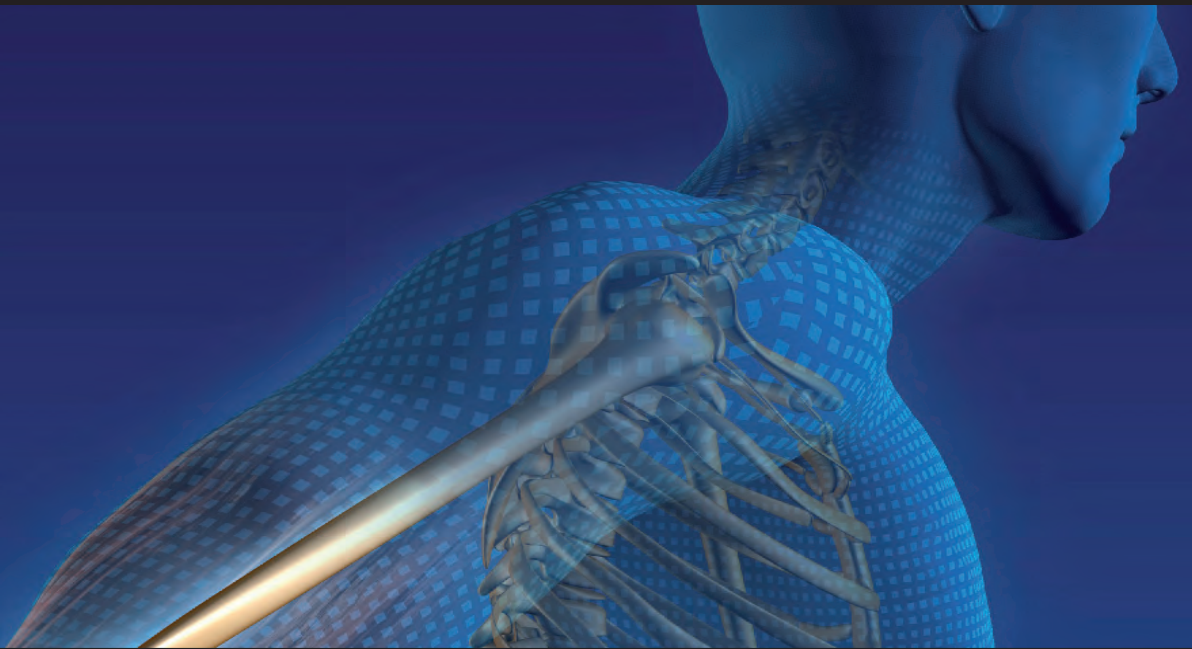


BJR

Congress series

Published by the British Institute of Radiology



Proceedings of the UK Radiological Congress 2011

6-8 June 2011, Manchester UK



© 2011 The British Institute of Radiology

ISBN 10: 0-905749-72-3

ISBN 13: 978-0-905749-72-3

British Library Cataloguing-in Publication Data

A Catalogue record for this book is available from the British Library

Legal Notice

All opinions expressed in this publication are those of the respective authors and not the publisher. The publisher has taken the utmost care to ensure that the information and data contained in this publication are as accurate as possible at the time of going to press. Nevertheless the publisher cannot accept any responsibility for errors, omissions or misrepresentations howsoever caused. All liability for loss, disappointment or damage caused by reliance on the information contained in this publication or the negligence of the publisher is hereby excluded.

Published by the British Institute of Radiology, 36 Portland Place, London W1B 1AT, UK (www.bir.org.uk). An electronic version of this publication is available at <http://bjr.birjournals.org>.

Typeset by The British Institute of Radiology.

CONTENTS

Eponymous Lectures

BIR-AGFA Mayneord Lecture	44
COR Stanley Melville Lecture	44
COR William Stripp Memorial Lecture	22
IPEM John Mallard Lecture	23
RCR Tesla Lecture	6

Advances in Technology

Advances Scientific Session	
BAMRR: MRI Without Frontiers	38
Beyond PACS; The Future for Clinical Data Management	50
Cancer Imaging Masterclass: Quantitative Imaging for the Future	35
Elastography	24
Emerging Technologies Scientific Session	31
Radiation Protection Keynote and Scientific Session	7
Veterinary radiology	27

Clinical

Breast Scientific Session	11
Hands-On Workshop : Cardiac CT I	44
Hands-On Workshop : Cardiac CT II	51
Cardiac Scientific Session	49
Chest Pain	35
Chest Workshop: HRCT Interpretation Workshop	
CT: Clinical Needs and Technical Solutions	20
Death to Bariums?	21
Education and Training Scientific Session	4
Film Viewing for FRCR and Beyond and Neuroradiology Scientific Session	9
GI Scientific Session	36
GU Film Viewing for the FRCR and Beyond	1
GU Masterclass I: State-of-the-Art Imaging	3
GU Masterclass II	11
Hepatobiliary Imaging Expert Panel	17
HRCT Expert Panel: How We Do It – Unknown Cases	45
Imaging of Brain Tumours	29
Interesting Neuroradiology and Head & Neck Cases Review	17
Interventional Radiology	45
Major Trauma	3
Masterclass II: HRCT Interpretation	23
Masterclass III: Nodules and Scientific Session	29
Masterclass: Axial Trauma	6
Masterclass: Breast	2
Masterclass: Cardiac Radiology - Which Is the Right Investigation?	41
Masterclass: Head and Neck Imaging	24

Masterclass: Liver and Pancreatic Imaging	30
Masterclass: MR Technology - Developments in MRI	44
Masterclass: MSK Ultrasound	2
Masterclass: Non-Accidental Injury	46
Masterclass: Pelvic Malignancy Imaging	36
Masterclass: Peripheral Trauma	17
Masterclass: Technical Advances in Thoracic Imaging CT	17
MR Imaging of the Liver - Radiological Surgical Correlation	44
Musculoskeletal Scientific Session	18
Neuroradiology Emergency Scenarios	7
Olympics 2012	11
Oncological PET CT in 2011	48
Paediatric Emergencies	36
Paediatrics Film Viewing and Scientific Session	51
Refresher Course: Imaging for Headache	21
Refresher Course: Knee MRI	21
Refresher Course: Lower Limb MRI	30
Refresher Course: Lung Cancer	22
Refresher Course: Paediatric Imaging	39
Refresher Course: Spine MRI and Scientific Session	39
Refresher Course: Stroke Imaging	3
Refresher Course: Thoracic Vascular Disease	51
Refresher Course: Upper Limb MRI	24
Tricky Situations In The Abdomen	24
Vascular/Interventional Scientific Session	41

Imaging Informatics

Developments in CR and DR; Science and Applications	36
Developments in Digital Mammography; Science and Applications	1
Developments in PACS: Science and Applications	17
Does PACS Provide for the Needs of Clinicians?	38
PACS: The Evolving Model	20
Radiography and Radiographers in a Digital World; Where Are We Now?	9

Service Delivery

An Update on Key Imaging Policy Messages	17
Consultant and Advanced Practice: It's Not All About Reporting	26
How To Save Money and Still Deliver a Quality Service	1
Improving Cancer Diagnostic Services and SD Scientific Session	46
Service Delivery Scientific Session	33
Student Radiography Scientific Session	14
This House Believes That Radiologists Have Given Up Enough of their Professional Role to Radiographers (Interactive Debate)	3

Special Interest

History of Radiology	30
Junior Radiologists' Forum	2

Satellite Sessions

Carestream Health	6
GE Healthcare	28
Understanding the whole system patient flow	11

Posters

Advances in Technology	55
Audit	130
Breast	68
Cardiac	75
Chest	70
Education/Training	124
Gastrointestinal	84
Gynaecology/Obstetrics	94
Head and Neck	113
Imaging Informatics	137
Multisystem Disorders	120
Musculoskeletal	96
Neuroradiology	107
Nuclear Medicine	121
Oncological	121
Paediatrics	116
Service Delivery	64
Trauma Imaging	135
Uroradiology	92
Vascular	79

Notes

Scientific Programme Abstracts Monday 6 June

08:30 – 09:20

Developments in digital mammography; science and applications

08:30 Developments in digital mammography

Workman, A.

Forster Green Hospital, Belfast, UK

No abstract supplied.

09:00 Impact of the developments on practice

Wallis, M. G.

Addenbrooke's Hospital, Cambridge, UK

Full field digital mammography removes all the problems of wet processing and storage. However the initial transition when, most, if not all the prior images are on film need serious consideration. The easiest option of just ignoring them comes at a cost of increased recall and perhaps even unnecessary biopsy. I will discuss the alternatives and their impact on cost and recall. Changing from long standing and well understood wet processing to proprietary “black box” electronic post processing might decrease the rate of asthma and dermatitis but we do not yet understand the impact this has on cancer detection. Twenty years ago we learned that “pretty” is not necessarily best.

After many years tomosynthesis is on the market and has FDA approval as an adjunct to 2D mammography on the basis of enriched test set studies only. So we await the large scale trials to determine its roll but new detector technology makes low dose dedicated mammo CT a real option.

A primary digital data set reduces the cost of CADetection and opens up the prospect of CADiagnosis and intelligent teaching and interactive tools. New detectors and tubes offer the tantalising promise of colour mammography with and without contrast.

08:30 – 09:30

GU film viewing for the FRCR and beyond

8:30 Unusual bladder lesions

Sahdev, A.

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

No abstract supplied.

09:00 Staging bladder cancer

Bharwani, N.

Barts and the London NHS Trust, London, UK

AIM:

To recognize imaging features of bladder lesions and test your image interpretation abilities in staging bladder cancer.

OUTCOMES:

1. To be familiar with the TNM staging of bladder cancer.
2. To be familiar with the recommended imaging modalities for staging bladder cancer.
3. Get an idea of your own ability to distinguish unusual variants and differential lesions of bladder cancer.

08:30 -10:10

How to save money and still deliver a quality service

08:30 Demand management: whose job is it?

Hankey, T.

Demand Management Solutions Ltd, Norfolk, UK

No abstract supplied.

08:50 Decision support software: spend to save?

Newman-Sanders, T.

Mayday Hospital, Croydon, UK

One of the central issues facing the NHS and other healthcare systems is that of how best to deploy the powerful weapon of diagnostic imaging to ensure a high quality, timely and cost effective service to patients. There have been a succession of recent initiatives to use diagnostic imaging more often, earlier and by a wider range of healthcare professionals than has traditionally been the case. The main drivers for this expansion and democratisation of diagnostic imaging have included the 18 week referral to treatment pathway, 'Better care closer to home,' and the 'Next Stage' review. The NHS and other healthcare systems across the world are now entering a climate of reduced resources aggravated by the global economic downturn. The role of decision support systems in improving the appropriateness of imaging requests, reducing unnecessary imaging and increasing the expertise of healthcare professionals in the optimal use of diagnostic imaging is being increasingly appreciated. The National Imaging Board Informatics Group has been working with potential partners to develop an interactive decision support system that could be made available to all users of NHS Diagnostic Imaging services. Valuable lessons are being learnt about the technological and financial challenges involved in getting such systems to work, how their effectiveness can be measured and how they are likely to benefit the wider NHS. It is hoped that the internationally respected RCR guidelines, 'Making Best Use of a Department of Radiology' could prove to be a key element of such a system. This presentation will provide a progress report on this work and how it could benefit the rapidly changing NHS.

09:10 Cross charging for radiology

Buckley, C.

King's College Hospital, London, UK

No abstract supplied.

09:30 Demand management: Just say no!

Summerton, N.

University of Hull, Hull, UK

No abstract supplied.

09:50 Different solutions to delivering a service

White, V.

Hampshire Community Health Care, Hampshire, UK

No abstract supplied.

08:30-10:00**Junior Radiologist's Forum****08:30 Radiology research: How to enhance your CV**

O'Connor, J.

University of Manchester, UK

No abstract supplied.

09:00 Becoming a consultant: How to secure your dream job

Laasch, H.

Christie Hospital, Manchester, UK

No abstract supplied.

09:30 The role of radiologists as medical managers

Taylor, P.

*Central Manchester University Hospital NHS Foundation Trust, UK***09:00 – 11:00****Masterclass: MSK Ultrasound****09:00 Shoulder**

Rennie, W. J.

Leicester Royal Infirmary, Leicester, UK

Goodwin, R.

Norfolk and Norwich University Hospital, Norwich, UK

PURPOSE: To introduce and demonstrate the technique and appearances of ultrasound of the shoulder, and its application.

