception, did not. No child progressed to surgery without an UGI contrast study. CONCLUSION: UGI contrast has a high specificity for the diagnosis of malrotation with or without volvulus. The application of imaging criteria could further improve diagnostic accuracy.

1550 Introducing a new classification system for congenital scoliosis and segmentation disorders of the spine

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KEY LEARNING OBJECTIVE: To gain exposure to, and understanding of, the classification system as developed by the authors on behalf of the International Consortium for Vertebral Anomalies and Scoliosis (ICVAS). DESCRIPTION: The ICVAS classification system has been developed by practitioners in radiology, orthopaedic surgery and clinical genetics. The aim is to reduce some (or all) of the confusion that currently surrounds diagnosis and classification of these congenital disorders. The system can be used transferably both in animal models and in bioinformatic approaches currently in development by segmentation biologists. The presenting author will introduce the basic "rules" and outline of the classification system, including the subdivision of vertebral segmentation defects (VSD) into single and multiple generalized vertebral segmentation defects (SVSD, MVSD), and the further subdivision of MVSD into localized and generalized (LVSD, GVSD). During this interactive session, attendees will receive handouts, and will work through examples with the presenting author. CONCLUSION: As a result of this session, attendees will have learnt a systematic approach to diagnosing congenital scoliosis and spinal segmentation disorders. This approach will be clinically useful to radiologists, spine surgeons and clinical geneticists. Ultimately there will be an internationally recognized approach, optimizing clinical and molecular (genetic) diagnosis of these disorders.

1600 Renal ultrasound in neonates with single umbilical artery. Is it necessary in all neonates?

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PURPOSE: To assess the clinical benefit of performing RUS in neonates with single umbilical artery (SUA) as the primary indication and whose mothers had a 20 week detailed antenatal scan. SUA has an incidence ranging from 0.3% to 2.13%. It is a clinical marker associated with a wide variety of congenital abnormalities with an incidence of renal abnormalities between 4.5% and 16%.The majority of these are self-limiting. In Aberdeen, the majority of the neonates with SUA undergo a renal ultrasound (RUS) examination at birth and all pregnant mothers are offered at least two antenatal scans (12 weeks and 20 weeks gestation). MATERIALS AND METHODS: Neonates were identified from Aberdeen maternity hospital database, to have SUA at birth between calendar years 2003 and 2005. A review of radiology results was done with a clinical case note review in neonates with abnormal examinations. RESULTS: Over the 3-year period a total of 47 neonates were found to have SUA of which 37 (79%) neonates underwent RUS. Of these 7 patients had abnormal RUS out of which 4 patients had major renal anomalies previously detected on abnormal antenatal 20 week scans, 2 patients had self-limiting abnormality and 1 patient died in the neonatal period due to multiple congenital anomalies. CONCLUSION: In our review, RUS performed in neonates with SUA as the primary indication offered no additional clinical information to the antenatal 20 week scan result. A RUS examination should be limited to neonates with SUA and congenital abnormalities or neonates with SUA whose mothers have not had antenatal ultrasound.

1610 Discrepancies in radiograph interpretation by radiologists versus emergency physicians in paediatric A&E

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PURPOSE: Misinterpretation of radiographs is a common source of medical error especially in the Emergency department .This could

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affect patient safety and quality of medical care. The purpose of this study was to identify the discrepancies in radiograph interpretation by Radiologists versus interpretation by doctors in the paediatric A&E and to determine its impact on patient care. MATERIALS/METHODS: Setting: Paediatric A&E ,North Middlesex Hospital; Study Period: August 2003. Retrospective study; Study number [*n*] = 118. Casualty cards of study population were reviewed and the X-ray findings were compared with radiology reports from the Patient Admission Service [PAS] system. Discrepant X-rays were reviewed again by a Consultant Radiologist. RESULTS: Results were described as discordant if the interpretations were not in agreement, concordant if being of the same opinion, concordant underread if the major findings were consistent but missed other findings. Majority were bone X-rays .Nearly three-quarters of them were interpreted by Senior house officers. 9% of the X-rays were identified as discordant, 61% as concordant and 8% were concordant under read X-rays. CONCLUSION: Radiograph interpretation by the paediatric emergency doctors were generally accurate. No adverse patient outcome was identified in the study. However, judicious consultation with a Radiologist in case of difficult situations will help us to deliver high quality of medical care.

1620 Chest X-ray findings in children with proven viral chest infections

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PURPOSE: Viral chest infections in children are common but accurate data on laboratory proven viral chest infections in children is hard to obtain. The aim of the study was to see what percentage of children with viral infections underwent chest radiography and to describe the patterns of abnormalities seen in this group. MATERIALS/METHODS: Data was obtained on children under the age of 24 months with a positive viral titre from January 05 to April 06. These were crossed referenced with the electronic patient records and their clinical diagnosis noted. The radiology history was reviewed and the CXR reports examined. RESULTS: Data were obtainable on 100 cases with a positive viral serology. Most had a clinical diagnosis of a respiratory tract infection or acute bronchioloitis (92%). There were 53 females and 47 males (mean age 5.8 months). The most common viral aetiology was the respiratory syncitial virus (RSV) (91%, *n*=91), with the remainder made up of parainfluenza, influenza and rhinoviruses. 67 (67%) cases did not have a CXR. Of the 33 who had chest radiographs, 17 were abnormal and 15 were normal. Data were unavailable for one. 8 (47%) had evidence of consolidation. Findings in the rest included peribronchial thickening, nodular opacity and/or large volume lungs. None had pleural effusions or adenopathy. CONCLUSION: A significant proportion of children with proven viral chest infections did not undergo chest imaging. The most common finding in the patients who underwent imaging was consolidation and peribronchial thickening but a significant percentage had a normal chest radiograph.

1530–1620
Service Delivery II: Scientific Session

1530 How do Australian speech and language pathologists practice radiation safety during video-fluoroscopic swallowing studies?

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PURPOSE: The video-fluoroscopic swallowing study (VFSS) is an X-ray examination for quantifying and demonstrating dysfunction of the oral, pharyngeal and/or oesophageal phase of the swallow. During this procedure, speech and language pathologists (SLPs) are potentially exposed to radiation. To effectively limit unnecessary exposure, SLPs are required to actively shield themselves by means of lead gowns and thyroid collars and be monitored with radiation badges. The aim of this research was to assess the level of current radiation protection practice amongst Australian SLPs performing these procedures. METHOD: A questionnaire containing both open and closed questions was distributed via the Speech Pathology Australia (SPA) and the Australasian Dysphagia Newsletter (ADN) websites. RESULTS: 69 questionnaires were returned. The results revealed that participants had received some radiation protection training, and this training had provided them with general knowledge on radiation protection. Nearly all (97%) participants indicated that they always wore lead aprons, 76% indicated they wore thyroid collars while only 36% consistently wore radiation badges. Despite the majority of participants being aware that increasing distance from the radiation source were effective radiation protection methods, nearly 30% revealed that they stood less than 1 m from the patient. CONCLUSION: The majority of participants indicated a lack of formal education and were generally unsure on whether the information they possessed was adequate to provide them with the protection they needed. The researchers recommend that education on radiation protection and safety be provided at University level and then be supplemented by regular in-service sessions.

1540 The effect of changes in workflow on radiology report turnaround time

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PURPOSE: This study aimed to determine the effect of implementing a third party transcription service and a scanned request card system on the report turn around time (RTAT) in the Radiology department. The study compares the RTAT of the original Radiology workflow (Phase 1) with the RTAT after outsourcing of report transcription (Phase 2) and following scanning of all paper requisition forms (Phase 3). Two distinct workflow changes occurred over the space of 6 months. The aim of this project was to determine how RTAT was affected by these. MATERIALS/METHODS: A specially designed RIS report was used to interrogated data pertaining to all MRI, CT, General and Ultrasound examinations carried out during a 6 month period. The time that elapsed between examinations being in "taken", "draft" and "signed" status was included in the customised RIS report. Statistical differences in the report turnaround times for each phase were calculated using the ANOVA statistical test. RESULTS: The RTAT for all three phases were significantly different ($p \leq 0.05$). The mean and standard deviations were for Phase 1 (*n*=1163) 36:47 min, (SD 29:42); Phase 2 (*n*=448) 106:09 min (SD 37:19); Phase 3 (*n*=762) 69:14 min (SD 44:49). CONCLUSION: This work enables better understanding of the effect of workflow changes on RTAT. External transcription, although delivering an economic benefit, resulted in an increase in RTAT. The availability of the scanned request had positive effect in report turnaround.

1550 Plain film reporting – can PACS improve patient care?

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PURPOSE: To compare the reporting of admission chest radiographs by the medical team with that of senior radiologists, and assess the likely clinical benefit from the introduction of PACS. MATERIALS/METHODS: The medical and radiology records of patients admitted by a medical team over a 5-week period were reviewed. The admitting team's reports of the CXR were compared with that of the consultant radiologist. Assessment was made as to the clinical impact of any discrepancies encountered. RESULTS: 65 of 87 patients reviewed (75%) had chest radiographs. 32 patients (49%) had no documentary evidence that the CXR had been reviewed by the admitting team and in 2 cases (3.1%) the CXR was unavailable at the post-take ward round. All the films received a formal radiology report, with a mean delay from the film being taken to the report being available of 40.4 days (max. 117 days). Overall concordance between the admitting team and the radiologist was 61%. The cases with "false-positive" admission reports (12%) were all of minor clinical significance. The "false-negative" discrepancy rate was higher (17%), with one case (1.5%) of "major significance" which led to an impairment of patient care. CONCLUSION: The admitting team's reports demonstrated a high error rate, but the majority of these errors did not have a major impact on medical treatment. However, the expected reduction in reporting delay (from 40 days to 1 day) due to the introduction of PACS may be clinically beneficial for the small number of patients with "major" interpretation errors.

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1600 Ultrasound of soft tissue foreign bodies in Accident and Emergency

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PURPOSE: To evaluate the possibility of providing an ultrasound service in Accident and Emergency (A&E) by Emergency Physicians for soft tissue foreign bodies. MATERIALS/METHODS: Soft tissue foreign bodies are a common problem in A&E. Patients are normally referred to the Radiology department for a scan where this is not palpable or visualized on plain radiography. If a foreign body is identified on ultrasound its location is marked on the skin and the patient referred back to A&E for removal. 26 patients presenting with this problem where consented for inclusion in the study. They where first scanned in A&E by a Senior Registrar or Consultant Emergency Physician on a handheld vascular access machine (10 MHz) optimized for imaging the soft tissues. These machines for vascular access are freely available in modern A&E departments. Following this scan, the patient was forwarded to the Radiology department where the routine scan was performed by a Radiologist. The Radiologist and the patient where blinded to the result of the first scan. RESULTS: The scan performed in A&E correctly identified 93% of foreign bodies. CONCLUSION: The early results suggest that this service can be provided with scans in A&E by Emergency Physicians on presently available equipment with referral to radiology for difficult cases. The study is ongoing.

1610 Converting from barium enema to virtual colonoscopy – an initial experience in the UK NHS

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PURPOSE: To evaluate our initial experience of replacing barium enema with a virtual colonoscopy (VC) service. MATERIALS/METHODS: Over 9 months, all requests for radiological investigation of the colon for symptomatic patients were converted to VC and these 104 men, 183 women (mean age 69 years) underwent VC by trained radiographers. Interpretation was performed by experienced radiologists. The most common clinical indications were altered bowel habit (39%) and failed colonoscopy (14%). Detected cancer cases underwent immediate CT staging and same day colonoscopy where possible. Raw frequencies and positive predictive values were used for analysis. RESULTS: 284 (99%) VC examinations were acceptable quality. Colorectal cancer was detected in 15 of 287 patients (5%); 14 (93%) underwent same day CT staging; 12 (80%) had endoscopy and biopsy [10 "same-day"]; 3 (20%) went straight to surgery; 14 (93%) were adenocarcinoma (PPV 0.93) and 1 (7%) was a GIST. A further 4 (1.4%) patients underwent combined VC/staging CT for known cancer and impassable stricture at endoscopy. No cancer was found in 8 patients with VC diagnosis of diverticular stricture. Of 15 large (≥10 mm) polyp cases, 10 underwent colonoscopy; 7 were adenomas, 2 polyp cancers; 1 IBD; and 1 not found (PPV 0.9). Of 29 medium (6–9 mm) polyp cases, 8 underwent endoscopy, with agreement in 4 (50%). There were 33 (11%) cases with potentially important extracolonic findings and no potentially serious adverse events. CONCLUSION: VC can be used safely for examining older symptomatic patients with acceptably low referral rates and high concordance with endoscopy for clinically significant lesions.

1530–1630
Forensic SFG II

1530 Disaster victim identification – the role of the United States DMORT team following Hurricane Katrina

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This presentation describes the deployment of the Disaster Mortuary Operational Response Team (DMORT) to Mississippi and Louisiana in the wake of Hurricanes Katrina and Rita. An overview of DMORT and its mission is given. The initial setup of the Deployable Portable Morgue Unit (DPMU) is explained with attention to the X-ray component and its role in morgue operations. The three generations of morgue operations in the aftermath of the hurricanes provided valuable experience not encountered in previous deployments, and the lessons learned and knowledge gained pertinent to radiography are shared. OBJECTIVES: By the end of this session the attendee will be able to: (1) explain DMORT and define its mission; (2) comprehend the magnitude of the Hurricane Katrina disaster; (3) be informed about the morgue setup and Radiology equipment utilized in the operations; (4) understand the problems encountered; and (5) appreciate the lessons learned and knowledge gained from this experience. OUTLINE: I. DMORT – What It Means: A. The mission of DMORT; B. Composition of DMORT; C. DMORT capabilities. II. Initial Deployment in the Aftermath of Hurricane Katrina: A. Conditions; B. Location; C. Equipment; D. Problems and solutions. III. Additional Deployments: A. Changes following Hurricane Rita; B. Equipment; C. Conditions. IV. Valuable Lessons: A. Equipment; B. Techniques and training; C. Coping.

1600 Invited review: Disaster victim identification – the role of the UK forensic radiography response team

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PURPOSE: To provide an overview of the role of forensic radiography in helping to identify victims of mass disasters and the work undertaken by the Association of Forensic Radiographers (AFR) to establish a data base of trained forensic radiographers capable of providing that service. ABSTRACT: Radiography has been an invaluable tool to forensic science since its discovery. Historically the use of radiography to help identify victims of mass disasters and genocide has been restricted by the available technology, cost benefit and politics. Incident planners relied upon local hospitals for the imaging resources. As a result inexperienced/untrained radiographers were called upon when both staff and equipment would also be required to support the survivors. AFR was established by a small group of radiographers with extensive experience in both mass disaster DVI and the investigation of genocide victims. Intent on providing a professional and organized response, AFR now train radiographers to set up and operate in temporary mortuaries. Registered on a national data base these radiographers staff the UK Forensic Radiography Response team (UKFRRT). AFR has worked with the Home Office and Regional Resilience Teams to embed centralised equipment and UKFRRT into their plans.

1530–1630
Ultrasound on-call: an introduction IV

1530 Invited review: The swollen leg: DVT and other causes

Evans, R.

Morriston Hospital, Swansea, UK

No abstract supplied.

1615 Discussion

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Notes

Scientific Poster Exhibition

Breast

POSTER p101

Does mammographic density of breast tissue predict re-excision rate in patients undergoing breast conservation surgery?

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PURPOSE: To show whether mammographic breast density at diagnosis predicts the re-excision rate in patients undergoing breast conservation surgery (BCS). MATERIALS/METHODS: 110 patients who underwent breast conserving surgery for breast cancer at Bristol Royal Infirmary in 2002 had their diagnostic mammograms retrospectively reviewed. The films were subjectively assessed by 2 Radiologists on a scale of density from 1–4 (<25%, 25–50, 50–75, >75%). Demographic and clinicopathological data were also collected retrospectively. RESULTS: The films were not located for 14 patients. Of the remaining 96, 32 (33.3%), 39 (40.6%), 22 (22.9%) and 3 (3.1%) were graded as densities 1, 2, 3 and 4 respectively. In total, 25 patients had repeat surgery of which the percentage in each group were 18.8%, 23.1% and 31.8%, respectively. All 3 patients with the densest mammograms had at least 2 operations. The mean density for re-excision was 2.23 *vs.* 1.85 for one operation ($p<0.05$; student *t*-test). CONCLUSION: Previously this centre has shown that age, mammographic tumour size, macroscopic size of specimen, invasive tumour size, invasive lobular carcinoma and positive Her-2 receptor status are other factors which predict re-excision. Mammographic breast density is a further factor predicting re-excision in patients undergoing BCS and should be considered when planning patient management.

POSTER p102

Screen-detected mucinous breast carcinoma: imaging features and potential for delayed diagnosis

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PURPOSE: Mucinous carcinomas can pose a diagnostic problem and potential delayed diagnosis because of their characteristically benign appearances. Current screen reading strategy aims to minimize psychological morbidity by not recalling all benign appearing masses. We reviewed all cases of screen detected mucinous carcinomas to determine whether this policy leads to more advanced stage of cancer at final diagnosis. MATERIALS/METHODS: 17 consecutive cases of screen detected pure mucinous carcinomas were diagnosed at The West of London Breast Screening Service between December 1999 and July 2006. Current and previous screening mammograms were reviewed by 2 experienced Breast Screening Radiologists. Mammographic and ultrasound appearances and pathology results were collated. RESULTS: 6/17 had previous screening mammograms. 8/17 had not been screened previously, 3/17 had screening films more than 12 years prior to diagnosis. Mammographic features included: predominantly well defined mass (8/17), irregular mass (4/17) or mass with microcalcification (5/17). 16 cases had ultrasound; appearances ranged from predominantly well defined hypopoechoic mass (10/16); the remainder appearing either as irregular mass (3/16) or ill defined area of altered echogenicity with no focal mass (3/16). In 3/17 (18%) cases, an abnormality was visible on previous mammograms. These cases exhibited subtle assymetry or benign signs, which did not merit recall at that time but change in appearance prompted recall for assesment at subsequent screen. All were lymph node negative at final diagnosis. CONCLUSION: Our study shows current screen reading policy does not lead to more advanced stage of disease at final diagnosis.

POSTER p103

Breast implants – an increasingly common companion of breast cancer

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KEY LEARNING OBJECTIVES: (1) Appearances of breast cancer in an augmented breast using multiple imaging modalities. (2) To be aware of the most important mimics in these often difficult cases. (3) To appreciate how image guidance can help carry out tissue sampling more accurately. DESCRIPTION: Breast cancer is the most common type of cancer amongst women in the UK with age standardized incidence of 120 per 100 000. In 2005, the UK Breast Implant Registry recorded the highest annual figure of breast implant registrations with 90% performed for cosmetic purposes. With the incidence of both breast cancer and breast augmentation increasing in economically developed countries, more women are presenting with breast cancer within an augmented breast. Whilst epidemiological studies do not support an increased cancer risk in these patients, it does pose well documented challenges to the radiologist in both the detection and subsequent interventions required for histological confirmation. CONCLUSION: We present a multimodality review of the imaging findings of breast cancer in women with breast implants using MRI, mammography, ultrasound and elasticity imaging.

POSTER p104

Artefact observations in digital mammography

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PURPOSE: The pictorial essay aims to demonstrate various artefacts observed in a detector-based mammography screening centre. MATERIALS/METHODS: Artefacts are observed by the radiographer during positioning of the woman or monitor image review after the data acquisition, during the radiographic PGMI image quality review programme, or during the radiologists' image interpretation. Various sorts of artefacts are illustrated. We used an extensive processing and a good lightening for image evaluation. RESULTS: Artefacts are illustrated by figures and text explanation. Artefacts seen were related to (i) the screened woman; (ii) the equipment; (iii) the image processing. The quality of monitors that implies the possibility to observe artefacts, is illustrated. CONCLUSION: Examples of different artefacts collected during a 3-year period in a screening center using detector-based mammography are shown. Awareness and knowledge will help the radiographer to prevent, identify and resolve them, thereby improving the accuracy of diagnosis.

POSTER p105

An audit of axillary ultrasound and fine needle aspiration (FNA) in pre-operative breast cancer management

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PURPOSE: Sentinel lymph node biopsy (SLNB) has led to a reduction in the number of patients undergoing axillary clearance with its inherent morbidity. However, a positive SLNB necessitates a second operation. Pre-operative radiological assessment of the axilla aims to reduce the number of two stage procedures. This has been introduced to our unit in an ad-hoc fashion. We assessed sensitivity and specificity of FNA and the impact of axillary ultrasound and FNA on surgical intervention. These results were compared with previous literature. MATERIALS/METHODS: A retrospective audit of patients with a first presentation of operable, invasive breast carcinoma between October 2005 and October 2006 was carried out. The radiology, pathology and surgical records were reviewed. RESULTS: Of 176 eligible patients, 70 (40%) had nodal metastases at operation. 59 of these underwent axillary ultrasound and 21 had axillary FNA. FNA was also performed in 8 of 106 node negative patients. The sensitivity of FNA was 62% (13/21) and specificity was 100% (8/8). Seven node positive patients did not have FNA despite abnormal nodes being described at ultrasound. All 13 women with positive cytology

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underwent axillary clearance at first operation. Axillary ultrasound and FNA avoided 13/70 unnecessary SLNB (19%). CONCLUSION: Our results compare reasonably with previously published data. Better results may be obtained if clear criteria for ultrasound and FNA are agreed. We aim to pre-operatively diagnose 25% of node positive patients in the coming year. We recommend axillary ultrasound in all patients suitable for SLNB and that all abnormal nodes are sampled.

POSTER p106

The role of axillary MRI in recurrent breast carcinoma – a pictorial review

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PURPOSE: To illustrate the role of axillary MRI in recurrent breast carcinoma. MATERIALS/METHODS: We have retrospectively reviewed 60 patients with an age range of 41–89 years (mean age of 62 years) over a 3 year period with suspected breast cancer recurrence. The patients presented with an axillary mass, pain, lymphoedema or neurological symptoms. Their axillary MRI scans were performed on a Philips Intera 1.5 T Scanner with both axillae image simultaneously using the Synergy body coil. Intravenous gadolinium was used in 38 cases. These scans have been reviewed for the presence and extent of the disease. Further histopathological correlation has been made wherever possible, along with clinical follow up. RESULTS: 20 patients (34%) had positive findings of recurrent cancer. 39 patients (66%) demonstrated post-operative appearances. 1 patient was claustrophobic and was excluded but her CT scan was positive for recurrence. In the patients with positive findings, 15 (75%) demonstrated irregular soft tissue/nodal mass with an average size of 31 mm, 3 patients (15%) had linear soft tissue enhancement suggestive of recurrence and 2 patients (10%) showed bony metastases. Various examples of disease recurrence will be illustrated. In 8 out of the 20 (40%) patients with positive findings, recurrent carcinoma was confimed on FNA, core biopsy or post-operative histology. CONCLUSION: Our study shows that axillary MRI is reliable and accurate in the assessment of recurrent breast carcinoma patients, and hence plays an important role in their further management.

POSTER p107

Use of technetium-99m-sestamibi scintimammography to detect residual breast cancer

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PURPOSE: Our goal was to determine the clinical usefulness of $^{99}Tc^{m}$-sestamibi in detecting residual disease post operatively in breast cancer patients. METHODS: We studied 53 patients who received 750 MBq $^{99}Tc^{m}$-sestamibi intravenously. Lateral and anterior planar images were gathered after 10 min of the injection. All these patients had undergone surgery for breast cancer and had histopathological/clinical suspicion of residual disease. Only focal increased uptake was interpreted as positive. Out of 53 patients aged 34–84 years (mean 56.15 years) 42 were invasive carcinoma (IDC/ILC/Mucinous Ca/Tubular Ca), 11 were ductal carcinoma *in situ* (DCIS). Sestamibi scan was positive in 16, negative in 34 and inconclusive in three patients. RESULTS: We report an overall sensitivity of 81% and specificity of 91% for the detection of residual cancer. In invasive cancers, the sensitivity was of 78% with a specificity of 92%, while in DCIS, the sensitivity was of 100% with 88% specificity. Three patients with malignancy had negative scans, three positive scans had no malignancy. CONCLUSION: Mammoscintigraphy with $^{99}Tc^{m}$-sestamibi has high specificity and adequate sensitivity to detect residual breast cancer.

ELECTRONIC POSTER e108

Spectrum of papillary lesions of the breast: clinical, imaging and pathological correlation

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KEY LEARNING OBJECTIVES: (1) To review the clinical presentation, imaging features, and pathologic correlation of papillary lesions of the breast. (2) To facilitate the recognition of these lesions by appropriate additional imaging workup. (3) To discuss the prognosis and therapeutic interest of these lesions. DESCRIPTION: Papillary lesions of the breast are a heterogeneous group of breast lesions that are difficult to diagnose as being benign or malignant. These lesions have varied morphologic features, carry differring prognostic implications to affected patients, and the definitive treatment. Benign papillary lesions include papillary apocrine changes, papilloma, and papilloma with superimposed changes. Malignant papillary lesions include papillary ductal carcinoma *in situ*, micropapillary ductal carcinoma *in situ*, invasive papillary carcinoma, and invasive micropapillary carcinoma. This exhibit illustrates the spectrum of clinical presentations, imaging features on different modalities, and pathological correlation of papillary lesions of the breast. CONCLUSION: Recognition of these papillary lesions will help faciliate diagnosis and proper management.

Cardiac

POSTER p201

Ten reasons to look at the heart on thoracic CT

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KEY LEARNING OBJECTIVES: To illustrate the appearance of cardiac pathology, now seen increasingly with the use of faster multidetector row CT imaging. Unexpected co-existent cardiac pathology is often demonstrated which can be important in interpreting symptoms or other radiological appearances. Occasionally there are significant prognostic implications. DESCRIPTION: Improved visualization of cardiac anatomy and pathology on standard thoracic CT studies means assessment is now possible of cardiac chamber size, myocardial wall thickness or focal abnormality, filling defects, valvular, coronary and pericardial disease. Previously the heart and related structures were obscured by motion artefact making diagnosis difficult. 10 cases of thoracic CT performed on multidetector row machines demonstrate a spectrum of incidental findings ranging from cardiac pathology such as infarction and mural thrombus to less commonly seen congenital anomalies and neoplastic disease. CONCLUSION: We present an imaging review of incidental cardiac pathology that was discovered on routine thoracic CT imaging performed in our hospital. It is important to be aware of the possibility and presentation of cardiac disease to maximize the diagnostic potential from thoracic CT imaging.

POSTER p202

Role of cross sectional imaging in evaluation of intracardiac masses

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KEY LEARNING OBJECTIVES: To demonstrate the spectrum of imaging appearances and severity of disease of various intracardiac masses like intraventricular thrombus, primary neoplasms and metastatic diseases. DESCRIPTION: The intracardiac metastatic deposits are more common than primary cardiac tumour. We present a wide spectrum of imaging findings obtained using CT and MRI. Rare presentations like metastatic deposits from melanoma were included. The advantages and limitations of each of these imaging modalities are discussed. CONCLUSION: The cross sectional imaging, particularly MRI is being increasingly used in diagnosing intracardiac masses. The non-invasive nature of these modalities and improved high spatial and temporal resolution are the main advantages.

POSTER p203

Impaired left ventricular function has a detrimental effect on image quality in multidetector row CT coronary angiography

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PURPOSE: To determine whether the image quality of coronary CT is affected by poor circulation times. MATERIALS/METHODS: 36 patients, 18 with suspected cardiomyopathy (CM) and 18 controls were

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approached to have CT coronary angiography. Contrast circulation times, coronary artery image quality, aortic root contrast attenuation and left ventricular (LV) functional parameters were assessed. RESULTS: Sub-optimal contrast opacification impaired image quality more often in the CM group than the control group (32.8% *vs*. 6.2%). There were significant differences between the groups for contrast transit time (p=0.03), LV ejection fraction (LVEF; p<0.001), LV stroke volume (p=0.02), peak aortic attenuation (p<0.001) and coronary segments with suboptimal contrast (p<0.001). A total of 55.6% CM patients had a contrast transit time ranging from 30–75 s; the number of "unassessable" segments increased with increasing transit time with a fitted quadratic model (R^2 = 0.74). The relationship between LV functional parameters and contrast attenuation may also conform to a quadratic model (R^2 = 0.71). CONCLUSION: LV haemodynamics influences coronary artery opacification with multidetector row CT. Poor LV haemodynamics pose technical and interpretational difficulties. Currently, a prolonged test bolus time (>30 s) and poor LVEF (<20%) might be suggested as additional gatekeepers to CT coronary angiography; there is also some evidence that contrast opacification begins to decrease again when LVEF > 60%. The results indicate the need for further studies examining CT imaging protocols in this clinical subgroup.

POSTER p204

Congenital cardiac defects: 64 slice computed tomography imaging

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KEY LEARNING OBJECTIVES: Review of techniques for cardiac CT imaging in congenital cardiac defect patients. DESCRIPTION: Outline of our experience of non gated and non sedated congenital cardiac scanning without the use of beta blockers. At least five studies have been performed using the state of the art 64 slice Siemens Somatom scanner. A despcription of our protocol and experience is presented. The utility of cardiac CT is presented in the context of congenital cardiac defect characterization, assessment and surgical planning. Some pictorial examples are presented including patent ductus arteriosus, transposition of the great arteries and ventricular septal defect. CONCLUSION: Cardiac CT is a safe and effective imaging modality for use in pre operative planning and assessment of congenital cardiac

POSTER p205

Multidetector CT and adult congenital heart disease – an evolving modality

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KEY LEARNING OBJECTIVES: Cardiac multidetector computed tomography (MDCT) is rapidly evolving, and can now show intracardiac defects clearly as well as coronary disease. We present a pictorial review of 12 patients with both common "grown-up" congenital heart (GUCH) defects, as well as some rarer conditions, that may be encountered in normal clinical practice. We will show that MDCT is a viable alternative to MRI for imaging of GUCH patients. DESCRIPTION: All patients were scanned using a 64-slice CT scanner, with ECG gating. Common conditions such as atrial septal and ventricular septal defects can be clearly demonstrated. We have also been able to show precise anatomic detail of the post corrective surgery appearances of Tetralogy of Fallot and Transposition of the Great Arteries. In addition we accurately demonstrate anomalous pulmonary venous drainage, Ebstein's anomaly, aortic coarctation, Cor Triatriatum, Patent Ductus Arteriosus and anomalous coronary arteries. The excellent spatial resolution of 64 slice MDCT enables accurate multiplanar reformatting and volume rendered analysis. CONCLUSION: Adult patients with congenital heart disease are becoming an increasingly common phenomenon as corrective surgery continues to improve. The evolving technology of MDCT also enables demonstration of intracardiac defects that may have previously gone undetected to now come to the fore. As cardiac MDCT grows in popularity it is likely that congenital defects will also be encountered more commonly. We have demonstrated that this modality is now a viable tool for the evaluation of adult congenital heart disease.

POSTER p206

Cardiac CT: lessons learnt and technique improvement over the first hundred patients

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PURPOSE: To illustrate the recent advances in cardiac CT technology and outline changes made in technique at our institution in order to optimize scan quality. MATERIALS/METHODS: Coronary artery and cardiac chamber examination has proved the most challenging and radiographically demanding of techniques for CT thus far. It has only recently been made possible due to the advent of ultra fast scanners, sub millimetre slice collimation, robust retrospective cardiac gating, improved contrast, delivery pumps and leaps forward in image processing software. A database was set up to record imaging details and subjective analysis of scan quality for the first 100 cardiac CT scans performed by our department. The scans were graded as excellent, good, poor or failure, with poor and failure considered as non diagnostic. RESULTS: The number of undiagnostic studies remained similar when comparing the first and second 50 (8% and 10%) but the number graded as excellent ("textbook") images rose from 8% to 18%. Contrast strength, delivery rate, field of view, patient positioning and ECG editing have all changed during this period. Details of these changes and useful tips for improving image quality are discussed. CONCLUSION: The high quality of images obtained with sustained improvement during the learning curve has enabled cardiac CT to establish a place in the management of coronary artery disease and complex cardiac problems.

POSTER p207

Left ventricular analysis by 64-MDCT in patients with severe pulmonary hypertension

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PURPOSE: To validate the left ventricular function data of 64-MDCT compared with the gold standard of cardiac magnetic resonance imaging (CMR) in patients with severe pulmonary hypertension of varied aetiology including Eisenmengers ASD, VSD and complex congenital heart disease MATERIALS/METHODS: 13 consecutive patients with severe pulmonary hypertension underwent CMR and a combined gated 64-MDCT pulmonary and coronary angiogram for assessment of *in situ* pulmonary thrombus, coronary artery disease and assessment of left ventricular function. Images were reviewed independently by two blinded observers. MDCT left ventriculography was reviewed on a Terarecon Aquarius workstation using a semi-automated time, volume threshold technique. CMR data was assessed using CMR Tools LV tracing analysis. Statistical differences in LV end-diastolic (EDV), end-systolic (ESV) and stroke volumes (SV) and ejection fraction (EF) were calculated using a Bland-Altman analysis and correlation coefficients. RESULTS: Left ventricular EF correlation between 64-MDCT and CMR was good (r=0.72). ESV (r=0.89) and EDV (r=0.68) also demonstrated good correlation, however subsequent SV demonstrated only moderate agreement (r=0.38). Bland-Altman analysis demonstrated good agreement between MDCT and CMR LVEF with all values falling within 2sd. Ten of the 13 studies had less than a 10% variation in LVEF. CONCLUSION: 64-MDCT LV analysis has both good agreement and correlation with CMR LV analysis in this small pilot study in a complex patient group. Whilst we would not advocate MDCT ventricular analysis for first-line assessment of ventricular function, MDCT derived values are meaningful in this complex patient population and provides clinical relevant data.

POSTER p208

MRI of surgically corrected transposition of great arteries – demonstration of the anatomy and complications in adults

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KEY LEARNING OBJECTIVES: (1) Highlight the frequency of operated transposition of the great arteries in adults. (2) Demonstrate the anatomy following Senning/Mustard and Arterial Switch operations. (3) Discuss the use of MRI to assess complications of

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these operations. DESCRIPTION: Transposition of the great arteries (TGA) is the second most common cyanotic congenital heart disease. Historically surgical treatment of this anomaly was with either the Senning or Mustard procedure both of which involve the formation of an intra-atrial baffle. More recently the arterial switch operation has taken over as the surgical treatment of choice. There is now a significant population of adult patients with surgically treated TGA. All patients were scanned on a 1.5 Tesla Siemens scanner. We present a pictorial review demonstrating the MRI appearances and complications of these surgical repairs. The complications of the Senning and Mustard procedures include baffle obstruction or leak, arrhythmias and right ventricular dysfunction. Arterial switch complications primarily involve right ventricular outflow tract/pulmonary arteries. The monitoring for these long term complications with MRI is discussed. CONCLUSION: Long term monitoring of surgically corrected TGA in adults is becoming increasing important as the population of adults with this condition increases. This poster serves to highlight the anatomy and complications using MRI.

POSTER p209

Progressive coronary calcification despite intensive lipid-lowering therapy: a randomized controlled trial

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PURPOSE: Observational studies have suggested that statin therapy may induce regression of coronary artery calcification. In a substudy of a trial recruiting patients with calcific aortic stenosis, we evaluated the effect of intensive lipid-lowering therapy on coronary artery calcification. METHODS: In a double blind randomized controlled trial, 102 patients with calcific aortic stenosis and coronary artery calcification were randomized using the minimization technique to atorvastatin 80 mg daily or matched placebo. Coronary artery calcification was assessed annually by helical CT. RESULTS: 48 patients were randomized to atorvastatin and 54 to placebo with a median follow-up of 24 months (interquartile range 24–30 months). Baseline characteristics and coronary artery calcium scores were similar in both groups. Atorvastatin therapy reduced serum low-density lipoprotein cholesterol (-53%; $p<0.001$) and C-reactive protein (-49%; $p<0.001$) concentrations whilst there was no change with placebo (-7% and +17%; $p>0.95$ for both). The rate of change in coronary artery calcification was 26%/year (0.234 (SE 0.037) logAU/year; $n=39$) in the atorvastatin group and 18%/year (0.167 (SE 0.034) log AU/year; $n=49$) in the placebo group: geometric mean difference of +7%/yr (95% confidence intervals -3% to +18%; $p=0.18$). There was no correlation between serum low-density lipoprotein concentrations and the rate of progression of coronary calcification ($r=0.05$, $p=0.62$). CONCLUSION: In contrast to previous observational studies, this randomized controlled trial has shown that, despite reducing systemic inflammation and halving serum low-density lipoprotein cholesterol concentrations, statin therapy does not have a major effect on the rate of progression of coronary artery calcification.

ELECTRONIC POSTER e210

64-MDCT coronary angiography: common artefacts, limitations and troubleshooting

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KEY LEARNING OBJECTIVES: To illustrate common artefacts affecting MDCT coronary angiogram interpretation; To discuss common limitations to MDCT coronary angiographic imaging; To discuss simple solutions to overcome these artefacts and limitations. DESCRIPTION: We highlight studies with common artefacts and sub optimal studies due to patient factors from our series of over 1000 studies. We hope to highlight steps that can be taken to maximize successful image acquisition and illustrate common pitfalls in interpretation and to pass on our "lessons learnt" to a wider audience who may be developing their own clinical service. SUMMARY: This paper discusses how to minimize the possibilty of sub-optimal image acquisition, identify artefacts that may cause mis-diagnosis of coronary stenoses and where possible, how to overcome or avoid these pitfalls.

ELECTRONIC POSTER e211

Non-invasive assessment of coronary artery bypass graft patency using 16-slice computed tomography angiography

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PURPOSE: Invasive coronary angiography is the gold standard means of imaging bypass vessels and carries a small but potentially serious risk of local vascular complications, including myocardial infarction, stroke and death. We evaluated CT as a non-invasive means of assessing graft patency. METHODS: 50 patients with previous coronary artery bypass surgery who were listed for diagnostic coronary angiography underwent contrast enhanced CT angiography using a 16-slice CT scanner. Images were retrospectively gated to the electrocardiogram and two dimensional axial, multiplanar and three dimensional reconstructions acquired. Sensitivity, specificity, positive and negative predictive value, accuracy and level of agreement for detection of graft patency by multidetector CT. RESULTS: A total of 116 grafts were suitable for analysis. The specificity of CT for the detection of graft patency was 100%, with a sensitivity of 92.8%, positive predictive value 100%, negative predictive value 85.8% and an accuracy of 94.8%. The kappa value of agreement between the two means of measuring graft patency was 0.9. Mean radiation dose was 9.0±7.2 mSv for coronary angiography and 18.5±4 mSv for CT. Pooled analysis of eight studies, incorporating 932 grafts, confirmed a 97% accuracy for the detection of graft patency by multidetector CT. CONCLUSIONS: CT is an accurate, rapid and non-invasive method of assessing coronary artery bypass graft patency. However, this was achieved at the expense of an increase in radiation dose.

ELECTRONIC POSTER e213

Cardiac imaging on 64 slice CT

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KEY LEARNING OBJECTIVES: To gain knowledge of the capabilities, techniques, indications, imaging features and the limitations of using a 64-slice CT scanner for cardiac imaging. DESCRIPTION: The advent of 64-slice CT has revolutionized non-invasive evaluation of the heart and coronary arteries. Many factors can influence the resolution of the images and hence the usefulness of the examination including patient heart rate, presence of calcification/metallic implants, cardiac wall motion etc. We present the technique of cardiac CT examination with the imaging features of a variety of cases including aberrant coronary arteries (some carrying increased risk of sudden death), post operative appearances, coronary fistulae, ventricular aneurysms and cardiac tumours. CONCLUSION: With the advent of 64 slice technology, CT has become a valuable tool in the non-invasive imaging of the heart.

ELECTRONIC POSTER e214

Estimation of LV function using cardiac MRI and echocardiography and its implications for ICD therapy

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PURPOSE: Implantable cardioverter-defibrillator (ICD) therapy reduces the risk of sudden death in patients with advanced coronary artery disease, especially in those with reduced left ventricular ejection fractions (LVEF). Accurate assessment of LVEF is crucial in deciding on ICD therapy. We compared visually estimated and calculated LVEF from standard 2-dimensional (2D) echocardiographic (echo) and cardiac magnetic resonance (CMR) views. Using CMR calculated LVEF as the gold standard we hypothesised whether estimated LVEF and echocardiographically calculated LVEF values were as accurate. MATERIALS/METHODS: 20 potential MADIT-II candidates (visually estimated LVEF<35%) with a previous myocardial infarction underwent transthoracic echocardiography

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(Vivid 5, GE) and CMR (1.5 Tesla, GE Signa). CMR-LVEF was calculated by planimetry of short axis cross-sections from base to apex; M mode-LVEF from long axis parasternal views of the LV end-systolic and end-diastolic dimensions; and 2D-LVEF from planimetry of the LV from the apical 4 chamber view. 6 experienced observers with >4 years echo experience visually estimated LVEF from apical 4-chamber and 2-chamber LV views obtained using both CMR and echocardiography. RESULTS: Using the Bland-Altman analysis (95% limits), bias from visually estimated CMR ranged from -8.08 to +2.64, visually estimated echo from -7.64 to +1.64 and echo calculated LVEF averaged from +8.39 (M-mode) and +5.15 (2D planimetry). CONCLUSION: Visual estimations of LVEF from CMR and echo as well as calculations of LVEF from M-mode and 2-dimensional echo correlate poorly with CMR-derived values, even with experienced observers. Echocardiographically-derived LVEF is inadequate in the identification of appropriate candidates for ICD therapy.

Respiratory

POSTER p301

Incidence of pleural plaques in patients with mesothelioma

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PURPOSE: To investigate the correlation between pathologically proven mesothelioma and evidence of calcified pleural plaques on cross sectional imaging. METHODS: 64 Patients with biopsy confirmed mesothelioma between Jan 2002 and Dec 2005 had their radiology records reviewed for CT or MRI reports indicating the presence of calcified pleural plaques. Where there were no records, film packets were retrieved and reviewed by the author. Patients with plain films only were excluded from the study, as only 8–40% of calcified pleural plaques are visible on plain films, and a two dimensional chest film may miss a posterior calcified plaque. RESULTS: Of the 64 patients, 52 had undergone CT or MR scanning. Of these 52 with cross sectional imaging, only 16 (30%) had calcified pleural plaques. These 16 patients were further assessed for relationship between side of tumour and side of plaques. 10 had bilateral plaques. 5 had plaques on the contralateral side to the tumour and only 1 had ipsilateral plaques. All 64 patients with records or retrievable films were further assessed for side of tumour. 26 were left sided, 37 right sided (58%) and 1 bilateral. CONCLUSION: Calcified pleural plaques are independent of mesothelioma. Most tumours were right sided.

POSTER p302

Radiological appearances of pathologies in secondary pulmonary lobule – a pictorial review

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KEY LEARNING OBJECTIVES: Secondary pulmonary lobule (SPL) is the smallest structural unit of lung that is surrounded by connective tissue septa. It is consists of airways, pulmonary arteries, veins, lymphatics and intertitium. The poster provides explanation of commonly used terms to describe pathological processes affecting structures within the lobule. It will help the radiology trainees to learn and appropriately use these terms and will help the respiratory physicians understand these terms used in radiology reports. It will also help general radiologists to refresh their knowledge. DESCRIPTION: The poster provides a schematic diagram of anatomy of SPL which is essential to understand the changes seen at this level in a high resolution computed tomography (HRCT). We have included a pictorial review with corresponding schematic diagrams of pathological processes affecting SPL. We have included following pathological processes: Interlobular smooth and nodular septal thickening; peripheral lobular abnormalities such as honey combing; centrilobular abnormalities such as intralobular septal thickening, nodules, tree-in-bud sign and centrilobular low attenuation; panlobular abnormalities such as consolidation, ground-glass opacity and panlobular low attenuation; combination/mixed abnormalities such as crazy paving pattern, mosaic attenuation and headcheese sign. CONCLUSION: It is challenging for a trainee to understand the terminologies commonly used in HRCT to describe the pathological processes affecting SPL. Better understanding of these terms earlier in the training, helps to systematically read such changes. This poster will help the viewers to understand and use such terms appropriately.

POSTER p303

Radiation induced lung disease-Imaging findings

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KEY LEARNING OBJECTIVES: In this poster we describe the histopathological changes, different radiological manifestations of the radiation induced lung disease, factors influencing the radiation effects in the lungs and also the effects of radiation injury to the heart. DESCRIPTION: Radiation is used as primary or adjuvant therapy in different tumours of the chest. Radiation injury of the lung usually results from treatment of a pulmonary or mediastinal neoplasm by radiotherapy. It may also be a complication of the treatment of breast cancer. The radiation affects both malignant tumours and also the surrounding normal tissues. Radiological manifestations of radiation induced lung disease include ground glass opacities or consolidation in the acute phase and traction bronchiectasis, volume loss and consolidation in the late phase. CONCLUSION: Knowledge of the spectrum of these manifestations is important to facilitate diagnosis and treatment of patients after radiation therapy for intrathoracic malignancies. Also understanding is essential if local recurrence of malignancy, lymphangitis carcinomatosis, radiation induced tumours, and infections are to be differentiated from radiation induced lung disease.

POSTER p304

Suspected lung cancer – optimizing diagnostic pathways

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PURPOSE: We reviewed the outcomes of patients with suspected lung cancer on CXR in order to develop recommendations to improve diagnostic pathways. MATERIALS/METHODS: 84 consecutive GP referred patients with suspected lung cancer on CXR were referred to chest clinic April–Sept 2006. Chest X-ray reports were grouped according to the abnormality prompting referral. The positive predictive values (PPV) of these groups for CT scanning and chest malignancy (CM) were calculated and each group further analysed. RESULTS: Of the 84 patients 60 had CT scanning and 38 were diagnosed with chest malignancy. Peripheral Masses (n=26) PPV: CT 0.73, CM 0.58, Hilar Mass (n=14) PPV: CT 0.79, CM 0.71, Consolidation (n=13) PPV: CT 0.46, CM 0.15, Bulky Hilum (n=10) PPV: CT 0.7, CM 0.2, Pulmonary Collapse (n=7) PPV: CT 0.86, CM 0.43, Multiple Masses (n=5) PPV: CT 1.0, CM 0.6, Unexplained Pleural Effusion (n=3) PPV: CT 1.0 CM 0.66, Other Presentations (n=6) PPV: CT 0.33, CM 0.17. CONCLUSION: Patients with high probability of malignancy *e.g.* peripheral and hilar masses, pulmonary collapse would benefit from direct booking of chest clinic and CT staging which would speed the diagnostic process. Patients with low probability of malignancy *e.g.* bulky hilum would benefit from CT only in the first instance which would reduce chest clinic referral. Chest clinic appointment before CT in our setting is beneficial for elderly patients with comorbidity and patients with persistent consolidation as they often did not need CT.

POSTER p305

3D conformal lung cancer radiotherapy planning in patients with post-obstructive atelectasis: usefulness of contrast enhanced CT

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PURPOSE: In 3D conformal lung cancer radiotherapy tumour should be included while surrounding healthy tissues excluded from radiation field with best precision possible. Atelectasis is known condition preventing accurate tumour contouring on conventional CT scans. The aim of this study was to evaluate usefulness of contrast enhanced CT for tumour contouring in lung cancer patients with post-obstructive atelectasis. MATERIALS/METHODS: 36 lung cancer patients with post-obstructive atelectasis were imaged with multislice CT using 2.5 mm slice thickness. Immediately after non-contrasted scan 80–120 ml of non-ionic contrast medium was intravenously

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injected. Scanning was initiated using CARE Bolus software of the scanner using 1.25 mm slice thickness. Tumour contour visualization was rated as perfect (contour is seen on every CT image), good (on majority of images) or unsatisfactory (is not seen). Perfect and good visualization were considered to be enough for tumour contouring. RESULTS: Tumour's contour was perfectly visualized before contrast enhancement in 6 (16.7%) patients, good – in 12 (33.3%), unsatisfactory – in 18 (50%), after contrast enhancement – in 17 (47.2%), 15 (41.7%) and 4 (11.1%) patients accordingly. Helpful CT-signs for contour visualization were: CT-angiogram sign was found in 32 (88.9%) patients, CT fluid bronchogram sign – in 30 (83.3%), stop of contrast-filled vessels and fluid-filled bronchi in the border of atelectasis and tumour – in 32 (88.9%). CONCLUSION: Contrast enhanced CT allows tumour contouring in 88.9% of patients with post-obstructive lung atelectasis while CT without contrast enhancement – in 50% of patients only.

POSTER p306

Long-term survival and freedom from progression after radical radiotherapy for PET staged patients with NSCLC

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PURPOSE: Historically, survival after radiotherapy (RT) for non-small cell lung cancer (NSCLC) has been dismal (5-year survival 5%). We present survival and progression data for 107 patients who received radical therapy after PET, illustrating the effect of superior selection. MATERIALS/METHODS: These are updated results of the first large prospective clinical trial of PET in radical RT candidates with NSCLC. Estimated median follow up was 4.7 years at analysis. Patients eligible for radical RT had stage IA–IIIB disease, good performance status and <10% weight loss, although the latter 2 criteria were occasionally relaxed. RESULTS: After PET, 30% of 153 candidates for chemoRT were treated palliatively because of PET-detected distant metastasis (18%) or extensive locoregional disease (12%). Palliative patents had shorter survival than patients treated radically ($p = 0.0002$). Survival at 1 year and 3 years was 68% and 28% for radical and 41% and 9% for palliative patients, respectively, suggesting that patients had been appropriately excluded from radical therapy. After 4 years, >20% of 107 radically treated patients were free from progression of NSCLC. The ideal group of patients for radical RT were 79 patients with ECOG 0-1, weight loss <10% and PET stage <IV. They had 3 year survival of 35% and estimated 4 year survival >20%. CONCLUSION: PET staging leads to stage migration in candidates for radical RT. Patients who remain candidates for radical therapy after PET have excellent survival and freedom from progression compared with historical series. All radical RT candidates with NSCLC should be staged with PET.