MATERIALS/METHODS: Lecture and simultaneous real time demonstration by specialist musculoskeletal radiologists

RESULTS: Increased understanding and awareness of the technique and its applications. The talk will be primarily aimed at those with little or no previous experience of the use of ultrasound to assess the musculoskeletal system, although

knowledge of basic shoulder anatomy will be very helpful.

CONCLUSION: A thorough demonstration of the technique and appearances of ultrasound of the rotator cuff and shoulder and its application in clinical practice.

09:30 Wrist and hand

Suresh, S.

Plymouth University Hospital NHS Trust, Plymouth, UK

Gafoor, A.

Derriford Hospital, Plymouth, UK

No abstract supplied.

10:00 Ankle and foot

Jackson, S.

Hope Hospital, Manchester, UK

Harris, J.

*Hope Hospital, Salford, UK***10:30 Knee**

Chandramohan, M.

Bradford Hospital, Bradford, UK

Muthukumar, T.

Royal National Orthopaedic Hospital, Middlesex, UK

No abstract supplied.

10:00 – 11:30**Masterclass: Breast****10:00 Breast elastography and other new ways of using ultrasound in the breast**

Svensson, W.

Imperial College Healthcare NHS Trust, London, UK

Breast ultrasound's current weaknesses include operator dependence and reproducibility, low specificity when used as a screening tool, poor detection of microcalcification, underestimation of tumour extent and failure to utilise more than 1 to 5% of the information in the returning ultrasound signal.

Recent advances particularly in elasticity imaging, whole breast volume ultrasound, and microcalcification detection are showing considerable potential for ultrasound screening, the evaluation of symptomatic focal abnormalities, axillary staging, monitoring of pre surgical adjuvant chemotherapy and follow up post treatment.

Ultrasound elastography can:

- improve Diagnostic accuracy used as an adjunct to BIRADs grading
- improve accuracy in demonstrating tumour extent
- help clinical management of: echogenic cysts, fat islands, fibroadenomas which are isoechoic with surrounding fat and small cancers hidden in complex areas of microcystic change.
- potentially reduce biopsy rates for benign lesions.

Whole breast volume ultrasound will change breast ultrasound practice by

- introducing operator standardisation, reproducibility and repeatability of measurement and interpretation
- changing who acquires the volume set and how breast ultrasounds are reported.
- Allowing accurate comparison of previous and current exams for screening and assessing treatment change

New methods to detect micro calcification may improve its localisation with ultrasound. Future advances are based on solid-state electronics engineering micro machining techniques producing arrays such as capacitive micro machined ultrasonic transducers with inbuilt microchips. This same electronic miniaturization also permits the faster processing of even larger amounts of data utilizing even more complex algorithms in the interpretation of returning echo signals.

10:30 New technology in breast imaging

Michell, M.

King's College, London, UK

No abstract supplied.

11:00 Breast screening: what does the future hold?

Evans, A.

The University of Dundee, Dundee, UK

No abstract supplied.

10:00 - 11:30:00

Masterclass: GU I - State-of-the-art-imaging

10:00 Adrenal imaging: new guidelines and recommendations

Sahdev, A.

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

No abstract supplied.

10:30 MR imaging in intermediate renal masses

Rockall, A.

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

No abstract supplied.

11:00 Urological discrepancies

Rottenberg, G.

The Churchill Hospital, Oxford, UK

No abstract supplied.

10:00 - 12:00

Refresher course: Stroke imaging

10:00 Evidence based stroke treatment and prevention in 2011

White, P.

Western General Hospital, Edinburgh, UK

No abstract supplied.

10:45 The current role of imaging in stroke treatment and prevention

Jarosz, J.

King's College Hospital, London, UK

No abstract supplied.

11:30 Practical image interpretation in stroke

Adams, M.

National Hospital for Neurology and Neurosurgery, London, UK

No abstract supplied.

10:15 - 11:45

Major trauma

10:15 Chest trauma

Vaidya, S.

Barts and the London NHS Trust, London, UK

No abstract supplied.

10:45 Abdominal trauma

Ridley, N. F.

Great Western Hospital, Swindon, UK

No abstract supplied.

11:15 Management of the bleeding patient

Uberoi, R.

John Radcliffe Hospital, Oxford, UK

No abstract supplied.

10:15 - 11:45

This house believes that radiologists have given up enough of their professional role to radiographers (interactive debate)

For the Motion

Adam, A.

St. Thomas Hospital, London, UK

Diagnostic imaging has a decisive influence on the patient pathway and, used correctly, it reduces costs and improves the outcomes of treatment. The process of making a radiological diagnosis is often misunderstood, not only by health care managers but also by many other medical and non-medical healthcare professionals. Pattern recognition plays a minor role in this respect. Radiologists reach a diagnosis via a synthesis of radiological findings, clinical signs, the patient's history, and laboratory RESULTS. This process can only be employed by someone in possession of a thorough understanding of medicine. Radiographers became involved in medical image interpretation in order to alleviate manpower shortages in radiology. Employed appropriately, radiographers can make a useful contribution in the performance of certain practical procedures and in areas of imaging, such as mammography, in which the detection rather than the interpretation of an abnormality is the main task. They are also essential in sonography because of its special manpower challenges. Independent practice by radiographers in areas in which there is a need for a differential diagnosis has not been shown to be either safe or cost-effective.

Team-working is very important in imaging. However, teams work best by combining diverse sets of skills for the benefit of the patient. Radiographers and radiologists have complementary expertise. The use of radiographers in the performance of tasks best performed by radiologists undervalues the profession of radiography and depletes its already overstretched workforce. Radiological and radiographic skills should be truly mixed rather than homogenised.

Against the motion

Seymour, R.

Torbay Hospital, Torquay, UK

No abstract supplied.

10:30 - 11:40

Education and training scientific session

10:30 Quantifying medical undergraduate Radiology teaching and junior doctor confidence in chest and abdominal radiograph interpretation

Rodrigues, J.¹ • Watson, D.² • Stevenson, J.³ • Glancy, S.³
¹Bristol Royal Infirmary, Bristol, UK, ²Glasgow Royal Infirmary, Glasgow, UK, ³Western General Hospital, Edinburgh, UK

PURPOSE: Traditionally, Radiology is not formally taught to undergraduates, yet increasingly Foundation Year 1 doctors (FY1s) are the first to view radiographs, and instigate treatment on their interpretation. We aimed to:

- 1) Quantify undergraduate Radiology teaching in UK medical schools
- 2) Determine FY1s' confidence at interpreting chest and abdominal radiographs.

MATERIALS/METHODS: On-line curriculae from all UK medical schools were reviewed for their reference to Radiology teaching.

Questionnaires were distributed to FY1s in South-East Scotland teaching hospitals. Respondents ranked, on 7-point scale, statements relating to confidence in chest and abdominal radiological interpretation.

RESULTS: Only 3/29 UK medical schools mentioned Radiology teaching in their online curricula.

31.4% FY1s contributed. 12.5% strongly agreed they received adequate undergraduate radiology teaching.

25% and 2.5% were strongly confident at interpreting chest and abdominal radiographs respectively. Only 5% were strongly confident at identifying both life-threatening conditions (pneumothorax and pneumoperitoneum) and conditions requiring urgent treatment (pulmonary oedema and pneumonia) on chest radiographs.

Respondents were significantly more confident in interpreting chest than abdominal radiographs ($p < 0.0001$), also significantly more confident to initiate treatment on their interpretation of chest radiographs ($p < 0.0001$).

85% and 82.5% strongly agreed there is scope to improve undergraduate and postgraduate Radiology training respectively.

87.5% strongly agreed that tutorial or lecture Radiology teaching as part of FY training would be useful.

CONCLUSION: Our study confirms objective and subjective lack of UK undergraduate Radiology teaching, and also low self-confidence amongst FY1s in radiographic interpretation.

This highlights the need to resource more formal Radiology teaching at undergraduate and postgraduate level.

10:40 The FRCR 2B examination: a survey of candidate perceptions and experiences

Yeung, A.¹ • Booth, T. C.² • Jacob, K.³ •

McCoubrie, P.⁴ • McKnight, L.⁵

¹Freeman Hospital, Newcastle upon Tyne, UK, ²Royal Free Hospital, London, UK, ³Weston General Hospital, Weston-super-Mare, UK, ⁴Southmead Hospital, Bristol, UK, ⁵Morrison Hospital, Swansea, UK

PURPOSE: To survey the views of recent candidates of the Fellowship of the Royal College of Radiologists (FRCR) 2B examination with reference to assessment validity, reliability and acceptability.

MATERIALS/METHODS: 1204 UK radiology trainees and consultants were invited to complete an automated internet questionnaire regarding their experiences and perceptions of the FRCR 2B examination. The questionnaire was informed by a review of the literature. Eligible participants were candidates who had taken the examination within the previous three years. **RESULTS:** We received 497/1204 (41%) responses of which 258/497 (52% of respondents) were eligible for inclusion into the study. The rapid reporting component is perceived to be significantly fairer than the oral section (82% versus 70% agree; $p < 0.001$). The oral component fared poorly in perceived performance-reducing anxiety levels but well in questions relating to validity and reliability. Female candidates are more likely to find the FRCR 2B unfair ($p = 0.01$) and experience performance-reducing anxiety ($p < 0.001$) than males. No gender

differences were observed in first-time pass rates ($p=0.6$). Candidate first language did not affect anxiety levels ($p=0.9$) or first-time pass rates ($p=0.06$). Only 12% of candidates agreed that the oral examination should move to an objective structured clinical format.

CONCLUSION: Candidates score the FRCR 2B examination well in test validity with little desire for change to the oral examination format. Efforts to help reduce anxiety levels in the oral component would improve perceived fairness.

10:50 A bibliometric analysis of radiology publication patterns in UK deaneries over a 5 year period

Johnson, C. A. • Yoong, P. • Rehman, J. M. • Toms, A.
Norwich Radiology Academy, Norwich, UK

PURPOSE: To describe the patterns of peer reviewed general radiology publication rates with reference to deaneries in the UK.

MATERIALS/METHODS: This was a retrospective bibliometric analysis of publications in the six highest cited general radiology journals (Radiology, European Radiology, American Journal of Roentgenology, Radiographics, Clinical Radiology and the British Journal of Radiology). Publications on Medline were identified using PubMed between 2005 and 2009. The publications originating from UK Radiology departments were identified and subcategorised into primary institution of origin, deanery and publication type. The total number of Radiology trainees in each deanery was obtained from GMC/PMETB.

RESULTS: 913 publications were included in the study. Original papers constituted 48.7% ($n=445$), review articles 30.3% ($n=277$) and case reports 17.4% ($n=159$). The total number of publications in each deanery ranged from 8 to 353, and publications per trainee from 0.22 to 1.78. The largest proportion of publications came from the London deanery ($n=354$, 38.8%), followed by Eastern 86 (9.4%), Oxford 70 and Yorkshire 70 (7.7% each). Relative to the number of trainees within each deanery, Oxford had the highest number of publications per trainee (1.78), followed by East Midlands (1.5), London (1.25) and Eastern (0.99). The three highest cited individuals were from London and authored 88 articles (25% of the London total).

CONCLUSION: There is a marked difference in the volume of published work in the general Radiology literature between the UK deaneries, even when differences in the number of regional trainees are accounted for.

11:00 A guide to learning techniques in the image interpretation setting - an evidence based approach.

Rogers, P. J. N. • Suresh, P.
Plymouth Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: The presentation will offer evidence based advice, for consultants and trainees, on how to create a productive, creative and stimulating learning environment in the context of radiology training, particularly in the image interpretation setting.

DESCRIPTION: The Royal college of Radiologists recently published guidelines to bring the curriculum in line with the GMC Standards for Curricula and Assessment Systems (July 2008). These changes are embodied by the new e-portfolio training system, which includes a mini-imaging interpretation assessment (Mini-IPX). These changes demand a more structured and informed approach to learning in the image interpretation environment.

The presentation will outline recent educational theories (for example the philosophy of "multiple intelligences" and "learning styles") which will help the audience understand the need for a variety of teaching styles, and then it will review the evidence base for a selection of educational techniques. Recent quantitative meta-analyses, including that by the educationalist John Hattie, have highlighted various educational techniques that radiologists will find useful in teaching trainees and students, as well as others that may not work so well.

CONCLUSION: Radiology is a visually fascinating speciality with unique learning opportunities, and should therefore be highly involving for learners, especially when the correct teaching approaches are used.

This presentation will be performed in a visually interesting, illustrative style that will offer practical advice to trainers and trainees. The focus will be on offering the reader useful techniques and tips to optimise education in the day-to-day image interpretation setting.