POSTER p307

Route to radiological investigations for PE – guidelines or *ad hoc*?

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INTRODUCTION: British Thoracic society set up guidelines (http://www.brit-thoracic.org.uk/iqs/sid.074699407005291876003 14/bts_guildelines_pe_html) in 2003 for management of suspected pulmonary embolism. The local trust has adopted the guidelines for patient management since. The aim was to assess the efficacy of the guidelines being followed in practice. MATERIALS AND METHODS: A prospective audit involving all patients with suspected pulmonary embolism, admitted to Medical admissions unit during a 6 week period (Oct–Nov 2006). The documentation of pre-test probability and the use of decision tree as outlined in the BTS Guidelines were assessed. RESULTS: 91 patients were managed as a suspected pulmonary embolism. 11 patients were diagnosed with a pulmonary embolism. Pre-test probability was documented in 30 patients, another 21 it was calculated from information documented in notes. Chest X-ray finding were not documented in 18. Inappropriate V/Q scans were done in 6 with negative d-dimer, anticoagulation was not given prior to V/Q or CTPA in 9. Guidelines were fully followed in 31 % (28). CONCLUSION: Pre-test clinical probability assessment and documentation was inadequate and subsequent inappropriate management was found. Optimal use of the guidelines especially risk stratification with assessment of pre-test probability should be mandatory.

POSTER p308

Auditing the algorithm for suspected acute pulmonary embolism: what happens following indeterminate ventilation-perfusion scintigraphy?

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PURPOSE: In suspected acute pulmonary embolism (PE), indeterminate ventilation-perfusion (V/Q) scintigraphy presents a diagnostic dilemma. This audit examined the diagnostic pathway taken for patients with indeterminate V/Q results. Audit targets were 100% appropriate referrals for scintigraphy and subsequent CT pulmonary angiography (CTPA) using the British Thoracic Society (BTS) guidelines for the management of suspected acute PE. METHODS: The reports of 508 consecutive V/Q scintigraphs from June 2005 to May 2006 were obtained retrospectively. For indeterminate reports, the patient's request clinical details, prior D-dimer and chest radiography results, and subsequent reports of CTPA and anticoagulation were examined. An independent estimate of clinical probability was determined using this information. Using this estimate, compliance with BTS guidelines was assessed. RESULTS: 74 patients had indeterminate reports. 41 patients (55%) had subsequent CTPA, with 8 positive for PE. 26 (35%) patients were anticoagulated. 25 scintigraphy requests (34%) were appropriate, 26 (35%) were not appropriate (PE excluded by algorithm, or that CTPA only was indicated) and in 23 requests (31%) essential algorithm steps were not performed. Comparison with ideal guideline compliance demonstrated that only 46/74 (62%) of requests for V/Q scintigraphy would be appropriate. Two CTPAs were unnecessary and a further 20 CTPA would be indicated. CONCLUSION: BTS guidelines are not consistently followed resulting in additional workload for imaging departments and unnecessary radiation dose to patients. Unfamiliarity and confusion amongst clinicians may be the cause. Imaging departments should promote guideline use or offer simpler strategies for diagnosis of acute PE.

POSTER p309

A pictorial review of "signs in thoracic imaging"

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KEY LEARNING OBJECTIVES: Signs in radiology represent characteristic descriptive patterns of certain abnormalities. There are several such signs commonly associated with thoracic imaging. Clear understanding of what these signs mean helps the radiologists to interpret the images more effectively, provide a more precise prediction of an underlying pathology and avoid using lengthy descriptions. We consider this poster to be useful as an educational tool for medical students, junior doctors and radiology trainees who can learn about the presence of these signs, understand what they stand for and register the corresponding images in their minds. It will also help to refresh the knowledge of radiologists. DESCRIPTION: We discuss both common and uncommon signs and describe precisely what each sign stand for. We have included following signs: Air bronchogram sign, Air crescent sign, Bulging fissure sign, Comet tail sign, Continuous diaphragm sign, Crazy paving sign, CT angiogram sign, CT halo sign, Deep sulcus sign, Double density sign, Fallen lung sign, Figure 3 sign, Fissure sign, Flat-waist sign, Fleischner sign, Gloved finger sign, Golden S sign, Hampton hump sign, Head cheese sign, Hilar overlay sign, Luftsichel sign, Positive bronchus sign, Ring around the artery sign, Scimitar sign, Signet ring sign, Silhouette sign, Split pleura sign, Thymic sail sign, Tree-in-bud sign, Westermark sign. We have used appropriate imaging modalities to describe the signs. CONCLUSION: We believe that this pictorial review with description will help the viewers to remember and recall the signs during their practice.

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POSTER p310

Misinterpretation of chest X-rays in the delayed diagnosis of lung cancer and its application to the timeliness of patient referral/ prognosis

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PURPOSE: Successful treatment of lung cancer depends on early diagnosis. Following our experience of several cases of lung cancer in patients where a retrospective review revealed an abnormal chest X-ray; we decided to study a cohort of recent lung cancer patients. OBJECTIVES: (1) Identify the proportion of lung cancers with abnormalities on chest X-rays taken prior to diagnosis. (2)Study the characteristics, change in survival and factors that led to this delay in diagnosis. MATERIALS/METHODS: Retrospective study of X-rays of all small cell and non small cell lung cancers diagnosed at QEH in 2003–2005 (n=507). 100% of X-rays were reviewed independently by a chest physician and radiologist. RESULTS: Of 169 patients diagnosed in 2005 (mean age 70.5 years; 57% male), 27.22% were found to have pre-existing chest X-ray abnormalities with a median diagnostic delay of 5.11 months.A Kaplan Meir plot showed a significant difference (p<0.05) in survival and treatment in this group. Undetected lesions was the most common cause [50% (23)]. 16 were small nodules, 3 consolidation, 2 had apical shadows and one a collapsed lobe. In 39.13% (18), action was delayed in spite of positive radiology (Median delay 2.12 months). 10.87% (5) were re-referred patients who were now found to have lung cancer (Median delay 9.2 months). CONCLUSION: This is the first reported study using PACS for a retrospective radiological review of patients with lung cancer. 100% of X-rays were available. A high index of suspicion is essential for lung cancer diagnosis. (This study won the Best Poster Presentation at Queen Elizabeth Hospital (QEH), London, 2006 in the "Raising the Standards" meeting).

POSTER p311

A comparison of Accident and Emergency chest radiograph reporting by radiographers and radiology registrars

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PURPOSE: The practice of radiographers reporting A&E films is well established. Selectively trained radiographers in our hospital have taken on the extended role of reporting chest radiographs in past 1 year. To ensure that we maintain high clinical standards and comply with guidelines of good clinical practice and clinical governance we decided to audit this practice. MATERIALS AND METHODS: A prospective study was conducted over a period of 4 months. A total of 168 chest radiographs were reported by radiographers during this time, these were then re-reported independently by radiology registrars junior (Year 1), senior (Year 4&5) of training. Consultant radiologist report was taken as the standard. All readers were blinded to radiographer's report. All reports with discrepancies were re-reviewed with team together, and an overall consensus was achieved regarding cases to be ignored, misses and overcall. RESULT: 168 chest radiographs were reported by all independently, 47 cases were reviewed again 12 cases were not found. The overall miss and overcall rate calculated for radiographers was 1.92% & 4.48%, 1st year registrar 1.92% & 7.05%, 4th year registrar 3.20% & 1.92%, and 5th year registrar 1.92% & 4.48%. CONCLUSION: The accuracy of chest X-ray reporting by selectively trained radiographers is comparable to that of final year registrars. Our study supports the extended role of radiographers reporting A&E chest X-ray after adequate training.

POSTER p312

Lung nodules revisited: a pictorial review

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KEY LEARNING OBJECTIVES: On viewing this pictorial review, the viewer should be able to: (1) Classify lung nodules based upon their appearance. (2) Recall those diseases which can manifest as pulmonary nodules on chest radiographs and CT imaging. (3) Identify the imaging appearances of lung nodules which are specific to a particular disease process. DESCRIPTION: Multiple lung nodules are often seen on chest radiographs and CT scans and their possible causes are numerous. Lung nodules can be classified into 4 categories: (1) Fine/Miliary; (2) Nodules greater than 5 mm; (3) High density/ calcified; (4) Cavitating. This exhibit will discuss and illustrate the potential causes of lung nodules in each of these 4 categories. In addition we will emphasis specific imaging appearances of lung nodules which are characteristic for certain diseases. CONCLUSION: On viewing our pictorial review, the viewer will be more confident at asigning a diagnosis when multiple lung nodules are seen on a chest radiograph or CT scan.

ELECTRONIC POSTER e313

Thoracic manifestations of *P.Jirorecii* Pneumonia (PCP) in HIV infected patients: a central London teaching hospital's experience

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KEY LEARNING OBJECTIVES: To illustrate the multiple thoracic manifestations of PCP in HIV infected patients. DESCRIPTION: The advent of new prophylactic and treatment options has resulted in a considerable increase in the survival of HIV infected patients. Pulmonary parenchymal complications remain the main cause of morbidity and mortality in these patients. The risk of developing specific pulmonary complications is influenced by the degree of immunosuppression. If the CD4 count is less than 200 cells mm^{-3} patients are at increased risk for PCP and disseminated TB. This educational exhibit reviews all of the pertinent imaging features of pulmonary PCP. Chest radiograph is normal in 5–10%. CXR commonly shows bilateral ground glass or reticular infiltrates in a perihilar distribution. Focal areas of consolidation, cystic lesions and multiple lung nodules are less common manifestations. On HRCT patchy or confluent, symmetric bilateral ground-glass opacities is characteristic. Uncommon HRCT findings include interlobular septal thickening and intralobular linear opacities. The complications of PCP are demonstrated. These include pulmonary cysts or pneumatoceles that develop in between 10% and 38% of patients. Pneumothorax and pneumomediastinum develop in less than 10% patients. With recovery PCP may result in interstitial fibrosis. Atypical manifestations of PCP such as bilateral alveolar infiltration, focal consolifdatiion, extrapulmonary PCP and granulomatous PCP are illustrated. CONCLUSION: This pictorial review of PCP illustrates our experience of PCP in HIV infected patients. The common and atypical manifestations of PCP are comprehensively demonstrated.

ELECTRONIC POSTER e314

Intra-thoracic venous anolamies: a pictorial review

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KEY LEARNING OBJECTIVES: (1) To recognize and provide overview of various mediastinal venous anomalies. (2) To review embryology and normal anatomy of mediastinal veins. (3) Identify the individual characteristics of these anomalies on cross sectional imaging. (4) Discuss the clinical and interventional significance of these anomalies. DESCRIPTION: Radiologists often encounter unsuspected mediastinal venous anomalies. Diagnoses of these anomalies are important as they can affect patient's further management and also avoid unnecessary additional investigations when they simulate intrathoracic pathology. Some of these anomalies are revealed by plain radiography; however most of them are seen on cross-sectional imaging. We describe the normal anatomy and cross-sectional image findings of these anomalies. We illustrate examples of various mediastinal venous anomalies seen on radiological investigation in our institution with their clinical significance. CONCLUSION: An understanding of various mediastinal venous anomalies is vital for radiologists. This pictorial review highlights the salient imaging features of these anomalies along with their clinical and interventional implications.

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ELECTRONIC POSTER e315

Non-malignant causes of [F-18] flourodeoyglucose(FDG) uptake within the thorax on PET/CT imaging: a pictorial review

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KEY LEARNING OBJECTIVES: To review the physiological causes of increased FDG uptake within the thorax on PET/CT imaging which may cause diagnostic confusion. To illustrate many benign processes within the thorax that can demonstrate increased FDG uptake and mimic neoplastic disease. DESCRIPTION: The relatively recent innovation of integrated PET/CT has increased diagnostic confidence in anatomical localization of focal FDG uptake. It is being increasingly utilized in the evaluation of solitary pulmonary nodules, and in the staging of patients with bronchogenic carcinoma of the lung. Increased FDG uptake is not, however, limited to malignant disease and both physiological and benign processes can demonstrate focal FDG uptake leading to diagnostic confusion. This pictorial review will illustrate, through a variety of FDG-PET/CT clinical cases, the pitfalls and normal variants in thoracic FDG PET/CT imaging. CONCLUSION: FDG PET/CT is a valuable tool in the management of patients with thoracic malignancy. Awareness of the variety of benign and physiological conditions which may cause FDG uptake inaddition to malignancy will lead to increased accuracy and diagnostic confidence in reporting studies

ELECTRONIC POSTER e316

Mediastinum anatomy: using 3DCT images to facilitate the understanding of mediastinum in plain film

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KEY LEARNING OBJECTIVES: To .understand the anatomical landmarks of the mediastinum in the plain film of the chest. DESCRIPTION: Using 3D images created by helical CT, the authours demonstrate the landmarks and interfaces that create the anatomical details of the mediastinum such as the anterior mediastinum triangle, the azygo-oesophageal recess, the aorto-pulmonary window, the azygos vein arch and others. Aditionally, other important anatomical details of the chest X-rays and CT are also explored. CONCLUSION: Creating a tridimentional concept of the anatomy of the chest with clear undestanding of the most important details is crucial for the identification of early signs of mediastinal or hilar mass or lymphadenopaty. At the end of the module, the reader is expected to have a clear undestanding of the major landmarks of the mediastinum and pulmonary hila and are expected to detect subtle changes that could indicate early abnormalities on plain films.

ELECTRONIC POSTER e317

Ultrasound guided cervical lymph node sampling in suspected lung cancer

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PURPOSE: Lung cancer accounts for approximately 30 000 deaths anually. Most patients present late with a poor prognosis. Ultrasound guided cervical lymph node sampling is a non-invasive and cost-effective technique which can provide both staging information and a formal tissue diagnosis. Our study assessed the diagnostic accuracy, sample adequacy and complication rates of this technique. MATERIALS/METHODS: Records were reviewed for all patients undergoing ultrasound guided cervical lymph node fine needle aspiration (FNA) or core biopsy for suspected lung cancer from February 2004 to March 2006. RESULTS: 39 patients underwent 41 biopsies (29 FNA; 12 core). The patients' diagnoses were as follows: NSCLC 16 (41%); SCLC 7 (18%); Lymphoma 5 (13%); Metastases 4 (10%); Other 7 (18%). Sensitivity, Specificity, PPV and NPV were all 100%. 10 patients' (26%) samples were inadequate. There were no complications. CONCLUSION: Ultrasound guided cervical lymph node sampling is an accurate and safe method of diagnosing and staging patients with lung cancer. Sample adequacy rates may be improved with on-site cytopathology services or increased use of core biopsies.

ELECTRONIC POSTER e318

Tuberculosis in the HIV infected patient

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KEY LEARNING OBJECTIVES: To demonstrate the radiology of tuberculosis (TB) in HIV infected patients. To illustrate the radiology of immune reconstitution inflammatory syndrome (IRIS) secondary to TB. DESCRIPTION: Worldwide HIV infection is the single greatest risk factor for TB. London accounts for 40% of cases of TB in the UK. TB rate has risen by 80% in London over 10 years to reach 40 cases/100 000. The manifestations are influenced by the degree of immunodeficiency. In patients with a CD4 count $\geq$200 cells mm^{-3} findings are similar to those in the immunocompetent host. Chest radiograph shows single or multiple 1–3 cm nodules, consolidation and cavitations involving apices. HRCT demonstrates centrilobular nodules or branching linear opacities resulting in a "tree-in-bud" pattern. In severely immunocompromised patients radiological manifestations often resemble primary disease. CXR findings include miliary disease, pleural effusion and lymph node enlargement. Contrast enhanced CT demonstrates nodes that characteristically show central low attenuation with rim enhancement. In 20% of severely immunocompromised HIV(+) patients CXR is normal. HRCT may show small nodules and lymph node enlargement. The radiological features of IRIS secondary to TB are shown. These include mediastinal lymphadenopathy severe enough to cause tracheal compression, increase in size of pre-exisiting nodes, pulmonary nodules, new infiltrates and pleural effusions. CONCLUSION: Pulmonary parenchymal complications remain the main cause of morbidity and mortality in HIV infected patients. This exhibit reviews the common and atypical radiological features of TB and IRIS.

ELECTRONIC POSTER e319

Pulmonary high resolution computed tomography (HRCT): does it have to be difficult?

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KEY LEARNING OBJECTIVES: (1) To understand the basic principles of HRCT interpretation. (2) To highlight the commonly encountered conditions on HRCT to the trainee radiologist and general radiologist alike. DESCRIPTION: HRCT is a widely used technique in the investigation of diffuse pulmonary disease where chest radiograph has a much reduced sensitivity. It is used as a guide to diagnostic interventions and to assess response to treatment as well as in the follow up of known lung disease. The basic principle of HRCT is to maximize spatial resolution by using the thinnest collimation and high spatial frequency algorithm. In order to interpret images, appreciation of the normal appearance of bronchi, blood vessel and secondary pulmonary lobule is essential. In this poster, we aim to give a brief overview of the secondary pulmonary lobule anatomy followed by a tabulation of the various descriptive terms used in image interpretation. Subsequently a pictorial review of the classical findings in the commonly encountered interstitial and airways disease will be presented. CONCLUSION: Although a vast array of conditions present as diffuse lung disease, only 10 to 20 conditions account for the majority. Understanding the pulmonary anatomy, pathophysiology and distribution of the disease process enables one to make a confident diagnosis in many cases whilst narrowing the differential diagnosis in others.

ELECTRONIC POSTER e320

Does pregnancy affect vascular enhancement in patients undergoing CT pulmonary angiography

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PURPOSE: To investigate the effect of pregnancy on vascular enhancement in patients undergoing CT pulmonary angiography for suspected pulmonary embolic disease. METHODS: 16 pregnant

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patients with suspected pulmonary embolic disease underwent CT pulmonary angiography at the NNUH between January 2002 and December 2006. Their images were compared to a control group of 16 non-pregnant females, who also had CT pulmonary angiography during the same time period. Both groups were matched for age, dose of IV contrast and mode of image acquisition. Vascular enhancement was assessed by measuring the CT numbers (Hounsfield units) at specific sites. The mean pulmonary arterial enhancement was compared between the two groups. RESULTS: There was a significant difference in mean pulmonary arterial enhancement between the study and control groups, with pregnant patients having a lower mean pulmonary arterial enhancement. One pregnant patient had a poor quality scan due to poor opacification of the pulmonary arteries and breathing artefact. This resulted in a false positive diagnosis of pulmonary embolic disease and subsequent thrombolysis. CONCLUSION: Pregnancy may decrease pulmonary arterial enhancement in patients undergoing CT pulmonary angiography. This may be explained by the physiological increase in plasma volume and cardiac output that occurs during pregnancy. Poor vascular enhancement reduces image quality and thus may affect diagnostic accuracy.

ELECTRONIC POSTER e321

Pulmonary lymphoma – a master of disguise

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KEY LEARNING OBJECTIVES: To illustrate the spectrum of imaging presentation of pulmonary lymphoma, highlighting its ability to mimic the appearances of other chest diseases. To raise awareness of the variety of presentations of lymphoma amongst those reporting chest imaging. DESCRIPTION: Pulmonary parenchymal lymphoma, either primary or secondary, may have a many and varied appearance on chest radiography and CT. It is a well known mimic of other conditions (such as primary bronchogenic carcinoma, metastases and pneumonia) and should therefore be included in the differential diagnosis of many chest diseases. We will illustrate the wide range of radiological appearances of the spectrum of pulmonary lymphomas by presenting chest X-ray and CT imaging of biopsy proven cases. Although malignant, lymphoma can present with relatively benign features, and hence knowledge of the features and possible presentations of lymphoma is essential to facilitate accurate diagnosis. CONCLUSION: This presentation will serve to highlight the spectrum of radiological appearances of pulmonary lymphoma, the appreciation of which is essential to facilitate accurate assessment, diagnosis and timely treatment.

ELECTRONIC POSTER e322

Cystic lung diseases: a HRCT guide to diagnosis

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KEY LEARNING OBJECTIVES: (1) To illustrate the range of diseases affecting the lung that manifest with parenchymal cysts. (2) To demonstrate the characteristic findings of these diseases. (3) To propose a diagnostic approach based on these findings to cystic lung diseases. DESCRIPTION: A number of pulmonary diseases may present with parenchymal cysts. These include Langerhan's cell histiocytosis, lymphangioleiomyomatosis, interstitial pneumonias, cystic bronchiectasis and emphysema. The differential is usually based on the distribution of these cysts and the presence of any associated parenchymal findings. The aim of this educational exhibit is to provide an overview of cystic lung disease, to allow the viewer to evaluate the key diagnostic features of these diseases, and to adopt a systematic approach in reaching a differential diagnosis.

ELECTRONIC POSTER e323

Mycobacterial lung infection: TB or not TB?

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KEY LEARNING OBJECTIVES: To describe the radiological appearances of various forms of tuberculosis and non tuberculous mycobacterial (NTMB) infections. To illustrate the difference in the imaging appearances of tuberculosis in children and adults. DESCRIPTION: There has been a gradual increase in the prevalence of mycobacterial infection, which accounts for substantial morbidity and mortality. The radiological features of classic NTMB is similar to that of mycobacteria tuberculosis but is usually more indolent than the active tuberculosis. This review summarizes the characteristic radiological abnormalities in tuberculosis (both in children and adults) and NTMB infections and also highlights the important radiological differences between the two. CONCLUSION: This presentation will serve to provide a good understanding of the different spectrum of radiological appearances of mycobacterial infection in patients with different immune status, which is essential to facilitate the diagnosis and successful treatment.

Gastrointestinal

POSTER p401

Usefulness of flow ratios with CD in alcoholic hepatitis patients

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PURPOSE: To estimate the reliability of hepatic blood flow ratios with colour Doppler ultrasound in the diagnosis of acute alcoholic hepatitis (AAH). MATERIALS/METHODS: Was included 30 acute alcoholic hepatitis patients compared with 20 cirrhosis patients and 32 healthy subjects. Was used colour Doppler scanner Aspen Acuson (Siemens) and head multifrequency transducer 1.75–4 MHZ. Measurements across the common hepatic artery in longitudinal images were recorded. Was injected echo enhancing agent (L- Vist, Sonovue) for imaging common hepatic artery in dispute cases. Was studied pulsatility and resistivity index (PI, RI), peak-systolic velocity (PSV),end-diastolic velocity (EDV) and lumen diameter of hepatic artery. RESULTS: Mean diameter of hepatic artery was observed larger in AAH patients (3.20±0.40 mm) comparing cirrhotic patients (2.40±0.39 mm) and healthy subjects (2.38±41 mm) (p<0.0001). Mean value of PSV was higher in AAH patients (1.60±20 cm) compared with cirrhotic (1.00±30 cm) and healthy subjects (1.30±50 cm). RI was ↓ in AAH patients (0.45±0.8) compared with cirrhotic (0.54±0.7 cm) and healthy group (0.63±0.7 cm) (p-value not significant). Pulsatility index was ↓ in AAH patients (1.05±0.40) compared with cirrhotic patients 1.31±0.43) and healthy group 1.45±0.43) (p<0.005). CONCLUSION: Hepatic blood flow ratios with colour Doppler ultrasound could contribute effectively in diagnosing acute alcoholic hepatitis.

POSTER p402

A correlated review of the contrast USS findings in benign focal liver lesions

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KEY LEARNING OBJECTIVES: The learning objectives of this exhibit are: (1) To demonstrate the role contrast USS plays in characterizing benign focal liver lesions. (2) Give an overview of the common appearances of these lesions using the modalities of CT, MRI and Nuclear Medicine. (3) Show the accurate correlation that exists between the differing modalities. DESCRIPTION: We will give a brief explanation of the basic physics involved in contrast USS. We will then review the contrast USS findings in benign common focal liver lesions, such as FNH, adenomas, haemangiomas, regenerating and dysplastic nodules, focal fatty change and abscesses. Finally, we will show the correlation that exists between contrast USS and CT, MRI, Nuclear Medicine or patholoigical specimens. CONCLUSION: Contrast USS is a cheap, accurate, readily available, non-ionising method for focal liver lesion characterization. It adds useful information in most cases and is diagnostic in many. We would advocate that it should become a standard addition to the assessment of all focal liver lesions.

POSTER p403

MRI imaging of focal hepatic lesions – a pictorial essay

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KEY LEARNING OBJECTIVES: To understand various techniques of MRI the liver. Pattern recognition of various focal hepatic lesions

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with MRI. Use of gadolinium and other liver specific contrast agents to evaluate focal hepatic lesions. TEXT: Liver MRI imaging techniques is described. Commonly encountered liver lesions in everyday practice with examples and use of MRI with contrast agents in accurate diagnosis of these lesions are discussed. Examples provided are focal nodular hyperplasia, hepatic adenoma, hemangioma, hepatoma, complex cysts, cholangiocarcinoma, lymphoma, metastases and peliosis. Correlation is also made with corresponding CT, ultrasound and PET images, where necessary. New techniques of imaging liver with MR contrast agents like gadolinium DTPA, Gadoxetic acid disodium (Gd-EOB-DTPA), Superparamagnetic iron oxide (SPIO) with 3D dynamic breath hold sequences are described with examples. Many a times the need for more invasive techniques like biopsy can be avoided. Breath hold 3D post gadolinium sequences is also used to provide accurate information in colorectal liver metastases, enabling proper pre-operative surgical planning. It is also particularly useful in pre-operative evaluation of Liver resections secondary to colorectal metastases. However, there are limitations and pifalls in these techniques, which are also briefly described. CONCLUSION: MRI is pivotal in characterization of liver lesions and for pre-operative planning of liver resection. Understanding the technique, strenghts and limitation is important to provide accurate information.

POSTER p404

Primary sclerosing cholangitis: pictorial review of imaging findings

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KEY LEARNING OBJECTIVES: To demonstrate the role of different imaging modalities with imaging findings in diagnosing the disease and associated complications of primary sclerosing cholangitis. DESCRIPTION: 32 patients diagnosed with primary sclerosing cholangitis (PSC) over last 3 years were retrospectively studied in a single centre. Imaging involved at the time of diagnosis of the disease and further follow-up imaging were studied. PSC is a chronic cholestatic liver disease of unknown aetiology. PSC is the most common hepatobiliary disease observed in inflammatory bowel disease (2.5–7.5%). The diagnosis is based on a combination of clinical features, cholestatic biochemical profile, imaging and liver histology. Imaging involves MRI Liver, MRCP, ultrasound, CT scanning and ERCP. Liver histology remains important to exclude other causes. We discuss the role of different imaging modalities involved and their limitations in diagnosis of PSC. We also demonstrate with examples the associated complications including cirrhosis, portal hypertension, strictures, cholelithiasis, cholangitis cholangiocarcinoma and examples of rare associations of sarcoidosis, hepatocellular carcinoma. We describe role of imaging in proposing treatment options (balloon dilatation/stenting of strictures). Liver transplantation remains the only effective therapeutic option for patients with end-stage liver disease from PSC. CONCLUSION: This poster demonstrates a pictorial review of imaging findings with examples of associated complications of primary sclerosing cholangitis.

Poster p405

Photodynamic therapy for cholangiocarcinoma

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KEY LEARNING OBJECTIVES: (1) To describe to technique of photodynamic therapy (PDT) as applied to cholangiocarcinoma. (2) To explain the mechanism of action of PDT. (3) To summarize current experience with PDT emphasising improved survival in inoperable cholangiocarcinoma. DESCRIPTION: PDT has been used in dermatology for many years but is emerging into wider clinical use for some internal malignancies. The technique exploits the fact that visible light induces cytotoxic free radical production after pre-treatment with photosensitizing agents (chemicals related to the haem breakdown products which accumulate in patients with porphyrias). The agents are preferentially taken up by tumour cells but also cause generalized photosensitivity for 4–6 weeks. Most cholangiocarcinomas are inoperable. The principal aim of management is to maintain biliary patency for as long as possible. Typically tumour ingrowth and overgrowth soon overwhelms internal stenting arrangements and median survival is around 100 days. In patients with inoperable cholangiocarcinoma we initially create the best achievable internal stenting arrangement and then deliver laser light to the tumour tissue via a fibre-optic catheter inserted into the bile ducts (percutaneously or endoscopically) 2 days after administration of photosensitizer. Survival data indicate a four-fold increase in median survival from around 100 days with stenting alone (±systemic chemotherapy) to 400+ days in patients who receive PDT. CONCLUSION: In patients with inoperable cholangiocarcinoma PDT is associated with substantial survival benefit. It is technically fairly straightforward to administer but currently limited to those centres which have access to the requisite photobiology department support.

POSTER p406

The return of CT cholangiography in the investigation of biliary disease

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KEY LEARNING OBJECTIVES: To understand the technique and protocol used in prolonged drip infusion CT cholangiography. To illustrate the value of CT cholangiography when compared to alternative imaging techniques. To review the clinical applications and possible imaging pitfalls of the technique. DESCRIPTION: This exhibit will discuss the history of bile duct imaging and the modalities used over the last 40 years. Patient preparation and the technique used, including work station analysis, for prolonged drip infusion CT cholangiography will be outlined. CT cholangiography will be compared with MRCP in determining which patients should proceed to ERCP. Clinical applications, including detection of bile duct stones, post operative assessment and delineation of bile duct anatomy will be discussed and a selection of case examples given. Case examples of pitfalls in image interpretation will also be given. CONCLUSION: CT cholangiography is a safe, non-invasive technique yielding high resolution, functional images of the biliary tree. It is superior to other biliary duct imaging modalities for identification of small (less than 3 mm) stones in a non dilated biliary tree and in the detection of normal anatomical variants. Careful case selection and strict adherence to the set protocol ensures the best results.

POSTER p407

Does parvus tardus waveform accurately predict hepatic artery stenosis in adult orthotopic liver transplantation?

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An ultrasound database was used to retrospectively analyse 8688 ultrasounds of 1302 orthotopic liver transplantation (OLTs) between Jan 1989 and 2005. Patient reports with parvus tardus waveform (PTW) as a primary finding were selected from the database. Serial liver function tests and clotting were recorded for these patients at specific time intervals. RESULTS: 1302 OLTs were carried out during the study period. 60 patients were identified as having PTW on colour Doppler ultrasounds. 29/60 (48%) went onto have an angiogram after the diagnosis of PTW whilst 31/60 (52%) had a repeat CDUS. 12/60 (20%) had persistent PTW, and four of these patients whose liver function tests deteriorated were diagnosed with stenosis following an angiogram. PTW completely resolved to a normal Doppler waveform in 19/60 (28%) with no clinical complications on follow up. 12/29 (62%) patients who had an angiogram were diagnosed with Hepatic artery stenosis. While 11/29 (38%) angiograms were negative for hepatic artery stenosis. 6/29 patients had hepatic artery thrombosis. This gave a positive predictive value (PPV) of 36.6. The difference in the degree of the Bilirubin level between date of diagnosis of PTW and 2 days prior, was significant between stenosis and no stenosis groups (p=0.017). CONCLUSION: We concluded that PTW alone was not found to be a good predictor of hepatic artery stenosis, PPV 26.6. Although in the absence of PTW there was a high exclusion value for hepatic artery insufficiency. The change in Bilirubin and the PTW together could be used together as predictor of patients at increased risk of hepatic artery stenosis.

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POSTER p408

MRI of the pancreas

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KEY LEARNING OBJECTIVES: To discuss the role of MRI in evaluating pancreatic pathologies. Discuss the technique of MRI of pancreas. To describe various pancreatic pathologies with examples on MRI. DESCRIPTION: MRI is increasingly used to diagnose pancreatic pathologies. They can be used to evaluate pancreatic tumours, cysts, pancreatic necrosis, strictures and duct blow outs. The pictorial essay provides examles of various pancreatic pathologies like pseudocysts, various cystic neoplasms of pancreas, panceatic head tumours difficult to see on CT and ultrasound studies, intraductal papillary mucinous neoplasms, lymphoma and metastases. Correlation is made to ultrasound, CT and endoscopic ultrasound imaging where required. CONCLUSION: MRI is being increasingly used to evaluate pancreatic pathologies. Understanding the technique, characteristic findings in various pathologies and limitations are important to provide accurate pre-operative evaluation.

POSTER p409

Diverticulae of the GI tract

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KEY LEARNING OBJECTIVES: (1) To understand the various clinical presentations of the different diverticulae of the GI tract. (2) To identify optimal imaging methods of their evaluation. (3) To understand the specific imaging features of different types diverticulae of GI tract and differentiate them from other sinister pathology. (4) To recognize the imaging features of common and rare complications of diverticulae of GI tract. DESCRIPTION: Diverticulae of the GI tract may be congenital or acquired. They can arise from all parts of the GIT. Depending on the site of origin and presence of complications, they may be symptomatic or incidentally discovered. They may mimic more sinister pathology. In this exhibit , imaging features of different diverticulae will be described along with guidance on best imaging techniques (fluoroscopic/cross sectional) to identify and evaluate them. Particular emphasis is placed on specifically identifying features that differentiate diverticulae from other sinister pathology. Imaging appearances of complications arising from diverticulae are also described. CONCLUSION: Diverticulae of the GI tract may be overlooked but may have significant clinical implications. Complications may arise from them. On occasion, they mimic other pathology . Awareness of various diverticulae of GI and their imaging features is essential for practicing clinical radiologists in solving diagnostic dilemmas.

POSTER p410

Laproscopic Roux-en-Y gastric bypass (LRYGBP): what the radiologist needs to know

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KEY LEARNING OBJECTIVES: (1) To understand the surgical steps behind LRYGBP, now a common surgical procedure, and the resultant post-operative anatomy. (2) To demonstrate the more common immediate and delayed complications of this procedure. DESCRIPTION: Obesity is a growing public health concern in the western world, and surgical treatment is becoming increasingly popular. The Roux-en-Y gastric bypass procedure, now routinely done laproscopically, has been shown to achieve better results than other forms of bariatric surgery. It is the surgery of choice at our institution and we have experience of over 160 cases in the last 3 years. LRYGBP is a complex surgical procedure with a steep learning curve; however, as a result of improvement in surgical skills and post-operative management the reported mortality is less than 1%. Nevertheless, it is associated with complications in up to 9.5%. Physical examination to elicit signs of complications is often limited in these patients, and symptoms of post-operative complications are often very non-specific. It is therefore common practice at our instituition to perform an upper GI study at 24–48 h with recourse to CT if required. Often the radiologist is the first to detect any problems. We provide a brief description of the post-operative anatomy following LRYGBP surgery including its common complications. CONCLUSION: It is essential for the radiologist to be conversant with the post-operative anatomy following LRYGBP, as well as the imaging features of the more common potential complications.

POSTER p411

MRI of small bowel Crohn's disease: determining the reproducibility of mural gadolinium enhancement measurements

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PURPOSE: To determine interobserver and intraobserver agreement in measurements of MRI-derived mural gadolinium enhancement in enteric Crohn's disease. MATERIALS/METHODS: In 22 patients with Crohn's disease T_1 weighted images were acquired 30 s, 60 s, 90 s and 120 s after 20 ml intravenous gadolinium. Maximal mural signal intensity was measured by 4 radiologists (2 experienced, 2 inexperienced) using self-positioned ("free") regions of interest (ROIs) and repeated using "fixed" ROIs chosen by one experienced radiologist. 1 month later the measurements were repeated using the same (e-Film) and different (Agfa) software platforms. A statistician analysed the data calculating components of variance and Bland-Altman limits of agreement. RESULTS: Just 3.0% ("free" ROI) and 0.5% ("fixed" ROI) of data variability was attributable to between-reader variation. Interobserver 95% limits of agreement for "free" ROI were improved using the "fixed" ROI: (-57, 119) versus (-50, 74) for experienced readers, and (-125, 91) versus (-81, 55) for inexperienced readers. "Free" ROI intraobserver limits of agreement (-97, 127) [experienced reader] and (-61, 60) [inexperienced reader], were not consistently better than interobserver agreement. "Fixed" ROI intraobserver limits of agreement were maintained between the two software platforms (-36, 60) and (-57, 99). CONCLUSION: Interobserver and intraobserver agreement for mural gadolinium enhancement measurements is good, independent of reader experience, improved by using "fixed" ROIs, and robust between software platforms.

POSTER p412

A study of utilization of imaging in patients with acute appendicitis

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PURPOSE: The aim of this project was to evaluate our current utilization of imaging and our accuracy of diagnosis of appendicitis. MATERIALS/METHODS: We retrospectively reviewed the records of 76 consecutive patients who underwent appendicectomy over a 6 month period. We looked at our current usage of of imaging, type of imaging performed, the correlation of imaging and histology, and the negative appendectomy and perforation rates. RESULTS: 76 patients were included in our study (35 females, 41 males). Average age was 34 years (range 6–78 years). Imaging was performed in 31 patients (41%). Ultrasound was performed in 20 patients (26 percent of all patients) and CT in 12 patients (16%). The imaging was 92% sensitive and ultrasound alone was 85% sensitive. Amongst the 21 female patients who underwent imaging, there was correlation with the histology in 81%. All scans had complete correlation with the histological diagnosis in males. Irrespective of imaging, we accurately diagnosed appendicitis in all male patients. Our institution had a negative appendicectomy rate of 14% and a perforation rate of 28%. Imaging influenced the decision to operate in 32% of the patients. CONCLUSION: There is a positive correlation of imaging with the diagnosis of appendicitis we believe that there is a place for imaging especially ultrasound in the routine investigation of females. CT may also be offered at the outset to patients with a high body mass index or intolerant to pain or where bowel pathology is suspected.

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POSTER p413

The ins and outs of endoanal ultrasound

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KEY LEARNING OBJECTIVES: (1) To understand the clinical indications for endoanal ultrasound and how to perform the procedure. (2) To learn the endosonographic appearances of the normal anal sphincter complex. (3) To learn the endosonographic appearances of those anal pathologies likely to be encountered in day-to-day clinical practice. DESCRIPTION: (1) The endosonographic anatomy of the various components of the normal anal sphincter complex will be described and illustrated. (2) The technique of how to perform endoanal ultrasound in daily clinical practice will be described, along with patient preparation. (3) A pictorial review of common anal sphincter pathologies including obstetric trauma, perianal fistula, iatrogenic injury, and how to assess the adequacy of surgical repair sonographically will be presented. (4) Common pitfalls and how to avoid them will also be discussed. CONCLUSION: Endoanal ultrasound is a quick and simple investigation and is the pivotal investigation for patients with anal incontinence. This exhibit will provide all of the detail and context necessary to introduce the subject.

POSTER p414

Accuracy of endoanal ultrasound in staging rectal cancer: a retrospective study

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PURPOSE: Mortality in rectal cancer is affected by accurate pre-operative assessment of depth of invasion of tumour (T staging) and lymph node involvement. The aim of our study was to assess the accuracy of endoanal ultrasound (EAU) in locally staging rectal carcinoma. MATERIALS: EAU was performed on a B&K Cheetah ultrasound machine using a 7/10 MHz probe with a focal range of 1–5 cm. A surrounding balloon with degassed water was used to reduce acoustic impedance. The TNM classification was used. METHODS: We retrospectively evaluated the case notes, radiological and pathological reports of 51 patients referred as possible rectal cancers for local staging with EAU over a period of 4 years. Pre-operative staging data were compared with pathomorphological findings of the specimens post biopsy or surgery to assess the accuracy of EAU. RESULTS: 23 out of the 25 Stage T1, 3 out of 9 Stage T2,8 out of 10 stage T3 and 0 out of 3 Stage T3/4 carcinomas were positive on EAU. CONCLUSION: There is excellent correlation of the T1 staging of EUA with pathological staging comparable to the specificity value of EAU in a recent meta-analysis at 86%. T2 staging did not show good correlation and is overstaged as 5 out of 9 were proven to be TVA. As evidenced in literature the T3/4 staging is inaccurate due to limited acoustic penetration.

POSTER p415

Perianal fistula imaging: establishing a line of communication

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KEY LEARNING OBJECTIVES: (1) To understand the classification of perianal fistula. (2) To learn the appropriate MRI imaging protocol. (3) To learn the MRI appearances of perianal fistula. DESCRIPTION: (1) The anatomy of the anal canal and perineum will be reviewed with particular reference to fistula formation. (2) We will suggest an MRI protocol suitable for imaging fistulae. (3) A pictorial review of the classification of perianal fistula will be presented using MRI images with annotated illustrations. (4) Common pitfalls in interpreting the MRI images will be discussed and how to avoid them. CONCLUSION: MRI is essential in the pre-operative assessment of complex/recurrent perianal fistula disease prior to surgery. This poster will give an overview of perianal fistula imaging and classification with emphasis on reporting for pre-operative planning.

POSTER p416

The use of groin ultrasound to identify hernias. Does it affect management?

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PURPOSE: Ever since the introduction of a groin ultrasound service at our institution we have seen a progressive rise in referrals. The authors set out to determine whether the provision of such a service to identify inguinal/femoral hernias in patients with groin symptoms and equivocal clinical signs improves patient management. MATERIALS/METHODS: This is a retrospective review of 243 groin ultrasound examinations performed on patients with groin symptoms during the period January 2000 to June 2004. The referral information, as well as details of the examination and subsequent follow-up were obtained through our Hospital/Radiological Information System. The minimum follow-up period is 2.5 years. A GE Logic9 ultrasound machine and a 7.5 MHz linear array probe were used for all the examinations. RESULTS: Of 243 patients, 92 (38%) were GP referrals and 151 (62%) were hospital referrals. The examinations were performed by radiology consultants or SpRs, the former accounting for 228 examinations (94%). Patient age ranged from 3 months to 88 years, with a male to female ratio of 3:1. 143 examinations (59%) were negative for hernias. Two of these had groin explorations performed and were found to be normal. The rest were discharged and none returned with related complaints. 97 scans (40%) were positive, as a result of which 65 patients (67%) had hernial surgery. Of these, only 4 were found to be false positive. 3 scans were equivocal. CONCLUSION: Groin ultrasound is a very useful tool in assessing the presence, or otherwise of groin hernias.

POSTER p417

The groin lump masquerading as inguinal hernia: a pictorial review of sonographic appearances

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KEY LEARNING OBJECTIVES: To recognize the typical ultrasound appearances of groin hernias and understand the key anatomic landmarks enabling differentiation between femoral and direct/indirect inguinal hernias, and recognize other commonly occurring masses in this region. DESCRIPTION: In most cases it is accepted that diagnosis of hernia is made by clinical examination. However, ultrasound has also been well documented to accurately diagnose both occult and typical groin hernias. Radiologists are increasingly being asked to confirm the presence of a hernia in patients with a palpable groin mass, where clinical diagnosis is difficult. This may be due to a number of causes including obesity, previous surgery, trauma, or radiation. We illustrate the normal ultrasound anatomy and the typical appearances of groin hernias, and an atypical case initially undiagnosed on ultrasound. Post operative appearances of surgical meshes and complications are also discussed. A variety of other lesions including spermatic cord lipoma, varices, abscess, lymphadenopathy, patent processus vaginalis and soft tissue neoplasm are presented. Where available, correlation is made with CT and MRI images, and histology. CONCLUSION: Radiologists are increasingly being asked to image the groin to diagnose hernia, or to localize and characterize the nature of other palpable masses in this complex area. We present an ultrasound pictorial review of key anatomic features and commonly occurring pathology in this region.

POSTER p418

Desmoplasia of the mesentery: imaging findings and spectrum of disease

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KEY LEARNING OBJECTIVES: (1) To describe the imaging findings of mesenteric lesions presenting with desmoplastic reaction. (2) To identify the useful radiological findings to differentiate the spectrum of mesenteric disease and narrow the differential diagnosis. DESCRIPTION: Mesenteric diseases encompass a broad spectrum of pathology. The primary neoplasms of the mesentery, like desmoid tumours, lipomas, and GIST are uncommon in comparison with secondary neoplasms, such as carcinoid tumours, metastatic disease, and lymphoma. Inflammatory conditions, such as sclerosing mesenteritis, are rare, and can be pathologically subdivided into

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mesenteric panniculitis, mesenteric lipodystrophy and retractile mesenteritis. Additional rare infectious and inflammatory conditions of the mesentery also exist, further expanding the differential diagnosis. We retrospectively reviewed the patients examined using CT and MR imaging at our institution for mesenteric disease. FDG-PET imaging is also included, if it was performed. Axial and multiplanar reformatted images from both helical and multidetector abdominal CT and MRI are illustrated. Distinguishing imaging features of inflammatory and neoplastic conditions, especially presenting as desmoplasia are examined, along with the patterns of tumour spread to the mesentery. In addition, rare infectious and vascular processes are discussed. CONCLUSION: We described the various radiological features of mesenteric lesions presenting with a desmoplastic reaction, including primary and secondary tumors. In addition to CT and MR imaging, FDG-PET may be a feasible method for differentiating between benign and malignant mesenteric tumours.

POSTER p420

Abdominal X-rays – an over (ab)used investigation

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AIM: To review the utilization of plain abdominal X-rays in acute general surgical admissions with abdominal pain. MATERIALS AND METHODS: 101 surgical admissions with abdominal pain were prospectively followed up. The diagnosis at admission, X-ray diagnosis, diagnosis at discharge, adherence to RCR guidelines, and the contribution made to the diagnosis by abdominal X-rays were studied. RESULTS: 87 (86%) of 101 patients had plain abdominal X-rays. Out of these, only 38 (43.6%) were ordered as per RCR guidelines. Of these 30 (34.4%) of these examinations contributed to patient management and diagnosis. The diagnoses made were bowel obstruction (14–54%), faecal loading (6–23%), bowel perforation (1–3%), renal /ureteric stones (4–14%) and hepatomegaly (1–3%). Only in 26 (29.8%) patients, the plain abdominal X-rays made the diagnosis. 49 (56%) X-rays could have been saved if RCR guidelines had been used. CONCLUSION: Plain abdominal X-rays continue to be excessively requested in general surgical admissions. They continue to be requested for conditions which are not normally diagnosed by abdominal X-rays. Adherence to RCR guidelines would help decrease excessive use of this investigation and reduce unnecessary radiation exposure to patients.

ELECTRONIC POSTER e421

Radiology of Roux-en-Y gastric bypass procedure: conceptualization and spectrum of complications at imaging

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KEY LEARNING OBJECTIVES: (1) To describe and illustrate the surgical technique of Roux-en-Y gastric bypass procedure. (2) To depict normal post-operative imaging appearances on both fluoroscopic and CT images. (3) To review the radiological manifestations of a spectrum of complications after Rou-en-Y gastric bypass procedure. DESCRIPTION: Roux-en-Y gastric bypass procedure is an effective surgical intervention in morbidly obese patients and is increasing in popularity. Knowledge of the post-operative anatomy is essential for radiologists to be proficient in the specific evaluation of these patients. Upper gastrointestinal series and abdominal CT are the primary radiological tools used in assessment of possible complications. The post-operative upper gastrointestinal series allows detection of anastomotic leaks, staple-line dehiscence, stomal stenosis, degradation of pouch restriction, and small bowel obstruction. CT may also allow diagnosis of anastomotic leaks, and is invaluable in characterization of small bowel obstructions and internal hernias. CT also offers the added advantage of providing guidance for interventional procedures such as aspiration and drainage of fluid collections. CONCLUSION: Radiology plays a crucial role in post-operative evaluation of Roux-en-Y gastric bypass procedure. Familiarity of post-operative anatomy and normal appearances is necessary in the detection of complications. This presentation illustrates the surgical alterations of the anatomy after the Roux-en-Y bypass procedure and review the radiological manifestation of a spectrum of post-operative complications.

ELECTRONIC POSTER e422

MR manifestations small bowel Crohn's disease

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KEY LEARNING OBJECTIVES: (1) To review the pathophysiology of Crohn's disease. (2) To learn the appropriate MRI protocol. (3) To learn the MRI appearances of Crohn's disease. DESCRIPTION: (1) The pathophysiology of Crohn's will be reviewed with particular reference to small bowel disease. (2) We will suggest an MRI protocol suitable for imaging small bowel Crohn's disease. (3) A pictorial review of the MRI findings of Crohn's will be presented using with annotated illustrations. (4) Common pitfalls in interpreting the MRI images will be discussed and how to avoid them. CONCLUSION: MRI is becoming increasingly used in the pre-operative assessment of complex/recurrent Crohn's disease. This poster will give an overview of Crohn's disease imaging with emphasis on MR findings useful for pre-operative planning.

ELECTRONIC POSTER e423

The study of mesenteric ischaemia by using multidetector-row spiral CT

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KEY LEARNING OBJECTIVES: Mesenteric ischaemia is a common disorder and a leading cause of death in elderly patients. In the last decade CT have tremendously altered the diagnostic approach to bowel ischaemia influencing also the therapeutic approach in the current practice. The learning objectives in this work are: (1) To understand and to describe the pathogenesis of bowel ischaemia according to its vascular (arterial and venous) causes. (2) To describe clinical, pathological and radiological manifestations of bowel ischemia. To evaluate the various MDCT signs of bowel ischaemia. DESCRIPTION: In this work we describe and show several MDCT imaging findings including arterial and venous occlusion and parietal effects as bowel wall thickening, portal venous gas, intramural pneumatosis, engorgement of mesenteric veins, loss or increase of bowel wall enhancement and infarction of other abdominal organs. We include several examples by using maximum intensity projection (MIP) and volume rendered (VR) images and some relevant cases. CONCLUSION: Mesenteric ischaemia is a dangerous condition and has to be early recognized; it may simulate other neoplastic and inflammatory conditions so is mandatory a tight integration between radiological and clinical signs.

ELECTRONIC POSTER e424

Assessment of the small bowel by MR enteroclysis: a pictorial review

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KEY LEARNING OBJECTIVES: To describe potential advantages of MR enteroclysis (MRE) as a method of examining the small bowel. Recognize normal and pathological appearances of small bowel as demonstrated by this technique. DESCRIPTION: In recent years, MRE has been developed as a means of evaluating the small bowel. Although MR has reduced spatial resolution when compared with conventional enteroclysis, it does have several advantages. The excellent soft tissue contrast of MR provides very detailed information about the bowel wall, as well as demonstrating extraluminal disease, the presence of which could only be inferred with conventional enteroclysis. The problem of overlapping bowel loops experienced with the conventional technique is also avoided. Furthermore, there is a significant reduction in radiation dose with MRE as other than fluoroscopic screening for placement of the nasojejunal tube, there is no exposure to ionizing radiation. At our institution, over 200 MRE examinations have been performed in the last 2 years. In this pictorial review examples illustrating both the normal appearances of small bowel and a range of pathological conditions will be presented. CONCLUSION: MRE is a valuable new method of evaluating the small bowel with several advantages over conventional enteroclysis.

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ELECTRONIC POSTER e425

Accuracy and usefulness of pre-operative MRI assessment of rectal cancer after neoadjuvant chemoradiotherapy

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PURPOSE: Advances in rectal cancer management have resulted in patients undergoing neoadjuvant chemoradiotherapy in order to optimize their surgical outcome and prognosis. Our aim was to assess the accuracy and usefulness of MRI re-staging following neoadjuvant chemoradiotherapy and additionally, illustrate the range of post treatment appearances. MATERIALS/METHODS: Between December 2004 and December 2006, 10 rectal cancer patients had MRI local staging before and after pre-operative neoadjuvant therapy. The MRIs were reviewed by 2 Consultant Radiologists and an SpR and reported by consensus. Comparison was made with the post-operative histopathology reports. RESULTS: In 7/10 (70%) cases, T stage concordance was demonstrated. Of the discrepant cases, one was overstaged due to extensive post-radiotherapy fibrosis and two were understaged due to the development of mucin pools and microscopic invasion at the anorectal junction. In 9/10 (90%) cases, N stage concordance was demonstrated. In the single non-concordant case, nodes were present but were not found to be malignant on histology. In 8/10 (80%) cases, circumferential resection margin (CRM) assessment was concordant. Discrepancies were due to overstaging of post treatment fibrosis and understaging of a small node near the mesorectal fascia. CONCLUSION: We have demonstrated good correlation in local staging between post neoadjuvant therapy MRI and post-operative histology, and this may improve as experience of this evolving technique increases. It could act as a useful tool to assess tumour response for pre-operative planning, or indeed, decide if observation may be a treatment option.

ELECTRONIC POSTER e426

CT features of inflammatory bowel disease and its complications

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KEY LEARNING OBJECTIVES: (1) Recognize the CT features of inflammatory bowel disease. (2) To understand the specific imaging features of different types of inflammatory bowel disease. (3) To recognize the CT features of common and rare complications of inflammatory bowel disease. DESCRIPTION: It is important for Radiologists reporting abdominal CT to recognize the features and complications of inflammatory bowel disease as this provides valuable information which guides clinical management.This pictorial review presents our experience of spiral CT feaures in inflammatory bowel disease over the last year in a large teaching hospital. Common imaging features include mural stratification, mural hyperenhancement, bowel wall thickening, mesenteric fat stranding and prominent vasa recta at contrast enhanced CT. Despite considerable overlap between the CT findings in Crohn's disease and in ulcerative colitis, there are often certain features that may help distinguish the two. These include the site and pattern of bowel involvement, the mean bowel wall thickness and the presence of certain specific signs, complications or extraenteric manifestations. We also illustrate some of the complications of inflammatory bowel disease including fistulas, sinus tracts, abscesses, phlegmons, malignancy and extraenteric manifestations of inflammatory bowel disease (including cholelithiasis, nephrolithiasis, sclerosing cholangitis and sacroiliitis). CONCLUSION: Spiral CT is a valuable tool in the management of patients with inflammatory bowel disease. Knowledge of characteristic appearances on CT and ability to recognize complications is critical in aiding optimal clinical management.

ELECTRONIC POSTER e427

Multimodality imaging of recurrent, extrahepatic colorectal carcinoma

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KEY LEARNING OBJECTIVES: To illustrate the spectrum of findings in patients with recurrent, extrahepatic colorectal carcinoma (CRC) in a variety of imaging modalities including MDCT, MRI and FDG PET/CT. The potential pitfalls/limitations of each imaging modality will be discussed. DESCRIPTION: Early detection of recurrent CRC has become more important as the treatment options for localized disease have improved. Accurate localization of tumour recurrence in patients with a history of colorectal carcinoma and a rising serum CEA is important in surgical management. Advanced imaging technologies such as MDCT, MRI and FDG PET/CT have led to improvements in the detection of local and distant recurrence. This pictorial review illustrates the imaging findings of recurrent extrahepatic CRC using these modalities. The limitations of each technique will be discussed. In particular the role of FDG PET/CT in the diagnostic algorithm will be reviewed and a variety of case studies will be shown. CONCLUSION: Advances in imaging technologies, in particular FDG PET/CT, are leading to more accurate assessment of extent of disease in cases of suspected recurrent CRC enabling more appropriate decisions in clinical management.

ELECTRONIC POSTER e428

Vanishing liver tumours

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KEY LEARNING OBJECTIVES: (1) To introduce to the viewer, the rare phenomenon of spontaneous resolution of benign and malignant liver tumours. (2) To review the literature and discuss the proposed aetiology behind this unusual phenomenon. DESCRIPTION: Tumours of the liver parenchyma are common and include benign and malignant neoplasms. Whilst progressive involution of haemangioendotheliomas is well recognized, spontaneous resolution of hepatic adenomas and hepatocellular carcinomas is less common and the exact aetiology and pathogenesis behind this unusual phenemenon is unclear. Inflammatory pseudotumours of the liver are an uncommon but increasingly recognized entity with a varied aetiology and presentation. The histological features are pathognomonic although the radiological characteristic are those of a tumour of hepatocellular or biliary origin. Various therapies with broad spectrum antimicrobial therapy are advocated but spontaneous regression may occur without treatment. CONCLUSION: Spontaneous resolution of liver tumours is a rare, but recognized entity that has been reported to occur within the spectrum of benign and malignant liver tumours occurring in both adults and paediatric population. This presentation reviews this radiological observation by case example and summarizes the current understanding of the pathogenesis of these tumours.

ELECTRONIC POSTER e429

Gastrointestinal ultrasound for residents: an interactive tutorial using realtime video

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KEY LEARNING OBJECTIVES: Demonstration of various gastrointestinal pathology with ultrasound as a dynamic imaging tool (using realtime video). To present technique and the key radiological findings for the diagnosis of common and rare pathology involving the gastrointestinal system. Case based learning using ultrasound as a problem solving tool. DESCRIPTION: This will be a clinically based tutorial using realtime video clips of ultrasound scanning to demonstrate various gastrointestinal pathology. Each case will be presented as a clinical scenario, coupled with moving images of an ultrasound examination. The participant will be encouraged to form an opinion after reviewing the images. Salient features of the examination will then be discussed, along with techniques and hints to improve image quality and diagnostic accuracy. This will be followed by a discussion of the diagnosis and possible differentials. The major subheadings of cases include: Chronic and acute liver pathology; Gallbladder and Biliary tract disorders; Pancreatic pathology; Small and large bowel pathology. CONCLUSION: Participants of this tutorial would be able to view various gastrointestinal pathology demonstrated with ultrasound in real time imaging. This enables the appreciation of a disease entity using ultrasound as a problem solving tool, with emphasis on technique and key radiological findings. The discussion around each case allows further consolidation of pre-existing knowledge.

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ELECTRONIC POSTER e430

Pitfalls of MRCP

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KEY LEARNING OBJECTIVES: List the pitfalls advantages of using respiratory triggered 3D multislice MRCP in the diagnosis of pancreatobiliary pathology. To outline the limitations of respiratory triggered 3D Multislice MRCP acquisitions and interpretations from MIP projections. To illustrate both technical and interpretive pitfalls of this MRCP technique. Suggest strategies for recognizing and avoiding these. DESCRIPTION: Several pitfalls are known to occur in both acquisition and interpretation of these sequences. Incorrect localization of respiratory tracking mechanism leads to motion artefacts. The highly T_2 weighted image makes the bile hyperintense which can totally obscure small callculi. Incomplete imaging may create confusion regarding ductal anatomy or disease. Abnormal ductal anatomy or fluid within normal adjacent structures can mimic pathology. Limited spatial resolution makes differentiation between benign and malignant strictures with MRCP alone difficult. Metallic foreign bodies produce adjacent signal loss causing pseudo-strictures. Similarly vascular pulsations may cause similar signal void. Fluid within the stomach or duodenum obscures the ductal structures and the use of negative contrast agents is advocated in many studies. Visualization of the terminal portion of CBD is frequently incomplete thus overinterpreted as strictures. MIP projections can also obscure both small and large calculi. All these pitfalls are illustrated with fine examples, thus aiding recognition of these pitfalls and avoiding them during interpretation. CONCLUSION: Respiratory triggered MRCP provides major advantages as a diagnostic tool, and offer superior image quality compared with tradition thick slab MRCP sequences. However various pitfalls have been observed and it is vital to recognize and avoid them.

ELECTRONIC POSTER e431

Complications of acute pancreatitis: a pictorial review

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AIM: To review the complications of acute pancreatitis and to demonstrate the imaging appearances. We discuss how radiology can help in the clinical management of these patients. DISCUSSION: Acute pancreatitis is a common surgical condition which occurs in 0.02% of the UK population. In the majority of patients, this is a clinical diagnosis and imaging is unhelpful. However, of the patients that develop complications such as necrotising pancreatitis, pseudocyst formation, abscesses and splenic vein thrombosis, diagnostic imaging is essential. Selected patients will require early intervention in the form of surgery or percutaneous drainage of abscesses and pseudocysts and therefore early diagnosis can help in reducing mortality and morbidity. In current practice, contrast-enhanced CT is the investigation of choice for both the diagnosis and the subsequent management of the patient. In this poster, we demonstrate the radiological features found in the complications of acute pancreatitis. Second, we discuss scoring systems such as the Ranson criteria, which have been developed to grade the severity of acute pancreatitis. Finally, we discuss how the imaging findings can predict the likelihood of complications occurring.

ELECTRONIC POSTER e432

The value of high flow rate in the study of pancreatic vessels by using multidetector-row CT

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PURPOSE: In many pathological conditions pancreatic vascular study is very important. The purpose of this study was to assess multidetector-row CT angiography (MDCTA) diagnostic efficacy in the study of pancreatic vessels and the effects derived from the use of an high flow rate contrast medium injection. MATERIALS/METHODS: We analysed retrospectively pancreatic arterial vessels in 80 patients (48 males; 32 females, mean age: 58 years), by using a multidetector-row CT scanner. In 40 patients we used 5 ml s^{-1} flow rate and for the others 40 we used 3 ml s^{-1} contrast medium injection flow rate. For each patients, the image quality of pancreatic arterial vessels was scored as 0 for bad quality; 1 for poor quality; 2 for acceptable quality; 3 for good quality 4 for excellent quality images. RESULTS: By using 5 ml s^{-1} flow rate a total value of 131 was obtained, and we observed pancreatico-duodenal artery in 38 patients (95% sensitivity; 95% CI 0.882–1). By using 3 ml s^{-1} flow rate the overall value obtained was markedly lower: 99, and pancreaticoduodenal artery was visible in 29 patients (72.5% sensitivity; 95% CI 0.587–0.863). The visibility of pancreatic vessels showed statistical difference ($p< 0.001$) with 5 ml s^{-1} flow technique and visibility of pancreaticoduodenal artery was significantly better also ($p < 0.05$) by using higher flow rate. CONCLUSION: MDCTA shows good results in the arterial pancreatic vascular study; in particular it is sensitive when an high flow rate contrast medium injection is used.

ELECTRONIC POSTER e433

Intraductal papillary mucinous tumour (IPMT) of the pancreas: a pictorial review

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KEY LEARNING OBJECTIVES: (1) Familiarize trainee radiologist with this rare but increasingly recognized entity. (2) Illustrate varied spectrum of appearances of IPMT on cross- sectional imaging. DESCRIPTION: Cystic pancreatic neoplasms are rare and include a variety of diseases including serous cystadenoma, mucinous cystic neoplasm, solid and papillary epithelial neoplasm, cystic islet cell tumour and IPMT. IPMT was first identified as a separate entity with unique features in 1982 by Ohhashi et al. IPMT, as the name suggests are intraductal mucin producing tumours with pappillomatous growth pattern that are usually slow growing. It includes a spectrum of conditions ranging from benign non-invasive adenomas to borderline and frankly malignant lesions. Broadly, they can be classified as involving the main duct, a segmental type involving the branch ducts and a combined form. Each of these has distinct imaging features on cross-sectional imaging. It is often difficult to distinguish benignity from malignancy based on imaging alone, although many criteria have been mentioned in the literature. In this poster, we shall discuss the different imaging modalities used for diagnosis and the common radiological findings associated with IPMT. CONCLUSION: Pancreatic intraductal papillary mucinous tumours are a distinct entity with a variable prognosis and Radiologists are often the first to diagnose this condition.

Genitourinary

POSTER p501

Renal angiomyolipoma: an overall review and the role of the interventionalist

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KEY LEARNING OBJECTIVES: The major teaching objectives are: (1) Understanding the clinical presentation and associations of angiomyolipomas. (2) The role radiology can play in diagnosis, screening and detection of complications. (3) An understanding of the surgical and interventional treatments available for treatment and management of complications. DESCRIPTION: We aim to: (1) Outline the pathophysiology of renal angiomyolipoma. (2) Review the differing clinical presentations. (3) Demonstrate the common radiological characteristics of the lesions using USS, CT, MRI, and angiography. (4) Review the treatment options comparing surgical versus interventional approaches with reference to our own institutions experience and that of the current literature. CONCLUSION: Interventional radiology has an increasing role to play in both characterizing and treating angiomyolipoma and their complications. There are obvious clear benefits of percutaneous therapy versus a more traditional surgical approach with a multimodality radiological approach helping to plan who and when to treat.

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POSTER p502

Evaluating the use of 3D ultrasound for volumetric verification of the bladder during radiotherapy

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PURPOSE: To assess the accuracy of 3D ultrasound (3D-US) as a substitute for CT scanning in determining bladder volumes in patients undergoing radiotherapy for bladder cancer, and to compare this with other established ultrasound methods based on 2D parameters and the portable Bladderscan™. MATERIALS/METHODS: 15 patients undergoing radiotherapy for bladder cancer underwent serial weekly CT Scans with immediate ultrasound scans taken whilst the patient remained on the radiotherapy table. The 3D-US volume was derived from an electromagnetic position and orientation system (Ascension Technology, Flock of Birds™), attached to a conventional 2D ultrasound scanner. This allowed for acquisition of multiple 2D images, into a 3D reconstruction and visualization programme (Tomtec) for volume determination. The 3D volume was compared with formulae based on maximum 2D parameters (Hakenberg and Poston), in addition to a portable Bladderscan™ measurement that was performed immediately thereafter. RESULTS: Based on 133 paired data sets, 3D-US showed a strong positive correlation (r=0.96, p=<0.001), though tended to underestimate CT volumes (mean difference -3.9 cm^3, 95%CI -6, +2 cm^3). 3D-US proved to be more precise, with a narrower 95% Bland Altman limit of agreement (-26.0, 18.2 cm^3), than 2D estimations based either on Hakenberg (-158.2, 210.6 cm^3), or Poston formulae (-153.5, 100.9 cm^3), or the Bladderscan™ (-151.2, 79.0 cm^3). CONCLUSION: 3D-US is a precise way of bladder volume determination such that it could be used as a substitute for CT in this respect. The additional ability to track bladder position bladder warrants further investigation as a tool for daily verification of the bladder during radiotherapy.

POSTER p503

Pictorial review of scrotal masses and mass like lesions

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KEY LEARNING OBJECTIVES: Describe the characteristic features of common and unusual scrotal masses on ultrasound (US). Illustrate the characteristic findings of some benign testicular lesions, which can be mistaken for malignancy. DESCRIPTION: This pictorial review presents a spectrum of scrotal lesions encountered in our practice with some pathological correlation. This spectrum includes a variety of common conditions such as epidydimal cysts as well as some unusual scrotal masses such as Leydig cell hyperplasia, dermoid cysts and scrotal myxomas, We also illustrate the key radiological features of some normal variants and benign intratesticular masses which can be mistaken for a testicular malignancy. Benign intratesticular lesions are rare but their recognition is important to avoid unnecessary surgical intervention. Additionally, some benign testicular tumours have some characteristic appearance on US allowing conservative surgery to be performed as opposed to orchidectomy. CONCLUSION: Radiologists play a pivotal role in the evaluation of scrotal masses. Knowledge of the normal and pathological US appearance of the scrotum, is essential for accurate diagnosis of disorders of the scrotum and its contents. The basic categorization of a lesion into intratesticular or extratesticular is generally simple but crucial for the patient's management. The characterization of testicular lesions with US can sometimes avoid the need for unnecessary surgery.

POSTER p504

Testicular torsion: a pictorial review of differentials and mimics using modern sonography

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KEY LEARNING OBJECTIVES: The incidence of testicular torsion in the UK is approximately 1 in 4000 males under the age of 25 years. Prompt diagnosis is essential as most testes can be salvaged if operated on within 6 h of onset. Torsion is a clinical diagnosis and ultrasound examination should not delay taking the patient straight to theatre for exploration; however, ultrasound is very useful in equivocal cases where the history and examination findings are atypical. Advances in technology, particularly the development of high frequency colour and power Doppler imaging make ultrasound a highly sensitive and specific test in the hands of a suitably trained operator. DESCRIPTION: We present a pictorial review of the grey scale and colour Doppler imaging features of testicular torsion. We also give examples of common ultrasound pitfalls and review the imaging features of conditions which can mimic torsion clinically. Our selection of images demonstrates well the grey-scale and colour ultrasound features of these differential diagnoses which include epididymo-orchitis, torsion of the testicular appendage, incarcerated inguinal hernia and testicular trauma. A suggested clinicoradiological management protocol for acute scrotal pain is also included. CONCLUSION: Testicular torsion remains a clinical diagnosis but colour Doppler ultrasound is the imaging modality of choice in equivocal cases. It establishes the diagnosis with a high degree of accuracy and easily.

POSTER p505

Unusual manifestations and associations of benign ovarian lesions

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KEY LEARNING OBJECTIVES: (1) To review benign ovarian lesions and their typical imaging appearances. (2) To recognize unusual manifestations and associations of benign ovarian lesions on imaging. (3) To recognize imaging features which raise the possibility of malignant change. DESCRIPTION: (1) A pictorial review of histologically confirmed benign ovarian lesions. (2) A pictorial review of unusual manifestations and associations of benign ovarian masses. In particular uncommon appearances of benign ovarian teratomas, fibrothecomas, endometriomas and inflammatory/granulomatous conditions. Examples include torsion, infarction, rupture and imaging features of malignant transformation. Histological correlation and a discussion of the literature will be reviewed. CONCLUSION: Benign ovarian lesions are common and are often managed conservatively. It is important for the radiologist to be aware of unusual features as these may change patient management. Associated malignancies in particular will require aggressive management and thus it is vital to exclude or confirm this diagnosis. We aim to demonstrate these,

POSTER p506

Problem solving MR pathway for complex and indeterminate adnexal masses

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KEY LEARNING OBJECTIVES: (1) To understand the problem solving MR imaging pathway for dealing with complex and indeterminate adnexal masses detected at ultrasound (US). (2) To recognize specific imaging features of various ovarian and adnexal pathologies. (3) To become familiar with the management options for the indeterminate adnexal mass. DESCRIPTION: US is the first line investigation for a suspected adnexal pathology. US distinguishes simple cystic lesions and some benign pathologies *e.g.* dermoids from malignant masses. However, with US, a significant minority of appear complex but indeterminate. We describe a simple pathway of MR imaging based upon characteristics of T_1 and T_2 weighted imaging dividing lesions into (a) T_1 bright, (b) cystic/solid nature and (c) T_2 dark. Specific additional MR sequences based on this distinction allow characterization of the great majority of adnexal masses and help to determine the organ of origin, nature and the contents of the mass. We illustrate key features which allow diagnosis of common indeterminate adnexal lesions. CONCLUSION: MR characterization of complex indeterminate adnexal masses can aid in surgical planning and medical management by both confident distinction of benign from malignant tumours and tissue specific diagnosis. The pathway described has been developed in the largest gynaecological network in the UK and is based on an experience of over 500 examinations in the last 5 years.

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POSTER p507

Patterns of relapse in ovarian cancer: a pictorial review

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KEY LEARNING OBJECTIVES: To understand and recognize the typical and atypical patterns of disease relapse in ovarian cancer. DESCRIPTION: The various malignancies of ovarian origin are the second most common of all the gynaecological cancers and the most frequent cause of death in this disease group. With the advent of more successful chemotherapy and cytoreductive surgery, more women are surviving early peritoneal spread of disease. Metastatic disease outside the peritoneal cavity and abdomino-pelvic lymph nodes is rare at presentation, but becoming increasingly recognized during treatment. This pictorial review outlines the spectrum of patterns of relapsed disease in ovarian cancer encountered in a tertiary referral centre. We demonstrate the appearances of recurrence in both common and atypical sites such as supradiaphragmatic lymph nodes, brain, soft tissue and bone. CONCLUSION: As available treatments become increasingly successful at controlling peritoneal disease, metastases outside the peritoneal cavity are being seen more frequently. It is important for the radiologist to recognize atypical sites of metastases in patients with recurrent ovarian cancer in order to facilitate early diagnosis and treatment.

POSTER p508

Unusual sites of ovarian carcinoma metastases

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PURPOSE: Epithelial ovarian carcinoma normally spreads, to the peritoneum via transcoelomic route and to the liver. With the development of new treatment modalities including new chemotherapy regimens, ovarian cancer is now considered a chronic illness by some oncologists and patient survival has increased. We present our experience of imaging patients with epithelial ovarian carcinoma who developed metastases in unusual sites. We aim to demonstrate the various uncommon sites where metastases from epithelial ovarian carcinoma may develop and to illustrate them with images from ultrasound, CT, and MR. MATERIALS/METHODS: We identified patients with epithelial ovarian carcinoma who had been imaged in our department, over the past 4 years. We retrospectively reviewed the reports and images of the initial and follow up scans of these patients, to identify any metastases in unusual locations. RESULTS: We found 11 patients with metastases in uncommon locations. Most of these patients had already been diagnosed with epithelial ovarian carcinoma and were being followed up during or after treatment. Most of the metastases were metachronous and had occurred after therapy. The unusual sites that we identified were spleen (haematogenous), adrenal, breast, cerebellum, bone – lumbar spine, psoas muscle, chest wall, anterior abdominal wall and lung. CONCLUSION: Ovarian carcinoma patients are now living longer than before and can present with unusual symptoms and signs during follow up. It is probable that chemotherapy may be less effective to metastases lying outside the usual sites of tumour spread. Hence these unusual locations may serve as sanctuary sites for tumour cells.

POSTER p509

Uterine leiomyomata: unusual cross-sectional imaging appearances of a common condition

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KEY LEARNING OBJECTIVES: To appreciate a spectrum of the complications of uterine leiomyomata and the corresponding imaging features. DESCRIPTION: Uterine leiomyomata (fibroids) are the most common tumour of the female reproductive tract. They represent benign hypertrophy of smooth muscle and connective tissue. Whilst fibroid disease may be uncomplicated, their potentially unusual behaviour patterns can cause diagnostic confusion. They may mimic other pelvic mass lesions, but certain radiological features can prove helpful in obtaining the correct diagnosis. Outgrowth of their blood supply results in degenerative change, commonly hyaline. However, myxoid, cystic and red (haemorrhagic) degeneration can sometimes occur, and fatty composition of a lesion may also cause diagnostic confusion. Complications can occur consequent to the position of the lesion in the uterine wall. A subserosal leiomyoma may undergo torsion or parasitic detachment ,which can cause difficulty in the assessment of adnexal masses. Submucosal fibroids may bleed or occasionally prolapse, and can therefore be confused with a primary cervical mass. Intravascular disease is also recognized, and peritoneal dissemination may easily be mistaken for a malignant process. We present a broad spectrum of cross-sectional images demonstrating unusual appearances of these prevalent lesions, which could be confused with other tumours of gynaecological origin. CONCLUSION: It is possible to correlate radiological appearances of these uncommon complications with their histopathological diagnoses, often allowing a more accurate pre-operative assessment of a complex pelvic mass.

POSTER p510

Unusual MR appearances of uterine leiomyomata

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KEY LEARNING OBJECTIVES: (1) To recognize the MR appearances of typical fibroids. (2) To recognize the range of atypical MR appearances of fibroids. (3) To correlate the histopathological findings with the imaging appearances. (4) To recognizse the pitfalls and differential diagnosis in MR imaging of fibroids. DESCRIPTION:The typical MR appearances of uterine fibroids are well established. However, there is a large spectrum of unusual MR appearances of uterine fibroids that may cause diagnostic difficulty, potentially leading to inappropriate treatment planning. The authors will demonstrate a wide spectrum of atypical MR appearances of uterine fibroids with their histopathological correlation. We will include atypical appearances due to: (1) Degeneration patterns; (2) Histological variants of fibroids; (3) Unusual growth and spread patterns; (4) Surgical or medical intervention. CONCLUSION: The MR appearances of benign uterine fibroids are variable. Recognizing the various patterns of benign fibroids enables the radiologist to suggest the correct diagnosis, preventing inappropriate treatment and management of the patient.

POSTER p511

MR staging of endometrial carcinoma: does contrast enhancement improve accuracy?

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PURPOSE: To assess whether contrast enhanced MRI improves the accuracy of endometrial carcinoma when compared with non-enhanced MRI using pathological findings. MATERIALS/METHODS: 48 patients with endometrial carcinoma were included in this retrospective study. All patients underwent MRI and subsequent surgery. 36 patients had non-enhanced MR staging. 12 patients had gadolinium-enhanced MRI in addition. Qualitative image analysis, including International Federation of Gynaecology and Obstetrics (FIGO) classification was made at the time of initial reporting. These were then compared with pathological findings and staging. Diagnostic accuracy in assessing depth of myometrial invasion, cervical involvement and predicting FIGO stage was evaluated for both groups. RESULTS: Accuracy of assessing myometrial invasion was 69% and 58% for non-enhanced MR alone and contrast-enhanced MR, respectively. Significant pathological upstaging to T1C or above occurred in 22% and 33% with downstaging (to T1A or T1B) in 12% and 8% of the non-enhanced and enhanced groups, respectively. 50% of the non-enhanced group upstaging was secondary to microscopic cervical involvement and 38% with positive peritoneal cytology. In the enhanced group this was 75% and 25%, respectively. Cervical involvement was accurately reported in 75% and 58% of the non-enhanced and enhanced groups respectively. Agreement with pathological FIGO stage was 42% and 33% of the non-enhanced and enhanced cohort, respectively. CONCLUSION: MRI supplemented by gadolinium-enhancement does not appear to improve the accuracy of local-regional staging of endometrial carcinoma when compared with non-enhanced MRI alone.

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POSTER p512

Evaluating the role of MRI as a radiological staging tool for endometrial cancer

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BACKGROUND: MRI allows assessment of myometrial invasion, cervical involvement, pelvic involvement, and pelvic and para-aortic lymphadenopathy. It is a useful tool for determining which women should be referred to the Gynaecological Cancer Centre for their surgery- stages of 1c or greater as defined in the "Improving Outcomes Guidance". In Northampton General NHS Trust, the MRI protocol was changed to include contrast-enhanced study in January 2004. AIMS: (1) To evaluate role of MRI in radiological staging for endometrial cancer. (2) To evaluate usefulness of introducing intravenous contrast-enhanced MRI images in staging endometrial cancer. METHODS: A retrospective review of 105 patients with endometrial cancer from January 2001 to July 2006. The MRI findings were compared against histological findings Inclusion criteria: Patients from Northamptonshire diagnosed with endometrial cancer. Exclusion criteria: Patients who did not undergo surgery. RESULTS: Over 80% cases were correctly or over-staged. The introduction of contrast enhanced MRI scans has significantly decreased the uncertainty of staging early disease (χ^2; $p< 0.05$). This has not reflected in increase in discordance between histological and radiological results. Instead, there has been almost a doubling in the correlation between radiological and histological results. DISCUSSION: We feel that MRI should continue to be used as a staging modality. The predictive accuracy of MRI has improved both with the introduction of intravenous contrast and also as we have become more experienced in its use. Feedback of pathological staging to our radiological colleagues in the Multidisciplinary Team meetings is likely to further improve correlation.

ELECTRONIC POSTER e513

A pictorial review of the CT and MRI appearances of unusual adrenal lesions

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KEY LEARNING OBJECTIVES: To describe and illustrate the CT and MRI appearances of unusual adrenal and suprarenal lesions. DESCRIPTION: Benign adrenal adenomas are relatively common, seen in 4–7% of the adult population. They can be easily diagnosed using specific CT and MRI techniques. Other, less common adrenal lesions may also be detected incidentally or as a result of endocrine dysfunction. Cross-sectional imaging can help in characterizing the nature of these lesions. The multiplanar capabilities of MRI and multidetector row CT are used to delineate the organ of origin of large suprarenal lesions. We aim to summarize the CT and MRI techniques used to diagnose adrenal adenomas and describe the spectrum of appearances of some unusual adrenal lesions including; adrenocortical carcinoma, ganglioneuroma, phaeochromocytoma, oncocytoma, myelolipoma and collision tumours. We include an unusual case of a large suprarenal leiomyoma presenting as an adrenal mass. Adrenal infarction presenting as adrenal enlargement is also illustrated. CONCLUSION: The purpose of this exhibit is to familiarize the reader with the CT and MRI techniques used in the characterization of adrenal adenomas.

ELECTRONIC POSTER e514

Transureteric ultrasonography: a useful technique in the investigation of ureteric stricture and pelviureteric junction obstruction

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PURPOSE: Conventional radiological investigations for ureteric strictures and pelviureteric junction (PUJ) obstruction often fail to reach a definitive diagnosis in certain patients. The aim of our study was to evaluate the potential role of transureteric ultrasound (TUU) in the further investigation of this subset of patients. METHODS: Between March 2001 and July 2006, 19 patients underwent TUU at our institution at the time of retrograde ureteropyelography. Miniature 12.5 MHz and 20 MHz transducers were passed up the ureter for further characterization of ureteric stricture or PUJ obstruction which had been suspected on previous imaging, typically intravenous urography, but for which a definitive cause had not been found. RESULTS: A definitive cause for the ureteric stricture or PUJ obstruction was identified in 14/19 (74%) cases investigated. These causes included extrinsic lymphadenopathy [4/14 (29%)], crossing vessels at the PUJ [3/14 (21%)], ureteric tumour [2/14 (14%)], calculi embedded within the ureteric mucosa [2/14 (14%)], an endometriotic cyst [1/14 (7%)], retroperitoneal malignant infiltration [1/14 (7%)], and an iliac aneurysm causing generalized ureteritis [1/14 (7%)]. CONCLUSION: TUU was effective in the further evaluation of ureteric stricture and causes of PUJ obstruction suspected on intravenous urography and/or retrograde ureteropyelography. In most cases (74%), significant causes were identified, and the technique accurately characterized ureteric wall pathology and delineated crossing vessel anatomy in PUJ obstruction. TUU is a safe technique, which adds no extra radiation dose to the patient, and we therefore recommend its use in this group of patients.

ELECTRONIC POSTER e515

The forgotten pelvis-a pictorial review of acute gynaecological pathology at CT

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KEY LEARNING OBJECTIVES: To demonstrate the spectrum of acute gynaecological pathologies. To illustrate the CT imaging features of early and late gynaecological infections. To propose an algorithm for the management of incidentally detected gynaecological pathologies. DESCRIPTION: CT is increasingly being requested in the emergency situation for evaluation of the acute abdomen in young and middle aged female patients. As a result we have identified many gynaecological pathologies that were hitherto unsuspected clinically. We will present a range of inflammatory and neoplastic processes which include pyometrium, ruptured dermoid cyst, pyosalpinx, tubo-ovarian abscesses, adnexal granulomatous masses as well as Krukenberg tumours, which all presented as abdominal pain. CONCLUSION: While ultrasound remains the mainstay of imaging of gynaecological pathology, and MRI is often required for characterization, our experience suggests we should have a heightened awareness of acute gynaecological disease at CT.

ELECTRONIC POSTER e516

Pictorial review: sonographic spectrum of intra-testicular abnormalities

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KEY LEARNING OBJECTIVES: Ultrasound is the initial imaging modality of choice for evaluating the scrotum. Although overlap in the ultrasound morphology of certain intratesticular conditions is well recognized, the knowledge of characteristic ultrasound features when coupled with clinical data, can allow one to make a more specific and confident diagnosis of intra-testicular abnormalities. The objective of this pictorial review is two fold: (1) To illustrate the spectrum of benign and malignant intra-testicular conditions; (2) To recognize the ultrasound appearances of intratesticular abnormalities where specific diagnosis can be made. DESCRIPTION: We retrospectively reviewed 99 cases of surgically and pathologically proven scrotal abnormalities diagnosed between January 2000 and May 2005. Further to these, we also include images of non-pathologically proven, but radiological benign cases which required no surgical intervention. A brief description of the key ultrasound findings of selected benign and malignant intratesticular lesions including testicular torsion, epididymo-orchitis, intratesticular simple cysts, tubular ectasia, epidermoid cyst, tunica albuginea cyst, intratesticular abscess , testicular infarction, haematoma, benign thrombosed cavernous sinus tumour, teratoma, benign adenomatoid tumour, lymphoma, seminoma, yolk sac tumour and sertoli cell tumour are demonstrated in this pictorial review. CONCLUSION: Ultrasound is known to be associated with a high rate of false-positive findings for testicular malignancy. However, familiarity with the ultrasound features of

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intratesticular conditions when correlated with clinical data can allow a more specific diagnosis to be made, thereby gratuitous surgical procedures such as testicular biopsy or radical orchidectomy can be avoided in some cases.

ELECTRONIC POSTER e517

3D MR urography in paediatrics

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PURPOSE: MR urography is increasing in paediatrics as an effective alternative to Intravenous urography and scintigraphy in selected subsets of patients. The aim was to illustrate the common anomalies seen in MR and review the common urological problems in children as seen on 3D MR urography sequences. MATERIALS AND METHOD: Retrospective study of MR urography at our tertiary pediatric referral centre in a period of 9 years. MR urography sequences performed in a well hydrated patient after administration of frusemide 1 mg kg^{-1} on table. No IV contrast injected. The imaging sequences used for optimal 3D MRU. RESULTS: MR urography demonstrated various anomalies like duplication system with ectopic ureteric insertion, renal scarring, multicystic dysplastic kidneys, atretic ureters, crossed renal vessels causing obstruction, PUJ and other unexpected renal pathologies. CONCLUSION: 3D MR urography is very useful in evaluation of common and uncommon paediatric urological problems. MR urography is increasingly replacing conventional urography in children.

ELECTRONIC POSTER e518

Ovarian cancer – how do we compare with surgical staging?

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KEY LEARNING OBJECTIVES: (1) Understand the role of CT staging in ovarian cancer. (2) Errors in interpretation of CT findings. (3) Specific review areas for ovarian cancer staging. DESCRIPTION: Radiological staging of ovarian cancer is crucial in treatment planning. Understanding pattern and variety of CT manifestations of ovarian cancer is vital for accurate reporting. We present our experience of pre-operative CT findings gathered over a 2 year period in a tertiary referral gynaecological oncology centre. An evaluation of CT is made by comparison with the gold standard of findings at surgery. Discrepancies between CT and surgery are highlighted with emphasis placed on potential pitfalls of CT interpretation. As a result of the analysis specific review areas are suggested for improving sensitivity and specificity in the interpretation of ovarian cancer CT. CONCLUSION: With the advent of multidetector CT and coronal reformats, radiological staging is comparable with surgery in the majority of cases. Errors in interpretation of CT can be minimized by an understanding of the potential pitfall and a systematic assessment of review areas.

ELECTRONIC POSTER e519

Pitfalls in reporting female pelvis MRI: a pictorial review

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KEY LEARNING OBJECTIVES: To alert the reader to potential problems and difficulties in reporting MRI of the female pelvis in both normal subjects and those with gynaecological disease. Examples used include interpretation difficulties/diagnostic dilemmas from our own institution, cases that have been referred to our institution for 2nd opinions and other pitfalls that have been reported in peer reviewed papers previously. DESCRIPTION: We will specifically look at variation in the appearances of the uterus, cervix and vagina which could be mistaken for pathological disease, such as; myometrial contractions, lower caesarean section scar, pelvic foreign bodies, cervical biopsy site and air and fluid within the vagina. CONCLUSION: This pictorial review will illustrate some of the common and less common potential pitfalls in reporting imaging of the female pelvis. It will be of help to both general radiologists and those with a specific interest in gynaecology.

ELECTRONIC POSTER e520

MR imaging features of ovarian pathologies – a pictorial tutorial

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KEY LEARNING OBJECTIVES: After reviewing this presentation, attendees will be able to: (1) Describe the MRI sequences used in the imaging of ovarian pathology. (2) Characterize ovarian masses as cystic, cystic and solid, or predominantly solid. (3) Identify the MRI features of neoplastic processes that differentiate malignant from benign disease. (4) Using the conclusions reached from "key learning objectives" 2 and 3, list a differential diagnosis of an ovarian mass on MR imaging. (5) Recognize the ovarian pathologies that have specific MRI features and can be confidently diagnosed with MRI. DESCRIPTION: This pictorial tutorial provides the reader with a systematic approach to the interpretation of MR studies of ovarian pathology. A brief overview of the MR sequences used at our institution is provided, along with a summary table of the T_1 and T_2 signal intensity characteristics of certain tissues important in ovarian pathology. The established MR features of ovarian malignancy are then described. Example MRI images of common pathologies with an explanation of the significant MRI characteristics are provided. CONCLUSION: MRI is a useful modality in the evaluation of ovarian masses. Systematic review of the morphological features, signal intensity characteristics and appearances, following intravenous contrast where appropriate, allow accurate differentiation of neoplastic from non-neoplastic pathologies. Neoplastic processes can then be placed in the spectrum from benign to malignant. Certain pathologies have characteristic features on MRI that allow a specific diagnosis to be made.

ELECTRONIC POSTER e521

CT KUB: the range of alternative diagnoses

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KEY LEARNING OBJECTIVES: CT KUBs are increasingly requested from accident and emergency departments. There can be a wide range of alternative pathologies mimicking the symptoms of renal colic. Thorough evaluation should be performed on the CT imaging to ensure alternative or dual pathologies are identified. We will review a wide range of pathologies that can be identified on CT KUB imaging. We will provide numerous examples of alternative diagnoses to urinary tract stones. DESCRIPTION: At our institution a CT KUB provision is available for patients with typical renal colic over the age of 24 years 24 h a day. The large numbers of CT KUB performed in the department has lead to a wide ranging experience of the range of mimics of renal colic. Non enhanced imaging to include to entire renal tract is performed on 4, 16 or 64 multidetector row CT scanners. Types of diagnoses that have been seen include; gynaecological pathology such as dermoid tumours,ovarian cysts, and recurrences of malignancies; gastrointestinal abnormalities including cholecystitis and appendicitis; and of course alternative renal pathologies. The classical appearances of non stone diagnoses may be difficult to interpret, or less easily identified on non-enhanced CT scans. CONCLUSION: CT KUBs are increasingly requested for diagnosis of possible urinary tract stones.

ELECTRONIC POSTER e522

MR renal imaging: correlation of MRI and CT in indeterminate renal masses

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PURPOSE: The use of MRI as a problem solving tool in further evaluating renal masses that are indeterminate on CT. We present a pictorial review of the MR imaging with CT correlation to illustrate its role in influencing management. METHODS: Retrospective review of cases from 2 Tertiary referral centres, over a 2-year period from January 2005. All scans have been reviewed by experienced Uroradiologists. MRs were obtained from Philips 1.5 T Intera and Siemens Symphomy 1.5 T, with sequences including T_1W pre/post IV contrast, with fat saturated, T_2W and opposed phase. RESULTS: 10 patients were identified from this 2-year period, including Bosniak category cysts II–IV, these were from general survey scans as well as more renal-targeted CT. When comparing CT staging to MR staging,

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MR up-staged disease in 5 of the patients, down-staged 4 of the cases and 1 case remained the same stage on both CT and MRI. This led to an alteration in management in 8 of the 10 cases. CONCLUSION: Although CT usually accurately characterises renal masses, MR is a valuable problem solving tool, and is very useful in further evaluating indeterminate renal masses, thus impacting significantly on management of such patients.

ELECTRONIC POSTER e523

Can ultrasound alone be used as a screening tool for the investigation of haematuria?

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PURPOSE: Literature has shown that ultrasound can diagnose transitional cell carcinoma (TCC) of bladder and renal cell carcinomas (RCC) >2.5 cm with a near 100% sensitivity. RCC less than 4 cm is asymptomatic and unlikely to cause haematuria. But how good is ultrasound at detecting upper tract transitional cell carcinoma? METHOD: We retrospectively analysed 37 patients with a diagnosis of upper tract TCC, who had presented with haematuria during the last 4 years. All these patients had the radiological diagnosis made with multislice CT and later confirmed histologically. We analysed what role ultrasound played in these patients on initial screening for haematuria. RESULTS: 31/37 patients had ultrasound as the initial investigation. Of these there were abnormal finding in 26 patients. In 15 patients ultrasound demonstrated a renal parenchymal or a renal pelvic mass, while in 11 patients ultrasound detected hydronephrosis alone. There were 5 patients who had false negatives. Nearly all of these scans were performed by junior specialist registrars on suboptimum machines with images stored only on photographic paper. CONCLUSIONS: We found in our cohort of patients ultrasound had a sensitivity of 84% in detecting an abnormality of the upper tracts. This figure is better than what is quoted in the literature for intravenous urography. The sensitivity potentially could have been higher if experienced sonographers or radiologists had performed the scans on better quality scanners.

ELECTRONIC POSTER e524

CT urography – just how good is it for bladder pathologies

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PURPOSE: To evaluate the role of multidetector row CT urography in the evaluation of bladder tumour in patients with painless haematuria. MATERIALS/METHODS: A retrospective review of CT urographies in 100 patients who were referred for painless haematuria was carried out. A 16 row multidetector CT scanner was used and unenhanced, nephrograhic, compression and excretory-phase images were obtained. Axial images and three dimensional reformations were reviewed by two radiologists. These findings were compared with the results of urine analysis, cystoscopy and or surgery. RESULTS: Cystoscopy showed bladder tumour in five patients out of 100. CT Urogram picked up the tumour in four out of the five. Thorough analysis of the single missed case showed that the tumour was a very small mucosal lesion seen on cystoscopy and the CT urogram showed no obvious abnormality. CT urogram was found to have a sensitivity of 83 % and specificity of 96 % for bladder tumours. CONCLUSION: 16 row multidetector CT urography provides satisfactory results in the investigation of bladder tumours. However, it is unlikely to replace cystoscopy as subtle bladder tumours can be missed. Rather, it is likely to supplement cystoscopy in ruling out upper urinary tract abnormalities as the cause for haematuria and hence may be considered an alternative to retrograde pyelogram. In our study, CT Urogram confirmed the cause for haematuria in 23% including three cases of renal cell carcinoma and one case of ureteric transitional cell carcinoma.

ELECTRONIC POSTER e525

Imaging findings of pouch of Douglas lesions: a pictorial essay

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KEY LEARNING OBJECTIVES: To be familiar with and able to recognize the spectrum of pouch of Douglas (POD) lesions encountered in daily practice, as they appear with various imaging modalities. DESCRIPTION: The POD is a unique anatomical space within the pelvis. A retrospective search of the cases with reported POD lesions, over a 2 year-period at our institution, was performed. A total of 9 cases, selected to illustrate the spectrum of conditions encountered, were studied. Correlation was made with the patients' presentation, clinical findings and subsequent management. The 9 cases highlighted include: benign and malignant neoplasms originating from the neighbouring organs, peritoneal metastases, abscesses, endometriosis, ectopic pregnancy, ovarian torsion and rarer entities like lost intrauterine contraceptive device (IUCD). The imaging findings of the above conditions, as depicted on plain radiographs, ultrasound (US), CT and MRI, are discussed. CONCLUSION: Pouch of Douglas lesions represent a heterogeneous group of conditions, which can sometimes be life threatening. Knowledge of the various entities is important to the radiologist as the imaging findings can be non-specific and a high index of suspicion may be required for diagnosis.

Head & Neck/ENT

POSTER p601

Imaging features of necrotizing otitis externa

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KEY LEARNING OBJECTIVES: To be able to identify the features, extent and complications of necrotising otitis externa (NOE) on CT, MRI and isotope imaging. To be aware of the strengths and weaknesses of each modality. DESCRIPTION: NOE is relatively rare; however, it is associated with serious complications and significant mortality rate. Clinical diagnosis is difficult and imaging is essential in early identification and appropriate treatment. Patients are referred to our area for hyperbaric oxygen treatment which forms an important part of therapy. As it is controversial which modality of imaging is best for initial assessment and follow-up, patients are imaged with CT, MRI and isotope studies. We present a review of the imaging features. Bone involvement may predominate with cortical bone erosion best demonstrated on CT and bone marrow changes ideally seen on MRI. In some cases the soft tissue component is the predominant feature and disease extent may be demonstrated on all modalities. Complications such as intracranial extension and dural enhancement are best seen on MRI. CT bone changes may persist despite disease resolution, MRI and scintigraphy are more sensitive in demonstrating response to treatment. In our department two isotope scans of the skull base are performed, combined with "Hawkeye" CT, which allows anatomical localization of increased tracer uptake. ^{67}Gallium SPECT and $^{99}Tc^{m}$ HDP bone scans are compared for discordant uptake to allow differentiation between ongoing infection from bone repair. CONCLUSION: Imaging has a key role to play in the early diagnosis and follow-up of NOE.

POSTER p602

JAWS – are you afraid?

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KEY LEARNING OBJECTIVES: Mandible is routinely imaged both as part of facial bones radiography and also individually by OPG. Most common presentation is for investigation of trauma to face. Mandible has specialized organs – teeth. Their pathological conditions affect surrounding bone as well. In addition to relatively difficult assessment of mandibular trauma, a significant tooth related pathology may be observed in otherwise normal looking mandible. As these are routinely assessed by either dentists or radiologists specifically trained in maxillofacial work, they pose a diagnostic dilemma for others. We are presenting a pictorial review of common mandibular pathologies including fractures, cysts, storage disorders and neoplasm. DESCRIPTION: Teeth are specialized organs embedded in the ring like mandible. Abnormalities of dentine, cement, tooth pulp and lamina dura may be encountered during routine work. Dental caries and related abscesses are relatively common findings as are complications secondary to dental procedures. They effect

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both cancellous bone – alveolar process, and compact bone of jaw. In addition mandible may be involved in specific bone pathologies as elsewhere. Examples include primary benign and malignant bone neoplasms, disorders of haematopoietic system, connective tissue disorders like Osteogensis imperfecta, metastatic disease etc. We are presenting a pictorial review of different pathologies encountered and their salient differential diagnostic features including their typical location, size and other radiographic features. CONCLUSION: Accurately diagnosing mandibular pathologies can be difficult for radiologists not experienced in this field. But following simple diagnostic clues, it can be achieved with accuracy.

POSTER p603

The role of computed tomography in upper aerodigestive tract injuries

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PURPOSE: To assess the role of CT in upper aerodigestive tract injuries. MATERIALS/METHODS: 26 patients presenting with symptoms of upper aerodigestive tract injury were examined by CT. RESULTS: 19 patients had blunt trauma to the neck while seven had penetrating injury. Most of the patients presented soon after injury. Symptoms included respiratory distress (14), neck tenderness (18), hoarseness (7), haemoptysis (2) and odynophagia (3). Soft tissue injuries were seen in 8 patients, aryepiglottic fold oedema – 4, aryepiglottic fold haematoma – 1, vocal cord oedema – 2 and pyriform sinus obliteration – 5. Supraglottic injuries were seen in six patients, glottic injury was seen in 8 patients and subglottic injuries in 4 patients. Tracheal injuries were seen in 8 patients and included cricotracheal separation (1), tracheal tears (5) and tracheal narrowing (4). Hypopharyngoesophageal injuries were seen in 2 patients. CT was helpful in localization of foreign bodies in 2 cases. CONCLUSION: CT was useful in deciding management of patients with upper aerodigestive tract injuries obviating the need of open exploration in patients with minimal mucosal injuries, undisplaced fracture and sealed tears. It was particularly helpful in cases when indirect laryngoscopy was not possible.

POSTER p604

Challenges and pitfalls in imaging of the head and neck following cancer treatment

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KEY LEARNING OBJECTIVES: To identify the expected findings in the head and neck following treatment for cancer and recognize features raising concern of recurrent disease. DESCRIPTION: One of the most complex areas of head and neck oncological imaging is assessing the post-radiotherapy and post-operative changes seen and differentiating these from recurrent disease. We provide a review of the appearances following radiotherapy, the commonly encountered surgical resections and reconstructive procedures. Obliteration of fat within flap reconstructions or alteration in bone marrow signal in bone grafts are key signs of recurrence. Soft tissue masses due to malignant disease need to be differentiated from scarring and from the muscle component of any flap, previously this was sometimes only achievable with biopsy or sequential imaging, now PET may assist in diagnosis. Radiotherapy changes may be identified on all modalities with thickening of the skin and interstitial tissues and an oedamatous appearance of subcutaneous fat. The carotid artery may also be seen to have a thickened wall, with a surrounding "cuff" of soft-tissue. CONCLUSION: A knowledge of the expected appearances of post-treatment imaging allows identification of features suspicious for disease recurrence.