11:10 Is the radiology clinic beneficial to the clinicians?

Chawla, S. • Chaudhry, M. • Belfield, J.
Royal Liverpool University Hospital, Liverpool, UK

PURPOSE: In our institution, we have a designated twice -daily Radiology Clinic run by the radiology trainees. The clinic enables clinicians to come to the department to discuss requests and queries. It also serves as a 'teaching tool' for clinicians and radiologists and allows the appropriate investigations to be performed thereby answering the clinical question. The aim of this audit was to determine whether the clinic is beneficial to the clinician and to establish how many cases are discussed.

METHOD: We carried out a prospective survey over one week in November 2010. A proforma was devised for the clinician and the radiologist. The key questions aimed at the clinicians were whether or not two clinics per day were sufficient, the usefulness of the clinic, the standard of the radiologists and whether they felt any changes were necessary. The radiologists were asked about the number of requests received and accepted, types of imaging modalities utilised and patient familiarity by clinicians. **RESULTS:** 96% of clinicians felt the radiology clinic was beneficial and 90% thought they gained useful knowledge from the clinic. 100% of registrars were deemed to be of a high standard. An average of 7 requests was received per clinic hour and 100% of clinicians were familiar with their patients.

CONCLUSION: Our survey confirms that our departments' radiology clinic does serve its primary purpose to the clinicians with additional benefit to the trainees.

The implementation of similar run clinics at other centres may prove useful enabling better productivity in tertiary radiology departments.

11:20 So just how emotionally intelligent is the profession of radiography?

Dawkes, T. A.¹•Mackay, S.²

¹Countess of Chester Hospital, Chester, UK ²University of Salford, Salford, UK

PURPOSE: The aim of this study was to explore for the first time the emotional intelligence profile of the profession of radiography and to determine if they were different to a comparison group.

METHODS: An online survey of the trait emotional intelligence of the radiography profession was undertaken (n=1997) between April and November 2010. All radiographers from across the UK were invited to complete the Trait Emotional Intelligence measure of Petrides. This comprises of 30 questions on a 7 point likert scale taking 15 minute to complete. Demographic information was also obtained. The scores for the global emotional intelligence along with the four factors of Well Being, Self-Control, Emotionality and Sociability were calculated and compared to a mixed comparison group (n=866) using a student T test (alpha level of 0.05).

RESULTS: The theoretical mean is 3.5 and the radiographers scored highly on all dimensions with scores of global EI 5.28 Well Being 5.74, Self-Control 4.89, Emotionality 5.39 and Sociability 4.88. There was a statistically significant difference (p<0.01) between the radiographers and the comparison group with radiographers scoring more highly on all factors except Sociability.

CONCLUSION: Radiographers have a higher Trait Emotional Intelligence than a comparison group.

11:30 Simulation enhanced learning and clinical competence: Phases I-III

Murray, L. A.¹•Gropper, R.²•Zychla, L.³•Maclver,

D.⁴•Ramsay, L.⁵•Pearce, S.⁶•Ripley, A.⁷

¹Mohawk-McMaster Institute for Applied Health Sciences, Hamilton, ON, CANADA, ²Consultant, Health Program Specialist, Toronto, ON, CANADA, ³Juravinski Cancer Centre, Hamilton Health Sciences, Hamilton, Ontario, Hamilton, ON, CANADA, ⁴Northern Alberta Institute of Technology (NAIT), Edmonton, AB, CANADA, ⁵Canadian Medical Association, Ottawa, ON, CANADA, ⁶Northern Alberta Institute of Technology, Edmonton, AB, CANADA, ⁷Northern Alberta Institute of Technology, Ottawa, AB, CANADA.

BACKGROUND: A lack in clinical placement sites, has led allied health programs to seek alternative curriculum delivery methods. In particular, the use of simulation enhanced learning has been highlighted as a potential teaching modality. The project goals were to develop allied health simulation tools, assess the effects of simulation, and determine whether the addition of simulation to traditional curriculum could decrease time to competence in the clinical setting for allied health students.

METHODS: Phase I consisted of developing a simulation

evaluation tool. In Phase II, students were assigned to a control group or to an intervention group. Simulation comprised of videotaped/written scenarios, role play and constructive feedback. Student scores were compared using 3 objective structured clinical evaluations each at pre/post time points to determine the simulation effect. Phase III measured student's competence in their first clinical rotation across 3 time points. Student scores were compared to determine time to achieve competence.

RESULTS: Phase I produced a reliable and valid evaluation tool. Phase II demonstrated higher mean scores for simulation students compared to the control group. In Phase III, simulation students performed better by the second week of clinical rotation on two competencies.

DISCUSSION: This study provides initial evidence that the inclusion of simulation-enhanced learning with traditional curriculum can decrease the time to clinical competence for certain clinical communication competencies in some allied health disciplines. Students who received simulation enhanced education mastered certain communication competencies earlier than the control group.

12:15 - 13:00 RCR Tesla Lecture

12:15 The role of information technology in optimising radiology practice

Thrall, J.

Massachusetts General Hospital, Massachusetts, USA

No abstract supplied.

13:30 - 14:30 Carestream Health

13:30 Carestream Health: Experiences and Productivity Improvement achieved using Cassette-Sized Wireless Detector in a mobile environment

Carradine, D.

University Hospitals Birmingham, UK

No abstract supplied.

13:30 - 15:00 Masterclass: Axial trauma

13:30 Cervical spine trauma

Richards, P. J.

University Hospital of North Staffordshire, Stoke on Trent, UK

No abstract supplied.

14:00 Thoracolumbar spine trauma

Lalem, R.

Robert Jones & Agnes Hunt Orthopaedic & District Hospital NHS Trust, Shropshire, UK

No abstract supplied.

14:30 Pelvic Trauma

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

Pelvis injuries represent a spectrum from those resulting from major trauma which are life threatening to those resulting from repetitive micro trauma in the form of insufficiency fractures which can also have debilitating affect on individuals as a result of long term pain. Using case based scenarios I hope to explore processes of diagnosis and risk assessment which rely on systematic assessment of patients presenting with pelvic injuries. Fractures and injuries to the pelvic ring, acetabulum will be discussed along with other injuries which include stress fractures, insufficiency injury and avulsion.

Emphasis will be placed on plain radiographic interpretation but the relative merits of CT and MRI will be emphasised as part of refining subsequent operative planning.

13:30 - 15:00
Neuroradiology emergency scenarios

13:30 Spontaneous intracranial haemorrhage

Herwadkar, A. V.
Salford Royal NHS Foundation Trust, Stockport, UK

No abstract supplied.

14:00 Management of intracranial aneurysms

White, P.
Western General Hospital, Edinburgh, UK

No abstract supplied.

14:30 Imaging in traumatic head injury

Straiton, J.
Leeds General Infirmary, Leeds, UK

No abstract supplied.

14:00 - 15:20
Radiation protection keynote and scientific session

14:00 Radiation protection considerations in proton therapy

Green, S.
University Hospitals Birmingham NHS Trust, Birmingham, UK

PURPOSE: To explore the issues which underpin the protection of patients and staff in proton radiotherapy

MATERIALS/METHODS: A general introduction to proton therapy will be provided, including some basic physics of depth-dose curves, and some general overview of the technology associated with delivering clinical proton treatments

Considering doses to the patient, the following issues will be discussed

- a) the sources of non-primary radiation dose to patients during treatment (head leakage, scatter and generated neutrons) and how these differ between x-ray and proton radiotherapy
- b) the doses from on-treatment imaging and whether there is a need for a different mind-set when considering these for proton radiotherapy and x-ray radiotherapy

Considering doses to staff, there will be a general overview of

- a) activation hazards from machine components and how machine configurations might impact on this
- b) design of the treatment room and necessary shielding considerations

RESULTS: For selected (younger) patients where outcomes in terms of cure-rates are good, suggestions will be made for work-flow designs which minimise patient dose to healthy tissue.

CONCLUSION: The physics advantages of proton therapy force us to re-evaluate some of the principles on which modern radiotherapy is based. Such re-evaluation is valuable as we seek to provide treatments with minimum health-detriment in the long term.

14:30 Development of IRMER reference levels for cardiac interventional procedures

Wilkins, H. B.
Royal Devon and Exeter Hospital, Exeter, UK

PURPOSE: The Ionising Radiation (Medical Exposure) Regulations require employers to establish diagnostic reference levels for radiodiagnostic examinations, having regard to European diagnostic reference levels where available. UK reference levels for cardiac procedures are relatively sparse and only partially reflect the range of cardiac procedures performed. Padovani et al (2008) have published European reference levels based on third quartiles from a survey undertaken by the SENTINEL consortium, rather than mean values as for UK reference levels. We undertook further work to identify local reference levels which more closely reflect procedure complexity.

METHODS: Retrospective analysis of a database of cardiac procedures has been performed to determine third quartile values for dose-area product values and screening times. **RESULTS** have been grouped into the following categories: angiography (left heart only), angiography (left and right heart), angioplasty, device implantation (single chamber), device implantation (dual chamber), device implantation (bi-ventricular), electrophysiology (diagnostic) and electrophysiology (ablation).

RESULTS: The local reference levels identified in this way are broadly in line with European reference levels, where they exist. Though at face value higher than UK reference levels, this is due to the different methods of statistical analysis.

CONCLUSION: Grouping cardiac procedures into the above categories has enabled development of more meaningful local reference levels linked to cardiac catheterisation clinical practice. Work in progress to reconcile European and UK statistical

methods will also be presented, together with progress in the development of further reference levels based on the number of 'cine' frames acquired and cumulative skin dose.

14:40 Optimising the radiation dose in CT coronary angiography - are we there yet?

Chhatani, S. • Sankaye, P. • Iyengar, S. • Hamilton, S. • Malghan, L. • Roobottom, C.
Plymouth NHS Trust, Plymouth, UK

Key Learning objectives: To review the technological strategies and advances those have been achieved in the acquisition of CT coronary angiogram (CTCA), especially Adaptive Statistical Iterative Reconstruction (ASIR) to reduce radiation dose.

Description: Radiation dose is a concern for all cardiac imaging studies using ionizing radiation. The reported effective radiation dose in conventional coronary angiography ranges from 3.1 to 9.4 mSv. CTCA has been shown to be highly accurate at detecting coronary artery disease (CAD) and has become the test of choice to rule out CAD in patients with low-moderate risk of disease. However the increased use of CTCA will come with an associated increase in exposure to radiation. This presentation reviews the radiation reduction strategies to minimise radiation to patients, without compromising image quality. These strategies include ECG controlled tube current modulation, using tube voltage and current according to patient BMI, using patient specific scan length, prospective ECG-triggering and recent developments like ASIR, high pitch spiral acquisition and Garnet detector technology. All these techniques and advances will be illustrated using graphs, tables and images.

CONCLUSION: CTCA has recently emerged as an effective non invasive method to image coronary arteries. Various developments over the years have led to a remarkable dose reduction. It is vital that all the radiation dose optimizing strategies are utilised and further to this, such developments can be utilized in any CT in general.

14:50 Reduction of radiation exposure for the examiner in angiography using a direct dosimeter

Kamusella, P.¹ • Wiggermann, P.² • Wissgott, C.¹ • Steinkamp, H.³ • Andresen, R.¹

¹*Institution of Diagnostic and Interventional Radiology/Neuroradiology, Westküstenklinikum Heide, GERMANY,*
²*Institution of Radiology, University Dresden, GERMANY,*
³*Institution of Radiology, DRK-Kliniken Berlin, GERMANY.*

PURPOSE: Prospective evaluation of radiation exposure of the examiner in angiography. Can a reduction of radiation exposure be achieved using a direct dosimeter (EDD-30, Unfors®) ?

MATERIALS/METHODS: A total of 183 diagnostic and interventional angiographies of the lower limbs using a direct dosimeter are analysed. The vascular interventions were performed either by an experienced examiner, an advanced examiner or by a beginner. The measuring sensor of the direct dosimeter was attached to the back of the left hand, below the sterile glove, and was worn throughout the examination. If the

limit values set on the dosimeter were exceeded, an acoustic signal sounded. At the end of the examination, the dose or the dose rate could be read off directly.

RESULTS: Exposure is clearly dependent on the experience of the examiner. The highest dose rate was found for the beginner, followed by the advanced examiner. The lowest dose was shown by the experienced examiner, although he mostly performed complex interventions. Over the course of 3 months, an improvement in the average dose or dose rate can be shown in the third month for the advanced examiner. For the beginner, there was a trend towards a slight reduction in the average dose. For the experienced examiner, a significant change in the dose was not found over the observation period.

CONCLUSION: The use of a direct dosimeter with an acoustic warning signal is a practicable tool for sensitising the interventional radiologist to unavoidable radiation exposure, with the aim of reducing the dose.

15:00 Optimisation of lateral thoraco-lumbar acquisition parameters for Cobb and superimposition methods of inter-vertebral movement estimation

Alqaroot, B.¹ • Twiste, M.¹ • Hogg, P.¹ • McAloon, M.¹ • Howard, D.¹ • McGill, G.²
¹*University of Salford, Salford, UK,* ²*Christie Hospital, Manchester, UK*

PURPOSE: Optimise dose and image quality to produce lateral thoraco-lumbar images suitable for accurate and reproducible inter-vertebral movement calculations using Cobb and superimposition methods.

MATERIALS/METHODS: In this optimisation procedure all acquisition parameters were thoroughly evaluated in terms of their effect on image quality and dose. Using an anthropomorphic phantom each parameter was evaluated independently while other factors were fixed. This resulted in the generation of several thousand images. These were then appraised using a visual analogue rating scale (VARS). Finally, effective dose (ED) of the VARS values which produced images of a suitable quality were calculated from Monte Carlo simulation (MCS) of dose area product (DAP) as well as entrance surface dose (ESD). **RESULTS:** Compared to diagnostic reference levels (DRL), DAP and ESD were reduced significantly (<80%) from the DRL of lateral lumbar or lateral thoracic exposures without affecting the required image quality for inter-vertebral movement calculation. Factors that effect this reduction include: placing the cathode toward the feet, using broad focal spot size, precise collimation, not using grid, moderately far SID (125cm) and low mAs. A reduction of patient effective dose (ED) of 75% of the typical lateral thoracic and lumbar exposures doses in UK.

CONCLUSION: Using a systematic approach for optimising the lateral thoraco-lumbar image for inter-vertebral movement calculation it is possible to produce a suitable image with significantly reduced ED. Our methodology may be a suitable way for optimising radiological exposures, as it considers the

interlinked effect of the range of parameters which effect image quality and dose.

15:10 Radiation protection for mobile digital mammography: Being in the vanguard.

Kotre, J. • Robson, K. J.
Freeman Hospital, Newcastle-upon-Tyne, UK

PURPOSE: The full-field digital mammography units now being installed on mobile screening trailers operate with higher photon energies, and at potentially higher workloads, than the screen-film units they replace. It is important to establish whether the existing designs of trailer provide adequate radiation protection. **MATERIALS/METHODS:** Detailed scatter measurements were made on four designs of full-field digital mammography units. Measurements were also made of the attenuation of 3mm aluminium in the scattered beam as this is frequently the protection offered.

RESULTS: The RESULTS showed the expected lack of agreement with the inverse square law and also some unexpected variations with tube angulation.

CONCLUSION: By use of low occupancy factors in the design, existing 3mm aluminium protection can be used with digital mammography, but it was not possible to establish this without detailed scattered radiation measurements.

14.00 – 16.00
Radiography and radiographers in a digital world; where are we now?

14:00 Professionals, technicians and technical experts? The modern radiographer's role

Snaith, B.
Pinderfields General Hospital, West Yorkshire, UK

No abstract supplied.

14:20 Is the end of CR in sight? The current state of digital imaging in radiography

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

No abstract supplied.

14:40 The wireless radiographer; Remote to the department imaging in a digital world

Hickey, N.
Siemens, Camberley, UK

No abstract supplied.

15:00 Data management, security and sharing. Issues for radiographers

Folan, M.
NHS Connecting for Health, Leeds, UK

No abstract supplied.

15:20 Life beyond radiology PACS - can the profession lead others in the storage and transfer of other medical images?

Harvey, D.
Medical Connections, Swansea, UK

No abstract supplied.

15:40 The Society and College of Radiographers - shaping the future role of the radiographer

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

No abstract supplied.

15:30 - 17:40
Film viewing for FRCR and beyond and neuroradiology scientific session

15.30 An examiner's approach to difficult cases in neuroradiology

Straiton, J.
Department of Neuroradiology, Leeds General Infirmary, Leeds, UK

No abstract supplied.

16:00 Challenging cases in paediatric neuroradiology

Batty, R.
Royal Hallamshire Hospital, Sheffield, UK

No abstract supplied.

16:30 Pathology, artefact or normal variant?

Pretorius, P.
John Radcliffe Hospital, Oxford, UK

No abstract supplied.

17:00 Neck ultrasound: Hot tips for cold abscesses

Boyd, E. • LaPorte, S. • Remedios, D.
Northwick Park Hospital, Harrow, UK

PURPOSE: TB is a growing problem and diagnosis of cervical TB adenitis is challenging. High sensitivity is essential to rule out, and high specificity to rule in disease, whereas the overall value of a feature is best assessed by the likelihood ratio. The purpose of this study is to identify the ultrasound features with the highest sensitivity, specificity and likelihood ratio.

MATERIALS/METHODS: Our institution is located close to a major international airport and has a diverse population with the highest reported incidence of TB in the UK. We performed a retrospective review of 544 consecutive patients referred for neck US and FNA. The diagnosis of TB was confirmed with either microbiology or cytology.

RESULTS: Of the 544 patients referred, there were 120 cases of

TB adenitis (22%). Of the nine ultrasound criteria, the highest sensitivities for diagnosing TB are: level 4/5 involvement (87%), matting (83%), necrosis (80%), low echogenicity (78%), unilateral presentation (75%), round shape (70%), peripheral blood flow (68%), hilar preservation (61%), maximum diameter >3cm (40%). Specificities are: matting (92%), hilar preservation (92%), maximum diameter >3cm (83%), peripheral flow (76%), necrosis (75%), round shape (54%), level 4/5 involvement (49%), unilateral presentation (37%) and low echogenicity (28%), and the highest likelihood ratios are: matting (10.6) and hilar preservation (7.6).

CONCLUSION: To rule out cervical tuberculous adenitis we suggest using the ultrasound criteria: level 4/5 adenopathy, matting and necrosis. To rule in disease, matting and hilar preservation are best and have the highest positive likelihood ratios.

17:10 Cone-beam computed tomography imaging of the middle ear: Refining scanning and visualisation protocols

Sauret-Jackson, V.¹•Saeed, S. R.²•Beale, T.³•Dawood, A.¹

¹Cavendish Imaging, London, UK, ²UCL Ear Institute, London, UK, ³Royal Free Hospital, London, UK

PURPOSE: Cone beam computed tomography (CBCT) has been shown to produce high-quality imaging of the ear both in-vitro and in-vivo. This paper aims at refining scanning and visualisation protocols to optimise usefulness of the images and radiation dose.

MATERIALS/METHODS: 12 patients were scanned for post-operative evaluation of cochlear implantation. The scanning parameters studied were 1) the size of the scanned volume (FOV), 2) shorter scanning time combined with hi-res/hi-fi. The assessment of the positioning of the electrodes in the cochlear was done using axial and multiplanar views combined with the "unravalled" view of the cochlear and cross-sections through that view.

RESULTS: A 4cm-diameter x 4cm-height cylinder is large enough to show the entire cochlear region of interest and delivers the smallest radiation dose. Hi-res and hi-fi images have similar signal-to-noise ratios, but combined with shorter scanning times, they contribute to lower the radiation dose to the patient compared to standard images.

CONCLUSION: The use of the smallest FOV contributes to lower radiation dose and needs careful anatomical training of the radiographer. Hi-res and hi-fi images combined with shorter scanning times are valuable options for clinical assessment of the implantation for no added radiation compared to the standard protocol. The addition of the "unravalled" view of the cochlear and cross-sections through that view is a tool helpful to the radiologist and clinician to identify the position of the electrodes in the cochlear scale.

17:20 Dilatation of Virchow-Robins spaces as neuroimaging marker of vascular dementia

Hansen, T. P. •Cain, J. •Purandare, N. •Jackson, A.
University of Manchester, Manchester, UK

PURPOSE: Dilated Virchow-Robin spaces (VRS) are surrogate biomarkers for microvascular angiopathy (MVA). We test two VRS scoring systems for their ability to separate Alzheimer's disease and vascular dementia patients in an elderly population. **MATERIALS/METHODS:** 80 patients (42 Alzheimer's disease patients and 38 vascular dementia patients) aged 63-91 years mean 77 years underwent MRI imaging with a 1.5T scanner (Philips). Scanning included a T1-weighted inversion recovery which best shows VRS. Scoring system 1 was based on that in Patankar et al 2005. VRS in the centrum semiovale (CSOV) and VRS in the basal ganglia (BG) were scored according to location. Scoring system 2 was adapted from Doubal et al 2010. Scored on the number of VRS in centrum semi-ovale and basal ganglia in a single slice. Scoring was blind to diagnosis. Scoring was performed on 25 subjects twice by two raters to assess intraobserver and interobserver variability.

RESULTS: Intraobserver and interobserver variability were compared for VRS score 1 and 2 using Cohen's Kappa and Altman Bland curves showed minimal bias and excellent agreement for both scores.

Scoring system 1 revealed no significant differences between the groups. Scoring system 2 showed that VRS scores in the BG were significantly higher in vascular dementia patients ($p=0.0464$, t test) but not in CSOV.

CONCLUSION: This study shows that even in an older population where VRS are present in every individual, more VRS are present in vascular dementia patients within the basal ganglia and the groups can be separated if a more discriminative scoring system is applied.

17:30 Cross-sectional body imaging in patients with symptomatic, solitary, supra-tentorial, parenchymal lesion - is it really necessary?

Khan, I.¹•Teasdale, E.²

¹West of Scotland Training Scheme, Glasgow, UK, ²Institute of Neurological Sciences, Glasgow, UK

PURPOSE: To determine the need for cross-sectional body imaging in patients with solitary, supra-tentorial, parenchymal lesions, prior to neuro-surgical intervention.

METHODS: Adults with symptomatic, solitary, supra-tentorial, parenchymal lesions discussed in the Neuro-oncology Multi-disciplinary Team (NMT) meeting between January 2009 and October 2009 were included. Data collected included histological diagnosis and whether the patient underwent any body imaging before or after initial biopsy or debulking. A questionnaire was distributed amongst the NMT clinicians to determine if there was any discrepancy between observed and theoretical practice. Data analysis was performed using SPSS software.

RESULTS: Out of 121 patients with histology, 88 had a primary malignancy. Most common lesion was glioblastoma multiforme ($n=71$). Forty-five patients with primary lesion underwent body imaging prior to resection/biopsy (51%). Out of the 30 patients with metastatic disease, 20 underwent body imaging prior

to resection. Ten patients showed further pathology on body imaging, though all underwent neuro-surgical intervention.

Thirteen neuro-surgeons answered the questionnaire. When asked whether they would first do a resection/biopsy or body imaging in a patient with solitary, supra-tentorial, parenchymal lesion and no history of malignancy, 8 out of 13 chose resection/biopsy. Three of the 5 colleagues who chose body imaging further stated that presence of pathology on the scan would not alter the planned surgical resection.

CONCLUSION: Majority of solitary, supra-tentorial, parenchymal lesions are primary neoplasms. Pathology found on body imaging did not alter the planned resection of the lesion. Cross-sectional imaging should therefore be considered after resection/biopsy of the lesion, depending on its histology.

15:30 - 17:00

Masterclass: GU II

15.30 Imaging for endometriosis

Babar, S.
Hammersmith and Imperial, London, UK

No abstract supplied.

16:00 Imaging uterine masses

Sala, E.
Addenbrooke's Hospital, Cambridge, UK

No abstract supplied.

16:30 Placental imaging

Narayanan, P.
St. George's Hospital, London, UK

No abstract supplied.

15:30 - 17:00

Olympics 2012

15:30 What imaging is required at the 2012 Olympic Games?

O'Connor, P.
Chapel Allerton Hospital, Leeds, UK

No abstract supplied.

16.00 The role of imaging sports injury during competitions

Healey, J.
Chelsea and Westminster Hospital, London, UK

Imaging Sports Injuries

Managing the healthcare of elite athletes is both a challenging and rewarding experience. The primary aim is to ensure that the athlete remains competitive throughout the season, whatever the sport. Unfortunately, sports-related injuries are common and may diminish the likelihood of achieving that aim. Prudent use of

imaging is essential in the management of these injuries. Whilst it is important not to overinvestigate these injuries, imaging is important if the diagnosis is in doubt or if the extent of injury can be determined to guide prognosis. Good communication between the radiologist and the medical team is mandatory and between the radiologist and the athlete is desirable.