POSTER p605

Late onset dysphagia or speach difficulties in the post pharyngolaryngectomy neck demonstrated by videofluoroscopy

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KEY LEARNING OBJECTIVES: Videofluoroscopic appearances of delayed onst spasm of the pharynx in post laryngectomy patients and its association with surgical constrictor closure as part of the laryngectomy. DESCRIPTION: We describe 22 post laryngectomy cases who have presented between 3 months and 10 months after treatment with worsening dyphagia and/or deterioration in speach production. In 18 of these cases a long segment of the pharynx demonstrated intermittent but persisitent spasm causing delay in transit of barium through the segment or reduced passage of air from tracheo-oesophageal valve through pharnx reducing the volume, duration and quality of phonation. Typically the spasm extended from the C3 to the C7 level and disappeared on relaxation. The videofluoroscopic appearances are demonstrated. These cases were associated with primary closure of the pharyngeal constrictor muscles as part of the laryngectomy. In 4 cases there was focal hypertrophy of cricopharyngeus as a result of chronic reflux which produced the same symptom complex. We descibe the role of botulinum toxin injection in these cases. CONCLUSION: This poster illustrates the importance of knowledge of delayed onset spasm in this diagnostically difficult group and presents suggested pathways for improvement of symptoms.

POSTER p606

Ultrasound elastography in thyroid malgnancy. What is its value?

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PURPOSE: Assessing accuracy of ultrasound elastography to differentiate benign from malignant thyroid tumours. MATERIALS/METHODS: From May 2005 to July 2006, 34 patients underwent thyroid ultrasound elastography and biopsy at our institution. 4 patients were excluded from the study as they contained cysts or extra thyroid nodes, which were biopsied. Real time elastography was performed using Hitachi EUB-8500 with a 6–13 MHz linear array probe. The elastography patterns were colour coded depending on appearances using a preset colour code as hard, mixed and soft. Biopsies were taken from one/two sites and sent for histology. The results were correlated to determine accuracy of the procedure. RESULTS: The 30 patients involved in the study had 34 biopsies. 22 biopsies were classified as soft nodules or diffusedly soft on elastography. 6 had mixed elastography appearance and 6 patients had a hard nodule on elastography. A total of 7 cancers were confirmed histological of which 4 were seen in elastographically hard nodules. Of the 6 mixed nodules 1 was malignant and of 22 soft nodules 2 were malignant. CONCLUSION: Elastography works on the principle that malignant lesions are harder than benign lesions. Of the 34 biopsies, 6 (18%) were hard on elastography, but of the 7 cancers, 4 (57%) were in hard nodules. On statistical analysis (Fischer's exact test) shows a specificity of 93% and a sensitivity of 57% and a PPV of 67%. This high specificity makes elastography a very valuable tool in deciding which nodule to target in a multinodular goitre.

POSTER p607

Embryology, anatomy and pathology of the parathyroid glands; ultrasound imaging techniques, characterization and localization

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KEY LEARNING OBJECTIVES: This exhibit aims to review the anatomy, embryology and pathophysiology of the parathyroid glands emphasizing the ultrasound imaging features of parathyroid pathology with correlation to other imaging. DESCRIPTION: The format of the exhibit will include discussion of the normal anatomy, embryology and physiology of the parathyroid glands. The pathophysiology of parathyroid diseases including differential diagnosis and a summary of imaging modalities will be explored. Ultrasound technique used in imaging the parathyroid gland, including techniques for localization to aid minimally-invasive surgery will be discussed. CONCLUSION: This exhibit emphasises the importance of knowledge of the anatomy, embryology and pathophysiology in arriving at the correct diagnosis and guiding the surgeons pre-operatively. Understanding the characteristic ultrasound imaging features and adopting a systemic scanning approach will aid pre-operative localization of parathyroid adenomas. Importantly, knowledge of the limitations of ultrasound in parathyroid imaging will aid in avoiding pitfalls.

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POSTER p608

Ultrasound for minimally invasive parathyroidectomy

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PURPOSE: We report the results of minimally invasive parathyroidectomy (MIP) under general anaesthesia aided by intraoperative ultrasound. METHODS: Pre-operative ultrasound identified single lesions in patients with pHPT. Under general anaesthesia and with the patients neck extended, intraoperative ultrasound was performed by a single radiologist who marked the skin overlying the adenoma for surgical excision by a single surgeon. From September 2004 and September 2006, 24 cases underwent MIP. RESULTS: 24/42 (57%) consecutive patients underwent MIP via a mean skin incision of 2 cm. 22/24 cases were histologically proven to be adenomata. In one case the pathologist was unable to distinguish between adenoma and hyperplasia. One case was a technical failure with excision of thyroid tissue only. Median operating time was 15 min (range 9–20 min), hospital stay was 2 days (range 1–4 days). Only 4% (1/24) of patients had recurrence of hypercalcaemia. CONCLUSION: Single lesions can be localized by ultrasound of the neck pre-operatively in 57% (24/42) of patients diagnosed with pHPT. MIP is an effective procedure in this selected group of patients; on table ultrasound guides the surgeon to the lesion quickly, reducing operative time and hospital stay.

POSTER e609

Imaging of multiple endocrine neoplasia

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KEY LEARNING OBJECTIVES: (1) To understand the classification of multiple endocrine neoplasia (MEN) syndromes. (2) To recognize the cross-sectional imaging features of the various pathologies of MEN, including ultrasound, CT, MRI, scintigraphy and PET-CT. (3) To discuss appropriate follow-up imaging strategies in these patients. DESCRIPTION: MEN syndromes are rare autosomal dominant conditions which consist of a complex of endocrine tumours. They are classically subdivided into types 1, 2A and 2B. Type 1 is the most common and comprises tumours of the parathyroid gland, pancreatic islets and anterior pituitary gland. Type 2A (Sipple syndrome) is composed of medullary thyroid carcinoma, phaeochromocytoma and parathyroid hyperplasia. Type 2B is defined by medullary thyroid carcinoma, phaeochromocytoma and marfanoid habitus. Familial medullary thyroid carcinoma is a separate hereditary syndrome without other associated endocrinopathies, although adrenomedullary hyperplasia may be present. The management of patients with MEN is multidisciplinary and imaging is a key component using a multimodality approach. CONCLUSION: The purpose of this exhibit is to demonstrate the radiological features of the MEN syndromes using multiple imaging modalities, and to discuss imaging strategies for diagnosis, management and follow-up.

ELECTRONIC POSTER e610

Radiological evaluation of vocal cord palsy

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PURPOSE: To identify the aetiology and ideal radiological investigation for patients with apparently idiopathic vocal cord palsy. MATERIALS/METHODS: Prospective study done with patients selected over 4 years and followed up between 18 months and 60 months. 86 patients presented to the ENT department with apparently idiopathic vocal cord palsy where no cause found on the initial examination. These patients where referred for CT scanning of neck (±chest). The radiology, clinical findings along with other investigations where evaluated. We looked at the outcomes which included identification of an aetiological factor and recovery of the vocal cord palsy. RESULTS: 54 patients had left sided, 29 right and 3 had bilateral vocal cord palsy. 24 (36%) of 86 patients had positive CT scanning. 21 (24%) cases showed mediastinal adenopathy ± pulmonary mass. The other 3 cases were a thoracic aneurysm, prostatic metastasis below the skull base, and a post cricoid tumour. Only nine out 24 patients with positive CT had CXR and out of these 4 were normal. During the follow up between 18 months and 60 months, four patients died of other causes. 15 (24%) of the 62 patients with negative radiology showed full recovery of the vocal cord palsy. CONCLUSION: The majority of patients with positive radiology have a malignant cause. CXR and panendoscopy are of limited use. CT neck ± chest does not miss any significant pathology. Clinical follow up of patients with negative radiology for 18 months is sufficient.

ELECTRONIC POSTER e611

Multi-detector-row CT angiography in the vertebral arteries study

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PURPOSE: The aim of this work was to evaluate best multidetector-row CT angiography (MDCTA) methods to study vertebral arteries in order to evaluate stenosis degree and what type of plaque determines the stenosis degree. MATERIALS/METHODS: We studied 56 patients by using a multidetector-row CT angiography for an overall number of 112 vertebral arteries. We analysed each vertebral artery for stenosis presence, stenosis degree and the type of the plaque (mixed, fatty, calcified). For each patient we generated post-processed images by using volume rendering (VR), maximum intensity projection (MIP) and multiplanar reconstruction (MPR) techniques. Moreover, to exactly determine the plaque type, we measured the attenuation of Hounsfield Units by using a circular or elliptical region of interest (ROI) cursor in the predominant area of plaque at each level. RESULTS: MDCTA detected 18 vertebral artery stenosis: 16 were produce by calcified plaques and 2 were produced by mixed plaques. Best sensitiviy and quality images were achieved by MIP reconstruction methods and by axial images with the use of the Thick Slab procedure. VR produces high quality images but the post-processing time necessary to render and exclude bony structures make this technique less useful. CONCLUSION: Multidetector-row CT angiography shows a great efficacy in the study of vertebral arteries; the use of post processing procedures determines optimal results and in particular MIP tool.

ELECTRONIC POSTER e612

Radiology of ophthalmic emergencies – a pictorial guide to emergency and emergent radiological investigation

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KEY LEARNING OBJECTIVES: To familiarize the on-call radiologist with the radiology of common ocular emergencies, including clinical findings, differential diagnoses, and diagnostic pitfalls. DESCRIPTION: True ophthalmic emergencies do not account for a large proportion of on-call radiological practice. However, these cases may require expedient investigation and diagnosis to prevent serious sequelae. As Medicine and Radiology become increasingly sub-specialized, the on-call Radiologist may arguably have a less complete understanding of the clinical findings, implications, and management of every ocular emergency, as compared with the senior Ophthalmologist or Neurologist. This study presents common, and not so common emergencies in pictorial form, with selected ultrasound, CT, and MRI images of traumatic, vascular, venous, infective, and mitotic pathologies from our department archive. Topics include the emergency imaging of: cranial nerve palsies, mass lesions and papilloedema, orbital fractures and penetrating injuries, thrombosis, haemorrhage, and vascular malformations. Correlating salient and often subtle clinical findings with anatomical and radiological findings, we aim to provide a comprehensive review of what the radiologist should look for, and hints for avoiding common diagnostic pitfalls. CONCLUSION: This study will aid the on call radiologist in the understanding of the significance of subtle ophthalmic findings, the choice of modality for imaging, and the interpretation of common pathologies.

ELECTRONIC POSTER e613

A pictorial review of the normal and the abnormal suprahyoid carotid space

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KEY LEARNING OBJECTIVES: (1) To describe and illustrate the normal CT and MR anatomy of the suprahyoid carotid space. (2) To illustrate the differentiation of mass lesions in the parotid space, masticator space, retropharyngeal space and pharyngeal mucosal space. DESCRIPTION: The carotid space is the area bounded by the carotid sheath and this extends from the skull base down to the arch of the aorta. Knowledge of the contents of the carotid space and its anatomy facilitates localization and diagnosis of masses within this region. Paragangliomata (carotid body, glomus jugulare, glomus vagale), nerve sheath tumours (schwannoma, neurofibroma), meningioma, lymphadenopathy, abscesses, carotid artery pathology (aneurysm, pseudoaneurysm, dissection, thrombosis) and jugular vein thrombosis will be demonstrated and accompanied by a detailed vignette covering the salient features. Pathological correlation will also be provided. CONCLUSION: The purpose of this exhibit is to familiarize the reader with the normal anatomy and pathology of the suprahyoid carotid space with their characteristic CT and MR appearances.

ELECTRONIC POSTER e614

Cross-sectional imaging of adult orbital pathology: a pictorial review

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KEY LEARNING OBJECTIVES: This pictorial review aims to illustrate the spectrum of orbital pathologies in adult patients and to demonstrate the specific features of these various orbital lesions. Providing imaging for the Birmingham Eye Hospital, one of the biggest eye hospitals of the UK, enabled us to source a wide range of cases of adult orbital pathology. We provide a guide to the general radiologist who does not encounter these conditions routinely in daily practice. DESCRIPTION: We retrospectively reviewed our imaging archive for cases of orbital pathology in adults. The selected cases were subsequently proven by histopathology or by clinical follow-up where biopsy/surgery was not a feasible option. We give a brief description of the salient CT and/or MRI features of a wide spectrum of these orbital conditions, which include choroid melanoma, orbital lymphoma, dermoid, carotico-cavernous fistula, optic nerve meningioma, thyroid eye disease, orbital pseudotumour, sub-periosteal abscess, bilateral optic inflammation and drusen. CONCLUSION: Cross sectional imaging plays a crucial role in the diagnosis and management of a wide range of adult orbital disorders. While some lesions have characteristic imaging findings, others have a non-specific appearance and need pathological examination for a specific diagnosis to be made. However, in the majority of cases, careful analysis of imaging findings whilst taking into account the pertinent clinical features provides an accurate diagnosis.

ELECTRONIC POSTER e615

The impact of multidetector-row CT angiography in the study of carotid artery after carotid endarterectomy

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KEY LEARNING OBJECTIVES: Several randomized trials have defined the patients that would have the most benefit from carotid endarterectomy. Carotid endarterectomy is a surgical procedure where the carotid is opened and a portion of atherosclerotic plaque is removed. CTA, with the advent of the multirow detector scan and with the development of reconstruction software rapid and devoted to the study of the vases, is widely use to assess the pathological carotid artery and for the follow up of patients that underwent to CEA. It is important to evaluate the post-CEA carotid in order to recognize complication as aneurisms and re-stenosis. In this educational work our purpose was to review the current indications and surgical principles of carotid endarterectomy (CEA). To identify characteristic CT imaging features of carotid that underwent to CEA. To understand and recognize post-CEA aneurisms and re-stenosis. DESCRIPTION: We studied 95 patients (64 males, 31 females) that underwent to CTA and then performed CEA. Each examination was performed by using a multidetector-row scanner; contrast material was injected into ante-cubital 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. Each patient was studied by using axial scans and reconstructed images. CONCLUSION: Presence of aneurysms and restenosis after CEA are frequent. CTA axial scans and volume rendered images underline with efficacy characteristic CT imaging features of carotid that underwent to CEA.

ELECTRONIC POSTER e616

Imaging of the parotid space

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KEY LEARNING OBJECTIVES: Describe the anatomy of the parotid space. Define the intra or extra parotid location of mass in this region. Review the imaging features to help in differential diagnosis. DESCRIPTION: Parotid Space Anatomy: The normal anatomy of the parotid space will be illustrated using CT & MR images. The course of the facial nerve will be described in detail. Localization of Parotid Space lesions: Lesions in the parotid space can be challenging to localize accurately by palpation. Accurate localization is essential to prevent iatrogenic complications. Imaging features helpful in localizing lesions will be discussed. Differential Diagnosis: The imaging features of common conditions that affect the parotid space including Pleomorphic Adenoma, Warthin's tumour, Infection, AIDS-related cysts, Haemangioma, Lipoma, Sjogren's Syndrome, Sialosis, Epithelial & Metastatic disease & benign masseteric hypertrophy will be discussed. CONCLUSION: Knowledge of the parotid space anatomy, accurate localisation of lesions in this region & relevant imaging features are essential to generate a differential diagnosis & guide further management.

ELECTRONIC POSTER e617

Benign cystic lesions of the head and neck

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KEY LEARNING OBJECTIVES: (1) To define and characterize the causes of benign cystic lesions of the head and neck. (2) To review the various imaging modalities used in the diagnosis of these lesions. (3) To provide the potential pitfalls in the diagnosis of these lesions. DESCRIPTION: Benign lesions in the head and neck can be subdivided into congenital and acquired causes which include thyroglossal duct cyst, branchial cleft cyst, cystic hygroma, epidermoid and dermoid cyst, thymic cyst, ranula, tuberculous adenitis and retropharyngeal abscess. We will define and provide a multimodality pictorial review of these lesions, with clinicopathological correlation. Furthermore we will include our local experience and potential pitfalls to aid management. Finally a review of the current literature will be made. CONCLUSION: Benign cystic lesions of the head and neck are not uncommon. Ultrasound should be the initial imaging modality of choice. In an adult patient it is vital to exclude a malignancy.

ELECTRONIC POSTER e618

The ABC guide to the OPG

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KEY LEARNING OBJECTIVES: (1) To demonstrate the normal anatomical structures that appears on an orthopantomogram. (2) To provide an approach to the assessment of radiographs. (3) To familiarize the viewer with descriptive terminology used in dental radiography. (4) To demonstrate some of the pathology affecting the maxilla, mandible and dentition. DESCRIPTION: The orthopantomogram accounts for 1.7% of radiographic examinations carried out at our institution. Knowledge of the normal anatomy is important in the recognition of abnormal radiographic signs. A basic understanding of oral pathology is also necessary to interpret such observed signs. The purpose of this educational exhibit is to guide the general radiologist through the assessment of an orthopantomogram, to illustrate lesions affecting the dentition and periodontal tissues, to demonstrate some of the odontogenic and non-odontogenic lesions affecting the mandible, and to highlight some of the pitfalls of radiographic interpretation.

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ELECTRONIC POSTER e619

Kinking and coiling: multidetector-row CT angiography in the evaluation of carotid artery course anomaly

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KEY LEARNING OBJECTIVES: In the carotid artery, elongation and tortuosity are fairly common and this conditions produces kinking and the coiling. Carotid insufficiency derived from kinking or coiling is a well known situation, and the prevalence of hypertension or neurological symptomaticity in subjects with kinking is higher than in subject without this anomaly. Our purpose is to review the anatomy and the difference between kinking and coiling carotid artery. To understand physiology and physiopathology and flow vascular effects produced by kinking and coiling. To review the CTA technical parameter to be used to produce optimal images, as well as the correct delay time, concentration and volume of contrast material and which techniques can be used including the visualization difference between maximum intensity projection (MIP), multiplanar reconstruction (MPR) and volume rendering (VR). DESCRIPTION: We analysed 230 patients (156 males, 74 females, mean age: 66 years) that underwent to CTA in order to evaluate carotid arteries. Each examination was 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. CONCLUSION: Presence of tortuosity of the carotid artery is a frequent condition. CTA may correctly evaluate this condition by using MIP and VR images. The use of only CT axial scans may produce incorrect data.

ELECTRONIC POSTER e620

Comparative audit of ultrasound guided fine needle aspiration of head and neck masses

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PURPOSE: Thyroid nodules are common, present in up to 50% of the population, with increasing prevalence with age. Many methods of obtaining cytological material from head and neck masses, including ultrasound guided fine needle aspiration, and fine needle capillary sampling. The rate of inadequate material for ultrasound guided biopsy in the literature is between 1% and 21.4% depending on size of lesion and method of sampling. MATERIALS/METHODS: A retrospective analysis of the most recent 50 head and neck ultrasound examinations performed which proceeded to fine needle aspiration (FNA) were identified in 2 different hospitals. One site used Fine needle capillary (FNC) sampling exclusively, the other used a combination of techniques. The histological report of the sampling was then obtained. RESULTS: Number of non-diagnostic samples from the site that used FNC exclusively was 10% with 15.7% of diagnostic samples having equivocal histological findings. The site that used a combination of techniques had a non-diagnostic sampling rate of 18%, with 34.1% of diagnostic samples having equivocal histological findings. CONCLUSION: Recommend the use of FNC sampling in obtaining ultrasound guided samples from head and neck lesions.

ELECTRONIC POSTER e621

"A site for sore eyes." The radiology of orbital infection

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KEY LEARNING OBJECTIVES: To review the anatomy of the orbit. To appreciate the routes of spread of infection and the pathophysiology of the complications of orbital infection. To display imaging examples of the causes, stages, complications and differential diagnoses of orbital infection. DESCRIPTION: Infection within the orbit is uncommon. Orbital cellulitis may cause devastating complications and carries significant morbidity and even mortality. The progress from a superficial infection to sight- or life-threatening complications can be very rapid. Sinusitis and preseptal cellulitis are the most common causes of orbital cellulitis and both are commonly encountered. In suspected cases of orbital cellulitis, early imaging with CT is essential for defining the limit of the infection, identifying complications and therefore directing optimal treatment. The superior soft tissue resolution, angiographic capability and fat-suppression techniques of MRI are very useful for further assessing orbital infection. The normal anatomy of the orbit and its relevance to the routes of spread of infection and the pathophysiology of complications will be reviewed. Imaging examples of the causes, stages and complications of orbital infection will be presented. Emphasis will be made of the often subtle, but extremely important abnormal findings within the orbit. Examples will also be included of other pathology which may mimic orbital infection. CONCLUSION: Cross-sectional imaging plays a crucial role in the diagnosis and optimal management of orbital infection. This presentation will review the important imaging findings.

ELECTRONIC POSTER e622

Post-operative neck: a radiological challenge

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KEY LEARNING OBJECTIVES: (1) To recognize the imaging features following neck dissection and reconstruction procedures for Head & Neck Cancer. (2) To recognize patterns and features of tumour recurrence in the surgically treated neck. DESCRIPTION: Radiologists play an important role in the management of patients with head and neck cancer. Modern oncological practice often involves combination treatment with chemotherapy, radiotherapy and neck surgery. Neck surgery can be broadly classified into 2 types: those that remove disease and those that reconstruct surgical defects. Crile, in 1906 first described classic radical neck dissection. Surgical practice has developed considerably and today, less mutilating modified neck dissection is practiced where appropriate. These are based on the fact that for most head and neck cancers, majority of nodal metastases occur in a predictable fashion. Surgical flaps have enabled surgeons to do extensive resection with better functional outcome for the patient. The post-operative neck is often a difficult area for interpretation from the Radiologist's perspective. It is important to be familiar with the standard post surgical appearances in the neck following surgery for Head & Neck tumours and to recognize patterns and the typical appearances of tumour recurrence. CONCLUSION: This poster will illustrate the typical appearances in the neck following surgery for Head & Neck cancers. Examples of tumour recurrence will also be presented.

ELECTRONIC POSTER e623

Imaging of the major salivary glands – role of USS/CT/MRI and conventional sialography

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KEY LEARNING OBJECTIVES: This poster highlights the role and merits of various imaging modalities of the major salivary glands. This will also illustrate various salivary gland pathologies and their characteristic imaging findings. DESCRIPTION: Imaging of the salivary gland depends on their clinical presentation. This poster aims to highlight the normal anatomy of the salivary glands and the indications for imaging. We aim to describe the role of the various imaging modalities to diagnose various pathologies of the salivary glands and give a logical algorithm depending on the clinical findings. The advantages and role of MRI sialography in relation to conventional sialography will be discussed. Various salivary gland pathologies including inflammation and tumour will be discussed with examples using CT/MR and ultrasound imaging. CONCLUSION: A logical algorithm for imaging of salivary glands will be discussed along with the roles and merits of various imaging modalities. Anatomy and characteristic imaging findings of the pathologies of the salivary gland will be described.

ELECTRONIC POSTER e624

Sonographic "Aunt-Minnies" of the adult neck

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KEY LEARNING OBJECTIVES:To raise the awareness amongst non specialists performing ultrasound of the neck, of the characteristic ultrasound appearances that may be encountered in day to day practice. DESCRIPTION: Ultrasound (US) is frequently the first investigation in a patient presenting with a neck mass. It helps to confirm the presence, define the size and extent of the mass, and demonstrate its relationship to surrounding normal structures. The ultrasound features of lesions like thyroid nodules and salivary gland tumours are commonly non-specific and cytological sampling is often needed for further evaluation. However, some appearances on ultrasound are characteristic and allow a specific diagnosis with a high degree of confidence. This facilitates further patient management and saves unnecessary investigations. Our study provides a pictorial review of cases such as colloid cysts, Sjogren's disease, Kuttner's tumour, carotid body tumours, or lipomata. CONCLUSION: Knowledge of the characteristic ultrasound appearances allows the early detection and accurate characterization of some neck masses, without any further investigation.

ELECTRONIC POSTER e625

Radiological staging of tongue cancer

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KEY LEARNING OBJECTIVES: To learn the imaging appearances of various stages of tongue cancer. To familiarize with advantages and limitations of various sequences of MRI and understand the role of other imaging modalities including CT and ultrasound. The tongue is the most common site or oral cancer. 1350 new cases are diagnosed in the UK each year. Accurate staging is essential for management. We present a pictorial review of the radiological staging of tongue cancer. DESCRIPTION: Despite a clinically small lesion, there may be deep invasion of the tongue by tumour. Staging involves a knowledge of the size of the primary tumour, degree of local extension and the size and location of any involved lymph nodes. The tongue is divided into the anterior 2/3 and posterior 1/3. These drain to different lymph node groups and have different survival rates. MRI and CT both demonstrate the extent of the primary tumour and local extension and nodal involvement. Tumour spread is common along neural and vascular structures that lie close to the hyoglossus muscle, increasing the likelihood of nodal involvement. Involvement of the lingual septum defines spread to the contralateral half of the tongue, which alters surgical management. CT is best for assessment of bony involvement. Ultrasound may also be used to assess local extension in anterior tumours. CONCLUSION: The location and stage of tongue cancer dramatically affects patient management and outcome. We present a pictorial guide to the staging of tongue cancer using MRI, and also the role of CT and ultrasound.

ELECTRONIC POSTER e626

Pictorial review: imaging of middle ear diseases – anatomy and pathology

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University Hospital of Coventry and Warwickshire, Coventry, UK

KEY LEARNING OBJECTIVES: This poster will exhibit a pictorial review of cross-sectional imaging findings of middle ear pathology. This will include anatomy, anatomical variants and common middle ear pathologies with post-operative findings. The role of CT and MRI will be discussed. DESCRIPTION: Diseases of the middle ear are common and it frequently requires cross-sectional imaging. This poster will illustrate the characteristic imaging features of various common middle ear diseases such as cholesteatoma, otitis, cholesterol granuloma, ossicular chain disruption, complications of cholesteatoma, tympanosclerosis, etc. The anatomy and anatomical variants will be discussed as seen on high resolution CT. CONCLUSION: The importance of a systematic and thorough multimodality imaging review including role of MRI is emphasised in imaging middle ear pathologies.

ELECTRONIC POSTER e627

Localization of parathyroid adenomas

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KEY LEARNING OBJECTIVES: (1) To highlight the typical and ectopic locations of parathyroid glands. (2) To review the pathophysiology of parathyroid adenomas. (3) To demonstrate the variety of radiological modalities available for localizing parathyroid adenomas. DESCRIPTION: (1) Typical and ectopic locations of parathyroid glands and how they relate to embryology. (2) Pathophysiology of parathyroid adenomas. (3) Non-invasive and invasive radiological studies available for localization of parathyroid adenomas. Non-invasive studies include scintigraphy, ultrasound (US), CT and MRI. Invasive procedures include parathyroid selective arteriography and/or parathyroid selective venous sampling. (4) Benefits and limitations of each type of study. CONCLUSION: Parathyroid adenomas occur in 80–85% of patients with primary hyperparathyroidism. Most individuals (83%) have four parathyroid glands: two superior and two inferior glands. There is also a spectrum of patients with differences in number and location. Ectopic glands can occur in up to 20% of the population. Major teaching points of this exhibit: (1) The variety of locations of the parathyroid glands. (2) The pathology of parathyroid adenomas. (3) The imaging modalities available for localization.

Neuro

POSTER p701

Diffusion-weighted MR of the brain: a review of current clinical applications

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(1) To review the physics underlying diffusion-weighted imaging (DWI). (2) To provide a guide to interpretation of DWI findings in ischaemic stroke and to recognize the potential pitfalls that may be encountered. (3) To pictorially illustrate the role of DWI in the diagnosis of additional disease processes such as infections, neoplasms, trauma, neurodegenerative and metabolic derangement disorders. DESCRIPTION: DWI provides a unique form of tissue characterization based on its sensitivity to the microscopic motion of water molecules. With regard to ischaemic stroke it is of particular use in the detection of hyperacute lesions as well as acute lacunar infarcts that may be indistinguishable from mature infarcts on conventional MRI. DWI has a role in diagnosing conditions with potentially reversible vasogenic oedema such as posterior reversible encephalopathy syndrome, as well as in the evaluation and dating of diffuse cerebral anoxia. Specific DWI abnormalities have been reported in a wide range of other conditions such as herpes encephalitis, abscesses, osmotic demyelination syndromes, neoplasms such as epidermoids, diffuse axonal injury and Creutzfeldt-Jakob disease. CONCLUSION: DWI is particularly sensitive in the detection of ischaemic stroke, but can also provide adjunctive information for a variety of other disease processes. As a rapidly acquired pulse sequence, it is therefore both practical and of diagnostic benefit to be incorporated into the MR brain protocol when investigating a wide range of conditions.

POSTER p702

One big headache! Pictorial review of MRI appearances of spontaneous intracranial hypotension

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BACKGROUND: Spontaneous intracranial hypotension (SIH) is a rarely reported syndrome characterized by a postural headache exacerbated in the upright position and relieved in the recumbent position with loss of CSF volume from the subarachnoid space. Causes include trauma, spontaneous (rupture of Tarlov's cysts), or iatrogenic (after lumbar puncture or spinal surgery) and results in CSF leakage, which typically occurs somewhere along the spinal column. SIH is often misdiagnosed and this can lead to inappropriate investigations or treatment. MRI imaging findings may be quite subtle and non-specific and are frequently overlooked which can lead to patients suffering with chronic headaches for many years. Imaging findings include sagging of posterior fossa contents with low lying cerebellar tonsils,

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elongation of the fourth ventricle, bilateral subdural effusions, and/or diffuse dural enhancement (confused for leptomeningeal disease). In addition, prominent dural veins have been reported. Symptoms may resolve spontaneously or following IV caffeine, however further workup, which includes CT myelography or nuclear scintigraphy (indium-111), is often necessary to identify the source of the CSF leak. If a source can be identified, correct positioning of an epidural blood patch can be performed and typically results in resolution of symptoms. We present a spectrum of MRI brain and spinal cord imaging findings which have been referred to two specialist neurology/neurosurgical centres. CONCLUSION: Awareness of this benign diagnosis, along with understanding and recognition of the spectrum of MRI findings allows correct diagnosis, prevents a more serious diagnosis from being considered and directs appropriate management.

POSTER p703

MRI findings in patients with epilepsy; a pictorial review of 5 years experience

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KEY LEARNING OBJECTIVES: MRI has become the primary radiological investigation in epilepsy due to its ability to detect abnormalities often occult on CT. We reviewed our experience from 2001 to 2005 in the setting of a major teaching hospital with a specialist epilepsy centre. DESCRIPTION: The epilepsy clinic reviewed over 5000 new patients during the study period, of which 1206 underwent MRI. In 160 patients (13.3%), significant abnormalities were found, including not only those classically associated with temporal lobe epilepsy (Mesiotemporal Sclerosis: 1.5%, Cortical Dysplasias: 1.9%, Grey Matter Heterotopia: 0.6%), but also other, potentially treatable conditions (Intracerebral neoplasms: 2.1%, White Matter pathology: 5.3% (diffuse 1.3%, focal 4%), Vascular Anomalies: 1.1% (including 8 cavernomas, 1 Aneurysm and 4 Arterio-Venous Malformations) and Hydrocephalus: 0.8%). CONCLUSION: MRI proved to be a powerful diagnostic modality in screening patients with seizures for treatable brain abnormalities. A pictorial overview of the most frequently encountered pathologies will be presented.

POSTER p704

Imaging of posterior reversible encephalopathy syndrome: typical features, variants and imaging differential diagnosis

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KEY LEARNING OBJECTIVES: PRES (posterior reversible encephalopathy syndrome) is a clinicoradiological entity which encompasses headache, altered mental status, seizures, cortical visual disturbance and posterior transient changes within the brain on neuroimaging. The aim of this pictorial review is to describe the various imaging manifestations of PRES. Atypical variants will be illustrated and the imaging differential diagnosis together with diagnostic pitfalls will be discussed. DESCRIPTION: PRES was first described in 1996. It is hypothesised that it occurs when the blood pressure exceeds the autoregulatory capacity of the brain vasculature resulting in vasogenic oedema. PRES is associated with hypertensive encephalopathy and pre-eclampsia, the post partum period, electrolyte disturbance and neurotoxic or immunosuppressive drugs such as cyclosporine. Neuroimaging has a key diagnostic role and is frequently characteristic. Early diagnosis is essential for the prompt control of the blood pressure and the removal of precipitating factors. MRI abnormalities include symmetric, bilateral, posterior hemispheric, subcortical white matter and cortical signal abnormality. Involvement of the frontal regions, deep grey matter, corpus callosum and posterior fossa structures are also reported. The role of perfusion and diffusion imaging has been explored. The imaging differential diagnosis comprises venous sinus thrombosis, posterior cerebral arterial infarction, vascullitis, encephalitis and demyelinating disorders. CONCLUSION: This review aims to raise the awareness of PRES and its characteristic imaging appearances. PRES usually resolves following removal of the precipitant; however, it represents a neurological emergency in which the radiologist plays a key role.

POSTER p706

Intrinsic spinal cord pathology: a pictorial review

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KEY LEARNING OBJECTIVES: To illustrate and describe a wide range of intrinsic spinal cord pathologies and the imaging characteristics that distinguish them. DESCRIPTION: MR scanning is the best modality to image the spinal cord and to characterize intrinsic cord lesions. Most radiologists are familiar with the frequently encountered spinal cord pathologies such as syringomyelia, astrocytomas and ependymomas. However, the cord is also home to many less common and rare lesions which need to be distinguished in order offer appropriate treatment, that is not always surgical and can sometimes be curative. In this review we illustrate the common as well as the rarely encountered cord pathologies including: infections – TB, HIV and schistosomiasis; inflammatory conditions – multiple sclerosis, ADEM and Sarcoidosis; vascular pathology – AVM, cavernoma, infarction; benign neoplasia – dermoids, lipomas; cystic lesions; and primary as well as metastatic malignant cord lesions. CONCLUSION: This pictorial review describes the characteristic MR features of various intrinsic spinal cord pathologies. The presentation would help the reader to reach a diagnosis or relevant differential diagnosis when confronted with an unusual appearance within the spinal cord.

POSTER p707

Diagnostic imaging of symptomatic vertebral haemangiomas

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KEY LEARNING OBJECTIVES: To describe the spectrum of radiological appearances of symptomatic haemangiomas and highlight the difficulty of diagnosis of compressive haemangiomas. To emphasise the value of correct diagnosis prior to intervention to allow appropriate management. DESCRIPTION: Asymptomatic vertebral haemangiomas (VHs) are common. They are a frequent incidental finding on plain radiographs, CT and MRI. Symptomatic, compressive VHs are rare. They tend not to conform to the same imaging features as their less aggressive form. These lesions are hypervascular and it is therefore advantageous to reach a diagnosis before surgical biopsy is considered. Recognition of the nature of these lesions may allow embolisation or surgery where appropriate. Asymptomatic VHs have characteristic imaging features reflecting their histopathological composition. Plain radiographs show longitudinally orientated prominent trabeculation, CT shows a speckled "polka-dot" appearance. Due to the fat content of VHs MRI shows them to be of high signal intensity on T_1 and T_2 weighted spin-echo sequences as well as on T_2 weighted fast spin-echo images. An additional feature on MRI is the presence of intraosseous signal voids representing the accentuated vertical trabeculae. Symptomatic haemangiomas, however, often lack these features making diagnosis more problematic. We present the imaging features on multiple modalities of three lesions causing cord compression which were histologically proven to be haemangiomas. CONCLUSION: Symptomatic VHs may not conform to the expected imaging findings of asymptomatic lesions, making radiological diagnosis potentially problematic. Review of these lesions using a number of imaging modalities may be valuable to allow appropriate management.

ELECTRONIC POSTER e708

The expanding role of diffusion weighted imaging (DWI) for emergency imaging

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KEY LEARNING OBJECTIVES: To understand the principles and basic physics of diffusion weighted imaging (DWI). To appreciate the indications for and role of DWI in daily radiological practice. To highlight the particular complementary benefits of the use of DWI for emergency neuroradiology imaging. DESCRIPTION: The volume of on-call neuroradiology imaging is increasing. DWI has become a more widely available MRI sequence and is an extremely useful technique

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which complements CT and conventional MRI. There is an established key role for it in stroke imaging, being able to provide the earliest possible radiological evidence of an acute infarct. Other features of DWI that make it particularly valuable in imaging emergency cases include its ability to distinguish vasogenic and cytotoxic oedema and the differing diffusion characteristics of abscesses and tumours, as well as fast acquisition times. This presentation includes relevant examples of on-call cases with corresponding CT and conventional MR images. CONCLUSION: DWI enables earlier detection of pathology and refinement of differential diagnoses. Both of these benefits prove invaluable to the reporting radiologist and clinicians managing acutely unwell patients.

ELECTRONIC POSTER e709

A novice's perspective of acquired leukoencephalopathy

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KEY LEARNING OBJECTIVES: Appreciate the spectrum of acquired myelin disorders. Understand the role of MRI in characterizing, classifying and differentiating the various pathologies. Illustrate the need for improved understanding of pathogenesis, so as to explain the diverse imaging appearances of acquired leukoencephalopathy. DESCRIPTION: This exhibit attempts to illustrate the role of MRI in characterizing myelin disorders. Myelin has preferential T_1 shortening effect, and MRI helps differentiate between grey matter, unmyelinated and myelinated white matter. Leukoencephalopathies, *i.e.* diseases predominantly affecting the white matter of the CNS, are broadly classed as hereditary and acquired. This exhibit focuses on characterization of acquired myelin disorders under the broad headings of: (1) Non-infectious inflammatory disorders including multiple sclerosis and ADEM; (2) Infectious-inflammatory disorders with special reference to HIV encephalitis; (3) Toxic-metabolic disorders including cocaine, amphetamine abuse and central pontine myelinolysis; (4) Hypoxic-ischaemic disorders and vasculitis; (5) Traumatic disorders and inclusive of diffuse axonal injury. CONCLUSION: While similarities of image abnormalities may explain the final common pathway in disorders of quite different origins, even in disorders with obvious similarities with regard to pathogenesis, striking differences in image abnormalities exists; underlying the inadequacy of our grasp of pathogenetic mechanisms.

ELECTRONIC POSTER e710

Radiological clearance of the cervical spine in trauma: an algorithm

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KEY LEARNING OBJECTIVES: (1) To review the current practice of the radiological clearance of the cervical C-spine in trauma in light of NEXUS and Canadian C-spine studies. (2) Assessment of the role of different imaging techniques from radiographs to MRI. (3) To present a revised imaging algorithm to aid clinicoradiological clearance of the cervical cpine in both the obtunded and alert patient. DESCRIPTION: Review the role of a radiologist in the initial assement of the cervical spinal trauma in a busy London trauma centre. Discuss the advantages and disadvantages of the each imaging modality to clear the spine of traumatic injury, including variety of Xray views, flexion/extension views, 64 multislice CT and MRI. Illustrate the common pitfalls in diagnosing spinal injury. Present a clinicoradiologic algorithm for cervical spine injury in both conscious and unconscious patients. CONCLUSION: The major teaching objectives of the exhibit are: (1) To discuss the problems around radiological clearance of the cervical spine in view of the findings of large North American studies. (2) To discuss the role of 64 multislice CT scanner in C-spine asssement and, (3) To describe an evidence-based clinicoradiological algorithm for the clearance of the cervical spine.

Musculoskeletal

POSTER p801

Superior labrum anterior-to-posterior (SLAP) lesions: a pictorial review

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KEY LEARNING OBJECTIVES: To identify anatomical variants of the superior and anteroposterior portion of labrum. To understand the classification and mechanism of SLAP lesions. To describe the appearance of SLAP lesions on MRI. DESCRIPTION: SLAP lesions are important clinical entities that are often associated with non-specific shoulder pain and instability. They tend to be due to trauma or repetitive overuse in athletes. 10 types or patterns of SLAP lesions have been described, with the type II lesions further subdivided into 3 subtypes. The diagnosis can be difficult to make as it may co-exist or overlap with rotator cuff and glenohumeral instability. A detailed understanding of these lesions along with the knowledge about their pathology and mechanisms are essential for diagnosis and appropriate management. CONCLUSION: This pictorial review illustrates the imaging spectrum of various SLAP lesions on MRI, emphasising the role of MR arthrography, in the differentiation of the anatomic variants and pathological conditions. This presentation will help the reader to provide the referring clinician with information for diagnosis and treatment planning when confronted with this important cause of shoulder pain.

POSTER p802

The effect of positioning on bone mineral density (BMD) measurement by peripheral quantitative computed tomography (pQCT) at the distal radius

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INTRODUCTION: Peripheral quantitative computed tomography (pQCT) is used increasingly for skeletal assessment. Standard procedure is to obtain a single 2D section through the 4% distal radius site. In longitudinal studies a single slice will be subject to positioning errors, and as there is heterogeneity of BMD and structure there will be errors in measurements. To overcome this problem we perform two 1.2 mm contiguous slices through the distal radius at the 4% (Slice 1) and 3.6% (Slice 2) site. AIM: In adults to: (1) investigate the magnitude of difference of BMD between the two baseline slices; (2) examine the error in BMD measured at baseline and follow-up. METHODS: pQCT measured in patients at distal radius: Baseline – n=2510 (1862F:648M); aged 20–85 years. Follow-up – n=337 (F); aged 20–85 years (baseline and follow-up scan). RESULTS: Baseline – Median difference between Slice 1 and Slice 2 (5th to 95th percentiles) – BMD: -3.1 (-13.29 to 6.7)mg cm^{-3} in females, -2.35 (-10.6 to 8.3)mg cm^{-3} in males; Total Area: -16.2 (-27.2 to -6.7)cm^2 in females, -17.7 (-29.3 to -6.2)cm^2 in males. Follow-up – One slice at baseline compared to one slice at follow-up. Scans matched for slice number: 168 (50%) scans in correct location. Scans matched for area: 261 (75%) scans in correct location. The error in BMD due to incorrect scan location at follow-up was up to ±14 mg cm^{-3}. CONCLUSION: At the distal radius BMD is heterogeneous emphasising the importance of accurate positioning. By obtaining two slices it is possible to increase the number of patients where the follow-up scan is in the correct location from 50% to 75%.

POSTER p803

"Pugilists Beware!". A review of the spectrum of hand and wrist injuries from a punch

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KEY LEARNING OBJECTIVES: In this poster we review the pattern of hand and wrist fractures seen as a direct result of a bare-fisted punch. The aim is to alert medical staff involved in these cases to the full range of injuries that should be considered. DESCRIPTION: A fracture of the neck of the fifth metacarpal is a well-recognized complication of a bare-fisted punch and has duly earnt its nickname the "Boxer's Fracture". In fact, it is relatively rare in professional boxers and is more appropriately referred to as a "Brawler's Fracture". In our experience however, a much wider spectrum of hand and wrist fractures are encountered resulting from this mechanism, some of which are overlooked. This includes fracture of other metacarpals (head, neck, shaft and base) and carpal bones, particularly the hamate and capitate. Carpo-metacarpal joint subluxations or dislocations are often associated with these injuries, which may be compound or

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involve foreign bodies. Occult and micro-trabecular fractures are also being increasingly recognized with the use of CT and MRI inpatients with normal or equivocal radiographs. We describe and illustrate with radiographs, CT and MRI the range of fractures encountered in our Emergency Department radiology service. CONCLUSION: Punch injury is a common presenting complaint in Accident and Emergency departments. The "Boxer's Fracture" is a well-recognized complication of a punch injury but there are wide ranges of other injuries, which must not be overlooked. With wider use of cross sectional imaging there is also more recognition of radiographically occult injuries.

POSTER p804

Real time ultrasound imaging of finger flexor tendons: normal anatomy, technique and tendon tears

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KEY LEARNING OBJECTIVES: Real time ultrasound examination has gained popularity in imaging finger flexor tendons. It allows direct visualization of the flexor digitorum superficialis and profundus tendons in the hand. The objective is to present the experience in the local unit, emphasising on techniques and limitations. DESCRIPTION: The technique of real time ultrasound and normal anatomy of flexor tendons will be outlined, including the typical gliding movement of the flexor digitorum superficialis and profundus tendons and potential artefacts. The second section shows examples of flexor tendon tears. The final section deals with the role of real time ultrasound in diagnosing potential complications, following flexor tendon repairs, including images of flexor tendon dehiscence, adhesion and tendon callus. CONCLUSION: Real time ultrasound is a reliable, non-invasive tool for imaging flexor tendon injuries and post-operative complications.

POSTER p805

MRI of soft tissues around the hip – a pictorial review

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AIM: To describe the anatomy of hip and illustrate various soft tissue lesions around the hip. The general availability and the recent technical advances of MRI, with high spatial and contrast resolution, allows for a clear definition and discrimination of even small anatomical structures around the hip and pelvis. The musculoskeletal soft tissue anatomy around the hip and pelvis will be presented, together with robust MRI protocol to cover all eventualities. The location of abnormalities will be emphasised together with an understanding of the various musculoskeletal pathologies encountered. Normal anatomy, variants and pitfalls will be illustrated along with description of MR technique, artefacts, and limitations.

POSTER p806

Late periprostetic fracture after total hip replacement: the start of an epidemic?

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PURPOSE: To illustrate the radiographic phenomena of late periprosthetic fracture (PPF). Over 40 000 primary total hip replacements are performed annually in the UK. Current guides to best practice suggest hip replacements should be followed up long term radiographically. These patients will present a challenge to radiologists/reporting radiographers. A review of recent literature is presented. MATERIALS/METHODS: A series of cases referred to our institution in the last 2 years with complications are presented. Salient radiographic features are highlighted. RESULTS: The incidence of periprosthetic femoral fracture after primary total hip replacement is 0.6%. Many patients who underwent total hip replacement 10–20 years ago have not been followed up clinically or radiologically. Significant numbers of patients are now presenting with periprosthetic fractures around the femoral component. These cases are difficult and expensive to revise. The patients are elderly and often have major co-morbidities. CONCLUSION: Several illustrative cases demonstrating the classification of femoral component loosening and the classification of femoral periprosthetic fractures are presented. The demonstration of how osteolysis can progress rapidly and in some instances result in PPF is highlighted. When loosening of the components is picked up appropriate action needs to be instigated at an early stage – this might be following review by a radiologist/reporting radiographer.

POSTER p807

Radiographicfeature of complications of hip resurfacing

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PURPOSE: the aim of this study is to present a pictorial review of the radiographic features of complications of hip resurfacing. The problem of early failure of "traditional" hip replacements in young and/or high demand patients has led to the increasing use of hip resurfacing. As more of these of these procedures are performed increasing numbers of radiographs showing these implants will come to radiologists/reporting radiographers for assessment either via accident and emergency or from general practitioners. MATERIALS/METHODS: Representive cases presenting over the last 2 years demonstrating a variety of complications are shown. RESULTS: Examples shown include dislocation, notching of the femoral neck, component malposition and femoral neck fracture. CONCLUSION: Current hip resurfacing implants at best only have medium term results. Femoral neck fracture following hip resurfacing is likely to become more common as the hip resurfaced population ages. Risk factors for femoral neck fracture following hip resurfacing are discussed, including the potential contribution of osteoporosis, avascular necrosis, intraoperative notching of the femoral neck and femoral component alignment. Avascular necrosis following hip resurfacing is hard to diagnose. Hip resurfacing shares some common complications with traditional hip replacement but also has some complications unique to this procedure.

POSTER p808

Local causes of groin pain – an imaging dilemma!

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KEY LEARNING OBJECTIVES: (1) To present the basic approach for imaging to diagnose local causes of groin pain. (2) To illustrate a wide spectrum of radiological manifestations of groin pathologies including the features of specific disorders that enables characterization and helps management. (3) To discuss the indications, advantages and limitations of various imaging modalities in groin pain evaluation. DESCRIPTION: Groin pain can be due to a number of diverse aetiologies which can broadly be divided into Inguinal canal abnormalities, musculo-skeletal and other soft tissue abnormalities. We illustrate the imaging features of these diverse aetiologies like direct and indirect inguinal hernia, sportsman's hernia (Gilmore's groin), hydrocele of the canal of nuck, epididymal granuloma, lipoma of the cord, avulsion injuries, calcific hip bursitis and adductor abscess. We discuss the role of the different imaging modalities and their applications in different pathologies. CONCLUSION: An understanding of the differential diagnosis of these conditions and a comprehensive strategy for evaluation are central for effective care. A multimodality approach with appropriate use is the key.

POSTER p809

Pictorial review of the MRI features of meniscal tears highlighting imaging pitfalls

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KEY LEARNING OBJECTIVES: (1) Understand the normal anatomy of menisci on MRI including normal variants that mimic pathology. (2) Understand the patterns of meniscal tears and their radiological signs found in symptomatic and asymptomatic knees. DESCRIPTION: MRI of the knee is the most accurate non-invasive imaging modality used to demonstrate meniscal tears and associated injuries. It is an examination commonly performed in all hospitals and reported by musculoskeletal as well as non musculoskeletal radiologists. Recent publications have highlighted the value of certain

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radiological signs and techniques in detecting specific meniscal tears, increasing the diagnostic accuracy rate and guiding orthopaedic surgeons appropriately. Understanding the meniscal tears that commonly cause symptoms (radial, vertical, complex and displaced tears) and those often found in asymptomatic knees (horizontal and oblique) is key to appropriate clinical interpretation. We present the normal anatomy of the menisci on MRI including the imaging pitfalls of normal variants mimicking pathology. Patterns of meniscal tears and their radiological signs found in symptomatic and asymptomatic knees will be described and illustrated using appropriate MRI imaging protocols. CONCLUSION: It is important to appreciate the different meniscal tears and their specific radiological signs in order to improve diagnostic accuracy rates and clinical outcome for the patient.

POSTER p810

Radiographic features of complications in unicompartmental knee joint replacement

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PURPOSE: Unicompartmental knee replacement is an increasingly common surgical procedure for osteoarthritis isolated to the medial tibio-femoral, lateral tibio-femoral or patellofemoral compartments. As more of these of these procedures are performed increasing numbers of radiographs showing these implants will come to radiologists/reporting radiographers from a variety of referrers for assessment. This study illustrates the spectrum of complications as they present radiographically. MATERIALS/METHODS: A review of patients presenting in the last 2 years is demonstrated. There are a large number of designs of these implants. We show the common appearances of some of these designs and the appearances relating to early and late complications. RESULTS: Early complications include problems with the collateral ligaments, dislocation of mobile polyethylene bearings, peri-prosthetic fractures and malalignment. Some of the radiographic features of these complications can be subtle. Late complications include wear, aseptic loosening and deep infection. CONCLUSION: Common features of some of these implants are shown. Radiolucencies around tibial components are a normal feature in some designs. Comparison with previous films is essential to accurate reporting.