The indications for imaging the athlete, the timing of that imaging and the optimal modality for the most common injuries is given. A series of case studies will be presented to illustrate how imaging can help in the management of sports injuries.

16:30 What it means to be an Olympic volunteer and how to apply

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

No abstract supplied.

15:30 - 17:30

Understanding the whole system patient flow

Facilitator

Silvester, K.
Programme Coach, The Flow, Cost, Quality Programme, London, UK

No abstract supplied.

15:30 - 16:30

Breast Scientific Session

15:30 Use of synthetic mammograms to assess readers' ability to estimate breast density

Makaronidis, J. M.¹•Berks, M.¹•Morris, J.²•Boggis, C.¹•Wilson, M.²•Barr, N.²•Sue, A.¹
¹University of Manchester, Manchester, UK, ²University Hospital of South Manchester, Manchester, UK

PURPOSE: Mammographic density is related to the risk of developing breast cancer, and also affects sensitivity of mammographic interpretation, likelihood of recall following screening, performance of computer-aided detection and local recurrence of cancer following surgery. Visual assessment of breast density, in which readers indicate the percentage of dense tissue in mammograms, is widely used. We investigate expert and non-expert assessment of percentage density using synthetic mammograms with known properties.

MATERIALS AND METHODS: We created 60 synthetic, mammogram-like images with densities comparable in area to those found in screening. Half the images contained a single dense area, and the remainder had multiple or linear densities. In half of the single density images, breast size varied. The images were randomized and assessed by 9 expert and 6 non-expert readers who marked percentage area of density on a visual

analogue scale.

RESULTS: Non-expert readers' estimates of percentage density were between 6 and 11% from the truth, compared with expert estimates which were between 10 and 19% from the truth. The readers were most accurate when the density formed a single area in the image, and least accurate when the dense area was composed of linear structures. In almost every case, the dense area was overestimated by the expert readers. Experts were ranked according to the degree of overestimation, which reflected their relative performance on real mammograms.

CONCLUSION: Readers vary considerably in their ability to estimate percentage density. Tests with synthetic images could be used for calibration or training to reduce discrepancies between readers.

15:40 The relationship of volumetric breast density to factors associated with breast cancer risk

Williams, M. W.¹•Diffey, J.¹•Prajapati, R.¹•Whiteside, S.²
•Morris, J.²•Hufon, A.³•Finegan, C.¹•Maxwell, A.⁴•Barr, N.³
•Boggis, C.¹•Wilson, M.³•Astley, S.¹

¹University of Manchester, Manchester, UK, ²Medical Statistics, South Manchester University Hospitals Trust, Manchester, UK, ³Nightingale Breast Centre, South Manchester University Hospitals Trust, Manchester, UK, ⁴Bolton, Bury and Rochdale Breast Screening Service, Royal Bolton Hospital, Manchester, UK

PURPOSE: The percentage area of dense breast tissue in a mammogram is correlated with risk of developing cancer. Recently, methods have been developed to measure the absolute volume of gland in the breast. Here, the relationship between volumetric breast density and risk factors is investigated.

METHODS: We analysed data from 452 women attending breast screening whose mammograms were calibrated to permit measurement of both absolute glandular volume and percentage volumetric breast density for each view. These women also completed a questionnaire from which age, BMI, HRT use and smoking history were obtained.

RESULTS: Mean age of the women was 63.29, mean glandular volume 75.76cm³ and mean percentage breast density 11.81%. Relationship between age and gland volume was significant (p=0.008) with older women having a lower gland volume. Relationship between BMI and both breast measurements was very significant (p<0.001). Women with a greater BMI have a lower gland volume and percentage breast density. HRT was also significantly related to breast density (p=0.043), with women using HRT having a higher percentage breast density. Smoking was significantly related to both gland volume (p=0.042) and breast density (p=0.047), with smokers having less dense breasts. Age, BMI and smoking had a significant independent relationship with gland volume. BMI and smoking were also found to have a significant independent relationship with breast density.

CONCLUSION: Relative and absolute volumetric breast density measures are related to risk factors for breast cancer, with smoking, increasing age and BMI leading to a reduction in volumetric density, and HRT an increase.

15:50 A case for axillary lymph node ultrasound and fine needle aspiration cytology in preference to core biopsy in the staging of early breast cancer

Bainbridge, J.¹•Parry, C.¹•Sullivan, C.¹•Gower-Thomas, K.²
•Young, P.¹

¹University Hospital of Wales, Cardiff, UK, ²Royal Glamorgan Hospital, Llantrisant, UK

PURPOSE: Studies suggest core biopsy to be the preferred technique for pre-operative axillary staging of early breast cancer. We aim to show that ultrasound and fine needle aspiration cytology (FNAC) is at least as accurate, and identify a minimum cortical thickness (CT) of pathological nodes to guide sampling. **MATERIALS/METHODS:** Histology reports for SNB and axillary nodal clearance were compared with pre-operative FNAC for patients that underwent primary surgery for breast carcinoma at two regional breast centres. Sensitivity and specificity of ultrasound guided FNAC and the node positive detection rate for pre-operative ultrasound was determined. Maximal nodal CT of the malignant axillary lymph nodes was also measured. **RESULTS:** 210 of 619 patients were node positive at surgery, 133 of these had pre-operative axillary imaging that was retrievable. Of the 57 patients who underwent pre-operative ultrasound guided FNAC, 46 were C5 for malignancy. In this cohort FNAC has a sensitivity of 81% and specificity of 100%. There were no false positive **RESULTS** and no complications. Ultrasound guided FNAC detected axillary nodal metastases in 35% of patients with early breast cancer. The CT of pathological lymph nodes ranged from 3 to 28mm. **CONCLUSION:** FNAC of suspicious axillary lymph nodes has an excellent sensitivity and specificity proving at least as accurate as core biopsy when staging early breast cancer. US guided FNAC detected 35% of axillary nodal metastases pre-operatively enabling a 1 stage surgical procedure. A cortical thickness greater than 2.9mm is a useful guide to indicate which nodes are suspicious and require sampling.

16.00 Multicenter, double-blind, randomized, intraindividual crossover comparison of gadobenate dimeglumine and gadopentetate dimeglumine for breast MRI

Martincich, L.¹•Favre-Pierret, M.²•Zechmann, C.
M.³•Corcione, S.⁴•van den Bosch, H. C.⁵•Pediconi, F.⁶
•Sardanelli, F.⁷•Gilbert, F. J.⁸

¹Institute for Cancer Research and Treatment (IRCC), Candiolo, Torino, ITALY, ²Center Oscar Lambret, Lille, FRANCE, ³German Cancer Research Center, Heidelberg, GERMANY, ⁴University Hospital "S. Anna", Ferrara, ITALY, ⁵Catharina Hospital, Eindhoven, NETHERLANDS, ⁶University of Rome "La Sapienza", Roma, ITALY, ⁷Università degli Studi di Milano, IRCCS Policlinico San Donato, San Donato Milanese, ITALY, ⁸Aberdeen Biomedical Imaging Centre, University of Aberdeen, Aberdeen, UK

PURPOSE: To intra-individually compare 0.1 mmol/kg doses of gadobenate dimeglumine (MultiHance) and gadopentetate dimeglumine (Magnevist) for contrast-enhanced breast MRI using a prospective, multi-center double-blinded, randomized protocol.

MATERIALS/METHODS: Institutional review board approval and patient informed consent was obtained. One hundred sixty-two women (52.8±12.3 years) enrolled at 17 sites in Europe and China between 07/07 and 05/09 underwent at least one breast MRI exam at 1.5T using 3D spoiled GRE sequences. Of these, 151 women received both agents in randomized order in otherwise identical exams separated by >2 but <7 days. Images, acquired at ≤2 min intervals after contrast injection, were evaluated independently by three blinded radiologists unaffiliated with enrolment centers. Histopathological confirmation was available for all malignant lesions (n=144), while benign lesions were confirmed either by histopathology (n=52) or by 12-month diagnostic follow-up (n=20) with mammography and/or ultrasound. Determinations of malignant lesion detection rates and diagnostic performance (sensitivity, specificity, accuracy, positive and negative predictive values [PPV and NPV]) were performed and compared (McNemar and Wald tests). A full safety assessment was performed.

RESULTS: Significant superiority for gadobenate dimeglumine was noted by each reader for malignant lesion detection (91.7-94.4% vs. 79.9-83.3%; p≤0.0003). Each reader reported significantly superior sensitivity, specificity and accuracy for breast cancer detection with gadobenate dimeglumine (91.1-95.2% vs. 81.2-84.6%; 96.9-99.0% vs. 93.8-97.8%; 96.7-98.2% vs. 92.8-96.1%; p≤0.0094) and significantly superior PPV (77.2-91.1% vs. 60.9-80.7%; p≤0.0002) and NPV (99.0-99.4% vs. 97.8-98.1%; p≤0.0003). No safety concerns were noted with either agent.

CONCLUSION: Gadobenate dimeglumine is superior to gadopentetate dimeglumine for breast cancer diagnosis.

16.10 Intra-individual comparison of gadobenate dimeglumine-enhanced breast MRI with gadopentetate dimeglumine-enhanced MRI, conventional mammography and ultrasound for breast cancer detection

Martincich, L.¹•Faivre-Pierret, M.²•Zechmann, C. M.³•Corcione, S.⁴•van den Bosch, H. C.⁵•Pediconi, F.⁶•Sardanelli, F.⁷•Gilbert, F. J.⁸

¹Institute for Cancer Research and Treatment (IRCC), Candiolo, Torino, ITALY, ²Center Oscar Lambret, Lille, FRANCE, ³German Cancer Research Center, Heidelberg, GERMANY, ⁴University Hospital "S. Anna", Ferrara, ITALY, ⁵Catharina Hospital, Eindhoven, NETHERLANDS, ⁶University of Rome "La Sapienza", Roma, ITALY, ⁷Università degli Studi di Milano, IRCCS Policlinico San Donato, San Donato Milanese, ITALY, ⁸Aberdeen Biomedical Imaging Centre, University of Aberdeen, Aberdeen, UK

PURPOSE: To intra-individually compare gadobenate dimeglumine-enhanced MRI with gadopentetate dimeglumine-enhanced MRI, mammography and ultrasound using a prospective, multi-center double-blinded, randomized protocol.

MATERIALS/METHODS: One hundred thirty-five women (52.25±12.61 years) with BIRADS 3/4 findings on mammography and/or ultrasound underwent two identical breast MRI exams in randomized order, one with gadobenate dimeglumine (MultiHance) and the other with gadopentetate

dimeglumine (Magnevist) each at a dose of 0.1 mmol/kg BW. Of these patients, 88 underwent mammography and ultrasound, 21 only mammography and 26 only ultrasound. MRI was performed at 1.5T using T2w and 3D spoiled T1w GRE sequences with a temporal resolution of ≤2 min. Images were evaluated independently by three, unaffiliated, blinded radiologists for cancer detection. Imaging findings were matched with histology data by a fourth independent, blinded, radiologist. Malignant lesion detection rates were compared (McNemar's test).

RESULTS: 122 malignant lesions were confirmed at histology in patients undergoing MRI and mammography while 123 were confirmed in patients undergoing MRI and ultrasound. Significant superiority for gadobenate dimeglumine over gadopentetate dimeglumine was noted by each reader for cancer nodule detection (94-96% vs. 81-85%; p<0.001). Significantly greater cancer detection was noted by all readers for gadobenate dimeglumine-enhanced MRI versus mammography (94-96% vs. 78%; p<0.001) and ultrasound (91-94% vs. 72%; p<0.001). Conversely, significantly greater cancer detection for gadopentetate dimeglumine-enhanced MRI was noted by just one reader in the comparison with ultrasound (82% vs. 72%; p=0.046). No safety concerns were noted.

CONCLUSION: Gadobenate dimeglumine-enhanced MRI permits significantly improved cancer nodule detection compared to gadopentetate dimeglumine-enhanced MRI, mammography and ultrasound.

16:20 An under 35 years symptomatic breast clinic is the way forward: a single institute experience.

Holland, M. A.

Pilgrim Hospital ULHT, Boston, UK

PURPOSE: Experienced sonographers have extended their role within the symptomatic breast service. A previous study had ascertained that they were able to provide radiological support to the surgeon independently of a radiologist in a clinic where mammograms were not routinely required. The aim of this study is to measure the effectiveness of this under 35 years diagnostic clinic led by a surgeon and supported by an autonomous sonographer and ensure cancers are being detected within the target population.

MATERIALS/METHODS: These clinics started in 2005. Sample size 613 patients, including females with symptoms referred from GP. Breast diaries were reviewed to ascertain core biopsies undertaken and histological diagnosis obtained.

RESULTS: 64 (10%) core biopsies were taken, 38 (59%) were ultrasound guided by the sonographer, 26 (41%) were performed freehand by the surgeon. 3 core biopsies were repeated following MDT discussion. 3 patients had breast cancer, 1 high grade DCIS, 1 high grade invasive ductal carcinoma and 1 with Grade 3 invasive ductal cancer with metastatic lymph node. 44 patients had Fibroadenomas, 5 fibrocystic change, 3 hamartomas. Other conditions included lipomas, phylloides tumour, inflammation, papillary lesion, fat necrosis, tubular adenoma and infarcted lymph node. To date no patients have represented with symptoms

in previous area of concern.

CONCLUSION: An under 35 year breast clinic led by a surgeon and supported by an ultrasound practitioner provides a comprehensive service with accurate diagnosis within all the relevant guidelines. It is effective in identifying the cancers within the relevant population and provides an excellent accessible service.

16:30 - 17:30

Student Radiography Scientific Session

16.30 The impact of the variation of conditions of exposure on the image quality and patient dose in lateral lumbar spine radiography

Enekwa, C. N.

Canterbury Christ Church University, Medway, UK

PURPOSE: To investigate the effect of using automatic exposure/varying field size, fixed exposure/varying field size, varying energy (kVp) on organ dose and image quality in lateral lumbar imaging.

MATERIALS/METHODS: A sliced RANDO® woman phantom was assembled in an experimental laboratory. The entire study was supervised by qualified personnel and all safety checks observed. Siemens x-ray tube, generator and table was used. The phantom was positioned in the lateral position throughout the study and images taken in various conditions under study. An automated computer recording was used to tabulate the results. PCXMC 2.0 dose calculation software was used to calculate specifically the dose to organs subject to direct exposure within the area of interest.

RESULTS: The use of automatic exposure control demonstrated a different result compared with fixed exposure at varying field areas (collimation). Whereas large field area resulted in lesser dose with automatic exposure, more dose is absorbed by the organs when a fixed exposure is used. Ovaries seem to absorb greater dose compared to testicles with the testicles showing no significant change in dose absorption. The image contrast also showed varying results with the two exposures. Some final year radiography students participated in interpreting image quality.

CONCLUSION: Variation of exposure conditions affects the outcome of image quality and absorbed dose. Respectively, automatic exposure and fixed exposure reduces and increases dose absorption at increasing field sizes whereas a high energy (kVp) reduces the dose absorbed by the organs. Safe and efficient x-ray examinations remain vital in the practice of good radiography.

16:40 Smoking is related to reduced QUS measures of bone density in a young premenopausal population?

Kinver, C. L. • Beadle, L. • Grigg, M. • Jones, H. L. • Birch, C. • Parry, L. • Byrd, H. • Molloy, E.

University of Exeter, Exeter, UK

PURPOSE: Smoking is considered a risk factor for osteoporosis and is included in the FRAX assessment tool for predicting 10-

year fracture risk as a clinical risk factor in a population over the age of 40. However, the achievement of the maximum genetic attainable peak bone mass is critical for reducing the risk of future osteoporosis. Therefore, the aim of this study was to investigate the impact of smoking on quantitative ultrasound (QUS) measures of bone density in a young female population. **MATERIALS/METHODS:** 102 young female students were recruited from a volunteer population. Current smoking was recorded and all participants underwent a calcaneal QUS scan to assess their bone density using a Hologic Sahara (Vertec Scientific, Berkshire, UK). The two groups were compared using a t-test.

RESULTS: There were 25 current smokers and 77 non-smokers within the population scanned. The smokers and non smokers were matched for age (21.0 and 21.8 years respectively) and BMI (23.3 and 23.8kg/m² respectively $p > 0.05$). The smokers had a significantly reduced T-score of -0.6 when compared to the non-smokers T-score of 0.04 ($p = < 0.01$). There were no significant differences resulting from alcohol or exercise in this population, suggesting that smoking is the main factor resulting in the reduced T-score.

CONCLUSION: These results demonstrate significantly reduced calcaneal QUS measures of bone density in young premenopausal smokers, suggesting smoking may impact on the achievement of peak bone mass.

16:50 Options for dose-optimisation for DR radiography of the pelvis

Manning-Stanley, A. S. • England, A. • Ward, A.
University of Liverpool, Liverpool, UK

PURPOSE: To investigate the options for dose-optimisation in DR pelvic radiography.

MATERIALS/METHODS: A phantom study was conducted using a DDR detector, utilising all AEC chamber combinations. Centring points were varied according to a 5cm x 5cm grid, with 'textbook' positioning at the centre. Current recommended orientation was phantom head toward (HT) the control console, based on upper lateral AEC chamber location. mAs (given), source-to-skin distance and kVp data facilitated surface dose (plus backscatter) and effective dose calculations. Six anatomical areas were blindly graded by two observers (3-point scale) for image quality (IQ). Statistical differences in radiation dose were determined using the paired student t-test. IQ data was analysed for inter-observer variability (weighted-kappa) and statistical differences (Wilcoxon test).

RESULTS: Switching to 'head away' (HA) orientation reduced mean radiation dose by 36.8%, ($p < 0.001$). A slight reduction in median IQ (15.5 v 15) was seen ($p < 0.001$). Only one HA oriented image (=1.6%) had anatomical areas graded as 'inadequate'. In the HA orientation, at least a 44% dose reduction was achievable ($p < 0.001$) when the upper AEC chambers were used, without the bottom chamber. In the HT orientation, at least 11% dose reduction was achieved ($p < 0.001$); here the bottom chamber was used alone, or in combination. IQ scores fell in each case, but

remained 'adequate'. Within certain AEC settings, doses were $\geq 50\%$ lower, when centred low versus high.

CONCLUSION: AEC chamber position should be clearly marked on equipment to facilitate dose-optimisation. AEC selection should be an active process. Lower pelvic centring is recommended.

17:00 The effect of visual acuity and contrast sensitivity on the accuracy of CT based AAA measurements

Rankin, J. K.¹•England, A.¹•Mehta, J.
University of Liverpool, Liverpool, UK

PURPOSE: To determine the effect of visual acuity (VA) and contrast sensitivity (CS) on abdominal aortic aneurysm (AAA) measurement accuracy when using CT images.

MATERIALS/METHODS: Thirty-three final year Diagnostic Radiography (DR) students underwent VS and CS eye tests. VA was assessed at 6m and 0.4m, CS was assessed using the Pelli-Robson and Vistech 6500 contrast test systems. Participants were then invited to measure the maximum AAA diameter on a series of 48 axial CT images. The series of 48 images included 24 duplicate images which were assigned an alternative identifier. This allowed researchers to quantify individual intra-observer variability when measuring the AAAs. All measurements were performed on a PACS workstation using electronic callipers, all observers were blinded to the presence of duplicate images. Correlation data between VA/CS and the paired measurement differences were generated at the end of the study.

RESULTS: The majority of participants displayed good visual acuity and contrast sensitivities. Median inter-observer variability for the paired AAA measurements was 1mm (range 0-25mm). Of the 726 paired measurements, 78% were within ≤ 2 mm and 95% ≤ 5 mm. Non-parametric correlations between participants' median paired difference and VA/CS RESULTS were calculated. Significant correlation was demonstrated between VA at 40cm (0.376; P=0.031) and CS with the Vistech system (0.420; P=0.003).

CONCLUSION: There is a low range in the contrast sensitivities displayed by Year 3 DR undergraduates. Despite this there are components of short distance visual acuity and contrast-sensitivity which are important in AAA measurement precision.

17:10 Is body mass index a good measure of body fatness?

Reid, E. J.¹•Kilsby, H.¹•West, H.¹•Scott, E.¹•Seymour, R.²•Knapp, K. M.¹
¹University of Exeter, Exeter, UK, ²Torbay Hospital, Torquay, UK

PURPOSE: Body mass index (BMI) is a common measure used to define body fatness, with the WHO defining cut-offs for underweight, normal range, overweight and obese. These cut-offs are related to increasing health risks in BMI's above the normal range. There is current debate that these cut-offs may not be suitable in non-Caucasian populations. However, body fatness and fat distribution also vary within a Caucasian population. The aim of this study was to investigate the relationship between BMI and body fatness in a female Caucasian population.

MATERIALS/METHODS: 47 Caucasian females were recruited from a volunteer population. Height and weight were measured and BMI calculated. Total body dual energy x-ray absorptiometry (DXA) was performed to measure fat and lean tissue mass and bone mineral density on a GE Lunar Prodigy. Visceral adipose tissue (VAT) mass was calculated for three different regions using T1 weighted abdominal magnetic resonance imaging (MRI) scans (Philips Intera). Correlations between BMI and body fatness were calculated.

RESULTS: The correlations between BMI and body fatness ranged from 0.71 to 0.96 (p<0.001), with the best correlation for total body fat and the worst between BMI and VAT.

CONCLUSION: These results demonstrate that BMI correlates well with total body fat. However, has a poorer correlation with regional body fatness and especially with VAT. The ranges of body fatness overlap within the BMI groups, suggesting better a measure of body fatness than BMI is required to more accurately estimate health risks.

17:20 Do the WHO recommendations for exercise lead to reduced body fatness?

Scott, E.¹•West, H.¹•Kilsby, H.¹•Reid, E. J.¹•Seymour, R.²•Knapp, K. M.¹
¹University of Exeter, Exeter, UK, ²Torbay Hospital, Torquay, UK

PURPOSE: Obesity is an increasing problem in the UK, with both nutritional intake and exercise contributing to over-fatness. The World Health Organisation (WHO) recommend 150 minutes of moderate exercise per week or 30 minutes five times per week. The aim of this study was to investigate the relationship between exercise and regional measures of body fatness.

MATERIALS/METHODS: 46 Caucasian females were recruited from a volunteer population. Height and weight were measured and BMI calculated. Total body DXA was performed to measure fat and lean tissue mass and bone mineral density on a GE Lunar Prodigy. VAT mass was calculated for three different regions from T1 weighted abdominal magnetic resonance imaging (MRI) scans (Philips Intera). Exercise was categorised by self-report from questionnaires. Differences between exercise groups were calculated using a t-test.

RESULTS: The groups were evenly matched for age and height. 24 were not undertaking sufficient exercise and 22 were compliant with, or exceeding the WHO recommendation. Body fatness was reduced for all measures of fat (p<0.05) except gynoid fat and region 2 visceral adipose tissue (p=0.12, p=0.06 respectively). There was no difference in lean tissue mass between the two groups

CONCLUSION: These results demonstrate significantly reduced body-fatness in the group who undertake regular exercise. This study was limited by the lack of dietary analysis of the participants and future work should include both diet and exercise.

Notes

Scientific programme abstracts Tuesday 7 June

08:30 - 09:20

Developments in PACS: science and applications

08:30 Common pitfalls in RIS PACS workflow

Zanoni, P.
University Hospital Bristol, UK

No abstract supplied.

08:55 Developments PACS and the future of data sharing

Quirk, P.
University Hospital Bristol, UK

No abstract supplied.

08:30 - 09:30

Hepatobiliary imaging expert panel

8.30 Imaging of diffuse liver disease

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

No abstract supplied.

09:00 Imaging of hepatobiliary emergencies

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

No abstract supplied.

08:30 – 09:30

Interesting neuroradiology and head & neck cases review

8:30 Interesting and difficult cases in neuroradiology

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

No abstract supplied.

09:00 Interesting and difficult cases in head and neck radiology

Madani, G.
Imperial College Healthcare NHS Trust, London, UK

No abstract supplied.

8:30 - 9:30

Masterclass: Peripheral trauma

08:30 Upper limb trauma

Elias, D.

King's College Hospital, London, UK

No abstract supplied.

09:00 Lower limb trauma

Lee, J. C.
Chelsea and Westminster NHS Trust, London, UK

No abstract supplied.

08:30 - 9:30

Masterclass: Technical advances in thoracic imaging CT

08:30 Dual energy CT

Vlahos, J.
St George's Hospital, London, UK

No abstract supplied.

09.00 Functional lung imaging

Van Beek, E. J.
University of Edinburgh, Edinburgh, UK

BACKGROUND: Traditional morphologic imaging of the lung has reached the limits of its capabilities. New ways of incorporating functional data from lung imaging are potentially of interest in determining the extent of lung diseases and to validate therapeutic effects.