POSTER p811

Activity related lower leg pain – a complex clinical spectrum or platform to portray imaging armamentarium?

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KEY LEARNING OBJECTIVES: (1) To present a systematic approach for imaging of activity related lower leg pain. (2) To illustrate a wide spectrum of radiological manifestations and the features of specific disorders, thus enabling characterisation and subsequent management. DESCRIPTION: Activity related lower leg pain is a common condition not only in sports persons but also across other groups in general population. The causes are numerous and include stress fractures, periostitis, chronic exertional compartment syndrome, tendinopathies, and neurovascular entrapments. Other causes in this spectrum of presentations include venous insufficiency and claudication, deep venous thrombosis and distant (referred) pain from spinal radiculopathy. The history and clinical examination does not always provide sufficient information in diagnosis and radiologists play a major role in management of these conditions. We propose a tailored multimodality approach including plain films, ultrasound, CT, scintigraphy and MRI to aid in the diagnosis of these varied aetiologies. We illustrate the specific imaging features of a wide range of pathologies causing activity related lower leg pain. CONCLUSION: The causes of exertional lower leg pain are varied and there is often overlap in the clinical presentation. We have presented a comprehensive review of these conditions and suggest a tailored multimodality approach.

POSTER p812

Metatarsophalangeal joint arthrography and magnetic resonance imaging and its role in imaging metatarsalgia

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PURPOSE: Instability and inflammation of the metatarsophalangeal joint (MTPJ) is a common cause of forefoot pain, especially in women, caused by increased weight bearing and hyperextension associated with modern footwear. Arthrography has enjoyed a recent surge in popularity, as it is an excellent way of showing plantar plate damage associated with this phenomenon. This study aims to show our method of imaging these joints, the relevant anatomy and a recent review of 7 patients who have recently undergone this procedure at our institution. Recent literature is reviewed. MATERIALS/METHODS: An anatomical review and method of injection is described and illustrated. A review of patients presenting in the last 18 months are demonstrated. The joint(s) is injected under fluoroscopic control with gadolinium laced contrast and images required during this part of the procedure. Patients are then imaged straightaway using MRI. RESULTS: 5 out of 7 patients had plantar plate ruptures at arthrography confirmed and repaired surgically. The addition of MRI also allows any possible differential diagnosis to be confirmed or refuted, and to assess the degree of concomitant MTPJ damage. CONCLUSION: The demonstration of plantar pate tear at arthrography has a high correlation with tears confirmed surgically and gives a high degree of confidence to the operating surgeon. It is very helpful to the foot surgeon in planning and execution of operating lists, allowing efficient use of this expensive finite resource and gives a highly specific

POSTER p813

MR assessment of patients with ankylosing spondylitis for treatment with TNFa inhibitors

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KEY LEARNING OBJECTIVES: To recognize the value of the STIR sequence in selecting the subgroup of ankylosing spondylitis patients who would benefit from TNFα inhibitors, and in monitoring response to treatment. DESCRIPTION: Ankylosing spondylitis patients with severe active disease should be considered for treatment with the new cytokine inhibitors etanercept or infliximab. These are licensed for this application but not yet considered by NICE for NHS funding approval. Recent work has shown acute inflammatory changes in the spine demonstrated on enhanced T_1 weighted and STIR sequences are significantly reduced following treatment. Over the past 18 months we have performed spinal MR to identify patients for treatment, and successfully used positive results to justify local funding of therapy. T_1 and T_2 weighted sequences are the routine protocol for assessing the spine. We also perform a STIR sequence, which we believe is more sensitive to inflammatory change than an enhanced T_1 weighted scan. Any segment of the spine may be affected, most commonly in the thoracic region, and we image the whole spine. We illustrate cases where active inflammation was not demonstrated on standard imaging, but clearly visible on STIR. A survey of MR departments in the region revealed a lack of awareness of the rationale for such imaging in these patients. CONCLUSION: MR usefully documents active spinal inflammation in ankylosing spondylitis patients for selection and justification of treatment with TNFα inhibitors, and in monitoring response to therapy. The protocol should include the whole spine, and include a STIR sequence.

POSTER p814

DYNESYS: dynamic stabilization of the lumbar spine – review of the device, uses and imaging appearances

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KEY LEARNING OBJECTIVES: (1) Introduce the device, the rationale for use and the surgical technique used for deployment. (2) Become familiar with the postoperative appearances on plain film, CT and MRI. (3) Determine which imaging modality to use in follow up and why. DESCRIPTION: The dynamic neutralization system for the spine (DYNESYS) was developed in Switzerland and has been used in clinical practice in Europe and the USA since 1994. In the UK the device has been in clinical use since 2002 and approximately 80 centres nationwide use it at present. The first line treatment for chronic lower back/leg pain attributed to degenerative disc disease is

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conservative management with multiplicity of treatments including analgesia, physiotherapy, facet joint injections and many others. When symptoms are not contained, spinal fusion surgery has traditionally been the next course of treatment. The DYNESYS system provides an alternative to permanent spinal fixation. The potential benefits of the DYNESYS system are that it allows a degree of movement of the spine and is potentially reversible. We will describe the surgical technique and illustrate the normal post-operative imaging appearances. We will also discuss the imaging used for the follow up in these patients with examples of complications that may be encountered. CONCLUSION: There is increasing evidence supporting the use of the posterior dynamic stabilization device. Radiologists need to have an understanding of the device, the surgical technique and possible complications.

POSTER p815

Musculoskeletal tuberculosis – extra spinal manifestations: a pictorial review

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KEY LEARNING OBJECTIVES: Illustrate the imaging features of musculoskeletal TB on plain film, ultrasound, CT and MRI with emphasis on some of the more atypical presentations. DESCRIPTION: It is estimated that worldwide 2 million people die from TB every year. There has been a steady increase in the incidence of TB in the UK since the mid-1980s. The number of extra-pulmonary cases of TB has increased from 2489 cases in 2000 to 3553 cases in 2005* (43% increase) in the UK. Despite this the musculoskeletal manifestations of TB are rarely encountered in day-to-day practice. The clinical presentation in these patients is often non-specific and insidious in onset. TB can therefore be overlooked as a potential diagnosis. London has a high incidence of TB compared with the rest of the country. The annual rate of incidence of TB in London is 43 per 100 000 compared with the national average of 4 per 100 000*. There is a varied ethnic mix in our practice in West London (London Borough of Hounslow) and TB is not an uncommonly encountered disease. We present cases of TB osteomyelitis, arthritis, bursitis, tenosynovitis and soft tissue masses. Appearances of the abnormalities on plain films, ultrasound, CT and MRI are provided. CONCLUSION: We hope that familiarity with the appearances of musculoskeletal TB on various imaging modalities together with knowledge of high risk patient groups, will help in the prompt diagnosis and treatment of this potentially curable and important public health condition.

ELECTRONIC POSTER e816

Sonography for lumps around hand and wrist: pictorial review

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PURPOSE: A retrospective review of the ultrasound investigation of 112 lumps around the wrist and hand. The aim of the study is to illustrate the spectrum of abnormalities found. MATERIALS/METHODS: Total of 520 ultrasound examinations for wrist and hand done during 2004–2005. 225 were primarily for swellings and 112 lumps were characterized. High frequency (7.5–13 MHz) linear array transducer used. Tumours that had been operated on and sent for histopathological examination were investigated. RESULTS: 112 lumps were found and characterized. There were 58 males and 54 females. Age range was 17–85 years. Incidental superficial nodules and Dupuytren's nodules (3); Congenital deformities: Accessory muscles (3) & Arteriovascular Malformations (3); Inflammatory masses: Chronic synovial hypertrophy (33) Implantation dermoid (1); Epidermoid cyst (1), Rheumatoid Nodule (1); Haematoma (1), Traumatic pulley thickening (1); Foreign bodies (2) Granulomatous response to fibrogenic foreign material (1); Bony protrusions Osteochondromas (3); and Ganglia (42). Benign tumours: Localized Villonodular Synovitis, Giant cell tumour (7); Haemangioma (2); Lipomas (2), Lipohemagioma (Masson's Tumour) (1), Nerve tumours: Neurofibroma (1), Schwannomma (1), Stump Neuroma (2). Malignant tumour Sarcoma (1). The study found 5 key ultrasound characteristics that were important for differentiating the tumours: echogenicity, echo structure, intrinsic vascularity, capsule, and pattern of growth. CONCLUSION: Ultrasound enabled a reliable diagnosis of the cystic or solid nature of the lesions, an accurate estimation of the volume, presence or absence of intrinsic vascularity and precise three-dimensional localization of the abnormality. Some of the lesions have characteristic benign appearance on ultrasound, which were illustrated.

ELECTRONIC POSTER e817

A pictorial review of soft tissue lumps in the hand and the wrist

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KEY LEARNING OBJECTIVES: To review the imaging features of soft tissue masses encountered around the hand and wrist emphasising those features that suggest a specific diagnosis. We present our experience by reviewing the imaging characteristics of the most common masses in this anatomically complex area with particular reference to ultrasound and MR. DESCRIPTION: We retrospectively reviewed the imaging of all patients referred for a lump in the hand or wrist over a 1-year period. Ultrasound was performed with a high frequency linear array transducer. MR was performed on 1.5 T scanner using an extremity coil. The majority of lumps are benign and have characteristic appearances on ultrasound and MRI. The common lesions that were demonstrated were ganglion cysts, giant cell tumours, neural sheath tumours, vascular malformations and inflammation particularly involving the synovium and the tendons. Malignant tumours are less common and include synovial sarcoma and liposarcoma although imaging can suggest the diagnosis histological confirmation is necessary. CONCLUSION: Ultrasound is the initial screening tool for evaluation of soft tissue masses for detection of the lesion, identifying whether it is solid or cystic and to characterize the intralesional vascularity. MR is useful to narrow the differential diagnosis of soft tissue masses already imaged with ultrasound.

ELECTRONIC POSTER e818

The role of urgent limited hip MRI in trauma

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KEY LEARNING OBJECTIVE: To evaluate the usefulness of limited hip MRI in the imaging algorithm for hip trauma. DESCRIPTION: Up to 14 000 people a year die in the UK as a result of an osteoporotic hip fracture. 11–15% patients with traumatic hip fracture, have negative or equivocal plain radiographs. 16 patients, who underwent urgent, limited hip MRI following trauma, between 2003 and 2006, were selected from our departmental PACS database. They all had initial radiographs, then subsequently underwent limited hip MRI (coronal T_1 and STIR sequences only). Indications for hip MRI were high clinical suspicion of fracture with normal or inconclusive radiographs, or to exclude pathological fracture in patients with obvious fracture. Where radiographs were normal (11), MRI showed fracture in 5, muscle injury in 2, and normal appearances in 4. Where plain radiographs were inconclusive, MRI showed fracture in all (3) patients. In the remaining 2 patients with obvious fractures on the plain radiographs, MRI showed metastatic pathological fracture in one. MRI confirmed fractures in 8/14 (57%); muscle strain/soft tissue injury in 2 (14%); and was normal in 4 (29%). MRI had the additional advantage of demonstrating multiple fractures of the pelvis (all sacral fractures) in 3 patients, not seen on the plain radiographs. CONCLUSION: Urgent, limited hip MRI following trauma is an accurate and cost effective supplement to plain radiographs in the imaging of patients with high clinical suspicion of fracture. In addition, MRI helps to exclude pathological fracture, elucidate co-existent multiple fractures and muscle injuries.

ELECTRONIC POSTER e819

Diagnosis is skin deep: a pictorial correlation of skin and the skeletal system

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INTRODUCTION: There are many disorders which lead to simultaneous changes in the skin and multiple organs. We would like to present a pictorial review of the conditions that affect the skin and the skeletal systems simultaneously. OBJECTIVE: A

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descriptive pictorial review of the radiological manifestations of disorders affecting the skin and skeletal system simultaneously, followed by a self-assessment section. DISCUSSION: As radiologists most of us have wide knowledge of the radiological features of skeletal disorders. However, we have limited knowledge of dermatological disorders, hence fail to correlate the two. We would like to illustrate the skin changes with correlated radiological findings in varied conditions like leukaemia, lymphoma, thyroid acropachy, pachydermoperiostosis, sarcoidosis, neurofibromatosis, cysticercosis, Maffuci's syndrome, dermatomyositis, scleroderma and Reiters syndrome. It is often the case that as clinical radiologists we have sparse history available to us at the time of the examinations. When presented with complex radiological findings, knowledge of the conditions and their associations is helpful. A prompt clinical review of the patient by the concerned radiologist can help clinch the diagnosis resulting in an appropriate referral pathway. Hence we believe that this pictorial correlation will be a useful aid for a clinical radiologist.

ELECTRONIC POSTER e820

Haematogenous osteomyelitis: radiologic pictorial essay with a critical analysis of the imaging methods available

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KEY LEARNING OBJECTIVES: To review imaging features, with pathological correlations, of haematogenous osteomyelitis in patients of differing ages, and in those with sickle cell disease. An imaging algorithm for the diagnosis of osteomyelitis and its complications will be outlined. DESCRIPTION: Haematogenous osteomyelitis has a wide spectrum of imaging presentations, depending on age and condition of the patient, causative organism, stage of disease and its anatomical location. Osteomyelitis is most common in children. A clear understanding of the pathophysiology, and familiarity with imaging techniques, is essential to ensure early diagnosis and optimum management, essential to prevent serious musculoskeletal sequelae. A variety of imaging techniques can be used, with all having strengths and weaknesses. RESULTS: Radiographs are the usual initial imaging investigation. Ultrasound (US) can detect fluid collections; CT is a useful method to identify early osseous erosion, the presence of sequestrum or gas formation. Both US and CT can be used to guide diagnostic fluid aspiration or drainage catheter placement. Radionuclide (RNI) and MRI are the most sensitive imaging methods for the early detection of osteomyelitis, and MRI provides more accurate information of the local extent of disease. RNI is particularly useful in identifying multifocal skeletal involvement. CONCLUSION: The diagnosis of osteomyelitis can involve multiple imaging techniques, each with strengths and weaknesses. A good knowledge of these is essential to ensure early diagnosis, and so avoid long term complications.

ELECTRONIC POSTER e821

Infectious myositis: a systematic evaluation of the MRI characteristics

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KEY LEARNING OBJECTIVES: To interpret the characteristic MRI features of infectious myositis and review several clinical cases. To provide an understanding of the pathophysiology of infectious myositis related to the MRI manifestations. To report the differential diagnostic points on MRI. To comment on the role of MRI in the diagnosis of the disease process. DESCRIPTION: Infectious myositis comprises a bacterial infection of muscle, usually caused by *Staphylococcus aureus* that is endemic in tropical regions. Musculature in the lower extremity, including the thigh and buttocks is affected more commonly than that in the trunk. Delay in accurate diagnosis is frequent, as infectious myositis may resemble osteomyelitis, septic arthritis, haematoma, thrombophlebitis, and sarcoma. In the early stage of infection affected muscle is enlarged and shows preserved intermediate to slightly increased signal intensity on T_1 weighted images, and abnormal high signal intensity on T_2 weighted and STIR images. With progression of the disease, MR images show single or multiple intramuscular abscesses characterized by a peripheral rim of increased signal intensity, representing blood products on T_1 weighted images and a central region, representing fluid, of intense signal on T_2 weighted and STIR images. Pus within the abscess can be hypointense, isointense or hyperintense on T_1 weighted images depending on the proteinaceous content of the fluid collection. The rim surrounding the abscess is hypointense on T_2 weighted images and enhances after intravenous administration of contrast material. CONCLUSION: MRI is vital for early diagnosis of infectious myositis that allows implementation of timely and appropriate treatment.

ELECTRONIC POSTER e822

Diabetic foot disease: imaging findings with anatomic correlation following amputation

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KEY LEARNING OBJECTIVES: To present the spectrum of abnormalities accompanying bone, joint, and soft tissue infection and neuropathic osteoarthropathy in the diabetic foot with imaging-anatomic correlation. To illustrate the complex anatomy of the foot and its derangement in diabetes. DESCRIPTION: Diabetic foot disease constitutes one of the most dramatic long-term complications of diabetes mellitus. Among diabetics, amputations of the lower extremity remain commonplace today. A 68-year-old diabetic man with severe chronic foot changes presented with septicaemia, which necessitated amputation of his left foot. 6 months earlier he had burnt the plantar aspect of his forefoot. Frontal and lateral radiographs of the involved foot were obtained. Using a band saw, anatomic sectioning in the transverse and sagittal plane was performed in the amputated foot. High-resolution radiography (Faxitron; HP) then was performed in these sections to allow imaging with close anatomic correlation. The joints of the forefoot and midfoot were involved most prominently. Radiographic alterations suggesting osteomyelitis included osteopenia, mottled osteolysis, bone erosions, periostitis, and soft tissue swelling. Osseous fragmentation, osteosclerosis, subluxation of the tarsometatarsal joints or Lisfranc's fracture-dislocation, and the "sucked-candy" deformity of the phalanges were additional findings indicating neuropathic osteoarthropathy. The imaging findings were confirmed at anatomic inspection. CONCLUSION: The primary diagnosis of diabetic foot disease rests in careful scrutiny of the foot radiographs. Classic radiographic findings prevail in the diabetic foot. Because of its high spatial resolution and low cost, radiography remains the initial imaging test preferred by many physicians for evaluating suspected osteomyelitis and/or neuropathic osteoarthropathy in diabetics.

ELECTRONIC POSTER e823

Imaging findings of musculoskeletal and vascular complications in drug users

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KEY LEARNING OBJECTIVES: To familiarize radiologists with the clinical features and pathophysiology associated with musculoskeletal and vascular complications in intravenous drug abuse patients. To offer a pictorial representation of the imaging findings that are encountered with serious infectious complications, in this particular patient population. DESCRIPTION: More than 266 000 drug abusers are estimated in the UK, 40% of whom are intravenous drug abuse (IVDA) patients. IVDA patients are at increased risk of medical complications including infection. Infectious complications can be disabling and life threatening and account for 60–80% of hospital admissions of IVDA patients each year. Complications are categorized as those that predominantly affect the soft tissues, and the bones and joints, while the blood vessels and the lymphatics can be offended as well. Soft-tissue complications in IVDA patients include cellulitis, ulceration, abscess, pyomyositis,

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septic bursitis, tenosynovitis, and necrotizing fasciitis. Foreign bodies in soft tissue due to needle fragments are common findings. Primary bone and joint IVDA complications include osteomyelitis (acute and chronic) and septic arthritis. Other IVDA complications affecting blood vessels and lymphatics include haematoma, arterial aneurysm and pseudoaneurysm, thrombosis, thrombophlebitis, "puffy-hand" syndrome, and lymphadenopathy. CONCLUSION: Imaging plays a central role in the early diagnosis of complications in IVDA patients, and can help minimize overall associated morbidity. In particular, MRI yields valuable diagnostic information regarding the regional extent of suspected infection, and the presence of surgical lesions that impact patient management. Familiarity with this topic can help establishment of the correct diagnosis and initiation of appropriate treatment.

ELECTRONIC POSTER e824

To evaluate the sensitivity of MRI knee in detecting meniscal and cruciate ligament tears

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PURPOSE: To evaluate the sensitivity, specificity, positive and negative predictive value of MRI knee in detecting meniscal and cruciate ligament tears. MATERIALS/METHODS: A retrospective audit was conducted on all patients who had MRI knee (reported by consultant radiologists) and subsequent arthroscopy (done by consultant orthopaedicians) in a 6 month period in a district general hospital. Patients with previous knee surgeries or repeat arthroscopies were excluded. 52 patients satisfied this criteria and were included in this audit. The age of the patients ranged from 26 years to 68 years and there were 58% males and 42% females. RESULTS: Using arthroscopy as the gold standard, MRI was found to have a sensitivity of 98%, specificity of 95%, positive predictive value of 94%, and negative predictive value of 96% in meniscal tears. In assesing anterior crucitae ligament tears, it had a sensitivity of 95%, specificity of 99%, positive predictive value of 92%, and negative predictive value of 100%. CONCLUSION: MRI knee has a very high positive and negative predictive value in detecting meniscal and cruciate ligament tears. Owing to its high negative predictive value, Arthroscopy can be safely avoided in those with negative MRI unless strong clinical suspicion remains

ELECTRONIC POSTER e825

Acetabular fractures for dummies: radiographic and CT appearances

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KEY LEARNING OBJECTIVES: Interpretation of five commonly occurring acetabular fractures on radiography and CT. To illustrate the key relevant anatomic features of acetabulum and the pelvis. DESCRIPTION: Normal anatomy of the acetabulum as well as characterisation of acetabular fractures is complex. This is made even more difficult by the different classification systems and the interpretation of widely accepted Judet-Letournel classification scheme. We attempt to describe the normal anatomy on Radiography and CT multiplanar reconstructions, especially of the anterior and posterior columns, anterior and posterior walls and the importance of obturator ring disruption in the fracture classification system. We describe the five most common types of fractures: Isolated posterior wall, Transverse, Transverse plus posterior wall, both column and T-shaped fractures. CONCLUSION: Radiography and CT multiplanar reconstructions are helpful in the understanding of five common types of acetabular fracture patterns.

Vascular/Intervention

POSTER p901

Pictorial review of the imaging appearances of aortic coarctation, its associations, treatment and complications

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KEY LEARNING OBJECTIVE: To give a complete overview of the spectrum of aortic coarctation from diagnosis to treatment. We will demonstrate all associated pathologies, such as bicuspid aortic valve and angiopathy, and show the appearances of the various treatment options and all related complications such as Dissection, Aortobronchopulmonary fistula (a life threatening complication), Intracranial aneurysm. The optimal radiological follow up will be discussed. DESCRIPTION: Many advances have been made in both the imaging and treatment options available for patients with aortic coarctation. MRI provides the capability of assessing both the anatomical and physiological importance of aortic coarctation and its associated lesions and complications. We will discuss the technical requirements of cardiac optimized MRI and CT, and demonstrate the anatomical and physiological information provided. How this influences treatment will be discussed. CONCLUSION: MRI and CT provide comprehensive tools for the diagnosis, treatment and long term follow up of aortic coarctation.

POSTER p902

MRI assessment of lack of aortic spiral flow is associated with increased progression of renal arterial disease

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PURPOSE: To determine the relationship between the lack of spiral flow in aorta and progression of renal arterial disease on MRA. MATERIALS/METHODS: Prospective study of 40 patients (23 male, 17 female) with clinically suspected renal arterial disease. Baseline and follow up (mean 10.2 months) comprising phase contrast flow quantification of the abdominal aorta for spiral flow and standard 3D contrast enhanced renal MRA were performed on at 1.5 T system. Renal artery stenosis (RAS) was graded as minimal (<30%), moderate (31–60%) or severe (>61%). RESULTS: Spiral flow in the aorta was seen in 21 patients (52.5%). 41 renal arteries in the spiral group and 32 renal arteries in the non-spiral group evaluated. The mean RAS at the baseline and follow up studies was 15% and 17% for spiral group and 25% and 36% the non-spiral group. In the non-spiral group, 7/32 (21.9%) RAS progressed , 2 from moderate to severe and 5 from minimal to moderate. In the spiral group, 1/41 (2.4%) progressed from minimal to moderate RAS. Significant difference was found in the non-spiral group (paired t-test $p < 0.0001$) but not in spiral group (paired t-test $p = 0.06$) on comparing baseline and follow up RAS values. Significantly greater progression of RAS noted at follow-up in the nonspiral group in comparison(two sample t-test $p= 0.0008$). CONCLUSION: Lack of spiral flow in aorta is associated with increased progression of RAS and determining lack of spiral flow during MRA examination may be a useful indicator to determine likelihood of RAS progression which may guide appropriate intervention.

POSTER p903

Does the use of base data improve the interpretation of contrast-enhanced magnetic resonance angiography?

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PURPOSE: To quantify the impact of venous contamination and use of MRA base data in interpretation of contrast enhanced magnetic resonance angiography (MRA) of the lower limb in a comparative study with conventional angiography (CA). MATERIALS AND METHODS: In a prospective study of 37 patients (mean age 60 years), floating table MRA was performed with bolus tracking and intravenous triple dose gadolinium chelate at 1 T within 5 days of CA. CA was performed with flush aortography and digital subtraction. Two readers blinded to the other study assessed CA and MRA of the arterial tree in 19 segments from infrarenal aorta to lower calf. MRA base data and maximum intensity projection (MIP) were compared. Venous contamination was documented. RESULTS: There was no significant difference between occlusions and non-visualized segments above the knee. From popliteal artery to lower calf, 83 of 727 segments were not visible on CA and 49 of 725 on MRA ($p = 0.0048$). 34 infrapopliteal segments were obscured at MRA by venous contamination. 132 infrapopliteal segments were occluded at CA and 98 segments on MRA ($p = 0.0398$). When evaluating MRA, there was no significant difference between MIP readings with base data and without base data. CONCLUSION: MRA demonstrated distal vessels better than CA. Venous contamination limited the value of

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MRA in severe disease and base data did not significantly improve accuracy. However, techniques such as calf timing test dose and thigh compression may overcome venous contamination as a limitation of MRA.

POSTER p904

Are there enough patients suitable for EVAR in a medium sized DGH?

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PURPOSE: The role of endovascular aneurysm repair (EVAR) for medically fit patients with abdominal aortic aneurysms (AAA) has been advocated based on its minimally invasive nature and its improvement in early mortality. It is as expensive as open surgical repair, has a higher re-intervention rate and unproven long term efficacy. Despite this, it has come to be regarded as a viable alternative to open surgery. This prompted us to consider the feasibility of introducing an EVAR service into the DGH setting. Materials: All patients who had a CT scan for assessment of AAA over a 2 year period were reviewed. Those with ruptured aneurysms or aneurysms smaller than 5.5 cm were excluded. The CT scans were reviewed to assess suitability for EVAR repair, focusing on the following criteria: infrarenal aneurysm, the angle of aneurysm with neck, the neck length, the diameter of the neck, its shape and its angle with the suprarenal aorta. RESULTS: 64 patients with a AAA had a CT scan of the aorta of which 46 met the inclusion criteria (37 male and 9 female; age range 64–85 years, mean age 74.1 years). Using only the morphology of the aneurysm, EVAR would be potentially suitable in 16 out of 46 patients (8/year), from a population of 250 000. CONCLUSION: In order to maintain expertise, we felt that there should be a minimum of 15 to 20 cases for EVAR per year. Our review suggests the number of patients presenting in a DGH setting is too small to instigate a service.

POSTER p905

Pictorial review – interventional techniques in the management of haemoptysis

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KEY LEARNING OBJECTIVES: To review and illustrate the interventional radiological management of patients presenting with haemoptysis. DESCRIPTION: Moderate to severe haemoptysis, which can be life threatening, may complicate a variety of chronic lung conditions. In our centre, the most common underlying pathologies are cystic fibrosis, aspergillus disease and bronchiectasis. The principle interventional technique practiced is bronchial artery embolisation. This requires a comprehensive knowledge of bronchial arterial anatomy, which is very variable. We illustrate common bronchial artery anatomy, variants and anomalous collateral vessels. The importance of spinal collateral vessels as to a potential source of complication is stressed. A further technique employed, related to aspergillomas, is that of CT guided intracavitary instillation of amphotericin paste, which acts as a sclerosant as well as an antifungal agent. In the case of both described techniques, repeat procedures may be required due to the nature of the underlying disease. CONCLUSION: Haemoptysis is a distressing and potentially life threatening condition for which minimally invasive techniques offer management options. Awareness of the potential pitfalls and complications of the common interventional techniques practiced is important to achieving a successful outcome.

POSTER p906

Initial experience of CTA for acute gastrointestinal haemorrhage

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PURPOSE: Multidetector CT (MDCT) angiography (CTA) has advantages over conventional angiography for acute gastrointestinal haemorrhage: It is non-invasive. Movement artefact is abolished. The underlying pathology can be assessed. We retrospectively review our Institution's experience. MATERIALS/METHODS: Over 2 years, 22 patients underwent CTA for acute gastrointestinal bleeding. Images were obtained using a GE Lightspeed 16-slice scanner. Arterial phase images were acquired at 0.625 mm and reconstructed up to 1.25 mm. Pre-contrast and delayed images were acquired at 5 mm. Active bleeding was diagnosed when contrast density was identified within the bowel lumen. RESULTS: CTA demonstrated the bleeding point in 6 patients (27 %); in 5, this was in the lower-GI tract. 5 underwent conventional angiography with 100% concordance with regard to the bleeding site. The other underwent surgery. Of the 16 patients with negative CTAs: 5 had further bleeding within 30 days: 3 had already been shown to have haemorrhagic duodenitis on endoscopy. 1 underwent proctoscopy which revealed dehiscence of his colorectal anastomosis. One underwent conventional angiography which revealed his rectal bleeding point. One patient died soon after CTA, probably from PE. The records of one patient are unavailable. 9 patients had a negative CTA and no further bleeding within the next 30 days. These patients were spared an invasive procedure. CONCLUSION: CTA if positive accurately localizes the site of bleeding and if negative spares many patients invasive investigation. In our series, CTA was better at identifying bleeding points distal to the ligament of Treitz, and in patients with evidence of ongoing haemorrhage.

POSTER p907

Pseudoaneurysms following pancreatitis or pancreatic surgery: imaging and endovascular management

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PURPOSE: Visceral artery aneurysms are among the most infrequent aneurysms that affect the arterial circulation – with approximately 25% presenting as a clinical emergency and 8.5% resulting in a fatal outcome. A ruptured pseudoaneurysm is the most rapidly fatal complication of chronic pancreatitis, with a reported mortality ranging from 12.5% in treated patients to approximately 90% in untreated cases. Clinical symptoms, natural history, and mortality of pseudoaneurysms following pancreatitis or pancreatic surgery vary depending on the vessels involved; the most common sites following pancreatitis include: hepatic, gastroduodenal and splenic arteries, and following pancreatic surgery include: hepatic and gastroduodenal artery stump. METHODS: During a 4 year period, nine patients presenting with pseudoaneurysms following pancreatitis or pancreatic surgery underwent treatment using interventional radiological techniques. All cases were retrospectively reviewed. The techniques used included transcatheter embolisation, covered stent insertion and percutaneous thrombin injection. RESULTS: All patients were successfully treated using interventional techniques. One patient who underwent percutaneous thrombin injection required further endovascular coiling due to refilling of the aneurysm sac. One patient developed multiple hepatic abscesses following embolisation. No deaths occurred. CONCLUSION: Management of pseudoaneurysms following pancreatitis or pancreatic surgery poses a challenge to the interventional radiologist. Surgery is associated with high rates of morbidity and mortality; therefore interventional techniques offer an attractive alternative with more acceptable complication rates.

POSTER p908

Venous interventions following cadaveric liver transplant

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PURPOSE: We describe our experience of endovascular treatment of symptomatic post transplant hepatic vein stenosis. MATERIALS/METHODS: A retrospective analysis of symptomatic patients referred for post transplant hepatic venoplasty and stenting. Diagnosis was based on clinical, radiological and laboratory findings. Following venography and pressure measurements angioplasty/stenting was performed. Technical success required angiographic improvement and pressure gradient reduction; clinical improvement related to improvement in liver function, diuresis and reduction in ascites. RESULTS: Incidence of hepatic vein stenosis was 2%. 21 patients (13 female) were treated for ascites, oedema or effusion. The time from transplant to first intervention ranged from 13 days to 941 days (median 178 days). Median number of interventions/patient was 2. The interval between interventions was 9–3274 days (median 221 days). The mean pressure gradients fell from 12 mmHg to 4 mmHg post intervention. Angiographic and clinical improvement occurred in 19

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(90%) of the patients. 10 (48%) patients required stenting for failed PTA or restenosis. One peri-procedural death occurred unrelated to the radiological intervention with a further 8 deaths during follow-up. CONCLUSION: Angioplasty is an effective treatment for post transplant hepatic venous outflow obstruction. Stent insertion can be reserved for patients with restenosis or resistant to angioplasty.

POSTER p909

Acutely occluded renal dialysis access – can they be detected early and is intervention worthwhile?

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PURPOSE: To retrospectively evaluate the efficacy, safety and outcome of percutaneous thrombectomy of thrombosed dialysis access and to determine whether it is possible to predict if an arteriovenous fistula will occlude MATERIALS/METHODS: All patients who underwent percutaneous thrombectomy in one unit from January 2003 till November 2006 were retrospectively analysed. The relevant data regarding the type and site of dialysis access, details of dialysis flow and pressures were obtained from case notes and renal dialysis records. The final outcomes in terms of technical success, complications, clinical success and patency rates were assessed as per the guidelines of the Society of Interventional Radiology (S.I.R). RESULTS: A total 92 fistula thrombectomies were performed in 65 patients. 85% of these were carried by radiological approach. The technical success was achieved in 67%, with a clinical success rate of 55%. Among these clinically successful patients, the primary patency at 3 months was 73% reducing to 40% at 6 months. The secondary patency was 70% at 3 months. There were 7 complications (4 haemotomas, 2 distal emboli and 1 steal phenomenon). The increasing venous pressure was useful in predicting the access occlusion. There was 13% increase in venous pressure 4 weeks prior to occlusion which increased to 30% in the week prior to occlusion. CONCLUSION: Dialysis access at risk of acute occlusion may be detected up to 1 month prior to occlusion. Percutaneous thrombectomy of thrombosed dialysis access is a safe and useful technique. It contributes significantly in salvaging and maintaining the haemodialysis access.

POSTER p910

The Synergraft 100 ™ bovine ureter: patency, imaging and intervention characteristics of this novel haemodialysis conduit

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PURPOSE: To assess the primary and secondary patency rates, imaging and intervention characteristics of these novel grafts which are alternative conduits for haemodialysis patients in whom native veins have failed. METHODS: Data were acquired retrospectively using the hospital RIS system, the vascular access department database and the Synergraft registry from 1/4/02 to 1/1/07. Patients were monitored with 6 monthly graft surveillance using Duplex following fistula formation. Patients with low flow at dialysis, stenoses demonstrated at Duplex, or clinically compromised grafts were referred for digital subtraction fluoroscopy (DSF) or percutaneous transluminal fistuloplasty (PTF). For each patient the number of interventions, site and number of graft complications, and patient outcome was recorded. RESULTS: A total of 32 Synergrafts in 28 patients were formed. 22 patients were followed up in our institution. A total of 54 fistulograms and 71 interventions were performed. There were 23 graft stenoses, 39 venous anastomosis stenoses, 20 central vein stenoses, 13 non central vein stenoses and one arterial anastomosis stenosis. The complication rate was very low with only 3 stents required for rupture (one in a graft). 17 patients are still alive, 14 grafts are still in use and one patient has had a renal transplant with the graft in use up to that point. For statistical analysis, primary and secondary patency rates of the grafts have been calculated using the Kaplein-Meier technique. CONCLUSION: Synergrafts have a promising role in patients with no available autogenous veins and are amenable to percutaneous intervention.

POSTER p911

Uterine artery (fibroid) embolisation: radiation doses and fluoroscopic times in a UK teaching hospital

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PURPOSE: To assess the radiation doses associated with uterine artery embolisation (UAE) and to determine the fluoroscopy times. To present our imaging parameters and procedural techniques. MATERIALS AND METHODS: Increasing number of UAEs are being performed for symptomatic fibroids. Most patients who undergo UAE are women of childbearing age, limitation of radiation is therefore important. This is a retrospective study of women undergoing UAE at Southampton General Hospital between 2003 and 2006. The radiation doses and fluoroscopy times were determined from the interventional room registry. Dose refers to skin entrance dose measured in cGy cm^2 using DAP meters and screening time refers to the length of time the patient received any kind of dose. The mean dose from the British Society of Interventional Radiology (BSIR) fibroid registry is 9000 cGy cm^2 and any patient in our group having received a dose of more than 6000 was further assessed. RESULTS: A total of 87 patients who underwent UAE were included. 49 procedures were carried out by the Consultant and 38 partly or entirely by senior radiology trainees. All procedures were performed using a unilateral groin puncture. The average radiation dose and screening times were 2070.95 cGy cm^2 and 749 s (12.49 min), respectively. Only 9 patients received a dose of more than 6000 cGy cm^2 which is significantly lower than the average dose of 9000 cGy cm^2 from the BSIR registry. CONCLUSIONS: UAE can be performed with minimal radiation doses and fluoroscopy times whilst maintaining quality standards.

POSTER p912

The corona mortis – bed rest and analgesia can be fatal in pubic rami fractures

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KEY LEARNING OBJECTIVES: After reviewing this presentation, attendees will be able to: (1) Describe the anatomy and incidence of the corona mortis. (2) Understand the significance of the corona mortis in the aetiology of life-threatening haemorrhage from isolated fractures of the pubic rami, and recognize the CT and angiographic appearances. (3) Appreciate the crucial role of both diagnostic and interventional radiology in the emergent management of this relatively rare, but potentially fatal, complication. DESCRIPTION: The corona mortis (crown of death) is a vascular anatomical variant that places vessels in close proximity to the superior pubic ramus and renders them liable to injury with isolated pubic rami fractures. This exhibit describes two cases of life-threatening haemorrhage arising from isolated pubic rami fractures. The presentation highlights the anatomy and incidence of the "corona mortis" anatomical variant and outlines its significance in predisposing these patients to post-traumatic pelvic haemorrhage. The role of CT in demonstrating acute haemorrhage with active extravasation of contrast adjacent to the fracture site, and the emergent treatment of this condition with successful embolisation of the bleeding vessel are illustrated. A brief explanation of the interventional technique is provided. CONCLUSION: Awareness of this rare but life threatening complication of isolated pubic rami fractures can lead to prompt radiological diagnosis and treatment. Such fractures are traditionally treated conservatively by clinicians who are less familiar with the anatomy of this region. It may fall on the radiologist to initially suspect the diagnosis and recommend appropriate investigation and treatment.

POSTER p913

"Curved sheath technique" in antegrade ureteric stent deployment – a novel and effective variation

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PURPOSE: Percutaneous antegrade ureteric stent deployment through a a lower pole nephrostomy is technically demanding due an adverse angle into the ureter, causing buckling of wire and catheter in the pelvis. In

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order to minimize this, deployment of a stiff, pre-curved vascular sheath was performed and its effect was evaluated. MATERIALS/METHODS: An initial audit of all percutaneous ureteric stents revealed that those performed through lower pole nephrostomies were technically demanding with higher radiation and complication rates due to the adverse angle of approach. 10 patients with lower pole nephrostomies, capacious pelves and high grade obstruction were included in this prospective study. During the procedure, a 9 french vascular sheath was inserted into the renal pelvis. A curve was mechanically put on the outer wall of the vascular sheath (modification discussed and agreed with manufacturer) before insertion such that the adverse acute angle could be obliterated. When the sheath was deployed, care was taken to position the distal tip at the pelvi ureteric junction. Wire and catheter combination was then used to cross the stricture and deploy the stent. RESULTS: In all the patients, the vascular sheath maintained its curvature when deployed, thus helping to negotiate the adverse angle. Passage of catheter, wire combinations and stent deployment was done without any buckling in the renal pelvis. Procedure time, radiation dose was reduced with no complications. CONCLUSION: The introduction of a stiff pre curved vascular sheath prevents cather buckling in the renal pelvis during insertion of antegrade ureteric stents via lower pole nephrostomies. There is substantial reduction in complication rates,procedural time and radiation dose.

POSTER p914

Failure of thrombolysis for lower limb arterial occlusion a predictor of subsequent amputation

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PURPOSE: To determine the factors predicting amputation of the affected lower limb 12 months after thrombolysis for acute arterial occlusion. MATERIALS AND METHODS: The clinical endpoints of 36 patients (23M/13F, average age 69 years) who were alive 1 year after catheter-directed thrombolysis with alteplase (average dose 30 mg, average duration 24 h) for lower limb arterial occlusion (28 native arteries, 8 grafts) from January 2001 to June 2005 were assessed. The amputation rate at 12 months was analysed in relation to the type of vessel, thrombolytic success or failure, presence or absence of complications, and further surgical requirement using Fischer's exact test. RESULTS: Successful thrombolysis, defined as complete clot dissolution based on angiographic imaging, was achieved in 67% of cases (18 native artery, 6 bypass graft) with a complication rate of 22.2% (n=8). The major and minor complication rates were 5.5% (n=2, hypotension, haematemesis) and 22.2% (n=8, groin haematoma, groin bleeding), respectively. No one had an intracranial bleed. 1 year after thrombolysis, 30.5% (n=11) had further surgery (embolectomy, bypass graft, fasciotomy) and the amputation rate was 22.2% (n=8). Statistical analysis showed that the amputation rate was significantly higher for patients with failed compared with successful thrombolysis ($p \leq 0.01$). The amputation rates did not reach statistical significance in relation to native artery or graft occlusion, presence or absence of complications, and whether or not additional surgery was required. CONCLUSION: Failure of thrombolysis, *i.e.* incomplete clot dissolution, was a predictor for amputation up to 12 months post thrombolysis regardless of the type of vessel occlusion, presence of complications or additional surgical requirement.

POSTER p915

Ultrasound-guided percutaneous injection of femoral pseudoaneurysms using thrombin: our experience

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PURPOSE: Pseudoaneurysm formation is a recognized complication of femoral puncture with an incidence of up to 8%. Treatment options include surgery or less invasive options, such as ultrasound-guided compression and percutaneous thrombin injection. Our aim was to retrospectively evaluate the effectiveness of ultrasound scan-guided thrombin injection as a treatment of iatrogenic femoral artery pseudoaneurysms. MATERIALS/METHODS: A retrospective study of all ultrasound guided-thrombin injections of femoral pseudoaneurysms performed during the period 2001–2005 in our institution. Experienced vascular radiologists carried out all procedures. A 22-gauge needle was used to inject 0.2–1 ml thrombin solution (500 IU ml^{-1}) to induce thrombosis within the pseudoaneurysms with an average procedure time of 15 min. The success and complication rates were obtained. RESULTS: A total of 35 women and 34 men underwent this procedure. No procedural complication or mortality occurred. The thrombin injection was successful in 66/69 (96%) patients. Two patients, however, required additional thrombin injection of 500–1000 IU 3 days following the original injection. The 3 patients in whom the procedure failed underwent endovascular stent graft placement. CONCLUSION: Ultrasound-guided percutaneous injection of thrombin is a quick, effective and safe method of therapy and is the treatment of choice for femoral artery pseudoaneurysms. Unsuccessful cases can be treated endovascularly without the need for surgical repair.

ELECTRONIC POSTER e916

Central and peripheral pseudoaneurysms: pictorial review and discussion of treatment options

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KEY LEARNING OBJECTIVES: (1) To understand the clinical situations where pseudoaneurysms present and their aetiologies. (2) To recognize the appearances of pseudoaneurysms using different imaging modalities. (3) To understand different treatment options, including minimally invasive and non-invasive radiological procedures. DESCRIPTION: Pseudoaneurysms are most commonly secondary to peripheral angiographic intervention, but have a number of aetiologies. They may be post-traumatic, including iatrogenic, inflammatory (*e.g.* pancreatitis) or infective. An understanding of these aetiologies is essential for optimization of imaging strategies allowing for early detection and treatment. This poster reviews the imaging characteristics of central and peripheral pseudoaneurysms using a variety of imaging modalities. These include CT, CT angiography (CTA) and digital subtraction angiography (DSA), MRI, ERCP, ultrasound and endoscopic ultrasound (EUS). Treatment options include surgery, ultrasound guided compression, endovascular intervention (embolisation using different agents or stent graft exclusion) and thrombin injection. We will discuss the role of radiological intervention. CONCLUSION: Early recognition and prompt treatment of pseudoaneurysms will reduce complications secondary to rupture. Modern radiological techniques allow for accurate diagnosis and minimally invasive therapeutic options, with reduced morbidity and mortality compared with surgery.

ELECTRONIC POSTER e917

Arterial and cardiac complications of central venous catheterization diagnosed by CT and CT-angiography (CTA)

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PURPOSE: The use of central venous catheterization (CVC) is routinely performed in hospital clinical practice with reported complication rates 1.6–13%. The early diagnosis of severe, potentially lethal complications like arterial puncture and cardiac effusion is crucial for proper patient management. We report the value of CT scan and CT-angiography (CTA) in the diagnosis of severe CVC complications. MATERIALS/METHODS: We reviewed 7 cases of patients in which CVC was complicated with arterial puncture [subclavian artery (6), brachiocephalic artery (1)] and 1 case with cardiac tamponade. The clinical presentation (dyspnoea, audible stridor on mild exertion, tachycardia, chest pain, drop of haemoglobin) was varied and some patients had coagulation disorders. X-rays and CT-CTA investigation followed before management. RESULTS: X-rays findings were in most cases vague. CT/CTA revealed the nature of the complication: acute bleeding (*i.e.* contrast media extravasation), mediastinal haematoma, pseudoaneurysm formation, hemopericardium. When the catheter was present CT scan determined its precise positioning and its entrance site into the arterial system. Except for the patient with cardiac tamponade who passed away during the CT examination, CT imaging was beneficial for early diagnosis and proper patient management. CONCLUSION: CT/CT-angiography in combination with 2D–3D postprocessing techniques clarifies complex vascular

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and nonvascular anatomy in thorax. Thus is the modality of choice for the assessment of thoracic vascular emergencies after iatrogenic trauma in the emergency setting. It is essential for all physicians involved to recognize early the clinico-laboratory evidence of CVC vascular complications. CT/CTA is useful in confirming the diagnosis and planning the therapeutical approach.

ELECTRONIC POSTER e918

Traumatic pseudoaneurysms in pelvis and lower extremities: CT and CT-angiography evaluation

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PURPOSE: To evaluate the potential of CT and CT-angiography (CTA) with two- and three-dimensional reformation in the assessment of traumatic vascular injuries of pelvis and lower extremities. METHODS/MATERIALS: 17 trauma patients with clinical suspicion for vascular injury were referred to our department for further investigation. Single slice CT was followed by CTA. 120 ml of non-ionic contrast medium was automatically injected at 4 ml s^{-1} and the scanning delay was 20 s. Sections of 3 mm thickness were reconstructed at 1.5 mm intervals. Postprocessing included 2DMPR, MIP and 3DVRT techniques. DSA followed in all patients. RESULTS: Among 17 patients, CT and CTA demonstrated a pseudoaneurysm formation in 8 cases [common iliac artery (2), internal iliac artery (2), external iliac artery (2), deep femoral artery (1), fibial artery (1)]. 9 cases were negative for vascular injury. DSA confirmed the above findings. CT and CTA were able to depict thrombus formation and allowed precise assessment of adjacent structures. In 2 cases with small pseudoaneurysms the change in vessel contour was better delineated by DSA. CTA in one case was limited by artifacts from a metallic hip joint prothesis. 6 patients were treated interventionally by endovascular repair. 2 patients were operated. CONCLUSION: CT and CTA offer useful information for therapeutical planning. The characterization of pseudoaneurysm formation in trauma patients is similar to DSA display. DSA seems to demonstrate better small pseudoaneurysms and has the distinct advantage for endovascular treatment at the same time.

ELECTRONIC POSTER e919

Intra-arterial thrombolysis for acute limb ischaemia. A definitive procedure or does it just bide time?

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PURPOSE: Intra-arterial thrombolysis is an alternative treatment strategy for acute limb ischaemia (ALI) being performed in the majority of ALI cases at our unit. We assessed limb salvage following thrombolysis and ascertained whether any further procedure was required to maintain limb survival. MATERIALS/METHODS: Case notes for patients who underwent thrombolysis for ALI according to our protocol were reviewed. 48 patients (50 events) were identified (31 male; ages 34–85 years; median 68.5 years) between 1997 and 2004. RESULTS: 49 cases presented with lower limb ischaemia, 35 of which had known pre-existing peripheral arterial disease. 1 case involved upper limb ALI. 33 cases involved native vessels, 17 involved grafts (14 prosthetic, 2 vein and 1 occluded stent). Using thrombolysis as an initial treatment strategy, overall limb survival on index admission was 84%. Of this group having successful limb salvage, 76% was attributable to thrombolysis alone, the rest being attributable to anticoagulation (no radiological evidence of recannalization) or subsequent surgery after failed thrombolysis. Significant complications occurred in 8% of cases, no deaths were attributed to thrombolysis. Patients alive at 6 months and 24 months after index admission having limb salvage attributable to thrombolysis alone had limb survival rates of 89% and 82%, respectively. The majority of these patients (>75%) did not require subsequent secondary procedures or surgery to maintain limb survival. CONCLUSION: The majority of patients alive 2 years after successful thrombolysis had limb survival without requiring further subsequent intervention. Thrombolysis is an acceptable and less invasive treatment of ALI, preventing many patients necessitating surgery.

ELECTRONIC POSTER e920

Hickman line removal by simple traction method

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PURPOSE: Interventional Radiologists are increasingly involved in the insertion and management of Hickman lines. There are various designs, with most incorporating a woven cuff to assist fixation through integration into subcutaneous tissues. Traditionally, removal by line traction has only been recommended for devices sited for a maximum duration of 2 months, with cut-down on to the fixation cuff for greater dwell times. The aim was to demonstrate the complication rate following removal by traction. MATERIALS/METHODS: Retrospective analysis was conducted on the removal of Bard Hickman lines. The reason for line removal, duration of placement, removal method and subsequent complications were recorded. Data was generated through case note review and computerized documentation retrieval. RESULTS: The results reflected a 36 month period, involving 110 lines, with line extractions performed by radiologists and other clinicians. The majority of lines were removed by simple traction, including those dwelling greater than 2 months; however, the technique depended upon the attending clinician's preference. Of lines removed locally, no procedural failures and no referrals for surgical cut-down were experienced following simple traction. CONCLUSION: Hickman line removal by simple traction is feasible in the majority of cases, obviating the need for surgical cut-down. Benefits were demonstrated in reduced clinician time, minimization of materials required and shorter on table durations for patients, without excess short-term complications.