Ways to evaluate lung disease now require quantification which is more sophisticated than merely visual assessment. Furthermore, advancement in protocols and a reduction in radiation dose offers new methods to become available on CT. At the same time, MRI is progressively applied in chest imaging, using both traditional proton MRI and more sophisticated hyperpolarised noble gas techniques.

Ultimately, these methods should help improve understanding of pathophysiology and be able to determine treatment effects much more precisely compared to traditional pulmonary function tests.

AIMS: This presentation aims to discuss:

- the methods for quantification of lung diseases
- novel ways of incorporating functional information
- applications in the areas of CT and MRI

09:00 – 10:30

An update on key imaging policy messages

9:30 An update from the centre: what's happening to imaging in DH with the new government?

Denton, E.
National Clinical Director for Imaging, Department of Health, UK

No abstract supplied.

09:45 An update on IR service change

Cavanagh, P.

Taunton & Somerset NHS Trust, Somerset, UK

PURPOSE: To provide an update on the improvement in the provision of Interventional Radiology

Key Points

1. To re-iterate the drivers for improved Interventional Services - focusing on the recent publication produced by the National Imaging Board - Interventional radiology: improving quality and outcomes for patients. Interventional radiology:
2. To assess the progress of the national work to drive this improvement focusing on the work co-ordinated by the National Imaging Board and outlined in a more recent publication of the DOH . Improving quality and outcomes for patients. Interventional radiology: guidance for service delivery.
3. To discuss future steps

This will focus on the opportunities and challenges to achieving the Vision of equality choice and access for all patients to quality, timely and safe interventional radiology services.

10:00 An update on the delivery of stroke imaging

Beale, A.

Royal Bolton Hospital, Bolton, UK

PURPOSE: An update on the Delivery of Stroke Imaging

Method: The National Stroke Strategy in England, was launched in December 2007, and set a clear direction for the development of stroke services in England over the next ten years. Much work has taken place to improve stroke services and the quality of care received by all who need it. There has been a recent concurrent public awareness campaign publicising the FAST criteria for stroke and reinforcing the emphasis on 'time is brain'.

In strokes, thrombolysis has been shown to significantly improve outcomes if administered early. For TIAs carotid recanalisation if performed early can also improve outcome, leading to a reduction in subsequent debilitating stroke.

This has led to the need for rapid access to imaging services as a key element in a gold standard service.

RESULTS: NHS Improvement have been visiting departments across the country to evaluate Stroke Imaging, assessing those that promote best practice and understanding where and why shortcomings occur. As part of the update Department of Health 'quality markers' will be explained and evaluated, data on thrombolysis shown and examples of best practice will be presented.

CONCLUSION: The days of passive management in Stroke and TIA's are over. Imaging departments cannot rest easy and must engage in the concept of 'Time is Brain' to do their part in improving the outcome of these conditions. An update on how the NHS is doing will be discussed.

10:15 An update on AAA screening

Earnshaw, J.

AAA Screening Programme, UK

No abstract supplied.

10:30 An update on PET-CT after the national contract

Webster, P.

CCMU, Department of Health, London, UK

No abstract supplied.

10:45 An update on extensions to the NHS breast screening programme

Sellars, S.

Cancer Screening Programmes, UK

In December 2007 the Cancer Reform Strategy (CRS)[1] was published. This set out the future expansions of the service including the management of women deemed to be at high risk of breast cancer and reinforced commitment to the NHS breast screening programme(NHSBSP).

Alongside expansion to the age range, there was also an expectation in the CRS that high priority should be given to moving from film based screening systems to digital as this would provide opportunities for improving the workflow and increasing the services capacity. It was expected that the existing PACS infrastructure would be utilised[2] [3]

In January 2011 "Improving outcomes: A Strategy for Cancer stated that the expansion project would run for two three-year rounds rather than one[4]. This would ensure that world class data on the effectiveness on screening these age groups.

This presentation will provide an update on the extensions to the NHS breast screening programme.

[1] Cancer Reform Strategy; Department of Health; page 47; December 2007

[2] NHS Breast Screening Programme; Achieving the Cancer Reform Strategy commitments; Advice to the NHS; January 2009

[3] The Operating Framework for 2010-2011 for the NHS in England; DH; December 2009

[4] Improving Outcomes: A Strategy for Cancer; DH; January 2011

09.00 – 09.30**Musculoskeletal scientific session****9:00 Cervical spine trauma radiographs: swimmers and supine obliques; an exploration of current practice**

Fell, M.

Milton Keynes General, Olney, UK

PURPOSE: To investigate current cervical spine radiographic imaging practices in conscious adult patients with suspected neck injury; to explore reasons behind variation and consider dose estimates. Comparison with a previous survey was made.

MATERIALS/METHODS: Questionnaires were sent to superintendent radiographers responsible for A&E X-ray departments in English trusts with over 8500 emergency admissions per year, with a response rate of 97% (n=181/186).

RESULTS: Departmental cervical spine imaging protocols were reported by 82% of respondents. None use fewer than the three standard projections; if the cervicothoracic junction (C7/T1), is not adequately demonstrated 87% use swimmers projections, 9% supine obliques, 3% CT alone. Following projectional radiography, 97% perform CT. A significant ($p=0.018$) increase was found since 1999/19 in CT use once the swimmers projection fails; fewer now use obliques at this point, continuing with CT instead. No significant difference ($p=0.644$) was found in choice of first supplementary radiographs; despite British Trauma Society's recommendation to undertake supine obliques, swimmers remain the most widespread technique. An 85% response rate ($n = 103/121$) completed a second questionnaire, exploring reasons behind the various practices. Several reported a perceived difficulty in interpreting oblique radiographs, some a concern over high dose of the swimmers.

CONCLUSION: Numerous issues affect the acquisition of cervical spine radiographs. Patient radiation dose should be a major consideration in selection of technique. A potential need for training in interpretation of obliques is highlighted. Specific guidelines for optimum projections should be researched, and protocols issued to ensure best practice

9:10 Diffusion weighted MRI for early diagnosis of axial spondyloarthropathy

Paliwalla, M.¹•Gartner, L.¹•Calnan, F.¹•Keat, A.²•Remedios, D.¹
¹Department of Radiology, Northwick Park Hospital, Harrow, UK, ²Department of Rheumatology, Northwick Park Hospital, Harrow, UK

PURPOSE: Radiographic changes are late sequelae of axial spondyloarthropathy (ASpA) and the use of Magnetic Resonance Imaging (MRI) is now advocated. Optimum outcomes are most likely with early treatment before radiographic damage has occurred. Diffusion-weighted imaging (DWI) has been used to identify bone marrow oedema in stress fractures and tumours. We have assessed the value of DWI for early diagnosis of sacro-iliitis and lumbar vertebral osteitis. **METHODS:** Consecutive adults, 18-45 years, referred to the Harrow Spinal Pain Triage Pathway with more than 3 months' duration of back pain completed a questionnaire to identify 5 cardinal features of inflammatory back pain. Patients with 3 or more features were offered standard T1, T2 and STIR sequences and, in addition, echo-planar DWI to identify subtle marrow oedema in the lumbar spine and sacro-iliac joints (SIJ's). Concurrent HLA-B27 testing was performed. **RESULTS:** 12 patients (6 male, 6 female), median age 34 years were studied. 3/12 (all male), were diagnosed with asymmetrical, bilateral sacro-iliitis. 2/12 also had vertebral osteitis. DWI demonstrated all changes, but in 2/3 cases only unilateral sacro-iliitis was shown on standard sequences. 1/3 patients was HLA-B27 positive. Significant degenerative disc disease was present in another 5 patients with normal SIJ's. 4 scans were normal. **CONCLUSION:** : DWI can detect early sacro-iliitis in a substantial minority of young adults with inflammatory spinal pain not seen on standard MRI sequences. The diagnosis of significant spinal abnormalities in two thirds of this group might contribute usefully to their

treatment. This study continues.

9:20 Imaging of the post-operative shoulder

Tyler, P. A. •Khoo, M. •Rajeswaran, G. •Sayanvala, H. •Sajid, B.
The Royal National Orthopaedic Hospital, Stanmore, Middlesex, UK

Shoulder surgery has a large role in both the DGH and specialist orthopaedic hospital, and radiologists must be aware of surgical techniques used, expected post-operative appearances and complications that may arise.

We review typical post-operative imaging findings following arthroscopic and open surgery for a range of pathologies, including open subacromial decompression, rotator cuff repair, and surgery for gleno-humeral instability. Gleno-humeral joint replacement for inflammatory, degenerative and malignant conditions is also reviewed. Post-operative complications are discussed and demonstrated with multimodality imaging.

9:30 The beak ligament: its anatomy and significance as illustrated on MRI

Menon, S. •Bhatti, W.
UHSM, Manchester, UK

BACKGROUND: We cannot but acknowledge the evolutionary leap that an opposable thumb has made possible. It however remains sadly true that the understanding of the anatomy and imaging assessment of the ligaments of the base of the thumb, which provide stability to a rather incongruous joint is limited.

AIM: It is hoped that this presentation will allow a better understanding of the musculo-tendinous and ligamentous anatomy of the thumb base as seen on MRI; explain the significance of the palmar beak ligament; and help in detection and appreciation of insufficiency of this ligament and its sequel. The deep anterior oblique ligament originates on the tuberosity of the trapezium & inserts on ulnar and volar edge of metacarpal base. The anterior oblique ligament provides mobility but prevents dislocation and maintains volar stability of saddle joint; by anchoring the volar lip of first metacarpal to trapezium and second metacarpal. Insufficiency of this ligament leads to basal joint arthritis and this ligament functions as a pivot for the first metacarpal during palmar abduction to allow pronation. **CONCLUSION:** It is vital to understand the ligamentous anatomy of the base of the first metacarpal, to detect insufficiency of this ligament so as to prevent arthritic sequel, and understand when a Bennett's fracture requires internal fixation for bony alignment and congruency of the articular surface. Injury to the ligaments at the base of the thumb can result in potentially disabling deformity if not adequately repaired or reduced, with massive personal and socioeconomic implications.

9:40 Occult scaphoid fractures: a review of literature looking at imaging modality of choice?

Patel, A. •Sahu, A. •Nensey, R. •Ninan, T. •Vardhanabhati, V. •Suresh, S.
Plymouth Hospitals NHS Trust, Plymouth, UK

INTRODUCTION: Scaphoid fractures constitute 79% of carpal bone fractures and are associated with significant morbidity and

severe complications such as are non-union, avascular necrosis, carpal instability and osteoarthritis.

PURPOSE: To avoid undertreatment & overtreatment, accurate and early diagnosis is required to confirm and exclude scaphoid fracture in occult cases.

RESULTS: We reviewed the available literature to compare the diagnostic performance of Bone scintigraphy, MRI, and CT. Nonunion rate varies between 5-12 % and the rate of AVN about 35%. MR can detect a trabecular fracture line associated with perifocal bone edema on STIR images. CT is cheap, quick and easily available. A recent systematic review and meta-analysis looked at twenty-six studies. Specificity of bone scan was worse than that of MRI ($p = 0.001$) and CT ($p = 0.001$). One study suggested that MR is inferior to CT in depicting cortical involvement ($p=0.03$) but better in trabecular fractures. A Danish study suggested that use of MRI increased hospital costs by 151 euro ($P<0.05$), but reduced non-hospital costs by 2869 euro ($P<0.05$)

CONCLUSION: MRI is highly accurate for confirming and excluding the diagnosis and can be used as the first choice investigations. More RCT's or paired design studies are needed to compare CT with MRI or bone scintigraphy. Bone scintigraphy and MRI have equally high sensitivity and high diagnostic value for excluding scaphoid fracture but bone scintigraphy is less specific. CT is the preferred modality to look at the location, deformity and union status of scaphoid fracture.

09:30 - 11:30

CT: Clinical needs and technical solutions

09:30 Iterative reconstruction (Low Dose)

Flohr, T.
Siemens Medical Solutions, Forchheim, GERMANY

Iterative reconstruction is not a new image reconstruction technique. For many years, it has been a well-established reconstruction method for positron emission tomography (PET) or single photon emission computed tomography (SPECT). Recently, iterative reconstruction was re-introduced to computed tomography (CT) as a method to improve image quality, enhance image resolution and lower image noise.

While increased spatial resolution is directly correlated with increased image noise in filtered back projection reconstruction as it is used in all commercially available CT-scanners today, iterative reconstruction to a certain extent allows decoupling of spatial resolution and image noise.