ELECTRONIC POSTER e921

Audit of colorectal stenting in the Oxford Radcliffe NHS Trust

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PURPOSE: To evaluate the effectiveness of colorectal stenting in the treatment of strictures in our institution. To assess the rate and causes of complications. MATERIALS/METHODS: This was a retrospective, case-note based review. The radiology information system was interrogated using the Boolean search criteria "stent" AND "colon" OR "rectum", between August 2004 and July 2006. 62 cases were identified. The case-note and radiology were retrieved and reviewed. The indications, procedure details and complications were recorded on a proforma for analysis. RESULTS: A total of 62 cases were identified, 38 male and 24 female with mean age of 73 years (range 29–82 years). 65% (n=40/62) procedures were performed for obstructing tumours and 65% (n=40/62) on a palliative basis. Diverticular strictures were present in 9% (n=6/62). The remainder were for extrinsic compression. 30% (n=19/62) lesions were at the rectosigmoid and 43% (n=26/62) in the sigmoid. Only two cases were attempted in the transverse colon and none in the ascending colon. 35% (n=22/40) of cases were colonoscopically assisted. The immediate technical success rate was 82% (n=51/62). 13% (n=8/62) of procedures were complicated by perforation. Of these 3 required emergent surgery, 3 were not fit for surgery and subsequently died. CONCLUSION: Colorectal stent is an effective treatment for obstructing lesions, with a high technical success rate. Despite the low complication rate in the published literature, this may not be reflected in clinical practice. Careful attention must be made to the results at one's own centre.

ELECTRONIC POSTER e922

Comparison of IVC filter tilt: is there a difference when inserted via a femoral or jugular approach?

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PURPOSE: To assess tilt of IVC filters inserted via either a jugular or femoral approach. IVC filters situated centrally within the IVC are easier to remove, require less screening time, and theoretically work better as they are designed to sit centrally. METHODS: All IVC filter insertions between 10 January 2003 and 10 November 2006 were reviewed. The filter orientation on an AP (and when available a lateral) cavagram was assessed. Orientation was defined as being within the

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central, middle, or outer third of the IVC at the filter tip. RESULTS: 74 IVC filters were inserted, 66 had tilt assessed in the AP plane, 27 had both AP and lateral films. Of the 66 cases with AP cavagrams, 31 filters were inserted via the jugular route, and 35 via a femoral route. Of the 27 cases with both AP and lateral cavagrams, 16 were inserted via a jugular and 11 via a right common femoral approach. There was no statistical difference in the orientation in the AP plane when comparing the two routes of insertion. There was poor concordance of orientation when AP and lateral views were compared. 47% of ALN filters and 16% of Tulip filters were central when inserted via a jugular approach. 38% of both filters were central when inserted via a femoral approach. CONCLUSION: No difference in orientation was demonstrated between jugular and femoral approaches. There is poor concordance of AP and lateral images. ALN filters are best inserted via a jugular approach.

ELECTRONIC POSTER e923

CT guided percutaneous nephrostomy

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PURPOSE: Percutaneous nephrostomy is traditionally undertaken using a combination of fluoroscopy and ultrasound. With experienced hands success is achieved in a high proportion of cases. However, the procedure may be technically demanding and occupy two modalities for a significant length of time. The acquisition of multislice CT (MSCT) prompted us to consider its use in percutaneous nephrostomy. This paper describes our findings and compares it with conventional techniques. MATERIALS/METHODS: 44 patients who underwent percutaneous nephrostomy insertion at Macclesfield District General Hospital, between January 2002 and March 2006, were reviewed. RESULTS: CT guided nephrostomy placement was performed in 30 patients. After 24 h 23 (77%) were functioning satisfactorily. Access was later lost in 5 (22%) – mean length of access of 6.8 days. Two were performed for failure of a fluoroscopic guided procedure. In the same time period 14 patients had fluoroscopic guided nephrostomy placement. After 24 h 11 (78%) of these nephrostomies were still functioning but access was later lost in 2 (18%), with a mean length of access of 6 days. CONCLUSION: MSCT guided percutaneous nephrostomy is a technique with a similar success rate to that found with conventional modes of access. If fluoroscopic guided percutaneous nephrostomy fails, MSCT guidance is an alternative. Both methods have similar success rates. We have personally found the technique easier than with an ultrasound/fluoroscopic approach, especially for inexperienced radiologists. It is quicker and requires less patient cooperation. In many cases it may be considered as the primary form of imaging guidance.

ELECTRONIC POSTER e924

Radiologic insertion of gastrostomy (RIG): method of choice for gastrostomy placement in head and neck cancers

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KEY LEARNING OBJECTIVES: To illustrate the technique, pitfalls and complications of direct gastrostomy under fluoroscopic guidance with an explanation of its benefits over percutaneous endoscopic gastrostomy (PEG) for nutritional support in patients with treatable head and neck tumours. DESCRIPTION: Methods of gastropexy and gastrostomy under image guidance are reviewed, along with a discussion of anatomy and technical aspects. The outcomes and potential complications are discussed in the light of a 2-year experience in a tertiary cancer centre. CONCLUSION: Radiologically inserted gastrostomy (RIG) is more successful than endoscopic placement and avoids the risk of tumour seeding to the stoma site. A wide range of tubes including low-profile devices can be placed at the initial procedure, but complications are common and require appropriate patient support and aftercare.

ELECTRONIC POSTER e925

A pictorial display demonstrating the complications that may occur after oesophageal stent placement

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KEY LEARNING OBJECTIVES: (1) Identify and demonstrate the variety of different complications that can arise after oesophageal stenting. (2) To identify the incidence of these complications. DESCRIPTION: The use of oesophageal self expanding stent placement is the main palliative option in the management of patients with a malignant stricture. Stenting relieves dysphagia in approximately 90% of cases. Although complications of stent placement occur in as many as 25% of patients, oesophageal stents have an established place in the management of inoperable oesophageal carcinoma. In our institution ELLA, Ultraflex or Flamingo self expandable metallic stents (SEMS) are inserted under fluoroscopic guidance for palliation of dysphagia secondary to an oesophageal tumour. We will describe and illustrate a series of complications that we have encountered post-operatively from the common to the extremely rare. We will also describe all the other complications that can occur. A significant proportion of patients described chest pain and mild haemorrhage. The other complications that we encountered were oesophageal stent migration, benign overgrowth within the stent, pylorus obstruction, obstruction due to a food bolus within the stent and also a case of sigmoid perforation. CONCLUSION: Oesophageal stent insertion is an effective palliative option for malignant oesophageal obstruction with a low complication rate.

ELECTRONIC POSTER e926

Journey into (K) space

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KEY LEARNING OBJECTIVES: Pass through the fundamental physics of MRI, continue on and understand the MR pulse sequence. Then, journey onwards into k-space and beyond and appreciate the refinements of modern MR pulse sequences. DESCRIPTION: Nuclear magnetic resonance has progressed rapidly from the first detection of the free induction decay signal. Spatial localization techniques have led to the development of pulse sequences. Pulse sequence design has evolved to allow development of new contrasts and faster imaging techniques. Without a background in classical physics radiologists often struggle to get to grips with the latest MRI sequences. With the vast volume of information now accumulated the physics of MRI has can appear a daunting subject. However, developing an understanding of the constituents of the MR pulse sequence and its relation to k-space can increase the clinical utility of even the most basic MRI technique. This work will review the fundamental physics of MRI and demonstrate the relationship between the pulse sequence and k-space. CONCLUSION: For the best clinical utility of the emerging MR techniques, radiologists need to understand not only disease pathology but also the physics of the MRI technique.

Paediatrics

POSTER p1001

A guide to diagnosis of acute hydrocephalus in children

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KEY LEARNING OBJECTIVES: This pictorial review presents a pathway for the diagnosis of acute hydrocephalus, highlighting clinical and radiological findings. Pitfalls are also addressed. DESCRIPTION: Untreated hydrocephalus can result in death or morbidity. Early diagnosis is essential. Clinical findings of increasing head circumference, widened sutures, tense fontanelle (unfused sutures), headache, drowsiness, vomiting, visual disturbance and papilloedema raise the suspicion of hydrocephalus. Before fusion of the sutures, transcranial ultrasound is the first choice, assessing for ventriculomegaly, haemorrhage or mass lesion. Following closure of the sutures, CT is first line. Ventriculomegaly, rounding of the 3rd ventricle, sulcal effacement, periventricular low attenuation, narrowing of the ventricular angle, widening of the frontal horn radius indicate hydrocephalus. MRI allows assessment of CSF flow techniques (although usefulness is questionable). Causes and complications can be assessed. Important pitfalls in diagnosis include differentiation from white matter atrophy. The most reliable sign for this is rounding of the 3rd ventricle, increase in the anterior and posterior recesses, commensurate dilatation of the temporal horns with the bodies of the

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lateral ventricles. Temporal horn enlargement is not reliable in children with temporal atrophy. Periventricular oedema is not seen in young children due to masking by high cerebral water content. Imaging does not correlate well to ICP, monitoring may be required. A baseline scan is recommended for follow-up. CONCLUSION: Acute hydrocephalus can be difficult to diagnose and may be fatal. Important clinical and radiological findings can assess the rapidity of onset, severity and find the cause, allowing for prompt neurosurgical referral.

POSTER p1002

Clinical usefulness of motion-correction in MRI of the paediatric brain

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PURPOSE: Motion in paediatric imaging results in degraded images often requiring sedation/anaesthesia to obtain diagnostic images. Repeat appointments impact on patient throughput, and pose risks to patient health. BLADE (Siemens) is a novel method of MR data acquisition, in which k-space data is acquired radially. The most important data is acquired many times over and any motion is averaged. We aim to assess whether BLADE images are clinically acceptable in the paediatric patient. METHODS: Paediatric patients presenting for cranial imaging were scanned on a 1.5 T Siemens Magnetom Avanto with axial T_2 weighted TSE sequences. 10 uncooperative patients were scanned with BLADE; images were compared with 10 images acquired using existing protocols in cooperative patients. Images were analysed by 2 independent observers and scored for identification of 3 anatomical structures – 1 (not visible) to 5 (clearly visible). Grey-white matter contrast-noise ratio (CNR) was calculated. RESULTS: CNR was found to be significantly better in images acquired with BLADE (25.8 *vs*. 14.0, p=0.002). Scoring results, averaged over both observers and all structures, did not differ significantly between the two groups. CONCLUSION: Images acquired with BLADE are clinically acceptable. BLADE can reduce the necessity for repeat examinations and anaesthesia. It should be used in uncooperative paediatric patients and has been incorporated into the brain protocol at Royal Manchester Children's Hospital. Furthermore, we intend to assess the presence of artifacts relating to high frequency edge motion in all images.

POSTER p1003

Location, location ... ultrasound differential diagnosis of benign childhood neck masses

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KEY LEARNING OBJECTIVES: (1) To revise cervical anatomy and embryological development of the neck. (2) To review common and unusual paediatric neck pathologies, taking an anatomical approach to site-specific conditions and their characteristic ultrasound findings. DESCRIPTION: (1) Anatomical review of compartments of the neck, including embryological development, with particular reference to branchial clefts and the thyroglossal duct. (2) Outline of the use of ultrasound in the investigation of childhood neck masses. (3) Discussion of common and unusual neonatal/childhood neck masses, with particular attention to benign pathologies which have predetermined anatomical locations and characteristic ultrasound features. (4) Sample case illustrations of benign congenital, acquired, inflammatory, infective and vascular conditions. CONCLUSION: (1) Benign paediatric neck masses are common, and often exhibit characteristic ultrasound features. (2) Knowledge of cervical embryology, anatomy, and the classical sites at which these pathologies arise is the key to offering a sensible, short differential diagnosis. (3) Often clinical examination and ultrasound alone yields the diagnosis without the need for further cross-sectional imaging and/or biopsy.

POSTER p1004

Oesophageal atresia and tracheo-oesophageal fistula: a pictorial review

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KEY LEARNING OBJECTIVES: To recognize the role of imaging and the most common radiological appearances in the diagnosis and post-operative follow-up of children with oesophageal atresia and tracheo-oesophageal fistula. DESCRIPTION: We review the imaging findings in 65 children with oesophageal atresia and/or tracheo-oesophageal fistula presenting to our institution over a 10 year period. We describe the role imaging plays in diagnosis and follow-up, illustrating normal post-operative appearances and those of some early and late complications. We also demonstrate some of the most commonly associated congenital abnormalities. CONCLUSION: We present a pictorial review of our experience in imaging children with oesophageal atresia and tracheo-oesophageal fistula over a 10 year period.

POSTER p1005

Pre-renal transplantation radiological investigation of the vascular anatomy in children

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PURPOSE-MATERIALS: Thrombosis, narrowing and anomalies of inferior vena cava (IVC) and iliac veins (IV) can influence the surgical technique for renal transplant (RTx) surgery. At our institution, all potential RTx recipients have imaging of their vascular anatomy, with most cases investigated by Doppler ultrasound (US). Magnetic resonance venography (MRV) is reserved to clarify US findings and investigate high-risk patients. The purpose of this study was to compare these modalities in the evaluation of the IVC and IV. METHODS: Retrospective review and correlation of imaging and operative findings of patients undergoing RTx surgery, who have had both US and MRV examinations to evaluate their vascular anatomy. 29 children (aged 1–18 years (median 12 years), 19 female) were investigated over 5 years. 21 had susbsequent RTx surgery (8 deceased and 13 living related donor transplants). RESULTS: Normal anatomy on US and MRV in 17 (confirmed in 12 at operation, 5 await RTx). Technically difficult US examination needing MRV for clarification in 6 (21%). Abnormal MRV and US correlation in 1 (3%). Normal US and technically inadequate MRV in 2 (7%). Normal US with anatomical variation on MRV in 3 (10%). The anatomical variations included left sided IVC, aberrant right common femoral vein (CFV) and left IV partly drains into the azygos and left renal veins. CONCLUSION: US is an excellent screening tool for the evaluation of vascular anatomy patency in children. US has a higher technical failure rate (21%), needing MRV for clarification, which is superior in delineating anatomical variants.

POSTER p1006

Paediatric bone densitometry reference data for the Stratec XCT-2000 peripheral quantitative computed tomography (pQCT) scanner

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PURPOSE: pQCT has the unique ability to provide measurements of volumetric bone mineral density (vBMD) and bone geometry. However, there is a paucity of appropriate reference data available for the clinical interpretation of pQCT measurements in children and young adults. The aim of this study was to provide UK-specific paediatric reference data for the Stratec XCT-2000 pQCT scanner. METHODS: The study cohort consisted of 379 (203 male, age 12.3 ± 3.0 years, range 5–19 years) healthy Caucasian children from the Greater Manchester region, UK. The Stratec XCT-2000 pQCT scanner was used to measure total and trabecular vBMD (mg mm^{-3}) and BA (mm^2) of the 4% distal radius metaphysis and BA, cortical area (CA), medullary area (MA) (mm^2), cortical BMC (mg mm^{-1}) and cortical thickness (CT, mm) of the 50% midshaft radius diaphysis. The LMS technique of Cole and Green (1992) was used to produce gender specific reference centile curves for all measured parameters. RESULTS: Reference centile curves showing the 5th, 25th, 50th and 95th centiles for the distal (total and trabecular vBMD and BA) and midshaft (BA, CA, MA. cortical BMC and CT) radius, at yearly age

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groups, were produced for each gender. CONCLUSION: We provide the first UK-specific paediatric reference database for the assessment of pQCT measurements of vBMD and bone geometry of the distal and midshaft radius. These data allow the clinical interpretation of pQCT measurements in children and provide a valuable tool for understanding disease aetiology and the effect of treatment upon vBMD and bone geometry in different patient groups.

POSTER p1007

Practical aspects of performing peripheral quantitative computerized tomography (pQCT) with particular reference to children

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PURPOSE: Quantitative computed tomography (QCT) has advantages over dual-energy X-ray absorptiometry (DXA) in skeletal assessment. These include volumetric bone mineral density (BMD) (mg cm^{-3}), which is not size dependent, as is DXA "areal" BMD (g cm^{-2}) (relevant in growing children). Dedicated QCT scanners measure BMD in peripheral sites (radius and tibia). Although there is almost consensus in sites scanned in the adult radius (distal 4%, mid shaft 50%), there is considerable variation in scanning children (radius and tibia), in both location and technique. Our unit has experience with over 2000 children and methods adopted will be described. MATERIALS/METHODS: In adults' forearm, distal surface of radius is used as reference line. However, as children, who are still growing, have epiphyses, the reference line has to be placed differently to avoid scanning through the metaphysis. Precision (coefficient of variation CV%) calculated by repeating scans in 10 individuals. RESULTS: CV% was: at 4% distal radius: trabecular BMD = 0.78%; total (trabecular and cortical) BMD = 2.07%; at 50% site: cortical BMD = 0.86%; cross-sectional muscle area = 2.9%. In certain patients pQCT can be difficult to perform; in Turner's syndrome a Madelung deformity distorts the distal radius and reference line; in children treated with bisphosphonate (cyclical pamidronate) consequent Harris growth arrest line will falsely elevate BMD. CONCLUSION: pQCT, involving extremely low radiation dose (0.43 μSv), has application in paediatric skeletal study in health and diseases. However, scanning protocols need to be standardized and considerable technical skill is required of operators, to achieve good reproducibility.

ELECTRONIC POSTER e1008

Imaging of severe forms of mucormycosis in 5 immunocompromised patients

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PURPOSE: To describe the imaging patterns of severe forms of mucormycosis in immunocompromised patients. MATERIALS/METHODS: Five cases of severe forms of mucormycosis occurring after allogenic bone marrow transplantation were observed during the 2002–2005 period in a transplantation department. The diagnosis of mucormycosis was confirmed in all cases by pathology. The radiological data, including ultrasound (n=3) and CT scans (n=13) were retrospectively reviewed. RESULTS: They included three cases of pulmonary and two disseminated forms. Pulmonary disease included mainly lung condensation areas, sometimes with low attenuation foci, and nodules. Renal, hepatic and splenic foci show well-delinated, hypoechoic lesions with no flow on Doppler study, and with no measurable enhancement on post-contrast CT images. Multiple hypoechoic nodules were found in the case of thyroid location. Rapid growing of lesions was assessed by follow-up by subsequent CT scans (n=3) and death occur in all the cases despite surgery (n=2) and intensive medical treatment. CONCLUSION: Mucormycosis is a severe opportunistic fungal infection that has to be considered in immunocompromised patients. Imaging may be helpful in the initial diagnosis, but pathological confirmation remains necessary. Follow-up by CT scan may contribute to the prognosis in determining the growing rate of lesions under treatment.

ELECTRONIC POSTER e1009

Paediatric lung CT – effect of dose reduction on nodule detection

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PURPOSE: Radiation dose of any magnitude can produce a detrimental effect manifesting as an increased risk of genetic mutation. Cancer development maybe delayed for many years following radiation exposure. Minimizing radiation dose in paediatric patients is particularly important. However, reducing dose can degrade image quality and therefore hinder lesion detection. This study investigates the effects of reducing the image SNR on CT lung nodule detection for a range of nodule sizes. METHODS: A simulated nodule was placed at the periphery of the lung on an axial CT slice using image editing software. Multiple copies of the manipulated image were saved with varying levels of superimposed noise. The image creation process was repeated for a range of nodule sizes. For a given nodule size, output images were analysed in decreasing noise level order by a blinded post FRCR operator. The operator was asked to locate the lung nodule and to indicate a level of certainty of its correct identification on each image. The experiment was repeated for each size of simulated nodule. RESULTS: For correctly identified lesions, lesion detection at at a given operator confidence level demonstrates an exponential relationship between SNR and lesion size. Increasing the SNR allows smaller lesions to be detected. Operator confidence levels increase as SNR increases. An increase in SNR has a greater effect on increasing operator confidence for larger lesions. CONCLUSION: Reducing paediatric radiation dose is of paramount importance, but this is counterbalanced by the reduced sensitivity and increased uncertainty of CT lung lesion detection.

ELECTRONIC POSTER e1010

Management of paediatric thoracic empyema

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KEY LEARNING OBJECTIVES: (1) Illustrate the radiological features of thoracic empyema. (2) Describe the approach of ultrasound guided catheter insertion. (3) Describe the use of fibrinolytic agents as used at our institute. (4) Describe the complications encountered. (5) Review the current literature detailing other accepted practices and current trends in management of paediatric empyema. DESCRIPTION: The poster will: (1) Demonstrate the radiological features of empyema using plain film, ultrasound and CT. (2) Describe the approach of ultrasound guided pigtail catheter insertion as used at our institute. (3) Describe the use of fibrinolytic agents as used at our institute. (4) Describe the complications encountered from the treatment of empyema. (5) Review of current literature detailing other accepted practices and current trends in the management of paediatric empyema. CONCLUSION: The main learning points are: (1) To recognize the radiological features of empyema in children. (2) Knowledge of technique of drainage procedure as described. (3) Review of other techniques and current trends in the management of paediatric empyema.

ELECTRONIC POSTER e1011

Survey of paediatric CT dose settings from referring hospitals to a specialist paediatric hospital

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PURPOSE: Medical radiation may account for over a third of all background radiation. Children have a higher radio-sensitivity for CT compared with adults. Minimizing CT radiation is thus very important. Referring hospital radiation settings were compared with our own, to identify dose settings that can be adjusted easily to minimize radiation exposure. METHODS: Retrospective data collection of CTs sent to Birmingham Children's Hospital (BCH) for an 8 month period. We collected demographics, referring location with machine slice number, kV, mAs, slice thickness. 3 body regions of interest were

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looked at; head, chest and abdomen/pelvis. At BCH, the main variable setting is the mAs. A "CareDose" programme has an upper mAs limit to minimize total dose. For heads, if child <7 years old, maximum =150 mAs; if >7 years, maximum =300 mAs. For chests, if weight <55 kg, 30 mAs; if >55 kg, 100 mAs. For abdomen/pelvis, if weight <55 kg, 90 mAs; if >55 kgs, 200 mAs. RESULTS: 93 CT scans on 63 patients came from 26 referring hospitals. 60/93 (65%) referred CTs gave dose settings. 48/63 (76%) patients came from West Midlands region. 7/26 hospitals had CT slice numbers ranging from 4 to 32. For patients <7 years with head CTs, 5/15 (33%) had higher mAs than BCH; those >7 years, 3/15 (20%) had higher mAs. For children <55 kg having chest CTs, 6/7 (86%) had higher mAs. Children <55 kg having abdomen/pelvis CTs, 3/5 (60%) had a higher mAs. Median slice thickness and kV were nearly identical to BCH. CONCLUSIONS: Some referring hospitals have paediatric CT mAs settings greater than at BCH. Radiation dose reduction is possible using lower mAs settings.

ELECTRONIC POSTER e1012

Langerhans' cell histiocytosis: a pictoral review of paediatric skeletal manifestations

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KEY LEARNING OBJECTIVES: To demonstrate the typical skeletal paediatric manifestations in Langerhans' cell histiocytosis. DESCRIPTION: Langerhans' cell histiocystosis is an infrequently seen condition with very variable appearances (incidence of 2–5/1 000 000). It most commonly affects the paediatric bony skeleton, but extra osseous manifestations in most soft tissues are also seen. Bones involved typically include the skull, ribs, pelvis, femur, vertebrae and occasionally the mandible. There have been a number of recent cases in our local paediatric institution. CONCLUSION: A pictoral review of the typical paediatric manifestations is presented.

Nuclear Medicine

POSTER p1101

Hot spots in sternum

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KEY LEARNING OBJECTIVES: To provide an educational and pictorial review of the scintigraphic findings of sternal lesions. To review normal variants, benign and sinister causes of hot spots in sternum and their correlation with conventional radiographic findings. DESCRIPTION: The sternum and sternoclavicular joints are difficult to evaluate with plain radiographs. The sternum, in particular, is a site at which it is difficult to differentiate between benign bone disease and bone metastasis, because of varied uptake and wide individual variations. We present the normal variants and a spectrum of abnormalities, and emphasise the role of bone scan as a useful radiological investigation for the sternum and sternoclavicular joints. Although uncommon, a wide spectrum of pathological processes may involve the sternum, including metastatic disease, costochondritis, fracture, sternotomy, pagets, osteomyelitis including SAPHO. We discuss and illustrate the scintigraphic features of sternal disease that may allow for the differentiation of these entities. CONCLUSION: We have provided a concise guide of scintigraphic findings of both common and uncommon sternal diseases thus allowing confident radiological diagnosis on imaging grounds.

POSTER p1102

^{99m}Technetium based myocardial perfusion imaging: pearls, patterns and pitfalls

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KEY LEARNING OBJECTIVES: (1) To review the importance of myocardial perfusion imaging. (2) To discuss the radiopharmaceutical properties and biodistribution of 99mTechnetium based tracers. (3) To illustrate normal, abnormal, variants and artefacts. (4) To emphasise the importance of obtaining good images. DESCRIPTION: Myocardial perfusion imaging (MPI) depicts the distribution of flow in the myocardium. MPI identifies areas of reduced myocardial blood flow associated with ischemia or scar. 201Thallium and 99mTechnetium based tracers such as tetrofosmin (myoview) and sestamibi (Cardiolite). The common indications of MPI are to assess (a) presence, location, extent, and severity of myocardial perfusion abnormalities; (b) significance of anatomic lesions detected by coronary angiography; and (c) viable myocardium. Following acquition, the images are initially reviewed for possible artefacts, patient motion, and overall image quality before visual or quantitative interpretation. The MPI, besides reversible perfusion and fixed defects (scars), also shows transient cavity dilatation (TID), cavity size (dilated left ventricle or small ventricle), lung uptake and increased right ventricular tracer uptake on stress images. This pictorial article reviews the pearls, patterns and pitfalls. Content Organization: (1) Radiopharmaceuticals and common indications; (2) Illustrated review of the imaging appearances: A. Normal appearances; B. Reversible ischaemia and fixed defects (single/multivessel); C. Transient cavity dilatation (TID); D. Dilated left ventricle, small left ventricle; E. Increased right ventricular tracer uptake; F. Triple vessel disease; G. Breast attenuation; H. Hepatobiliary and gut uptake; I. Miscellaneous. CONCLUSION: Major Teaching Points: The precise appearances/patterns of MPI in various clinical settings. Pitfalls and unusual findings.

POSTER p1103

Qualitative analysis of indeterminate pulmonary nodules using neoSPECT

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PURPOSE: Differentiating benign from malignant solitary pulmonary nodules is becoming functionally rather than anatomically based. We attempted validating the imaging parameters for NeoSPECT prior to undertaking patient studies, which we then further stratified to try improving specificity and sensitivity. METHODS: Lung phantom built *de novo* from pre-existing CT data to incorporate varying size "nodules" was scanned with differing matrices, energy collimators, camera head orbits and count rates. 12 resulting images with different parameters independently reviewed by 5 assessors were scored for lesion clarity. Using the best protocol in patient studies allowed nodule uptake quantification: less than lung, lung > nodule > spine, equal to spine and more than spine. Histological confirmation was attempted for all cases. RESULTS: Of 12 image acquisition parameters, standard manufacturer protocol gives best images as judged unanimously. Using this technique with phantoms, 98% sensitivity and positive predictive values were achievable even for 10 mm "nodules". In patients, comparing uptake in the lesion against the spine revealed sensitivity and specificity of 93% with PPV of 97% and NPV of 91%. CONCLUSION: Validating one's own NeoSPECT protocol then qualitatively assessing lesions can reliably differentiate benign from malignant SPN, although results should be corroborated with prospective studies.

POSTER p1104

Renal scarring: DMSA scintigraphy *vs*. ultrasound in the adult population

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PURPOSE: It is recognized that the ultrasound detection of renal scarring (RS) in children is difficult, due to limitations of patient size and ability to cooperate. These factors are less significant in the adult population. Does this mean that ulltrasound (US) can be used more reliably, in the adult population as a predictor of renal scarring when compared with DMSA scintigraphy? MATERIALS/METHODS: 60 adult patients (age range 16–82 years) with suspected renal scarring were investigated by contemperaneous US and DMSA scintigraphy. DMSA scans were divided into "normal" (Group 1) and "abnormal" (Group 2). RESULTS: In Group 1 all the US scans were normal (30/30). In Group 2 23/30 (76.7%) of patients with scarring on DMSA showed corresponding (within the same kidney and at the same location) scarring on US. The sensitivity of US was 76.7%. The specificity was 100%. The positive predictive value of 100% and a

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negative predictive value of 81.1%. The overal accuracy was 88.3%. CONCLUSION: In the adult population with suspected renal scarring US has a high positive and negative predictive accuracy. Routine use of DMSA scintigraphy as "first-line" investigation in this population would appear to be inappropriate.

POSTER p1105

Oncological applications of SPECT tracers in the era of PET and PET/CT

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In oncology there are several areas where nuclear medicine techniques using single photon emission computerized tomography (SPECT) and positron emission tomography (PET) may give valuable information about functional events at molecular and cellular levels. Although PET has gained a rightful place in nuclear oncology imaging there is still much that can be done using single photon emission tracers, the major advantages being availability and cost effectiveness. Commonly used SPECT tracers in oncology are ^{111}In-pentetreotide, ^{123}Iodine, ^{123}I-MIBG, ^{201}Thallium, ^{99}Tc^{m}-MIBI, ^{99}Tc^{m}-MDP. SPECT imaging is an accurate method for detecting cancer and associated metabolic abnormalities, but does not often provide the anatomical landmarks or localisations. Recent development of dual-modality integrated imaging systems (SPECT/CT) will help in solving this problem. This pictorial article reviews the scope of using these tracers in oncology in various cancers. PURPOSE: (1) Review the oncological applications of SPECT tracers. (2) Discuss the radiopharmaceutical properties of ^{123}I, ^{123}I-MIBG, ^{111}In-pentetreotide, ^{201}Tl, ^{99}Tc^{m}-MIBI, ^{99}Tc^{m}-MDP in oncology. (3) Common indications. (4) Illustrate imaging appearances in various tumour types. Content Organization: (1) Oncological applications of SPECT tracers in imaging: Thyroid cancer; Neuroendocrine tumours; Breast; Soft tissue and bone tumours; Sentinel nodes; Miscellaneous. (2) Imaging with SPECT tracers and their mechanism of localisation/uptake. (3) Illustrated review of imaging appearances: (a) Normal appearances; (b) Disease stages. (4) Advantages and limitations. CONCLUSION: Major Teaching Points. (1) SPECT tracers are useful in specific cancer types. (2) Radiopharmaceutical properties of various tracers. (3) The precise appearances of each tumour type at various stages. (4) Variants, pitfalls, unusual findings.

POSTER p1106

Comparison of hepatic lesion detection in metastatic colorectal carcinoma: ^{18}Fluorine-FDG PET-CT versus contrast enhanced CT and MR

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PURPOSE: Hepatic metastectomy has survival benefit in colorectal cancer (CRC). Accurate pre-operative staging is essential. The value of ^{18}F-FDG PET in detecting extrahepatic disease is well established. The purpose of this study was to compare the accuracy of PET, CT and MR for detection of hepatic metastases in CRC patients referred for possible liver resection. MATERIALS/METHODS: All CRC patients with suspected liver metastases considered for hepatic resection who had PET and contemporaneous cross sectional imaging (MR=26, CT=15) were identified retrospectively from a departmental database. Each imaging study was independently re-evaluated by two experienced radiologists. The anatomical site, size and degree of diagnostic confidence (5 point scale, 1=benign, 5=malignant) for each hepatic lesion was recorded. Histological tumour type, timing of chemotherapy and post-surgical histology was compared when available. RESULTS: 31 patients were evaluated. 77 hepatic lesions were identified on MR and 45 on CT. PET identified 38 of 77 MR detected lesions (49%) and 14 of 45 CT detected lesions (31%). Most FDG negative lesions on were either small (< 1 cm) or had a low confidence score for malignancy on cross-sectional imaging (< 3). No lesion with an indeterminate confidence score on cross-sectional imaging was upgraded by PET. 1 patient had chemotherapy directly before their negative PET scan. CONCLUSION: PET-CT has a complementary role in the pre-operative assessment of CRC patients with hepatic disease. PET missed small hepatic lesions and did not clarify indeterminate hepatic lesions.

POSTER p1107

Applications of [18F]FDG-PET/CT in lymphoma managment – a pictorial review

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KEY LEARNING OBJECTIVES: Lymphoma is a common lymphoproliferative malignancy for which there is robust evidence supporting the use of [18F]FDG-PET/CT in staging, planning treatment, assessing treatment response and detecting residual disease or recurrence. There are also well documented pitfalls in the interpretation of [18F]FDG-PET/CT images in the assessment of lymphoma patients. DESCRIPTION: [18F]FDG-PET/CT has been shown to more accurately stage lymphoma than conventional imaging techniques, often revealing [18F]FDG-avid lesions not thought to be significant on size criteria alone. More accurate staging, as with any other malignancy, aids selection of the most appropriate treatment. In lymphoma this may include directing lymph node biopsy, guiding choice of chemotherapeutic regimen and also determining extent of radiotherapy field. Distribution of activity and standardized uptake values of partially treated lymphoma on interim [18F]FDG-PET scanning (after 1–2 cycles of chemotherapy) is useful in predicting treatment responses before a change in tumour volume might be expected. As such, a "positive" interim [18F]FDG-PET/CT can precipitate an early change in chemotherapeutic regimen. In addition, post-treatment [18F]FDG-PET/CT can distinguish between residual fibrotic or necrotic masses and metabolically active residual disease that requires further treatment. We present a series of cases that illustrates these points and so demonstrate the evolving role of PET/CT in patients with lymphoma. Potential pitfalls of PET imaging will also be outlined.

POSTER p1108

Pertechnetate scintigraphy in the evaluation of suspected Meckel's diverticulum – still a useful test?

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PURPOSE: Pertechnetate scintigraphy was established as a reliable, non-invasive method for investigating cases of suspected Meckel's diverticulum in the 1970s. However, no recent studies have been performed to evaluate its accuracy, and some studies have questioned its usefulness in an era where laparoscopy is readily available. We aim to re-examine its value amongst the paediatric population, and provide a concise literature review of its history, its technique and diagnostic pitfalls. METHOD: A retrospective approach was taken. 73 paediatric patients were identified who underwent the test between January 2004 and May 2006 inclusive. The results were then correlated with clinical notes and surgically obtained histological specimens where available. RESULTS: 73 children were identified who had the scan, 9 of which were suggestive of a Meckel's diverticulum (12%). Of these 8 were confirmed histologically, with one false positive. Of 64 negative scan results, 19 patients had some histology, none of which showed an occult diverticulum (no false negatives). CONCLUSION: We have demonstrated a high sensitivity and specificity, confirming that pertechnetate scintigraphy is still a reliable non-invasive diagnostic test and is particularly suited to paediatric patients where minimal intervention is preferable.

POSTER p1109

Facts or artefacts – common pitfalls in nuclear medicine imaging

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KEY LEARNING OBJECTIVES: Nuclear medicine reporting requires an understanding of the different aspects of image acquisition to enable recognition of common pitfalls and artefacts. This leads to more comprehensive interpretation and reporting of patient images. DESCRIPTION: Approximately 680 000 nuclear medicine procedures are performed in the UK annually. The most common procedures are bone scans, followed by lung and cardiac studies. The numbers of procedures are increasing by approximately 10% per

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annum. The individual reporting these studies will encounter not only an increased workload but also an increased variety of procedures. There are various causes of artefacts in nuclear medicine imaging. They can be due to the radiopharmaceutical, either during preparation or injection. Artefacts also result from problems with the gamma camera and associated hardware or software. Patient factors result in artefacts, either within or on the surface of the patient. Determination of the origins of these artefacts may require examination of the equipment, the patient, or possibly further imaging. We present a series of nuclear medicine images demonstrating some of the more common artefacts encountered during bone, lung, thyroid, cardiac and PET imaging. Explanations of the causes in each case are provided. CONCLUSION: Identifying artefacts can be difficult, particularly if they mimic pathology. In order to accurately report nuclear medicine images, an awareness of these artefacts is essential. This pictorial review is intended to raise awareness of artefacts so that these pitfalls are avoided during reporting.

ELECTRONIC POSTER e1110

Reduced activity ventilation perfusion (VQ) scans in pregnancy – a justifiable compromise?

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PURPOSE: The choice of diagnostic imaging in pregnant patients with suspected pulmonary embolus (PE) is complicated by concerns regarding the effects of radiation and iodinated contrast on the mother and fetus. Although CT pulmonary angiography (CTPA) is becoming the preferred first line investigation, VQ scanning remains popular in many departments. At UHCW, one third of the normal activity of Technetium 99m ($^{99}Tc^{m}$) MAA is used for perfusion imaging in pregnancy. A review of our current practice was carried out to ascertain whether reducing the $^{99}Tc^{m}$ activity affects the ability to interpret the scan decisively. MATERIALS/METHODS: A retrospective review of the 223 VQ scans in women aged ≤40 years in 2006 was performed. VQ scan method and reports of pregnant patients were compared with age-matched post-partum controls. RESULTS: 28 (12.6%) of the 223 scanned women were pregnant and matched with 28 post-partum controls. The average age of both groups was 27 years. The mean activity of $^{99}Tc^{m}$ used was 32 MBq (pregnant) versus 96 MBq (post-partum). There were no indeterminate reports given for the pregnant group versus 3 in the post-partum group. During this period 16 CTPAs were carried out in women of the same age, of who 4 were pregnant. CONCLUSION: Despite the availability of CTPA, VQ scanning remains a more popular choice for imaging pregnant women with suspected PE. Reducing the $^{99}Tc^{m}$ activity does not appear to influence the scan quality. We recommend that reduced activity $^{99}Tc^{m}$ VQ scans can be used in pregnancy, without jeopardising scan quality.

ELECTRONIC POSTER e1111

A pictorial review of abnormal non-osseous uptake of $^{99}Tc^{m}$ MDP

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KEY LEARNING OBJECTIVES: To highlight some interesting cases of $^{99}Tc^{m}$ non-osseous uptake, providing a differential diagnosis and showing correlation with other imaging modalities, where appropriate. DESCRIPTION: $^{99}Tc^{m}$ MDP isotope bone scans are primarily used to assess skeletal pathology and often identify abnormalities before any radiographic changes are apparent. The radioisotope may, however, accumulate abnormally within extraosseous sites due to a variety of benign and malignant causes, which may not be clinically apparent. The exact mechanism for this is unknown but factors upon which it is determinant include sites of extraosseous calcium and bone deposition and conditions that result in a hyperaemic state with altered capillary permeability. A brief description of the key features, and a working differential diagnosis, is presented for a selection of interesting cases of non-osseous uptake of $^{99}Tc^{m}$ MDP, including a meningioma, wegeners granulomatosis involving the para-nasal sinuses, inflammatory breast changes, myositis ossificans, liver metastases, splenic infarcts and chemotherapy induced renal damage. These findings were serendipitously demonstrated on initial bone scintigraphy and later confirmed with other relevant correlative imaging modalities. CONCLUSION: Incidental abnormal soft tissue uptake of $^{99}Tc^{m}$ MDP on bone scans is diagnostically important. It raises the possibility of an abnormality, which is often clinically occult. This guides further correlative imaging, which usually confirms the diagnosis.

ELECTRONIC POSTER e1112

Pyrexia of unknown origin: a review of the use of FDG-PET/CT

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KEY LEARNING OBJECTIVES: (1) A review of the current literature regarding FDG-PET imaging in pyrexia of unknown origin. (2) Understand the mechanism of FDG uptake in conditions presenting as a pyrexia of unknown origin. (3) Appreciate the role of FDG-PET/CT imaging over conventional imaging in the investigation of pyrexia of unknown origin. DESCRIPTION: Pyrexia of unknown origin (PUO) is defined as a prolonged pyrexial illness (>3 weeks) for which no cause can be found on standard investigations. FDG-PET imaging is increasingly used in the evaluation of such patients; however, it is still a novel approach. FDG-PET has been shown to be helpful in identifying the source of disease where other imaging techniques have failed. FDG-PET/CT has the additional benefit of improved anatomical information to guide clinicians in the management of these complex cases. Here we provide a review of the evolving use of FDG-PET/CT as demonstrated by six challenging cases. These cases show the value of combined FDG-PET/CT over conventional imaging with ultrasound, CT, MRI and ^{111}indium labelled leukocyte imaging. CONCLUSION: FDG-PET is a useful imaging technique in the investigation of patients presenting with pyrexia of unknown origin.

ELECTRONIC POSTER e1113

Extra-thoracic tracer uptake on ^{18}F-FDG PET-CT in patients with non small cell lung cancer – interpretative pearls and pitfalls

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KEY LEARNING OBJECTIVES: To understand the cause and significance of extra-thoracic tracer uptake on ^{18}F-FDG PET-CT in patients with non small cell lung carcinoma (NSCLC). DESCRIPTION: Fluorine^{18} fluorodeoxyglucose (FDG) PET-CT is integral to management of non small cell lung cancer (NSCLC) patients with potentially curable disease. Extrathoracic tracer accumulation frequently occurs and may be due to various infectious/inflammatory processes or occult malignancy elsewhere. Furthermore, physiological extrathoracic tracer uptake occasionally causes interpretative difficulties. Awareness of the potential causes of extrathoracic uptake is essential for accurate image interpretation. The exhibit will illustrate the spectrum of causes of extra-thoracic FDG uptake in NSCLC patients. Key interpretative pearls and pitfalls will be described and situations warranting further investigation will be reviewed. CONCLUSION: Extrathoracic FDG uptake has many causes and familiarity with these ensures accurate image interpretation.

ELECTRONIC POSTER e1114

Nuclear medicine imaging in the diagnosis of prosthetic joint infections

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KEY LEARNING OBJECTIVES: To understand the role of functional imaging using radionuclides in diagnosis of prosthetic joint infection DESCRIPTION: Infection and aseptic loosening are important complications of orthopaedic joint prosthesis and accurate differentiation between the two is crucial. Clinical signs, inflammatory markers and joint aspiration are often not conclusive. Plain radiography has low sensitivity and specificity for diagnosis. Interpretation of CT and MRI are affected by artefacts produced by the prostheses themselves. Functional imaging with radionuclides is very useful in this setting. Bone scanning is a good initial screening test as a normal scan excludes infection. An abnormal scan needs further evaluation as it lacks specificity. A number of different radiopharmaceuticals

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are available as imaging options at this point to diagnose or exclude infection. These include Technetium-99m ($^{99}Tc^{m}$) or Indium-111 (In-111) labelled white cells, Gallium-67 (Ga-67) and more recently $^{99}Tc^{m}$ Sulesomab-a murine monoclonal antibody fragment targeting white cells. The best imaging agent depends upon patient characteristics, the joint affected and the duration after surgery. The advantages and disadvantages of the different functional imaging agents and the best tool for use in different clinical circumstances is discussed with illustrative examples. CONCLUSION: Nuclear medicine imaging plays a pivotal role in diagnosing prosthetic infection. Choosing the right imaging option according to the clinical setting helps in accurate diagnosis.

ELECTRONIC POSTER e1115

Pearls and pitfalls of white cell scintigraphy in infection and inflammation: a pictorial review

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KEY LEARNING OBJECTIVES: (1) To review the utility of white cell scintigraphy in suspected infection and inflammation. (2) To illustrate the interpretative pearls and pitfalls of white cell scintigraphy. DESCRIPTION: White cell scintigraphy can be used to investigate possible inflammation or infection in a variety of clinical situations. The technique often has a complementary role when there is clinical uncertainty or equivocal findings on other imaging modalities. All white cell scintigrams performed over a 3 year period in a busy tertiary referral centre where reviewed and correlated with clinical records and contemporaneous cross-sectional imaging. This allowed a pattern of diagnostic pearls and pitfalls to be developed to help improve future interpretation and training of junior staff. Referral patterns and diagnostic yield where also analysed to ascertain the value in different clinical situations. The exhibit will illustrate the key interpretative pearls and pitfalls of white cell scintigraphy, describe the more common applications and review the utility of the technique in a variety of different clinical scenarios. CONCLUSION: White cell scintigraphy has a complementary role in the investigation of selected patients with suspected infection or inflammation. Knowledge of the interpretative pearls and pitfalls helps maximize the diagnostic utility of the technique.

ELECTRONIC POSTER e1116

Clinical applications of SPECT-CT: beginning of an exciting new era

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KEY LEARNING OBJECTIVES: To evaluate the use of SPECT-CT in various clinical scenarios. DISCUSSION: Single-photon emission computed tomography (SPECT) is an accurate method for detecting cancer and various other metabolic abnormalities. However, the main drawback is that often it does not provide the anatomical landmarks needed to precisely localize lesions. On the other hand, CT scan offers excellent anatomic detail but is less sensitive because they do not provide functional detail. Combining SPECT and CT adds the advantages of both the modalities while overcoming their drawbacks. In this exhibit, we present a pictorial review of various clinical scenarios where SPECT-CT helped to arrive at the correct diagnosis. CONCLUSION: SPECT-CT can improve diagnostic confidence in various clinical situations posing diagnostic difficulty. It is a new modality and we present our experience.

Multi-System

POSTER p1201

A pictorial review of pulmonary and extrapulmonary manifestations of sarcoidosis

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KEY LEARNING OBJECTIVES: To illustrate common pulmonary manifestations and uncommon extrapulmonary presentatations. DESCRIPTION: Sarcoidosis is a noncaseating granulomatous multiorgan disease with variable clinical and radiological presentations. Thoracic disease contributes 90% of the cases. Our exhibit presents multimodality imaging features of thoracic and extrathoracic manifestations including different stages of pulmonary, cardiac, CNS, ocular, salivary gland, gastrointestinal, reticuloendothelial sarcoidosis etc. CONCLUSION: Apart from recognizing pulmonary sarcoidosis, it is important to recognize extrapulmonary features of sarcoidosis to aid correct diagnosis for prompt clinical management.

POSTER p1202

Hollow viscus injury – role of CT in thoraco-abdominal trauma

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KEY LEARNING OBJECTIVES: To learn diagnostic imaging features of hollow viscus injury following trauma. To understand the value of CT as a problem solving tool. DESCRIPTION: Blunt hollow viscus injury (HVI) is uncommon and is associated with high morbidity and mortality .The diagnosis of HVI is difficult and often delayed or missed which further adds to the morbidity and mortality. As a consequence of improved quality of CT, even subtle injuries are increasingly being diagnosed. CT has proved to be a helpful tool for decision making with regard to management. The purpose of this review is to examine the current diagnosis and thus timely management of hollow visceral injury. It also describes technical details of this diagnostic imaging modality. This pictorial essay gives examples of the radiological presentation of not only bowel injuries but also present examples of bronchial and bladder injuries. Radiological imaging is essential for making the correct diagnosis and managing appropriately. CONCLUSION: HVI is a rare but deadly phenomenon. The high mortality rates reflect the severity of the HVI . CT imaging is essential for making the correct diagnosis and managing it appropriately.

ELECTRONIC POSTER e1203

Wegener's granulomatosis: a review of multimodality imaging characteristics

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KEY LEARNING OBJECTIVES: To understand the basic clinical, histopathology and radiological findings of this disease. To illustrate the multiple usual and atypical radiological manifestations of this disease and the disease processes that it may mimic. DESCRIPTION: This disease can manifest in any organ and a multimodality approach is necessary for evaluation. Wegener's granulomatosis is a disease of unknown aetiology that is characterized by necrotizing granulomatous vasculitis of the upper and lower respiratory tract, glomerulonephritis, and a variable degree of small vessel vasculitis. Wegener's granulomatosis occurs with a frequency of approximately 1 case per 30 000 individuals. The diagnosis is becoming more common because of enhanced recognition and better testing (*e.g.* cANCA and PR3). We present a series of patients who presented with unusual radiological manifestations of this systemic disease and discuss the conditions that it may mimic. This series includes cases with cavitating nodules and bilateral hilar lymphadenopathy, unilateral testicular infarcts, lung cavitation with secondary fungal infection, subglottic bronchial stenosis, bilateral otomastoiditis and a patient with cerebral vasculitis. CONCLUSION: Wegener's granulomatosis is an increasingly common condition and the radiologist should be aware of the many multiorgan manifestations of this disease.

ELECTRONIC POSTER e1204

Leukaemia – spectrum of imaging findings from top to tail

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LEARNING OBJECTIVE: To review and illustrate the spectrum of imaging features of leukaemia involving various organs and the complications of its therapy. To understand the role of imaging in patients with leukaemia. DESCRIPTION: We present a wide spectrum of imaging findings obtained using conventional radiographs, bone scintigrams, ultrasound (US) scans, CT scans, and MR images in patients with leukaemia. Recent advances in therapy for haematological neoplasms have greatly improved the prognosis but

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have resulted in an increased incidence of associated complications and toxic effects such as typhilitis and infections. To simplify the approach and facilitate differential diagnosis, the imaging features have been broadly classified into two main categories: manifestations of primary disease and complications of therapy (radiation therapy, chemotherapy and immunosuppression. This exhibit will review the spectrum of imaging features of leukaemia, including less common sites brain and bowel. CONCLUSION: Although definitive diagnosis relies on laboratory findings, the imaging appearances can be strongly suggestive of the diagnosis and plays an important role in the detection of complications . Familiarity with the imaging findings is essential for proper diagnosis patients with oncohaematological disease.

Miscellaneous

POSTER p1301

Bacterial contamination of computed radiography (CR) cassettes

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PURPOSE: The Department of Heath is committed to reducing infection in the NHS. The Health Act 2006: Code of practice for the prevention and control of healthcare associated infections has recently been published. It sets out criteria by which managers of NHS organizations are to ensure that patients are cared for in a clean environment and where the risk of healthcare associated infections is kept as low as possible. Within radiology the use of CR cassettes on multiple, often infected patients is an important potential route of transmission but there is little published in the literature on the contamination of these cassettes and how it can be reduced. MATERIALS/METHODS: 20 CR cassettes at each of three sites within the University Hospitals of Leicester (UHL) were swabbed in a standardized fashion before and after cleaning with Trigene wipes. No prior notice was given of the intent to swab and all swabs were obtained on the same day of the week. There is an established CR cassette cleaning rota established at all of the three sites sampled. RESULTS: Low level bacterial contamination of CR cassettes was demonstrated in a small percentage of the sample and this was effectively reduced or removed by cleaning with Trigene wipes. CONCLUSION: Current cleaning regimens employed at this trust are effective in minimizing bacterial contamination and in cases where there is increased risk of transmission the use of Trigene wipes can decrease the bacterial contamination of CR cassettes.

ELECTRONIC POSTER e1302

***In utero* magnetic resonance imaging of fetal lung**

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PURPOSE: To establish the normal range of total lung volume and magnetic resonance signal intensity for fetuses in the second and third trimester, and relate these to corresponding values in conditions such as congenital diaphragmatic hernia (CDH), cystic adenomatoid malformation (CAM) and bronchial or laryngeal atresia. MATERIALS/METHODS: 273 measurements of fetal lung volume were obtained using a planimetric technique from 104 *in utero* MRI scans with a range of gestational age from 19 weeks to 35 weeks. 151 measurements of fetal lung signal intensity were obtained relative to fetal cerebrospinal and gastric fluid. RESULTS: Normal mean total lung volume V was fitted to a power curve V=1.43 G^3 mm^3 (R^2 = 0.90), where G is gestational age in weeks. First and second standard deviations were calculated at 25% and 50% from the mean. The majority of cases of CDH lay below the second standard deviation, and several cases of CAM, laryngeal and bronchial atresia lay well above the second standard deviation. Signal intensity ratios showed large measurement variation. Underlying trends indicated a rise in lung signal intensity relative to gastric fluid from 19 weeks to 35 weeks, and a fall relative to CSF beyond 27 weeks, but these were not statistically significant. CONCLUSION: Fetal lung volume measurement proved to be a reproducible technique with acceptable levels of variability and error to distinguish several pathological states. The technique used to measure signal intensity was less successful, and the underlying trends detected would require a more precise measurement technique for confirmation.

ELECTRONIC POSTER e1303

"Guns in the city" – a pictorial review of injury caused by gun and knife crime

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KEY LEARNING OBJECTIVES: To present a pictorial review and share our experience of a varied spectrum of gun and knife crime injuries imaged over the past 5 years. DESCRIPTION: Gun and knife crime in the UK has soared over the last 5 years. The West Midlands has been highlighted as a region in which such crime is on the increase. City Hospital serves Birmingham city centre, with over 100 000 A&E referrals a year, seeing more stabbings and shootings than any other hospital in the West Midlands. Many such incidents require emergency imaging, and CT is often the modality of choice. Following a rise in the frequency of our out-of-hours CT imaging for gunshots and stabbings, a 5 year review of CT departmental records was performed. Patient demographics and CT imaging of this group of 53 patients have been analysed. This poster will demonstrate the broad spectrum of injuries we have observed, highlighting a number of interesting cases and giving a general radiological overview of the subject. CONCLUSION: As gun crime in the UK continues to increase, the role of imaging, and requirements placed upon the reporting radiologist (mostly in an out-of-hours setting) is also set to increase. CT provides early diagnostic information essential for planning of emergency treatment. It also helps select the cases for follow up, intensive care or conservative treatment. Centres such as ours, which have been experiencing high rates of such crime for a number of years, should ensure that our experience is made available to others.

ELECTRONIC POSTER e1304

Imaging of vascular and non-vascular catheters and stents

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KEY LEARNING OBJECTIVES: To aid recognition of a wide spectrum of commonly encountered vascular and non-vascular catheters and stents. To enhance knowledge of correct positioning of these. To recognize the indications, contraindications and complications of their insertion. DESCRIPTION: Patients often require insertion of various drains, vascular lines, stents and tubes, both in the acute and chronic setting. This presentation will review some of the commonly encountered tubes and lines in everyday practice. This will take the form of a pictorial overview supplemented with questions and answers to enhance basic knowledge. We will also demonstrate the complications of their insertion on plain film radiography, fluoroscopy and cross sectional imaging. CONCLUSION: Being able to recognize the most commonly used catheters and stents in practice is important for the confident interpretation of all forms of imaging. No doubt as the spectrum of interventional procedures continues to expand this skill will become increasingly important.

Service Delivery

POSTER p1401

A longitudinal study to evaluate an A&E reporting service

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BACKGROUND: A radiographer-led reporting service was introduced in 2003. Pre implementation [baseline] data were used as a benchmark against which post implementation data were compared. PURPOSE: To evaluate the A&E radiographer reporting service and also the compliance with NICE head injury guidelines. MATERIALS/METHODS: Data were collected and analysed over a 5 year period; comparative data were generated between 1 January and 31 March for each of the study years. The reporting rate and timeliness of the reports were analysed along with report accuracy, sensitivity and specificity. Compliance with NICE guidelines (Head Injuries, June 2003) was evaluated through analyses of referral patters. RESULTS: Radiographer reporting ability was sustained at a high level – mean accuracy = 97.8%; mean sensitivity = 95.7%; mean specificity = 98.6% (audit based upon 791 examinations). The reporting rate for: skeletal examinations increased from ~40% (pre) to ~80% (post implementation); chest examinations

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increased from ~13% (pre) to ~47% (post). The timeliness of the report was improved and sustained, *e.g.* skeleton examinations - pre ~10 days to post ~5 days. Skull X-ray examination rate fell dramatically between 2003 and 2006 (from 589 to 38), reflecting implementation of NICE guidelines; in the same time period CT brain referrals increased (from 159 to 310). CONCLUSION: Radiographer reporting has improved the delivery of the reporting service. The A&E service appears to be complying with NICE head injury guidelines.

POSTER p1402

The evolving role of the research radiographer in a teaching hospital department of radiology

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KEY LEARNING OBJECTIVES: This presentation will outline: Why we need radiographers involved in research. The role of the research radiographer. The development of knowledge and skills required to support research. DESCRIPTION: The government's ambition is to raise the level of research and development (R&D) to 2.5% of GDP by 2014. Revenue streams for funding research are changing from NHS R&D to project based funding. To bid successfully for project grants a department of radiology needs a research radiographer who is familiar with radiographic techniques and the processes of a radiology department. Successful research bids will broaden the revenue base for the department. This extended role provides a new avenue for the development of advanced practice for radiographers. In our experience the research radiographer has evolved to promote, manage and co-ordinate both external and internal research. The role has included establishing standard operating procedures, service level agreements and governance frameworks to support grant applications, R&D submissions, and Good Clinical Practice (GCP) in Research. The knowledge and skills required to develop this role have been acquired by enrolling on Research methodology MSc modules, GCP in research study days, attending LREC and RGC meeting as an observer, and liasing with other research professionals. The development of this role has been mentored by the radiologist research lead. CONCLUSION: The research radiographer can be a pivotal advanced role within a teaching hospital department of radiology by promoting research and generating income.

POSTER p1403

Clinical governance of non-radiology performed ultrasound – a case study

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PURPOSE: Non-radiology ultrasound is a growing field and concern has been expressed regarding the standard and assurance of such developments. This case study will explore a clinical governance framework for ultrasound performed within the emergency department by clinicians across 3 acute hospitals. METHOD: Leadership for emergency medicine ultrasound was provided by a Consultant Emergency Physician and a Consultant Radiographer with support from sonographers and radiologists. Ultrasound equipment has been available since January 2005 and education has been provided to support their development. Review of images from each scan is undertaken and 6-monthly feedback is provided to individuals and annual reassessment is undertaken. RESULTS: In excess of 400 scans have been completed since 2004 and over 20 emergency physicians trained. Regular review has provided feedback on learning points to the individual and provides a demonstration of their competency. The scope of ultrasound has extended from vascular access, trauma assessment (FAST) and identification of abdominal aortic aneurysms to the diagnosis of deep vein thrombosis within the emergency department. CONCLUSION: Clinically based ultrasound can be introduced successfully and continues to provide a focused answer to acute presentation. By working together the emergency and radiology departments have developed a framework to ensure that the clinical governance of such a system is appropriate and robust.

POSTER p1404

A&E department self reporting of out of hours CT head examinations – how safe is it?

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PURPOSE: To establish whether significant abnormalities are missed by A&E staff, if accurate CT head reports are made in the notes and whether patients are discharged inappropriately from A&E. MATERIALS/METHODS: Retrospective data collection from 1 calendar month of out of hours (OOH) CT head requests from a trauma centre. The A&E cards were checked for a written scan report and compared with the formal Neuroradiology report issued the following morning. Discrepancies were graded Level 1 (not affecting patient management) and Level 2 (significant miss). Significant misses were investigated further to assess whether patients came to any harm. RESULTS: During August 2006 (including 8 weekend days), 133 OOH CT head scans were performed (M:F = 71:62, mean ages 39.5 years and 56.2 years, respectively). Trauma (43%) was the most common presentation. 24 were referred to inpatient teams with no written report and a further 7 (all subsequently normal) had no report recorded. 7 (5.3%) patients' notes were not available. In the remaining 95, 22 errors were made of which 4 were Level 2 (4.2%) – 3 of these patients were admitted in any case, the other was successfully recalled by telephone the following day. Most Level 1 errors revolved around the early signs of acute infarction. CONCLUSION: 4 of 95 patients were significantly mis-interpreted, however, all of these were admitted or promptly followed up. With appropriate training and support, it is possible for A&E staff to report OOH CT head safely.

POSTER p1405

Do you need a percutaneous nephrostomy tonight?

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PURPOSE: Percutaneous nephrostomy (PCN) is vital in management of patients with renal tract obstruction from various causes. Interventional radiologists place most of these during normal working hours; there are increasing demands for a comprehensive 24 h service. Lack of interventional radiologists (IR) make provision of PCNs outside normal hours difficult. Our hospital is a busy District General Hospital where 2 IR perform 50–70 PCNs annually. They are unable to safely provide a comprehensive 24 h PCN service. We are planning to develop a local network out-of-hours service and performed this study to determine which patients clinically require emergent PCNs. MATERIALS/METHODS: All PCNs performed in 2005–2006 were reviewed looking at indications for PCN, pre-PCN urea and creatinine levels, time interval from request to PCN, trend in urea and creatinine levels post-PCN and any adverse clinical event. RESULTS: 122 PCNs were performed. Most PCNs were performed within 24 h of request. In the absence of sepsis, severe uraemia with electrolyte imbalance or anuria/oliguria, delaying PCN to next working day did not jeopardise clinical or biochemical recovery. Pre-procedural stabilisation of patient was more important. CONCLUSION: Most PCNs can be safely deferred to the next working day. Patients with anuria/oliguria + renal obstruction, sepsis or uraemia with metabolic derangement require emergent PCNs. Initial clinical assessment and resuscitation/stabilization of these patients by an experienced urologist is mandatory, together with close cooperation with IR performing the PCN. This is especially important if a network of hospitals provides the out-of-hours service, and where transfer of the patient may be required.

POSTER p1406

Emergency use of magnetic resonance imaging

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PURPOSE: This study investigated the use of MRI in Avon for clinical emergencies, and the role of national and local guidelines. METHODS: The study comprised two elements. First, a literature and internet review of guidelines and protocols for the use of emergency MRI. Second, four centres were compared to establish current MRI practice, and the use of local guidelines for emergency imaging. RESULTS: Current published guidelines indicate for which conditions MRI may be an appropriate investigation, but there are no guidelines as to which clinical conditions may warrant an emergency referral. Each centre has some agreed clinical protocols for the

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management of emergency MRI referrals. Royal United Hospital Bath operates a consultant to consultant referral system. Southmead has a guideline for imaging suspected metastatic spinal cord compression. Bristol Royal Infirmary images spinal cord compression, critical ischaemic legs, and sagittal venous thrombosis in an agreed out of hours protocol. Weston General has no on-site MRI scanner, and has developed referral protocols with adjacent clinical units. All centres agree that acute spinal cord compression and venous sinus thrombosis warrant emergency referral. CONCLUSIONS: (1) All centres have a strong reliance on consultant to consultant referrals, regardless of the indication. (2) An agreed list of indications for emergency MRI needs to be developed. (3) It is important to realise the impact that national guidelines would have on a department.

POSTER p1407

The impact of a musculoskeletal interface service with direct MRI access

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PURPOSE: To evaluate the impact of a Physiotherapy led Musculoskeletal Service in Primary care with MRI access on back pain services. MATERIALS/METHODS: The musculoskeletal interface service has been in operation for 6 years. The activity for the year 2005/06 was reviewed to establish if it achieved its primary aim of ensuring patients received appropriate diagnostic tests and treatment. Patients with Low back pain were referred to the service instead of the more conventional consultant out-patient option. The records of 1299 patients were reviewed to ascertain the utilization of imaging tests and the outcome of the consultation. RESULTS: 42% were discharged after 1st appointment; 7% referred to orthopaedic/spinal service; 20% referred for pain management; 31% discharged after investigation ± injection; 31% patients had MRI; 7% patients had plain X-ray. CONCLUSION: An appropriately skilled interface service with access to diagnostics is an effective way of providing appropriate management to patients with low back pain and can significantly decrease the demands on conventional secondary care services. The level and choice of imaging test compares with equivalent utilization from secondary care services.

POSTER p1408

Primary care referrals to an open access magnetic resonance imaging pilot in the north west

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PURPOSE: To review primary care referrals to the open access MRI pilot in south Manchester for appropriateness of referrals, diagnostic yield and influence on patient management. MATERIALS/METHODS: Retrospective study of MRI requests and outcome data for 150 consecutive patients referred by primary care practitioners to the South Manchester Mobile MRI Pilot. Appropriateness of requests was assessed according to the joint RCR/RCGP guidelines issued recently. A clinically significant finding was defined as one likely to alter the patient's management. RESULTS: 134 scans (89%) were requested for musculoskeletal problems and 16 for brain and ENT problems. 97% referrals were appropriate based on the RCR/RCGP guidelines. 49 scans (33%) showed clinically significant findings including nerve root compression, meniscal tears, rotator cuff tears and an arachnoid cyst. 83 patients (55%) were referred to secondary care. 23 (15%) were referred before the scan, and 8 (5%) at the same time as the scan, and 52 (35%) after the scan had been performed. 6 patients (4%) were referred for MRI scans as the open access service was available, when otherwise they would have been managed without it. 61 patients (41%) were managed in primary care following MRI when they would have otherwise been referred to secondary care. CONCLUSION: Our initial study shows that open access MRI has contributed to effective patient management in primary care allowing more informed decisions and has led to a reduction in the number of secondary care referrals.

POSTER p1409

Open access brain MRI – a comparison of the diagnostic yield of 4 different referrer groups

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PURPOSE: Work in progress. To compare the diagnostic yield of brain MRI requested by 4 different referrer groups, and to assess if it should be restricted to hospital consultants only. This is of particular interest in the current situation as there will be an increase in General Practioner requests with the introduction of Independent Sector Treatment Centres. MATERIALS/METHODS: 3 initial referrer groups were identified as regularly requesting MRI of the brain, these were: (1) Hospital Consultants, (2) General Practioners and (3) Neuro PCT (consisting of a neurologist who worked only for the PCT and not for the hospital trust). The Neuro PCT group was sub-divided into 2 – 1 group of patients whose requests were from the neurologist and the other group were those that had been referred to the neurologist but a MRI had been requested prior to being seen. 100 consecutive scans and request cards from each group, starting from 1 July 2005 were retrieved and analysed to see if there was a significant abnormality on the images, and if this corresponded to the severity of the symptoms described on the request card. Follow up scans for known conditions were disregarded. The 4 different groups were compared to see if there was a statistically significant difference in the diagnostic yield and the clinical importance of the abnormalities diagnosed. RESULTS: Early results suggest there is no significant difference in the diagnostic yield between the referrer groups.

POSTER p1410

Outsourcing bone densitometry in East Lancashire and its effect on service provision

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PURPOSE: the effects of outsourcing of the bone densitomerty service, using local radiogrraphers and radiologists in East Lancashire are presented. At the time the contract was awarded there was a 2 year waiting list, despite award of a waiting list iniative award 18 months earlier. MATERIALS/METHOD: The contract was awarded to an experienced DXA radiographer, within the independent sector, who was invited to use existing infrastructure in the locality. Time management was altered radically, leading to a much increased throughput. A retrospective review of waiting list times has been undertaken. RESULTS: The new arrangements lead to a 2 year waiting list being resolved in 3 months. The service currently runs with a maximum waiting time of 4 weeks. CONCLUSION: The incentivized time management system has allowed much greater numbers of scans to be performed and has been met with many positve comments from local clinicians. Many scans are referred directly from local general practitioners. The use of a local radiologist allow a better continuity of care and cross referencing to other imaging streams, which is of great value in assessing the presence of fragility fractures.

POSTER p1411

Open access barium meal service for general practitioners: are guidelines followed?

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PURPOSE: Open access General Practitioner (GP) referrals for barium meals are common. Requests were audited and rated against dyspepsia management guidelines from British Society of Gastroenterology and Scottish Intercollegiate Guidelines Network. MATERIALS/METHODS: Retrospective analysis of 59 GP requested barium meals performed from June 2005 to June 2006 at Macclesfield District General Hospital was undertaken. RESULTS: 37 of the 59 patients were included (mean age: 59.6 years; range: 16–98 years). The remainder were excluded because of incomplete data. Only 7(18%) patients had Upper GI Endoscopy (UGIE) prior to or after the barium meal. *Helicobacter pylori* was tested in 16 (43%). Of those who underwent the meal, 6 patients (16%) did not tolerate or refused UGIE and 8 patients (22%) had sinister symptoms. 20 (54%) patients had a normal examination. 2 (5%) patients each had an oesophageal filling defect or narrowing. 13 (35 %) had mild reflux or hiatus hernia. UGIE was recommended in 5 (13%) for further evaluation. The average radiation dose was 717 cGy. CONCLUSION: Barium meal is less sensitive and specific than UGIE. *H. Pylori* eradication and

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UGIE are primary tools in the dyspepsia management and guidelines suggest that a barium meal is indicated when UGIE is not feasible. We found, a barium meal was adopted as a first line examination by GPs – contrary to current evidence and guidance. Only 18% had a UGIE and 43% a *H. Pylori* detection test. Direct referrals from primary care may be inappropriate and continued monitoring is mandatory.

POSTER p1412

Significant colonic pathology at double contrast barium enema; straight to test verus routine pathway

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PURPOSE: A new colorectal cancer diagnostic pathway was implemented to address the government directive for a 2 week wait for investigation of colorectal symptoms suggesting malignancy. We aim to compare the amount of significant pathology in symptomatic patients referred for double contrast barium enema (DCBE) via the straight to test (STT) pathway compared with the conventional referral route via outpatient clinic referral. The additional resource prioritization for this group should be expected to produce a significantly higher yield for colonic pathology to justify its introduction. MATERIALS/METHODS: Reports of all DCBEs performed in a 4 month period were retrospectively analysed, after the introduction of the STT policy, for abnormal findings and referral source (STT versus routine pathway). RESULTS: A total of 81 DCBE examinations were performed in the study period. 54% were requested by the STT route. There was no significant difference in age (p=0.07) or gender (p=0.98) and patient symptoms were similar for the 2 groups. Rates of diverticular disease (45% STT & 59% routine) and normal examinations (24% STT & 30% routine) were also matched. Significant findings (polyps, strictures, malignancy or inflammatory bowel disease) were found in 20% of STT and 12% of routine referrals, with no statistically significant difference (p=0.38). CONCLUSION: A STT policy results in earlier detection of pathology, but a larger study would be needed to demonstrate statistical significance. Nevertheless, implementation of the policy should not be at the expense of increased waiting times for routine referrals.

POSTER p1413

The Redditch Radiology Redesign Project – the CT radiographers tale

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PURPOSE: In August 2005, the CT waiting time was 15 weeks. Changes were made to CT workflow as part of the Redditch Radiology Redesign Project to reduce waiting times for CT patients. METHOD: First, a subgroup modality team was set up to discuss and apply departmental vision and strategy levels for all radiology modalities including CT. Real time demand and capacity data collection was set up for capacity planning. It was calculated that only a modest daily increase in CT scanner throughput was required to reach optimum capacity. To achieve this, the idea of "green streaming" was introduced. A Lean tool called a "Glenday Sieve" was applied to the pattern of CT activity. From this, the most common and quickest scans were identified and allocated to a regular 1 h slot between 9–10 am and 2–3 pm booking patients every 10 min. Examples of "green stream exams" included heads, high resolution thoraxs, sinuses and KUB scans. The aim was to use the economies of repetition to push the greens through more efficiently releasing more capacity into the system. The booking templates were changed to incorporate this. The "green hours" were protected *i.e.* interruptions were minimized and the phone was redirected for this hour. RESULTS: CT waiting times fell to 2 weeks within 3 months and without any increase in resources. CONCLUSION: It is imperative to realise the importance of team work- getting every team member on board so new changes can be adopted quickly and in a positive way.

POSTER p1414

Planning for the future, a student's view

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PURPOSE: Current cohorts of radiography students represent the future radiography workforce and the hypothesis for this study is that this group are informed and persuaded by the rhetoric of the professional body in relation to role development opportunities. This feasibility study was conducted as preparation for a longitudinal study investigating role development expectations of radiography students with a view to predicting the possible impact of misalignment of expectation and valence on this potential workforce. METHOD: A descriptive, cross sectional survey was undertaken to identify attitudes and opinions of a cohort of 37 final year radiography students. Topics associated with role development were explored using self completion, structured questionnaires in the Likert scale format. Attitude questions were constructed to illicit information in relation to 3 main themes of investigation; expectation, knowledge and valence. RESULTS: 100% of participants stated an expectation for role development opportunities with 97.3% indicating that these expectations would be realised within 5 years of graduation and 75.6% within 2 years of graduation. A significant correlation between this expectation and job satisfaction was noted (p<0.05) (2 tailed). 94.6% expressed an interest in role development, with 78.6% indicating that they would be prepared to move departments in order to meet their expectations. CONCLUSION: Results indicate that student radiographers are influenced by role development rhetoric. Expectation and valence of role development opportunities are seen to be intrinsically linked with job satisfaction suggesting that misalignment of these would have a potentially negative impact on motivation and retention of the future radiography workforce.

POSTER p1415

Observational study of Radiology Consultants input at cancer multidisciplinary team meetings in Manchester Royal Infirmary

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PURPOSE: MDTs are mandatory in hospitals providing cancer services, increasing the workload on a radiology department. Such meetings should fulfil the requirements as published by the Royal College of Radiologists. We assessed time spent by each Radiology Consultant involved with Cancer MDTs and whether this was included in their job plans. This time consisted not only of attending MDTs but reviewing images in advance and carrying out tasks resulting from decisions taken. METHODS: Prospective questionnaire to Consultant Radiologists involved in Cancer MDTs at Manchester Royal Infirmary. Each was asked to monitor their hours of input into MDTs over 4 weeks (with a 100% response rate). RESULTS: Time spent attending MDTs ranged from 1 h to 5 h (mean 2.6 h per Consultant per week). Time spent reviewing images ranged from 0 to 3.5 h (mean 1.2 h per Consultant per week). Time spent carrying out other tasks ranged from 30 min to 4 h per week (mean 1 hour per Consultant per week). The total input to MDTs ranged from 1 h to 12 h per Consultant per week (mean 4.8 h per Consultant per week). Overall Radiology Consultant input to MDTs per week is 44 h . Of these 22 h were not included in job plans. CONCLUSION: The work generated by an MDT is significant for most Radiologists and it would appear that 50% of this work is not accounted for within individual Consultant job plans, therefore not complying with the RCR recommendations.

POSTER p1416

What will happen to Radiologists in 2009?

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PURPOSE: Give the Radiologist an understanding of applicable rules and definitions of the European Working Time Directive, highlighting recent cases in the European courts which may change our working practice forever. BACKGROUND: The European Working Time Directive (EWTD) is an EU initiative designed to prevent employers requiring their workforce to work excessively long hours, and will reduce the working week for doctors to an average of 48 h by 2009. There are numerous definitions within the EWTD that the radiologists must be aware of for example "working" and "rest", these definitions affect what we as Radiologists do on call. The European court of Justice ruled in the SIMAP case (2000) and *Landeshaupstadt Kiel v Norbert Jaeger* (2003) that doctors are essentially only "working" when we are onsite in the hospital, even though we are contactable,

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and have a duty to remain free for the rest of their time on call. The working week without call stands a 39 h, so this means that by 2009 that we will have a maximum of 9 h of on call time which we can spend in house "providing professional services" by the EWTD. As it is impossible to predict exactly how much time we as radiologists will spend "in house" on any given call,the likelihood is that we are going to adopts a "shift" system in Radiology by 2009, unless there is a change in legislation.

POSTER p1417

Physicians' awareness of RCR guidelines – a comparison between two large NHS Trusts in England

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PURPOSE: The RCR publishes regular guidelines on referral criteria for most imaging investigations. We assessed the awareness of these guidelines amongst physicians across two large NHS teaching trusts in England. MATERIALS/METHODS: A questionnaire based on scenarios presented in the RCR publication *"Making the Best Use of a Department of Clinical Radiology"*, 5th edition was sent to medical consultants, registrars and senior house officers at Sheffield and Leeds Teaching Hospitals. The questions related to indications for chest, abdominal and skull X-rays. The responses were assessed against the standard recommendations in the RCR handbook.Chi-Square test was used to compare the proportions of people who had seen the guidelines. RESULTS: 175 and 200 questionnaires were sent out in Sheffield and Leeds, respectively, with a 75% comparable response rate from both trusts and an even spread between trainee and consultant responders. Percentage of correct responses from Sheffield (Leeds) for Consultants , SpRs and SHOs, respectively, were: Chest Radiograph: 58% (49%), 55% (45%), 41% (44%); Abdominal Radiograph: 47% (46%), 43% (40%), 43% (40%); Skull Radiograph: 61% (56%), 52% (56%), 55% (58%). Only 5.3% and 8.6% of the responders in Sheffield and Leeds, respectively, had seen the RCR guidelines handbook (Chi-square test: p=0.28). CONCLUSION: These results show very poor awareness and availability of RCR guidelines amongst physicians. The comparative study may well reflect the national situation. The study highlights the urgent need for improving accessibility and better implementation of guidelines. The cost of guideline distribution may be offset by the reduction of inappropriate referrals, unnecessary investigations and irradiation.

POSTER p1418

Cranial ultrasound training – is this the way forward?

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KEY LEARNING OBJECTIVES: (1) Background principles. (2) Requirements for basic competencies. (3) Questionnaire assessment of improvement. DESCRIPTION: The key principles of training in medical ultrasound are the same for all regardless of professional background. The Birmingham Women's Hospital multidisciplinary Cranial Ultrasound Course started in September 2004. The practical training is based on the *RCR guidelines for US training for Medical and Surgical Specialities*. The course covers physics, anatomy, normal variants, pathology and technique. Competencies are assessed through logbooks submitted prior to 3 of 4 modules, as well as discussion with course faculty mentors and work based preceptors. A questionnaire was sent to the 14 candidates from the 2005–2006 course to assess changes in skills and competencies. 8 of the 9 respondents had performed cranial ultrasound prior to the course, 7 [78%] were scanning at the time the questionnaire was completed. Of these 7 all were writing their own reports, 5 scanned regularly, performing 2–5 scans per session, whilst the others scanned *ad hoc*. Levels of competency in various aspects before and after the course were self assessed on a scale 1–4 and increased as expected. This was particularly apparent in those who were completely confident in identifying normal anatomy which increased from 22% to 66.6%. Identification of pathology increased from a level of 0% to 100% adequate and 44.4% completely confident. CONCLUSION: Structured multidisciplinary training increases the skills of all candidates. Regular performance of the procedure is the most important criteria for improving and maintaining competency.

POSTER p1419

Virtual learning environments: the use of WebCT as an aid to the student learning experience

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KEY LEARNING OBJECTIVES: This poster will provide an overview of e-learning utilising WebCT as a learning tool across the BSc(Hons) Diagnostic and Therapeutic Radiography 4 year degree programmes. It will demonstrate how it has helped to facilitate independent learning which can ultimately lead to improved patient care. DESCRIPTION: The programme's philosophy believes that quality of the educational process has a positive effect on the attitude of the student, enabling enhancement of professional practice. The poster is aimed at illustrating how the radiography team incorporated WebCT into undergraduate and postgraduate programmes. WebCT provides students with resources needed for both directed and self-directed study, for example, PowerPoint presentations, with many narrated and accompanied by a script, ensuring adherence to current SENDA (2001) regulations. Related self-tests and quizzes provide formative assessment and allow students and lecturers, via the tracking facility, to check progress. Summative assessment is also carried out successfully in some modules. Online discussions are used throughout the programmes, for example, to critically discuss academic papers and for tutorial preparation. This encourages independent learning. Additionally the poster will demonstrate the generic administrative area, which has handbooks, guides, and a module evaluation area. CONCLUSION: One of the cornerstones of the programme is to develop graduate radiographers with an independent attitude towards continuing education, committed to seeking professional excellence in diagnostic or therapeutic radiography. WebCT is a useful tool in the pursuit of this goal.

POSTER p1420

Radiography and the ageing population

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KEY LEARNING OBJECTIVES: Debate how demographic changes will impact upon radiographic service delivery. Demonstrate an understanding of how an ageing population will affect certain types and range of radiological examinations. Discuss how CPD may be used to respond to these changes. DESCRIPTION: Sources of data on health and the ageing population were reviewed. Literature describing and debating relationships between age and prevalence of selected types of disease and disability are also considered. Included are heart disease, osteoporosis, hip fractures and general chronic illnesses. Graphic illustrations are provided. CONCLUSION: Radiographers need to consider how they may enhance attitudinal skills via continuing professional development. Reference is made to the National Service Framework for Older People, age discrimination, advocacy and human rights issues.

ELECTRONIC POSTER e1421

Quo Vadis Radiology? The evidence based approach

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KEY LEARNING OBJECTIVES: To help radiologists who have no postgraduate specialist training in research to become familiar with evidence-based medicine (EBM) and to find solutions that are based on best current available information for problems arising in their clinical practice. DESCRIPTION: EBM integrates clinical experience and patient values with the best available research information in order to expand the knowledge of the research evidence and to provide sensible answers of imaging questions in clinical decision making. The link between EBM and radiology is the integration of evaluative sciences and technology assessment into clinical practice In this presentation

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evidence-based radiology (EBR), as a relatively new approach to the practice of radiology based on the principles of EBM, will be discussed. The five tools of EBM will be in details analysed. Simple and advanced EBM searching strategies will be shown. A complementary list of reference and targeted engines, dedicated for radiologists, as well other tools for the most thorough search will be also provided to all participants. Limitations of EBM will be also presented. CONCLUSION: Although EBM does not answer to every clinical question, it provides us valuable additional evidence helpful in decision making. EBR can help radiologists in rigorously evaluating all what they are reading and hearing, in order to construct a more definitive knowledge basis for every day best medical imaging choices for patient care.

ELECTRONIC POSTER e1422

Audit of percutaneous nephrostomy performance in a teaching hospital: implications for training

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PURPOSE: Proficiency performing percutaneous nephrostomy is considered a core skill by the Royal College of Radiologists. Changing training patterns, especially increased trainee numbers resulting from the Radiology Integrated Training Initiative (RITI), mean growing competition for training experience. The availability and use of potential nephrostomy training opportunities was reviewed during an audit of departmental performance. METHODS: A retrospective audit of nephrostomy performance between 2004 and 2006 was undertaken. Cases were identified using the RAD system. Data on complications, success rates, individual operator numbers and the time of day the nephrostomy was performed were extracted from the case-notes. RESULTS: 149 nephrostomies, averaging 5.7 per month, were performed with data available for 140 episodes. Registrars attended 54% of these training opportunities. Most (114/140) were performed during office hours. The complication rate appeared higher with registrars present, although statistical significance was not tested in view of small sample size. With 6 registrars per year group, this would allow a maximum of 11.4 nephrostomy training opportunities per registrar for the entire duration of their training. CONCLUSION: Potential training opportunity use was suboptimal. Training opportunities remain limited even if this use is maximized. Alternative training strategies, for example simulators, may ultimately be required if nephrostomy is to remain a core skill. Alternatively, a restructuring of service provision, with subspecialization and removal of nephrostomy as a core skill, may be necessary.

ELECTRONIC POSTER e1423

The financial impact of removing skull radiography from the A&E department

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PURPOSE: An investigation into the financial implications of restricting skull radiography (SXR) in the A&E department. METHODS: We undertook a prospective study to evaluate the the number of SXRs and CT brain examinations performed for trauma. This data was initially collected over a 3 month period (Jun–Aug 2005). Following this a protocol for restricting SXRs was introduced into the A&E department. After 12 months the number of SXRs and CT brain examinations was again recorded (Aug–Oct 2006). Data from these two study periods was compared with demonstrate changes in the numbers of SXR and CT brain examinations performed and the financial implications of any changes in referral trend. RESULTS: During the initial data collection period there were 258 head injuries requiring imaging (207 SXR/51 CT scans). The mean number of SXR and CT brain scans performed per month was 69 (range 59–75) and 17 (range 15–19). This translated into a total cost of £4326 for head injury related imaging per month. Following the implementation of the protocol there were 77 patients requiring imaging (8 SXR/69 CT scans). The mean number of SXR and CT brain scans performed per month was 3 (range 2-–4) and 23 (range 21–25). This gave a reduction in imaging costs of £2268 per month $p<0.05$. CONCLUSION: There is growing evidence regarding the limitations of SXR for trauma. Adoption of national recommendations to remove/limit the use of SXRs can save a significant amount of money and does not contribute to a significant increase CT workload.

ELECTRONIC POSTER e1424

Can A&E staff independently and exclusively report their own trauma extremity films? An audit and literature review

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PURPOSE: Plain film reporting still makes up a significant proportion of the reporting work in radiology departments. Trauma extremity films on patients admitted via the accident and emergency department constitutes the significant majority. With these films being looked at by radiographers (red dotting films), trauma juniors and/or senior doctors; is there still a necessity for reporting of these films by radiologists? Previous published studies have shown junior doctors reported as few as 32% of films correctly. MATERIALS/METHODS: Retrospective analysis was made of all patients who presented through the Accident and Emergency department at Sandwell Hospital, Birmingham over two separate 1-week periods. Extremity films were identified and the report in the notes made by the clinician was compared with the Consultant Radiologist report. Discrepancies were identified and any films where there was discord, were double reported by another Consultant Radiologist to provide a "gold standard" report. RESULTS: 64% of the radiographs were agreed normal, 18% were agreed abnormal but 18% were abnormal identified by only one department. After double reporting, A&E had an error rate of 12% with false positive rate (identifying a fracture where none was present) of 23% and a false negative rate (missing a fracture where one was radiologically present) of 5%. Errors were greatest with shoulders, elbows and ankle X-rays. Radiology had an error rate of 5%. CONCLUSION: Although A&E doctors have a high standard of reporting, with a low false negative rate, there is still a need for radiology to report all trauma films.

ELECTRONIC POSTER e1425

Audit of non cancer recalls in breast screening

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PURPOSE: The minimum standard for recalls for further assessment according to the quality assurance guidelines for breast cancer screening radiology is less than 10% for prevalent and less than 7% for subsequent screens. The object of this audit was to determine whether our recall rates met these targets and identify the type of cases recalled in order to minimize the non-cancer recalls. MATERIALS/METHODS: Film packets from the non cancer recalls in June 2005 were retrieved, they were categorised into prevalent and previously screened. The reason for recall was noted and whether it had been a result of arbitration or not. Local guidelines were put into place and a reaudit performed in June 2006. RESULTS: In June 2005 the total recall rate was 6.1% of which 27% were prevalent and 73% had previously attended. 21% resulted from arbitration. 7% were symptomatic recalls. Distortion and asymmetry mostly resolved on paddle views. 24% were due to calcifications. Local guidelines put into place as a result included an increase of the review of arbitrations, more specific symptomatic history. and increased compression at screening was suggested. There was a decrease in the recall rate to 4% in 2006, 45% of which were prevalent and 55% had previous films. None were symptomatic recalls, 11% were due to arbitration, and 21% (*vs*. 24%) were recalled due to calcifications with a proportional increase in the recall of masses. CONCLUSION: Following local changes the targets for non cancer recall rates have improved.

ELECTRONIC POSTER e1426

Reporting times before and after the introduction of PACS

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KEY LEARNING OBJECTIVES: Appreciate the impact of PACS on reporting times for plain film and CT. DESCRIPTION: We present the findings of an audit of reporting times before and after the introduction of PACS at the Royal Cornwall Hospital. Times to report

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dictation and times to report publication were studied for groups of inpatients, outpatients and A&E patients undergoing plain film and CT investigations before and after PACS. Comparison of reporting times for tape dictated versus VR reports, and volume of films reported are also presented. RESULTS: Reporting and report publication times were significantly reduced for all patient groups having plain films reported ($p<0.000$). The volume of films reported increased by 36%/month, and the percentage of films reported increased by 50%. Reporting times for all patients having CT were not significantly different to times before PACS, demonstrating no adverse effects due to increased plain film reporting. CONCLUSION: PACS has led to a significant increase in the percentage of plain films reported, and, in combination with VR, significant improvements in the times in which reports for CT and plain films are available.

Audit

POSTER p1501

Impact of NICE head injury guidelines on activity and sensitivity over 4 years

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KEY LEARNING OBJECTIVES: The NICE head injury guidelines were published in June 2003 and adopted in Leicester for managing patients with head injury. There was concern that the new guidelines were too inclusive and that the workload would increase markedly with a decrease in the pick up rate of intracranial injury and an increased radiation dose from a population perspective. DESCRIPTION: Over a period of 4 years during the month of November all patients referred for brain CT from the A&E department for acute head injury or suspected subarachnoid haemorrhage (SAH) were audited. The total patients scanned during the month was recorded. The notes were retrospectively reviewed to determine if the presentations met the guidelines for scanning and the sensitivity (percentage of positive scans) was also determined. From 2002 to 2005 the number of scans has doubled in absolute terms. 96% of scans performed for trauma or SAH were indicated following retrospctive review of the accident and emergency notes. The sensitivity, measured as any positive finding on CT has been maintained around 20–25% since the introduction of the guidelines. CONCLUSION: There has been a marked increase in the work load of head scanning since the introduction of the guidelines but the scans are being performed in the groups defined by the guidelines and the sensitivity of the guidelines is high.

POSTER p1502

Audit of radiographers' red dot accuracy in our clinical practice

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PURPOSE: Retrospective review of the accuracy of radiographers' red dot in our accident and emergency practice. METHODS: Red dot labelled radiographs of the appendicular skeleton were retrospectively reviewed and the results compared with the reference standard report by post FRCR radiologists. RESULTS: We reviewed a 1000 trauma radiographs (557 female and 443 male) in an 8 day study period. We included X-rays of the musculoskeletal system (upper and lower limb including shoulder and hip joint, cervical spine and skull). The facial views, chest and abdominal films were excluded. A total of 118 X-rays were marked with a red dot. This resulted in 98 true positive, 20 false positive, 48 false negative and 834 true negative. The sensitivity and specificity were 67% and 98%, respectively. Positive predictive value was 83% and negative predictive value was 95%. Of interest, 21 of 48 (44%) false negative cases were reports on distal upper limb (wrist, hand and fingers) whilst 9 of 20 (45%) false positive cases were reports on the foot. CONCLUSION: Red dot accuracy in our institution was 93%. Distal extremities proved to be a difficult area for accurately marking the red dot. Compared with the literature, our institution showed worse sensitivity but equal specificity (a recent metanalysis showed pooled sensitivity of 90% and specificity of 94%).

POSTER p1503

Flagging systems – a worthwhile failsafe or just another potential complication?

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PURPOSE: There is great debate surrounding the radiologists' responsibility in effectively communicating unexpected results to referring clinicians. In our centre a flagging system has been introduced to alert clinicians to potential new diagnoses of cancer. We reviewed abnormal barium enemas and assessed the impact the flag status had on subsequent patient management. MATERIALS: A retrospective review of barium enema reports in a 6 month period was undertaken with abnormal reports categorised with regard to their flag status (flagged or standard). The films were then reviewed by a consultant radiologist (blinded to the report) to assess the appropriate flag status based on the findings alone. In a second arm of the study, patients with histologically proven colorectal cancer were retrospectively reviewed. Flag status was determined in those cases diagnosed on barium enema. The results were then correlated with endoscopic, surgical and histological findings from the case notes. RESULTS: 68 out of 704 barium enemas were reported as abnormal. Only 10 of these reports were flagged. 25 of the remaining 58 cases were considered to show a potential new cancer but were not flagged. 15 of these cases were subsequently confirmed as malignant or pre-malignant histologically. The diagnosis was established earlier in patients with a flagged barium enema report (17.5 days) than a standard report (24.5 days). CONCLUSION: There has been poor utilization of the flagging system in our centre. This simple measure potentially improves communication of key reports thereby streamlining the patient pathway.

POSTER p1504

An audit of unnecessary treatment in the management of deep venous thrombosis

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PURPOSE: This audit aims to assess the management of patients presenting to a distrcit general hospital casualty with a suspected deep venous thrombosis. Particular reference is made to the time interval between presentation and the definitive diagnosis of DVT by Doppler ultrasound and the consequences of this interval for the patient in terms of unnecessary anticoagulation therapy. MATERIALS/METHODS: Normally suspected DVT cases are sent home from casualty and attend daily for subcutaneous Tinzaparin until the diagnosis is confirmed on Doppler ultrasound. During a 2 month period a retrospective study of the radiology computer records was made to follow the course of casualty patients with suspected DVT. RESULTS: 68 casualty suspected DVT patients were referred for Doppler scans during the 2 month period. 37% of scans were positive and 59% negative for DVT, the rest being indeterminate. The mean no of hours between request and scan was 53 h and the median 26 h, due to a few long waiters. CONCLUSION: Nearly 60% of DVT Scans are negative and these patients wait a median of 1 day and a mean of 2 days for this negative result, while on Tinzaparin. Tinzaparin injections have side effects including allergic urticaria, thrombocytopenia and risk of GI and other bleeds. Given the lack of specificity of D Dimer and clinical methods of DVT diagnosis, the solution must involve more timely provision of DVT Doppler scanning.

POSTER p1505

Blitz audit of management of reactions to intravenous contrast media

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PURPOSE: To audit the current knowledge of treatment of intravenous contrast reactions (using the new RCR guidelines 2005 as a benchmark) and crash trolley locations amongst the trainee radiology registrars. The results were compared with an initial audit to assess whether the action plan had lead to improvements. MATERIALS/METHODS: We placed the current RCR contrast reaction guidelines in conspicuous places around the department and on the crash trolleys following our previous audit. Over 2 days we assessed trainees with a questionnaire covering three possible contrast reactions including urticaria, bronchospasm and generalized anaphylaxis. We also asked the location of the crash trolleys. Our target was that 100% of trainees

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should be able to rapidly and appropriately treat intravenous contrast reactions. RESULTS: 25 out of the 35 trainees took part. For urticaria 96% (96% in previous audit) gave antihistamines. For bronchospasm 100% (79%) gave salbutamol. For generalized anaphylactoid reaction with hypotension nobody suggested raising the patients legs (not in previous guidelines). Adrenaline 100% (100%), correct dose 36% (7%). Oxygen 76% (86%). Intravenous fluids 44% (86%). Crash trolley location 68% (61%). CONCLUSION: Overall it was clear that trainees are aware of the principles of management. However, increasing the display of guidelines the specifics of management have generally improved but do not meet our target. All the trainees have been issued with the new guidelines. We plan to introduce anaphylactic training into the yearly resuscitation update. We also plan to improve the visibility of the crash trolleys. Re-audit is planned for 1 year.

POSTER p1506

GET SMASHED: an audit of the use of imaging in acute pancreatitis

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PURPOSE: The incidence of acute pancreatitis in the UK appears to be rising. Incidence ranges from 150 to 420 cases per million population. There are national guidelines for its diagnosis and management (Gut 2005). This audit was to asses current practice in our London teaching hospital against these guidelines. MATERIALS/METHODS: All cases of acute pancreatitis over 1 year identified via the Electronic Patient Record and Radiology Information System, were included. Incidence of ultrasound, CT and further imaging (MRCP) or intervention (PTC, drainage, or ERCP) was recorded and for what indication (*e.g.* for diagnosis or disease severity grading) and whether they occurred within stipulated time limits. RESULTS: 123 cases were identified. 81% had ultrasound; of whom 84% had it within 24 h of admission. 52% had CT for diagnosis; of whom 88% had it within 48 h of admission. 23% had CT for disease severity grading; of whom 14% had it 6 days after admission. No reports explicitly used the Balthazar criteria. 6% had MRI. 26% underwent intervention. CONCLUSION: There is good access to ultrasound and CT for the diagnosis of acute pancreatitis. However, CT for staging is not performed at the optimum time, and is not reported using the Balthazar criteria. Education of referrers and radiologists of these guidelines is required, before re-audit.

POSTER p1507

"Routine chest X-rays": justification of paediatric chest radiograph requests in accident and emergency

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PURPOSE: Chest radiographs (CXR) comprise approximately half of A&E paediatric radiology examinations performed in our institution. Over 50% are requested out-of-hours (when staffing levels are reduced and senior support less readily available) despite proportionately fewer paediatric attendances occurring during this period. The pattern and justification of requests was therefore reviewed. METHODS: Prospective data were gathered from 27/7/06 to 12/9/06 for paediatric CXR referrals from the A&E department. Request forms, PACS and the A&E database were reviewed. RESULTS: 113 patients were examined (62 male, 51 female) with a mean age of 4 years 10 months. 45 studies were performed in-hours (0900–1700) and 68 out-of-hours. Requests were categorized as: "justified", "equivocal", "unjustified" or "no data given" with reference to "Making the Best Use of a Department of Clinical Radiology. Guidelines for Doctors (5th Edition)". 72% of studies could be appropriately justified on the basis of the information provided. 21% of requests were designated "equivocal", 5% "unjustified" and 2% "no data given". A Chi-squared test demonstrated no significant difference ($X^2 = 2.614$) when in-hours *vs*. out-of-hours data were compared. Out-of-hours requests were not made by more junior grades of doctor. No individual or particular grade of doctor was responsible for a disproportionate number of unjustified or equivocal requests. CONCLUSION: Appropriate clinical justification is lacking or equivocal in a substantial proportion of A&E paediatric CXR requests. Scope for reduction of the paediatric emergency CXR radiation dose burden exists through more rigorous adherence to available guidelines.

ELECTRONIC POSTER e1508

A two phase audit of contrast and drug recording; illustrating the successsful effect of change

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PURPOSE: Phase 1: To audit the recording of contrast/drug information from IVU's. Our original practice recorded data in a log book, request card (RC) and RIS computer. AIMS: Ascertain if it is necessary to record details of drugs and X-ray dose on more that one medium. Ensure consistency of recording results across the mediums if required. To effect change and re-audit as needed. Phase 2: The results from the original audit led to several changes in practice and the audit re-run. MATERIALS/METHODS: Phase 1: IVUs from 50 patients were retrospectively assessed over 6 months, the data entered in to a specially designed speadsheet. Phase 2: Prospective assessment of 50 patients with data now recorded on RIS and RC only. Data recording simplified (expiry date dropped as tracaeble from batch number) and a flow chart, with the booking out procedure, placed in a prominent position in the IVU room. Data analysed by the Clinical Audit & Effectiveness Department. RESULTS: Phase 1: X-ray Dose: 66% patients recorded on RIS and request card (RC). Contrast Name and Batch No: 56% and 34% had data recorded on all three mediums, respectivley. Expiry Date: 34% patients recorded in log book and RC. 26% were not recorded on either. Phase 2: X-ray Dose: 96% patients recorded on both mediums. Contrast Name and Batch No: 88% and 84% had data recorded on both mediums, respectivley. CONCLUSION: Significant improvement achieved in data recording since the original audit. A re-reaudit is planned to improve practice further.

ELECTRONIC POSTER e1509

Audit of non attendance for specialized radiological investigations at a paediatric tertiary referral centre

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PURPOSE: The Birmingham Children's Hospital is a busy tertiary referral centre serving not only the West Midlands but also receiving national referrals. Non-attendance is an NHS wide problem and is of particular importance in this specialized paediatric referral centre. The purpose of this audit was to identify reasons for non-attendance in order to implement changes and increase attendance rates. MATERIALS/METHODS: This was a prospective audit analysing the number of paediatric patients failing to attend appointments over a 3-week period in ultrasound, CT and MRI. Patient's guardians were contacted by telephone and a proforma was used to ascertain the reason for failing to attend. RESULTS: There were 30 non-attendees over a 3-week period. 23 were male and 7 female, with 20 non-attendees for ultrasound examination, 9 for MRI and 1 for CT. The most common reason for failure to attend (14/30) was due to communication breakdown resulting in patients being unaware of the appointment. This was often due to language difficulties with parents unable to understand appointment letters in English. Other reasons included appointment letters sent to the wrong address and incorrect telephone numbers. CONCLUSION: Efforts need to be made to improve patient attendance. In areas with a large ethnic minority population it is important to appreciate the language barrier that may exist. Communication with parents of different ethnic groups can be readily improved by producing appointment letters with key points in different languages. Attendance can also be improved by ensuring contact details are correct and asking patients to confirm appointments.

ELECTRONIC POSTER e1510

CT scans in acute head injury – are we following the national protocol ?

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PURPOSE: In June 2003 the National Institute for Clinical Excellence (NICE) issued guidance on the management of head injuries in the UK. Key features included wider indications for CT and that CT

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should be performed within the hour if indications were met. This study was undertaken in order to investigate whether NICE guidelines and protocols for head injury were being adhered to in a District General Hospital and to suggest recommendations to implement change where appropriate. MATERIALS/METHODS: Setting: A&E/Radiology Department at Chase Farm Hospital, London. Period of Study: September to November 2005 and April to May 2006. Prospective data was collected from the Patient Admission Service (PAS) and Radiology department. Measured criteria included: (1) Are CT scans performed appropriately/inappropriately according to NICE Guidelines? (2) Are CT scans performed within 1 h if criteria were met? RESULTS: 122 patient notes were reviewed. 93.1% of scans were done appropriately. 6.9% of patients who met the NICE guidelines for CT did not receive a scan. 78% scans were performed within 4 h. 0% scans were performed within 1 h. 81% notes were adequately documented. CONCLUSION: This study demonstrates a responsive radiological and emergency service with no adverse outcome during the study period. Head CT was however not performed within 1 h due to limitations surrounding the referral system. Recommendations for improvement included the creation of a new referral system protocol starting at Nurse Triage and including A&E staff and the Radiology department.

Radiation Protection and QA

POSTER p1601

Correlation between occupational exposure levels, patient exposure levels and screening times

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PURPOSE: In cardiology, occupational exposure levels in centres with high workloads are a matter of concern. There are occasions when a personnel dosemeter reading may be unavailable and an estimation of occupational exposure must be made. The aim of this work is to investigate a method of estimating occupational doses by comparing workload and personal dosemeter readings. MATERIALS/METHODS: A retrospective survey of workload, over 12 months, was made for each of the 7 cardiologists. Radiation output (DAP $Gycm^2$), screening times (hours) and personal dosemeter readings (mSv) per day were recorded. These data was used to investigate the correlation, if any, between occupational exposure and DAP and/or screening times. Workload in DAP/screening times between consultants was matched, and measured vs. calculated occupational exposure compared. RESULTS: The survey indicated that although the number of cases per week is lower, the workload is considerably higher than that previously reported. Daily patient throughput ranged from 11 to 15 clinical cases, contributing an average DAP of 830 $Gycm^2\ day^{-1}$ with 1.6–2 h of screening. Occupational exposure levels per month (whole body) ranged from 0.1 mSv to 1.20 mSv, with eye doses of between 0.1 mSv to 2.50 mSv. However, if the monthly workload between consultants is matched, a reasonable estimation of occupational doses can be made. CONCLUSION: A reasonable estimate of occupational exposure can be made by examining extensive data on workload. Further investigation into clinical case type and complexity is being undertaken.

POSTER p1602

Effective radiation dose in oncology patients undergoing CT staging examination: comparison of two different protocols

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PURPOSE: To compare the effective dose received by oncology patients undergoing staging CT examinations of the chest, abdomen and pelvis using two different CT protocols. MATERIALS/METHODS: 18 oncology patients booked for follow up CT examinations of the chest, abdomen and pelvis during the month of July 2006 were randomly selected for the study. All patients had undergone previous staging CT of the chest, abdomen and pelvis on the Siemens Sensation 16 multislice scanner using a single-scan protocol from lung apices to ischium in the portal-venous phase. All 18 patients subsequently underwent a revised CT protocol consisting of an initial arterial phase scan from lung apices to costophrenic recess and a second portal-venous phase scan from top of diaphragm to ischium. The CTDI was measured for each scan. From this the effective dose was calculated. RESULTS: The effective dose ranged from 4.7 mSv to 17.4 mSv in the single scan protocol and from 8.4 mSv to 26.7 mSv in the multiscan protocol. The average effective dose was 8.56 mSv and 13.4 mSv for the single-scan and multiscan protocols, respectively. This corresponds to a 36% higher effective dose using the multiple scan protocol. The average effective dose was 9.5 mSv in males and 8.3 mSv in females using the single-scan protocol compared with an average of 13.4 mSv in males and 12.2 mSv in females using the multiscan protocol. CONCLUSION: A considerable increase in effective dose using a multiscan compared with a single-scan protocol is demonstrated.

POSTER p1603

Comparison of radiation doses due to cone-beam CT, SPECT/CT and standard multislice CT

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PURPOSE: Radiation doses due to multislice CT scans are well documented, and essential for exposure justification. However, there is little data on doses from other more recent CT attachments. This study estimates effective doses for scanners in Nuclear Medicine and Radiotherapy departments. MATERIALS/METHODS: The Infinia Hawkeye enables registration of CT images with radioisotope images. Radiation doses were measured using a standard CT phantom in order to calculate CTDI and DLP for common scans, and this data was used to determine effective doses. The Acuity Simulator, in the Radiotherapy Department, is capable of producing cone-beam CT images for treatment planning, in addition to radiography and fluoroscopy. Radiation doses due to the cone-beam CT scans were measured and effective doses estimated. RESULTS: With the Infinia Hawkeye "half-scan" dose reduction feature enabled, it was found that effective doses were significantly lower than standard CT doses: chest scan dose was 1 mSv compared with 2.6 mSv using standard CT. Using matching scan lengths, the doses due to cone-beam CT were found to exceed standard CT doses (chest scan 9 mSv). However, scan lengths for treatment planning may be shorter than diagnostic imaging, therefore reducing the patient dose. CONCLUSION: The registration of CT to radioisotope images provides useful localization information, and the additional radiation is low when compared with standard CT or Nuclear Medicine doses. Conversely, the radiation dose due to cone-beam CT was found to be high and exposures must be thoroughly justified.

POSTER p1604

Occupational and patient radiation exposure from endovascular repair of aortic aneurysms

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PURPOSE: Endovascular stent-grafting is a procedure for the treatment of abdominal aortic aneurysms and is increasingly preferred over "open" surgical methods. However, it is a long, complex and high dose procedure performed using a mobile C-arm and where there is little local protection from radiation exposure. A risk assessment, based on estimated workload, typical dose–area products (DAPs) and screening times, identified the need to monitor doses to the interventional radiologist, and prompted a patient dose audit. Based on initial observations radiologists performing this procedure could possibly require classification. MATERIALS/METHODS: In addition to their film badges worn under the lead apron, three interventional radiologists were asked to wear an electronic personal dosemeter (EPD) at neck and knee level outside the apron and a ring thermoluminescent dosemeter (TLD) on their left ring finger for a minimum of 20 stent-grafting procedures. EPD readings, DAP, screening time and relevant patient data will be recorded for each procedure, and each ring TLD will be readout at the end of the monitoring period. RESULTS: Initial measurements have shown that dose–area products range between 50 $Gycm^2$ and 240 $Gycm^2$ with screening times of up to 93 min. A patient dose audit and details of staff doses will be presented. CONCLUSION: It is expected that additional radiation protection will be required to keep doses to staff who perform multiple and long high dose procedures as low as reasonably practicable and classification may be required. Without due care and radiation awareness doses to patients could approach threshold values for deterministic effects.

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POSTER p1605

AEC systems in CT: a regional dose audit

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PURPOSE: The use of multislice CT has increased significantly in recent years. Most new scanners are equipped with automatic exposure control (AEC) systems with the aim of reducing patient dose. This dose audit assessed the effect of AEC settings for chest-abdomen-pelvis (CAP) examinations performed on six GE multislice CT scanners in the East Anglian region. MATERIALS/METHODS: Dose information (CT dose index, $CTDI_{vol}$, and dose length product, DLP), scan parameters and AEC settings (noise index) were recorded for a minimum of 10 patients undergoing a CAP examination on each scanner. RESULTS: The regional mean DLP of 1080 mGy cm was greater than the National Reference Dose of 940 mGy cm. There was only weak negative correlation between DLP and noise index. Scan parameters and AEC settings differed between the sites and could account for the wide range of DLP results from the different scanners. Most notably, centres using narrow reconstructed image widths tended to deliver greater doses to patients, even when high noise indices were chosen. CONCLUSION: Dose reduction in CT cannot be achieved by simply choosing a high noise index, but requires an understanding of other factors such as slice width. Careful optimization of parameters in consultation with reporting radiologists is necessary. The current National Reference Doses (NRPB W-67, 2003) are already outdated since they do not consider a significant number of 16- and 64-slice scanners. Narrow reconstructed image widths are often used on these scanners, which, as this audit shows, tend to result in higher patient doses.

POSTER p1606

Long-term sequelae of radiation exposure due to CT in childhood – 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. Children represent a susceptible group for radiation-related cancer. This study will assess the safety of CT scans in children and adolescents. STUDY DESIGN: A 5-year retrospective study of 200 000 children (aged <18 years) scanned using CT prior to 1997 will be conducted. Detailed information, including radiological, clinical and demographic details, will be downloaded from information systems in radiology departments across the UK. Patients with existing cancer at the time of the initial scan will be excluded. Patient data will be linked with the NHS Central Registry who will provide cancer and mortality information. A nested case-control study of leukaemia, using film records, will assess dose–response more precisely. METHODS: A survey of large UK radiology units is being carried out to assess the availability of electronic data. Based on this information, departments will be invited to contribute patients to the study cohort. Cancer risk in relation to radiation dose, estimated by an expert dosimetrist, will be evaluated using multivariable statistical regression analyses, taking into account potential confounding factors, including other radiation exposures and socio-economic status. CONCLUSION: This study of a subset of the population, which is likely to show the greatest effect of radiation from CT, should there be one, will provide the information urgently required to allow guidelines to be developed for safe and more effective use of CT scans in children and adolescents.

POSTER p1607

Developing a QA programme for CR/PACS; is it worth it ?

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PURPOSE: To demonstrate the value of QA in maintaining consistently high image quality from the outset in a digital department following the switch from traditional screen–film processing. MATERIALS & METHODS: It is necessary to provide knowledge, training and the resources necessary to guarantee a high level of precision in testing. A QA routine has been established and a high frequency of testing was carried out at implementation. This has now settled in to the frequency recommended by IPEM 91. Whereby some areas complete daily tests and others monthly and 3 monthly. Good communication with the service and radiation protection providers has been maintained. Findings are reviewed on a regular basis. RESULTS: Tests are performed with high accuracy and repeatability. The programme is a valued contributor to maintaining standards and avoidance of non-compliance. Problems have been detected promptly and evidence of long-term stability gathered to support reducing the frequency of testing at the earliest opportunity and keeping downtime to a minimum. The continuous improvement process is enabled. CONCLUSION: Vulnerabilities, equipment malfunction, performance and non-compliance issues are not unusual when introducing new technology and systems of work. Addressing knowledge, skill level and resource issues combined with careful planning of, application and integration of QA activities into the CR/PACS environment has ensured that image quality has remained optimized. Deficiencies are highlighted at the first opportunity, making it possible to limit their impact and duration to the absolute minimum. Our opinion is that a QA programme is worth it.

POSTER p1608

CT kilovoltage practical routine measurement

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PURPOSE: To test a method of routine measurement of kV and filtration for CT that is simple, accurate and can be carried out using standard rotational CT scanning. Changes in kV and HVT can affect patient dose and the CT number versus linear attenuation coefficient relationship. This can be important in general CT scanning and for CT scanners used for radiotherapy planning. MATERIALS/METHODS: An UNFORS LXi dosemeter that uses a compact solid-state detector system was used to measure kV and HVT from a single exposure. Placing the detector in the primary CT X-ray beam in the CT X–Y plane enabled one rotational scan to generate kV and HVT. Comparing the results obtained in rotational scanning mode (clinical mode) to that obtained with the X-ray tube stationary indicated good agreement in the results obtained. RESULTS: Measurements were obtained for 3 multislice CT scanners comparing results obtained with the CT tube stationary to that in the rotational mode gave an average agreement of 0.8–2.2% at 80–140 kV. The agreement for HVT was 0.6–2.6% at 80–140 kV. These results indicate a filtration value of 10.3±0.3 mm of aluminium. CONCLUSION: Using an UNFORS LXi multifunction dosemeter CT, kV, and HVT can be obtained for one rotational scan. This is a useful addition to the routine measurements made on CT scanners as it can indicate the reasons for changes in dose and CT number variation. This is especially relevant in applications where the CT data is being used for further calculation as in radiotherapy planning.

POSTER p1609

Local performance checks on MR Scanners across BUPA

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PURPOSE: To investigate the worth and methodology of local performance measurements on MR scanners across an organization. METHODS: A protocol was established to measure signal and noise on a weekly to monthly basis by local radiographic staff for all commonly used coils on MR scanners across BUPA hospitals. The scans were carried out using a specified spin echo technique and utilising the manufacturers supplied phantoms. Regions of interest were drawn to calculate signal and noise values in specific locations. These were then used to derive signal to noise ratios and uniformity values for each coil. RESULTS: Results were obtained from 11 scanners over a period of between 3 months and 5 months with the majority of tests being performed weekly. Baseline measurements showed a wide variation between sites for the same coil with the highest signal to noise ratio on the head coil being 2.9 times higher than the lowest. The widest variations in signal for the most common coils were

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observed for the spine coil. Many coils were consistent over time with results fluctuating well within ±20% of the mean, but a number of coils were less consistent. CONCLUSION: A wide variation in results was observed. The results support the case for carrying out local performance checks on MR scanners.

POSTER 1610

Are lightweight composite aprons suitable for personnel shielding in nuclear medicine?

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PURPOSE: Nuclear medicine technologists (NMTs) have the highest effective doses of medical radiation workers. While lead aprons are mandatory for staff present in the X-ray room, they are rarely used by NMTs who come into close contact with radioactive patients. With increases in the use of lightweight materials in diagnostic radiography, the research aim was to assess the effectiveness of lightweight aprons in shielding against $^{99}Tc^{m}$ gamma rays. METHOD: The doses received from a scattering phantom (patient) to the entrance, 9 cm depth and exit of an anthropomorphic phantom (NMT) were measured with LiF: Mg,Cu,P TLDs. Doses were assessed with no shielding, a 0.5 mm lead apron and a 0.5 mm Roland Light Weight apron between the patient and NMT. Spectral changes to the entrance surface of the anthropomorphic phantom were also assessed. RESULTS: The lead apron decreased entrance surface doses by 76%, while the Roland apron reduced this dose by 59%. The spectral analysis shows that the Roland composite apron provided better (15%) dose reduction at energies less than 95 keV though lead is superior (35% more efficient) at higher energies. CONCLUSION: The dose reductions provided by both aprons were significant. While the 0.5 mm lead apron demonstrated better shielding characteristics for $^{99}Tc^{m}$, the savings in dose associated should be considered with the 20% weight differential. It is recommended that the Roland composite apron is suitable to be worn for NMTs interacting with patients injected with a $^{99}Tc^{m}$ labelled radiopharmaceutical.

ELECTRONIC POSTER e1611

Staff dose reduction by changing equipment operating parameters in C-arm fluoroscopic procedures

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PURPOSE: This study investigated how staff dose could be reduced in C-arm fluoroscopic procedures by the variation of operational parameters, including collimation size, magnification factor and image-intensifier (II) to object distance. MATERIALS/METHODS: This study was carried out using a C-arm fluoroscopic unit (Philips Integris V3000). Two anthropomorphic phantoms were used simulating both patient and operator. A typical common abdominal fluoroscopic procedure was set up. Evaluation of staff dose was performed by changing the operating parameters of the X-ray unit, which included collimation size, magnification factor and II to patient distance. Staff dose measured include dose of the eye, thyroid, body entry at table level, testis and hand (on patient's right femoral region). A 60 cm^3 ionization chamber was used to measure the doses. RESULTS: There is a decreasing trend of staff doses with the decreasing beam collimation. Five collimation sizes were investigated. Results show that with the use of the largest collimation size (26 cm × 26 cm), the mean dose rate at the eye (10.1 μGy min^{-1}), thyroid (41 μGy min^{-1}), mid-body entry (62.2 μGy min^{-1}), testis (51.3 μGy min^{-1}) and hand (61.4 μGy min^{-1}) were 3.5, 3.8, 2.9, 3 and 4.8 times that with the smallest collimation size (14 cm × 14 cm), respectively. Similar decreasing dose trend was found with increasing magnification factor and increasing II to object distance. CONCLUSION: Staff dose will be minimized with the use of the smallest realistic (region of interest included in the view) collimation size, minimum II to patient distance and the realistic largest magnification factor.

ELECTRONIC POSTER e1612

Optimization of current and novel display technologies for radiological images

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PURPOSE: Standards and guidelines must be developed and clinically validated to ensure that soft-copy medical images yield the highest diagnostic efficacy. The current study aims to establish up-to-date, relevant guidelines on the optimization of existing and novel monitor types for use in digital imaging and to determine the types and calibration of monitors currently used in Irish hospitals. MATERIALS/METHODS: A survey of monitor types and calibration in Irish hospitals will be conducted. High- and low-specification monitors typical of those used in wards and radiology reporting rooms as identified from this survey and high dynamic range (HDR) monitors, a new technology with a much greater contrast ratio than commercially available types, will be tested. Physical tests using TG18 and SMPTE test patterns will be performed on each monitor type. Two observer studies utilizing clinical chest and breast images will then be carried out. In each, four specialist radiologists will independently evaluate 100 images (50 normal, 50 containing simulated lesions). Participants will mark the location of perceived lesions and score each on a confidence scale. From this observer data a metric of performance will be obtained through JAFROC methodology. RESULTS: JAFROC analysis will be applied to all observer scoring data. A one-way analysis of variance will be used to detect any significant differences in diagnostic efficacy between monitor types. CONCLUSION: The study will establish standards for optimizing monitor types for viewing soft-copy medical images, compare these with those in current use in Irish departments and investigate the usefulness of new HDR technology.

ELECTRONIC POSTER e1613

No ifs or buts, you simply need to know this if you are a radiologist or radiographer!!

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PURPOSE: If a patient has any condition which can affect his visit to the radiology department (for example allergy to contrast media), this can be placed as a warning on the patient's radiology record (CRIS record) saying that the patient has Alarms. Hence it is extremely important that all the radiologists and the radiographers know how to correctly use the ALARMS system on the CRIS. MATERIAL AND METHOD: We carried out a prospective audit asking the radiographers and radiologists to directly demonstrate how to view and place an ALARM on the CRIS system on a test patient. In order to further improve the accuracy of this audit, we completed the whole exercise in 2 days. 34 people participated in this audit including 9 consultant radiologists, 16 radiographers and 9 radiology registrars. RESULTS: While all knew what ALARMS meant, only 50% (17/34) knew how to view the details and only 26% (9/34) knew how to place an ALARM on the CRIS system. To rectify this weakness, training in CRIS and ALARMS has been made compulsory CPD training for radiographers and radiologists. CONCLUSION: This audit showed that not every radiographer and radiologist knew how to use the ALARMS system effectively. As this is an important risk management strategy, we present a poster demonstrating what conditions can be placed as an alarm and how to view details about the ALARMS on the CRIS system.

ELECTRONIC POSTER e1614

Are we using too much radiation in CT colonography? A dosiometric audit including barium enema comparison

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PURPOSE: This audit set out to measure the effective dose to symptomatic patients undergoing a newly introduced service of CT colonography (CTC) and compare this dose with that received during a routine double contrast barium enema (DCBE). These values were also compared with the "standard" doses quoted in the literature. MATERIALS/METHODS: 53 symptomatic patients who underwent

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CTC were compared with patients who underwent DCBE during the same 1-year period. CTC was performed on a GE Lightspeed 16 or 32 multislice machine in both the supine and prone positions following full bowel preparation and air insufflation. Effective dose was calculated for both examinations from dose–length product (DLP) and dose–area product (DAP) measurements, respectively. RESULTS: Effective doses for DCBE (mean dose 5.90 mSv; dose range 2.12–21.33 mSv) were comparable with dose levels from the American Physics Society and the Health Physics Society. Effective doses for CTC (mean dose 12.18 mSv; dose range 3.86–45.82 mSv) were higher than doses quoted in the recent literature (mean doses 1.8–2.4 mSv), many of which were performed for screening rather than for symptomatic patients. CONCLUSION: Effective doses for CT colonography where significantly higher than standard dose ranges and DCBE. A new lower dose CT protocol for both symptomatic and screening CTC patients has been enforced.

Development in MR & CT

POSTER p1701

Clinical applications of using a TSE sequence with reduced sensitivity to inplane motion (BLADE)

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KEY LEARNING OBJECTIVES: This poster will describe the technical aspects of this modified Turbo Spin Echo Sequence (BLADE) and provide examples of clinical applications where this technique can be utilised for a number of different body areas. DESCRIPTION: BLADE is a modified Turbo Spin Echo sequence which can register patient motion in the image plane during image acquisition and then correct for this motion during the image reconstruction process. This is done by continuously acquiring low resolution images during motion. This data is then used to correct for motion. BLADE can be used in different orientations together with multichannel coils and parallel Imaging (GRAPPA). Different image contrast can be achieved dependent on the clinical application. T_1 TSE, T_2 TSE, T_2 TSE (Restore), dark fluid and T_1 inversion recovery can be acquired with BLADE. This means that it can be used to improve the image quality on uncooperative patients for a variety of applications, reducing the need for sedation and anaesthesia. Areas that potentially benefit from using BLADE include CNS, orthopaedic and abdominal imaging. CONCLUSION: BLADE is now a commercially available product which can be used in a variety of different applications to correct for inplane motion. This will prove to be a very useful clinical tool for improving image quality for uncooperative patients and children.

POSTER p1702

Myocardial MR first-pass perfusion is a useful adjunct to dobutamine stress wall motion assessment

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PURPOSE: Dobutamine stress MRI is increasingly being used as a reliable method of identifying stress induced myocardial ischaemia. In some patients, cine images at peak stress are suboptimal due to patient motion or dysrhythmia. This study sought to investigate the additional benefit of first-pass perfusion imaging at peak dobutamine stress. METHODS: 11 consecutive patients undergoing dobutamine stress MR for assessment of suspected coronary artery disease were evaluated. At rest and at each dose increment of dobutamine, cine images were obtained in six imaging planes. At peak stress first-pass perfusion images were acquired in four planes following an intravenous bolus of gadolinium-DTPA. Qualitative analysis of wall motion and perfusion images was performed. RESULTS: Eight patients had adequate diagnostic wall motion imaging including at peak dobutamine stress, and all of these had diagnostic perfusion images. Three patients had suboptimal peak stress cine images, due to patient dysrhythmia and respiratory motion. However, all these patients had diagnostic perfusion imaging, with perfusion defects present in two patients. CONCLUSION: First-pass perfusion imaging during dobutamine stress is a useful adjunct to wall motion assessment in identifying myocardial ischaemia. It is most valuable in those patients that have suboptimal or non-diagnostic cine images at peak stress.

POSTER p1704

Dual-source cardiac CT: are the doses really lower?

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PURPOSE: Dual-source CT allows images to be acquired in as little as 83 ms, offering potentially improved cardiac imaging. It is claimed that dual-source CT also results in lower patient doses. However, during procurement of a new scanner, manufacturers gave conflicting opinions as to how doses compared with their competitors. The aim of this work was to resolve these discrepancies, and subsequently to assess whether dual-source CT actually results in lower patient doses. METHODS: Recommended exposure parameters were used in conjunction with the ImPACT CT Dosimetry Calculator to estimate patient doses from two single-source CT scanners and the dual-source Siemens Definition. Results were calculated for routine coronary angiography on patients with a range of heart rates. Following installation of the dual-source scanner, a dose audit has been carried out to compare actual patient doses with those from the equivalent Siemens single-source scanner. RESULTS: Using recommended exposure parameters, patient doses from the dual-source scanner were estimated to be 50–80% of those from the two single-source scanners considered. However, the benefit obtained from dual-source CT was found to depend on heart-rate and the extent to which mA modulation is applied. Results from a preliminary dose audit show the actual effect of dual-source CT, by comparing patient doses with those from an equivalent single-source scanner. CONCLUSION: Dual-source CT potentially offers significant benefits for cardiac imaging. Prospectively comparing doses between scanners is complicated by the large number of variables involved, but initial evidence supports claims that dual-source CT can result in lower patient doses.

ELECTRONIC POSTER e1705

"Clinical applications of body diffusion"

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KEY LEARNING OBJECTIVES: This poster describes the clinical usefulness of body diffusion in MRI. Diffusion imaging is a technique, which has long provided significant clinical information in neurological studies. This poster describes the possible clinical utility of diffusion based techniques in areas outside of the CNS. It presents two clinical case studies which show body diffusion imaging is becoming a clinically relevant tool. DESCRIPTION: REVEAL is an EPI based diffusion technique utilizing a parallel acquisition regimen (GRAPPA) to reduced susceptibility artefacts. The technique typically uses b-values of (600–1000) for suppressing signal from normal tissue, thus having the effect of highlighting lesions that demonstrate restricted diffusion properties. Alternatively, low b-values can be used to eliminate signal from vessels, which can be a useful technique in liver imaging and is compatible with breathhold or free breathing acquisitions. There are a rapidly growing number of clinical applications for body diffusion. Research has found distinctive diffusion characteristics for different disease processes and normal tissue in the liver, kidneys, prostate, vertebrae and lymphatics. ADC values are proving very useful in the classification of disease, especially in diagnosing and staging oncology cases. Body diffusion has become extremely useful in differentiating between primary tumours and metastases. This has lead to the prospect of whole body diffusion screening with "PET-like" images. CONCLUSION: Body diffusion is now well within the realm of clinical imaging, although still in its infancy, the potential for future applications of these sequences is evident.

ELECTRONIC POSTER e1706

The clinical feasibility of push-button prostate MRS

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KEY LEARNING OBJECTIVES: With the invasive nature of prostate biopsy and difficulty in targeting actual tumour tissue for accurate

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histology, prostate MRS is becoming increasingly popular as a non-invasive approach to aiding differential diagnosis between carcinoma and BPH. This presentation is aimed at evaluating the feasibility of introducing MRS into prostate MR examinations and assessing the benefits it can offer. DESCRIPTION: Currently diagnosis relies on elevated PSA levels, biopsy and clinical MRI. However, in some cases there can be elevated PSA with negative biopsy and MRI. In these cases a non-invasive approach to investigating the metabolic activity of the prostate is a beneficial procedure that can increase confidence levels in the diagnosis of prostatic carcinoma. This has particular importance for patients without extracapsular lesions who may be candidates for a prostatectomy. 3D CSI of the prostate using body matrix or endorectal coils and optimized CSI protocols enable the metabolic profile of the entire gland to be interrogated in a single 11-min acquisition. Saturation bands prevent contamination from adjacent fat and automated adjustments and post-processing require minimal user intervention and produce routinely good spectral quality. Data can be viewed as individual spectra, spectral maps or as metabolite images at the click of a button and metabolite ratios can be used to distinguish tumour, BPH and normal prostate tissue. CONCLUSION: Spectroscopy has become "user friendly" with pre-defined protocols and automatic adjustments enabling "push-button" examinations to be readily integrated into the clinic and offering enhanced confidence in diagnosis of complex cases.

ELECTRONIC POSTER e1707

Diffusion imaging: an interactive tutorial

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KEY LEARNING OBJECTIVES: An engaging, interactive tutorial is used to convey the physics and the major clinical applications of diffusion imaging techniques in MRI. DESCRIPTION: Diffusion imaging is a very active area in both routine clinical and research MRI. It is important to have a strong grasp on the fundamentals of diffusion imaging in order to exploit the full potential of existing and emerging techniques. Unfortunately the physical concepts behind diffusion MRI are relatively complex and not easily presented in textbook format. Here we make use of the graphical capabilities of electronic media to provide an animated, interactive and visually striking tutorial on diffusion imaging. The concepts of diffusion, anisotropy, the diffusion tensor, diffusion weighting, ADC maps, trace images and tractography are covered. The underlying physics presented is strongly grounded in clinical cases embedded in the tutorial. CONCLUSION: This educational presentation is recommended to radiologists, radiographers and physicists new to diffusion imaging or those looking for a fresh, graphical based perspective on the subject.

ELECTRONIC POSTER e1708

Interobserver variability in the measurement of abdominal aortic calcification using unenhanced computed tomography

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PURPOSE: To assess the degree of interobserver and intraobserver variability when measuring the calcification in the abdominal aortas of volunteer subjects. METHODS: 34 subjects were randomly selected from a larger pool of 75 volunteers who had been recruited into a separate study of arterial stiffness and who had undergone CT scanning. Aortic calcification was measured for each subject within a pre-defined section of abdominal aorta by two independent observers using commercial image evaluation software (Siemens Leonardo workstation with Syngo software). The differences between observers' results were calculated and plotted on Bland-Altman plots to determine the degree of interobserver variation. Additionally, one observer repeated the measurements and the degree of intraobserver variability plotted in the same way. RESULTS: The level of both interobserver and intraobserver variability was low. Of 34 subjects, only two results were significantly different (> 1.96 SD from mean) when measured by both the same and different observers. Two key potential sources of significant variation were identified. First, selection of a different image slice to represent the inferior extent of the aortic bifurcation (the starting point for measurements) and second, the presence of heavily calcified aortas which exaggerated any minor differences in results. CONCLUSION: Numerous methods of quantifying aortic calcification have been published; however, there has been a lack of consensus with regard to technique and comparisons between studies has been difficult. This study has demonstrated a method that is robust enough to allow its use in future studies, with minimal interobserver and intraobserver variability.

Technique optimization and analysis

POSTER p1801

Denoising medical images with wavelet and training based methods

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KEY LEARNING OBJECTIVES: To describe advanced and efficient medical image denoising techniques and to compare their performances using noise contaminated images achieved from different modalities. DESCRIPTION: One limiting factor common to medical imaging modalities is the noise generated by the system during the acquisition. This noise reduces the image quality and produces undesirable effects. While specific hardware and software have been developed for eliminating motion artefacts, only few basic methods are used in current practice to reduce the noise. The noise, by affecting the general quality of the image, indirectly influences the required hardware (*i.e.* CT number of slices and MRI magnetic field), settings (*i.e.* X-ray dose and MRI protocols) and acquisition time with evident effect on the cost of the diagnostic exam. Denoising is essential in application requiring fast acquisition (*i.e.* functional MRI) or where the aim is to extract quantitative parameters from the images (*i.e.* kinematic parameters during lateral and forward bending in fluoroscopic sequences). Techniques aimed to reduce the noise on medical images must cope with several difficulties such as: importance of original diagnostic information, differences between noises generated by different modalities, relevance of the human visual system on the perceived noise. CONCLUSION: We demonstrate that it is possible to reduce the noise contaminating medical imaging from different modalities using frequency and spatially adaptive techniques. These techniques adjust automatically their characteristics on the basis of a limited amount provided information.

POSTER p1802

Nocturnal switching off of computers in an imaging department offers major financial savings

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PURPOSE: To assess whether the imaging department is turning off all computers and monitors out of hours. METHODS: The 24 imaging department computers were each assessed by an imaging SpR at 2000 hours on 3 occasions (two Monday nights and one Friday night). On each occasion a record of whether the main computer and screen were switched off was made. Two computers were excluded from the survey (to allow the radiographers to provide a 24-h service). RESULTS: A total of 24 computers were assessed, on 3 different occasions (72 total assessments). 51/72 (80%) computers and 60/72 (83%) screens were left switched on. Certain computers in the communal areas were always left on. Of the 8 consultant's machines, none of them were completely switched off for every assessment. On the Friday night, 19 computers and monitors were left switched on, amounting to 64 h of wastage. CONCLUSION: This constitutes a huge amount of wasted energy and money. According to Government figures, turning off all 24 computers and monitors every night and weekend would save £1440 a year. Extrapolation of our results to the whole trust's computers would result in a saving of around £62 400 a year. An automatic, trust-wide, nocturnal power down has now been instituted. All radiology departments should raise awareness of these potential savings and encourage measures to maximize compliance.

POSTER p1803

The scientific contribution of imaging in Egyptology: the "virtual unwrapping" of a mummified limb

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PURPOSE: Radiographic imaging of Ptolemaic Mummy DUROM 1999.32.1 in 1964 revealed an artificial left upper limb attached to a deformed distal forearm. The forearm was removed from the mummy in 1965. Until 2005 the internal structure of the artificial limb remained unresolved and the nature of the deformity continued to be speculative. We applied modern imaging techniques to further define the construction of the artificial limb and the cause of the skeletal deformity. MATERIALS/METHOD: Imaging included AP and lateral radiographs and CT using a General Electric MDCT Lightspeed scanner. These images, in conjunction with original radiographs of the intact mummy, revealed the nature of the restored limb and enabled differential diagnoses (DD) of the deformity to be determined. RESULTS: Native limb: radiographs confirmed a tapered radius and ulna with defective distal regions suggesting a dysplasia (DD = neurofibromatosis, Madelung type deformity, amniotic bands). Artificial limb: this was a complex construction of linen and reeds indicating a post mortem restoration and not pre mortem prosthesis. CONCLUSION: Using modern imaging techniques we have been able to confirm that the artificial limb is a restoration and that the most likely aetiology of the limb deformity is amniotic bands.

POSTER p1804

Dual energy subtraction chest radiography: our clinical experiences

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KEY LEARNING OBJECTIVES: (1) To describe the technique of dual energy subtraction radiography. (2) To demonstrate the clinical application of dual energy subtraction radiography. (3) To describe pitfalls of image interpretation. DESCRIPTION: The concept of dual energy radiographic technique was described 50 years ago; however, it is only now we have realised its diagnostic potential with the advent of digital radiography and flat plate detectors. This presentation will illustrate the clinical application of this technique in the thorax with relevant case presentations. We will illustrate the value of this technique in detection of pulmonary nodules and calcification, and also demonstrate some common pitfalls of image interpretation. We will also discuss the issues surrounding best practice and application of this technique. CONCLUSION: Dual energy subtraction radiography is a clinically useful technique in the assessment of pulmonary pathology.

POSTER p1805

Portrait of a chest X-ray

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PURPOSE: To assess the orientation of chest X-rays acquired by computed radiography and optimize image presentation to assist in diagnosis. METHOD: Our hypothesis is that portrait orientation allows for optimal display on PACS, maximizing diagnostic yield. Initial audit of 166 serial CXR in June 2006. No published data is available to establish a target and a best guess of 90% portrait orientation was chosen. Re-audits, in Oct 2006 and Nov 2006, assessed 100 sequential CXR. We assessed the proportion of portrait CR and maximum achievable rate based on chest diameter of <35 cm. Interim targets of 30% and 40% were set. Staff were informed of the results after each audit cycle. RESULTS: Initially, 166 images reviewed; 100 CR (60%). Of these 88 landscape, 12 portrait (12%). 90% target not met. Second cycle: 100 images; 70 CR (70%). Of these 26 (37%) portrait. Of the 44 landscape, 37 (84%) had chest diameter <35 cm. Maximum portrait rate was (26+37)/70 = 90%. Interim 30% target met, 90% target not met. 90% was achievable. Third cycle: 100 images, all CR. 51 (51%) portraits. Of the 49 landscape images, 35 (71%) had chest diameter <35 cm. Maximum portrait orientation rate was (51+35)/100 = 86%. Interim 40% target met. 90% target not met. 90% target not possible. CONCLUSION: Significant change in radiographic technique allowing optimal presentation. Maximum rate of 90% portrait orientation is not a realistic target, this has now been adjusted to 80%. This audit cycle has been adopted as a departmental quality standard.

POSTER p1806

An investigation of the effect of kVp and the anti-scatter grid on effective dose and the visualization of pathology in the PA chest radiograph

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PURPOSE: The purpose of this study was to determine the best compromise of effective dose and image quality for the visualization of chest nodules in Direct Radiography using ROC analysis. MATERIALS/METHODS: Six kVp values with and without a grid were selected to produce radiographs of the phantom. Lung pathology was simulated depicting actual pathology using earplug wax and a range of subtlety. Three experienced Radiologists were recruited to assess the images and decide on the presence or absence of pathology. Their diagnostic performance was rated through the use of receiver operating characteristic (ROC) A_1 values and the false positive and false negative ratio. From the ROC curves, image quality results were obtained. This combined with effective dose measurements allowed conclusions to be drawn regarding the best compromise kVp setting with and without a grid. The decision on best kVp and the use of the grid and was made by balancing effective dose and A_1 values. RESULTS: The results showed that image quality is always higher with a grid and that a range between 125 kVp and 137 kVp with a grid is the best setting for DR PA chest radiography using simulated pathology. A kVp setting of 137 produces 1.94 times less dose than 70 kVp with a grid. CONCLUSION: The use of 137 kVp with a grid results in a good compromise of dose and image quality during DR chest imaging.

POSTER p1807

Me and my PACS – ergonomics of a filmless radiology department

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KEY LEARNING OBJECTIVES: Government has set the target of 100% filmless radiology departments and picture archive and communication system – PACS – is already a reality in many hospitals. We aim to highlight the ergonomics of a filmless radiology department in the light of recent studies on this subject. DESCRIPTION: A comfortable environment reduces the work related stress and chances of error. Evolution of traditional viewing boxes to visual display units has led to an increase in the speed of reporting. This change is accompanied by complaints of wrist and shoulder pains, eye fatigue, neck pain, and backache. A tired eye and fatigued brain is more likely to commit an error. Placing the monitor too high exposes wider area of eye, leading to accelerated tear evaporation. This causes increased eye fatigue and blurring of vision. After intensive close screen work a colour tinge is visualized with white and black objects – McCollough effect. Transient functional myopia in computer users can occur due to ciliary muscle spasm. Overhead lighting near monitor and dust on the screen cause further strain as if "looking through haze". Misjudged height of chair or maladjusted back support can lead to chronic strain on muscles of back, shoulders and wrist. All this can be avoided by simple adjustments in our working environment. CONCLUSION: Change in working practice brings new challenges with it. We aim to highlight reasons for frequent complaints following prolonged use of PACS and adjustments in our environment, which can maintain efficiency for longer period.

POSTER p1808

Phantom-based investigation into dose–image optimization of pelvic and abdominal examinations using direct radiography

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PURPOSE: An investigation into the potential of direct radiography (DR) to reduce patient dose for abdominal and pelvic radiography examinations. Previous findings for DR chest radiography suggest dose savings approaching 50%; however, there remains a paucity of studies on abdominal and pelvic DR examinations. MATERIALS/METHODS: In total 42 pelvic and 42 abdominal images were produced using an anthropomorphic phantom and an amorphous silicon flat-panel detector

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system with the individual dose–area product (DAP) readings recorded over a range of kVp and mAs values. All images were scored by three experienced radiographers using a range of image quality criteria. Intraobserver and interobserver variability/consistency were tested statistically (Mann-Whitney U). Mean effective dose (ED) values were calculated from the DAPs. The ED values in conjunction with their associated image scores were analysed with regard to dose reduction. RESULTS: Dose reductions approaching 85% for both examinations in comparison to the maximum Commission of European Communities ED values were found. kVp selection and appropriate manipulation of mAs allowed lower doses to be utilized. Dose reductions for the pelvis were found to exceed abdominal dose reductions by 20%. This difference was equivocal between images of high diagnostic efficacy and between images of lower diagnostic quality. CONCLUSION: DR's potential to reduce ED varied between the abdomen and pelvis. A combination of differences in their inherent anatomical subject contrast and varying image contrast requirements are suggested as the basis for the dose reduction differences. A clinical study and revision of ED recommendations is suggested.

POSTER p1809

Wedge-filtration: image quality and patient dose reduction in the imaging of the antero-posterior thoracic spine

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PURPOSE: To investigate the effect of wedge-filtration on image-quality and patient-dose when undertaking computed-radiography (CR) of the thoracic-spine. METHODS: Anteroposterior (AP) projections of the thoracic-spine were acquired using an anthropomorphic phantom (RSD Pixy, USA) with and without wedge-filters (clear-lead gradated (Cone Instruments, USA) and wedge (Nolan, New Zealand)). Radiographic images were acquired (Siemens Multix-Top X-ray tube, Konica Regius-150 CR system) and processed using linear and non-linear (thoracic-spine optimized) look-up-tables. Four independent, blinded observers scored the images using a 4-point scale rating the visibility of key anatomical features. Overall diagnostic quality was rated as poor, acceptable or excellent. Dose measurements at the upper-, mid- and lower-thoracic-spine were undertaken (Barracuda multimeter (RTI, Sweden)). RESULTS: The visibility of key anatomical features varied with the type of filter and look-up-table used. Such variations were not always statistically significant and did not impact on the assessment of overall diagnostic quality – all images were rated, on average, as acceptable. Both filters did reduce patient-dose. The clear-lead filter reduced doses by 58% at the upper-, 41% at the mid- and 23% at the lower-thoracic-spine (all $p < 0.001$). The upper-thoracic spine dose was reduced by 64% with the wedge-filter ($p < 0.001$) but was not significantly reduced at the mid- or lower-thoracic spine. CONCLUSION: CR offers the ability to manipulate and optimize images and so, in terms of image-quality alone, wedge-filtration for radiography of the AP thoracic spine may not be necessary. However, the use of such filtration still offers benefits in terms of patient-dose reduction.

POSTER p1810

Geometric validation of a virtual radiography simulator

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OBJECTIVE: To develop new software for simulation of radiographs based on perspective projections through CT data (a digitally reconstructed radiograph, DRR), to evaluate the accuracy in the projection geometry, and to measure the speed of calculation. METHODS: A "virtual radiography" software algorithm was developed on a personal computer with graphics card, with models of a patient, X-ray tube, bucky and cassette. The model of the patient was derived from data from a CT examination of a skull phantom. DRR's of the patient model could be rendered as perspective projections based on the relative positions between the models. The projection geometry of the software was validated by identifying "Hard Landmarks" visible on plain films of the skull phantom and on the resultant simulated images. (Mastoid tip, Bregma, Anterior Nasal Spine, Sella (ant), Petrous ridge, Outer Canthus and Inner Canthus). The distances between 3 hard landmarks in any one plane (axial, Coronal and Sagittal) were measured and compared (9 in total). RESULTS: There was no difference between distances in any of the three planes (axial, coronal and sagittal). The simulated images were also compared qualitatively and tracings were able to be superimposed exactly. The computations were carried out in <5 s for each projection. CONCLUSION: The software developed for personal computers equipped with recent graphics cards can produce DRRs with high geometric accuracy based on perspective projections through a CT dataset. This software can be used for simulation of radiographic examinations.

POSTER p1811

DynaCT; the technique, radiation dosimetry, indications and efficacy

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PURPOSE: DynaCT is a technique allowing cross sectional data to be collected by rotating the flat plate of a digital subtraction angiography unit. We detail how to optimize this technique whilst minimizing patient radiation dose. The value of this technique following coiling of cerebral aneurysms was assessed. METHODS: Three DynaCT acquisition modes were assessed; 10 s low dose, 10 s high dose and 20 s high dose. Dose measurements were made using a Perspex CT head phantom. 41 consecutive patients with subarachnoid haemorrhage (SAH) had routine DynaCT following the interventional treatment. The DynaCT scan was compared with the most recent 16 slice CT taken prior to treatment. RESULTS: The CTDIs of DynaCT in the head Phantom were: Low dose 10 s 12 mGy; High dose 10 s 35 mGy; High dose 20 s 60 mGy. The CTDI for Siemens 16-slice CT using the same phantom was 110–118 mGy. In the 41 patients with SAH undergoing interventional procedures DynaCT was valuable in the detection of hydrocephalus, fresh subarachnoid haemorrhage, stent opening. DynaCT contributed to a change in management in 43% of cases. CONCLUSION: DynaCT is a valuable adjunct to flat plate DSA. Used routinely at the end of interventional procedures, it can detect unsuspected hydrocephalus and fresh haemorrhage altering management in 43% of our cases The optimum protocol is 10 s high dose which combines adequate image quality at a dose of 30% of routine head CT.

ELECTRONIC POSTER e1812

Findings of patients undergoing diagnostic guidewire biopsy after introduction of the mammotome

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PURPOSE: Mammotome biopsy is accurate for localization and sampling of radiologically abnormal tissue. Since its recent introduction, histological diagnosis can be obtained in more cases without requiring surgery. Nonetheless, certain cases still require diagnostic guide wire biopsy (DGWB), though it has been postulated that the mammotome has reduced the need for this. We assessed cases requiring DGWB, their histological findings, and how management was affected since introduction of the mammotome. MATERIALS/METHODS: Theatre lists for the same consultant prior to and after introduction of the mammotome were retrospectively reviewed. Patients who underwent DGWB were identified and their subsequent histology was obtained via our pathology database. RESULTS: 16 women (ages 43–76 years, mean 55.9 years) underwent DGWB in 1 year prior to introduction of the mammotome (8.9% of breast operations). 7 invasive breast cancers were diagnosed requiring further surgery. 2 had DCIS, and 7 had benign breast pathology, none of whom required further surgery. 18 women (ages 21–70 years, mean 53.6 years) underwent DGWB the following year after introduction of the mammotome (9.1% of breast operations). 1 patient was diagnosed with invasive cancer requiring further surgery. 1 was diagnosed with DCIS and 16 had benign breast pathologies, none of whom required further surgery. CONCLUSION: Pathologies discovered by DGWB were benign in the majority of cases after introduction of the mammotome not necessitating further surgery. Although the number of operations for women with breast cancer has decreased since introduction of the mammotome, the overall need for DGWB does not appear to have been reduced in our hands.

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ELECTRONIC POSTER e1813

Characterization of architectural distortion using computerized lacunarity analysis in digital mammograms

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PURPOSE: Architectural distortion (AD) is one of the commonly missed signs of breast cancer. The purpose of this study is to explore the application of lacunarity analysis to characterize AD in digital mammograms. MATERIALS/METHODS: As a high order fractal feature, lacunarity can be used to measure the degree of heterogeneity or structural variation within a digitized image. The underlying hypothesis of this study is that the differences between AD and normal breast parenchyma can be quantified by using the lacunarity analysis. Low lacunarity values correspond to a homogeneous parenchymal pattern, whereas high values correspond to a heterogeneous (AD) pattern. 55 regions of interest (ROIs), 128 pixels by 128 pixels in size, were selected from the Mammographic Image Analysis Society (MIAS) database (all 19 AD in MIAS were included, 36 ROIs depict normal breast parenchyma). The lacunarity of each image was calculated using the method proposed by Mandelbrot. ROC curve was constructed to evaluate the performance of the lacunarity analysis. RESULTS: Based on the two-tailed *t*-test, the mean value of the lacunarity of AD ROIs (0.0169 ± 0.0167) is statistically significantly greater than that of the ROIs of normal breast parenchyma (0.0052 ± 0.0036) (p=0.00003). The corresponding 95% confidence interval for the difference is CI = [0.0078, 0.0157]. ROC curve has showed that a cutoff value of 0.0093 has a 100% sensitivity and 65% specificity, respectively. CONCLUSION: This study demonstrates that lacunarity analysis is capable of locally identifying the presence of architectural distortion in digital mammograms.

ELECTRONIC POSTER e1814

Invisible minute bone-fractures in CT enhanced to provide clear diagnoses and measurements by a CAD

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PURPOSE: Computer aided detection (CAD) software based on the De-Convolution Technique can be used to detect edge profiles to sub-pixel accuracy and to enhance them without any noise increase. This is achieved via empirical edge-to-edge corrections of penumbral spread caused by energy source size and detector size and other second order effects under the strict spatial bandwidth control of a universal Line Spread Function. We applied this software to CT images of a patient's subtle humerus fracture to test whether this software could potentially improve fracture detection, delineation and for quantitative measurements. MATERIALS/METHODS: (1) New York Catphan 500 Phantom was used for CT calibrations; (2) Field trial example: A patient's humerus fracture was examined by CT: 120 kVp; 100 mA; 2 mm slice; 1 s slice^{-1}. RESULTS: (1) Phantom calibration: (a) Distance: accuracy confirmed to 1/50 of a pixel ((delta)r in (delta)r/r) at 1% low contrast edge. (b) Area/Volume: accuracy confirmed to 1/10 of pixel ((delta)r in 2(pi)r(delta)r/((pi)r^2)) at 1% low-contrast edge. (c) Modulation Transfer Function at the high contrast edge improved from 5.83 lp cm^{-1} to 15.75 lp cm^{-1} at 10% modulation after 9× magnification and enhancement. (2) Patient field trial example: Fracture measurements: Fracture width on images: 8, 9, 10, & 11 were 1.35, 1.30, 1.09 and 2.30±0.02 mm, respectively. CONCLUSION: Invisible and barely visible minute bone fractures were enhanced to become clearly visible for both accurate diagnosis and measurement. This has potential applications in the treatment planning and the quantitative assessment of the bone fracture healing process in Orthopaedics.

ELECTRONIC POSTER e1815

Vertebral fractures in osteporotic patients: treatment with the kyphoplasty procedure

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KEY LEARNING OBJECTIVES: To outline the fundamental aspects of kyphoplasty and present our experience with the procedure. To demonstrate the technique in detail. To illustrate example cases of vertebral compression fractures treated with kyphoplasty. DESCRIPTION: Balloon kyphoplasty is a modification of the vertebroplasty procedure that employs an inflatable balloon to correct kyphosis and treat pain prior to fracture stabilization with bone cement. We treated 15 patients ranging in age from 41 years to 86 years (mean age 75 years). Eight patients (53%) had primary osteoporosis and 7 patients (47%) had steroid-induced osteoporosis. There were 14 fractured thoracic vertebrae and 10 lumbar vertebrae. We performed this minimally invasive procedure under local anaesthesia using a transpedicular approach. A working canula was placed into the vertebral body, through which a drill was directed to create a cavity for insertion of the balloon tamp. The balloon was then inflated to reduce wedging deformity, and the fracture was stabilized with bone cement. All patients experienced dramatic and rapid pain relief after the procedure. Average restorations of the vertebral body height were: anterior 52% (3.7 mm), mid 66% (4.7 mm), and posterior 53% (1.5 mm). Two patients with chronic obstructive lung disease experienced improvement in respiratory function. In all but one case, the procedure was well-tolerated by the patients. We encountered no significant complications. CONCLUSION: Our results show significant kyphosis reduction (ranging from 52% to 66%), in patients with painful vertebral compression fractures. Balloon kyphoplasty provides an efficient means for ameliorating the pain associated with osteoporotic vertebral fractures.

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Notes

Author index

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D

E

F

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K

L

M

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Notes

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Notes

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