In an iterative reconstruction, a correction loop is introduced in the image reconstruction process. After an image has been reconstructed from the measured projection data, a ray-tracing in the image is performed to calculate synthetic projections that exactly represent the reconstructed image. The deviation between measured and calculated projections is used to reconstruct a correction image and up-date the original image in an iterative loop. Each time the image is up-dated, non-linear image processing algorithms are used to stabilize the

solution. They maintain or enhance spatial resolution at higher object contrasts and reduce image noise in low contrast areas. This step, called regularization, is responsible for the image noise reduction properties of an iterative reconstruction. The repeated calculation of correction projections removes image artifacts introduced by the approximate nature of the filtered back projection reconstruction, but does not necessarily reduce image noise. In addition to artifact reduction, image resolution can be increased by careful modeling the measurement system during forward projection in a so-called model-based iterative reconstruction.

We review the basic principles of iterative reconstruction and commercial realizations such as iterative reconstruction in image space (IRIS), sinogram affirmed iterative reconstruction (SAFIRE) or model based iterative reconstruction (MBIR). We explain the potential of these techniques with regard to radiation dose reduction, and we demonstrate their limits.

09:45 - 11:30

PACS: The evolving model

09:45 The death of PACS-What PACS has taught us about sharing clinical information

Dugar, N.
Doncaster Royal Infirmary, Doncaster, UK

No abstract supplied.

10:10 An audit of governance arrangements for UK PACS systems following the Connecting for Health deployment 2006-09

Ryall, C. J. • Drinkwater, K.
RCR Clinical Audit Committee

All UK departments were invited to audit their PACS governance arrangements against standards published by RCR Faculty in 2008. In general suitable governance was in place. Low compliance, or potential issue for management were found in respect to (1) Caldicott issues for teaching, audit and research, and the control of JPEG export (2) arrangements for regular and documented **PACS image Quality Assurance (3) restriction of access to images/reports of staff/celebrities. (4) audit of inappropriate access (most PACS offered an audit trail and 25% of respondents had already detected "inappropriate access". There was no significant training issue. Progress towards governance of image transfer between trusts and teleradiology was felt to be satisfactory, but gaps remained in legal work and in urgent patient transfer. 10% of teleradiology arrangements did not yet meet the RCR "equivalent confidentiality" standard. In secondary questions 92% of respondents reported periods when no workstation was unavailable, a similar number were still viewing some images on standard PC screen.

10:35 Data sharing: current and future solutions

Young, P.
Burnbank, UK

No abstract supplied.

11:00 Clinical networking with PACSMail

Gatley, S.
Sybermedica Ltd, Cambridge, UK

DOH IT Director General Christine Connelly has painted a radical new picture of the way in which the new UK government wants the NHS to operate. Her vision is one in which we, the patients, make decisions about what we do with our data and who we allow to access it.

Although there is currently a massive gap between the IT needs of a busy hospital department and the familiar consumer-oriented world of Facebook or the i-Phone app store, the UK government is committed to ensuring that NHS information systems are increasingly able to output information to places that are accessible from beyond the walls of the NHS - and this has the potential to fuel the gold-rush of a completely new healthcare economy. Supported by appropriate standards and restrained by appropriate role-based access control, clinical networks could become as easy to form as the social networks of today.

We report on Sybermedica's PACSMail clinical networking platform, launched two years after Facebook, which allows registered clinicians to sign up and share clinical information, including CT and MRI scans between colleagues. The system is secure, standards based, and no IT support is required.

What sets PACSMail apart from other shared EPR's is that, like social networking sites, it allows the clinicians themselves to sign-up, create their identity and build their networks. PACSMail is a long way from having Facebook's record of 400 Million users but the potential for this technology to enable new forms of clinical collaboration is real and current.

10:00 - 11:30

Death to bariums?

10:00 Cross sectional imaging of the small bowel

Phillips, A.
Royal United Hospital, Bath, UK

No abstract supplied.

10:30 Colonography - current roles, optimisation of technique, tips and pitfalls

Planche, K.
Royal Free Hampstead NHS Trust, London, UK

CT colonography has evolved over the last 10 years from a new technique performed in specialist centres to a mainstream technique performed routinely in most hospitals. It can now be used as a diagnostic and screening investigation and has largely

replaced the barium enema. CTC has been accepted as a safe reliable technique with good sensitivity and specificity.

There have been extensive discussions between radiologists and gastroenterologists about the role of CTC and where it should sit in the diagnostic pathway. CTC is used in some centres in a limited role for example following a failed optical colonoscopy (OC) or if OC is contraindicated. In other centres it is used as a first line investigation for symptomatic patients and in colorectal cancer screening programmes. The current role of CTC will be discussed.

To provide a high quality service, CTC technique must be optimised. Important imaging factors will be discussed including bowel preparation, scanning protocols, reporting methods and training.

Reporting of CTC requires attention to detail to avoid perception and interpretation errors. Common problems and pitfalls can be overcome with a variety of useful techniques and observations. Helpful reporting tips and common errors will be highlighted.

11:00 Anorectal MRI - techniques and tips

Tolan, D. J.
Leeds Teaching Hospitals, Leeds, UK

No abstract supplied.

10:00 – 11:30

Refresher course: Imaging for headache

10:00 Imaging in acute headache

Scoffings, D.
Addenbrooke's Hospital, Cambridge, UK

No abstract supplied.

10:30 Imaging of chronic headaches

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

No abstract supplied.

11:00 Practical image interpretation

Pretorius, P.
The John Radcliffe Hospital, Oxford, UK

No abstract supplied.

10:00 - 11:30

Refresher course: Knee MRI

10:00 The menisci and cartilage

Kainberger, F.
University of Vienna, Vienna, AUSTRIA

No abstract supplied.

10:30 The cruciates

Bergin, D.

TUESDAY

University College Hospital, Galway, IRELAND

Cruciate ligaments are arranged like a letter X that stabilize the knee while allowing a very large range of motion. The anterior cruciate ligament (ACL) and the posterior cruciate ligament (PCL) are strong bands that extend from the head of the tibia to the intercondyloid notch of the femur.

The ACL originates from deep within the notch of the distal femur and attaches in front of the intercondyloid eminence of the tibia. This allows the ACL to resist anterior translation of the tibia, in relation to the femur. ACL injury is the most common knee ligament injury, especially in athletes. Lateral rotational injuries cause the ACL to strain or tear. ACL tears almost always require surgery with graft repair. Other common injuries accompanying ACL tears are meniscus, MCL, and knee cartilage tears.

The PCL connects the posterior intercondylar area of the tibia to the medial condyle of the femur. Its function is to prevent the femur from sliding off the anterior edge of the tibia and to prevent the tibia from displacing posterior to the femur. Common causes of PCL injuries are direct blows to the flexed knee, such as the knee hitting the dashboard in a car accident or falling hard on the knee. Ligament reconstruction may be used to replace the torn PCL with a new ligament using a graft taken from the hamstring or Achilles tendon from a host cadaver.

This lecture describes the pathophysiology and MR appearance of derangement of the cruciate ligaments of the knee.

10:50 Extensor mechanism

Hussain, S.
Royal Berkshire Hospital, Reading, UK

The extensor mechanism of the knee consists of the patellofemoral joint, quadriceps and patellar tendons, and the adjacent soft tissue supporting structures including the patellar retinacula and intra-articular fat pads.

A range of pathologies may affect the extensor mechanism in both the adult and paediatric populations, which often give rise to anterior knee pain; these include traumatic and overuse injuries, tendinopathy, chondromalacia patellae, patellar maltracking and abnormalities of the fat pads. The lecture aims to describe the anatomy and biomechanical function of the patellofemoral joint, and illustrate the spectrum of disorders pertaining to the extensor mechanism of the knee.

11:10 Post-op knee

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

No abstract supplied.

10:00 - 11:30

Refresher course: Lung cancer

10:00 Current Issues in Lung Cancer Staging

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

No abstract supplied.

10:20 Lung cancer screening - where are we now?

Gleeson, F.
Churchill Hospital, Oxford, UK

No abstract supplied.

10:40 Management of subsolid nodules

Walsh, S.
Royal Brompton Hospital, London, UK

Subsolid pulmonary nodules on CT are now known to frequently but not always fall into the histopathologic spectrum of peripheral adenocarcinomas of the lung. Other potential benign diagnoses include focal fibrosis, focal inflammation and organising pneumonia. The Noguchi classification of adenocarcinoma of the lung is a histopathologic classification which correlates well with the CT appearances of subsolid nodules and their prognosis. Serial CT imaging of these lesions indicate that they may undergo a step-wise progression from one Noguchi type to the next, manifested on CT as an increase in size and/or progression from pure ground-glass opacity to mixed ground-glass/solid nodules or pure solid nodules. This pattern of progression together with other important characteristics such as longer volume doubling times has necessitated a revision of current management guidelines, although thus far, a consensus has not been reached. Specific issues which have proven problematic include the need for a consensus on CT classification, identifying characteristics on CT which best predict malignancy and prognosis and validating methods to evaluate these parameters with precision. This includes measuring growth rates and proportions of ground-glass opacity and solid components within a nodule. The role of PET/CT in evaluating subsolid nodules is less clear. The aim of this lecture is to first, outline the spectrum of appearances of subsolid nodules on CT and how these relate to histology and prognosis. A discussion of the difficulties associated with their evaluation and management will follow. Finally, suggested guidelines for the management of subsolid nodules will be outlined.

11:00 Ablative techniques - when? where? how?

Grubnic, S.
St. George's Hospital NHS Trust, London, UK

No abstract supplied.

12:00 - 12:45

CoR William Stripp Memorial Lecture

12:00 If it is not broken mend it! The holistic approach to image interpretation

Harries-Jones, H.
Poole Hospital NHS Foundation Trust, London, UK

The radiographers' role in hot reporting is now well established. Radiographer led discharge of normal findings is also developing in some units in the UK. This has been very effective in reducing waiting times and enabling patients to be treated by emergency nurse practitioners without the need to consult medical staff. This in turn frees up doctors to deal with medical emergencies. Another important aspect is cost saving from having patients treated for false positive and taking up valuable appointment time and importantly potential litigation from false negative findings.

However what is normal? The imaging report may read "No bony injury" but there still maybe a substantial injury that needs treating.

It should not be the case that these patients are sent home with no further advice or treatment plan. This can limit their recovery from non bony trauma and could result in long term problems and a further drain on healthcare resources.

This lecture will discuss how with extra skills and training, the radiographer can provide a top class and cost effective service for this group of patients which may otherwise "fall through the net" especially if referred direct to the imaging department by general practitioners .

Poole Hospital NHS Trust is working on the concept of providing GP s with a " see and treat service" run by advanced practice or consultant radiographers. This would provide direct income and lessen the strain on emergency department staff.

This concept fits in well with the role of the advanced practice radiographer in the emergency department and highlights the potential future as independent practitioners in minor injury care.

13:00 - 13:45
IPEM John Mallard Lecture

13:00 Ultrasound elastographic techniques: past, present and future

Bamber, J.
Royal Marsden Hospital, Surrey, UK

No abstract supplied.

14:00 - 15:30
Masterclass II: HRCT interpretation

14:00 Reticular Patterns

Copley, S.
Imperial College Healthcare NHS Trust, London, UK

The reticular pattern is defined on chest radiography as 'a collection of innumerable small linear opacities that, by summation, produce an appearance resembling a net (synonym: reticulation)'. The reticular pattern is well-demonstrated on HRCT and may represent interlobular septal thickening, intralobular lines, or honeycombing. A reticular pattern on

HRCT, usually (but not always), represents interstitial lung disease. An important caveat is that a limited subpleural reticular pattern may also be seen in asymptomatic older individuals, and it is important not to 'overcall' clinically significant disease in this context.

There are many causes of the reticular pattern on HRCT including: asbestosis, drug-induced interstitial lung disease, chronic hypersensitivity pneumonitis, collagen vascular disease, radiation fibrosis and sarcoidosis.

The common idiopathic interstitial pneumonias associated with the reticular pattern include usual interstitial pneumonia (UIP) and non-specific interstitial pneumonia (NSIP). UIP is the commonest histopathologic pattern demonstrated in idiopathic pulmonary fibrosis (IPF) and on microscopy is characterized by spatially and temporally inhomogeneous fibrosis with honeycombing and architectural distortion. Macroscopically, honeycombing is commonly seen affecting the subpleural, basal lung. By contrast, NSIP is histopathologically characterized by spatial and temporal homogeneity, with varying severity of fibrosis and inflammation. It is important to differentiate between the two histopathologic entities because of differences in survival, the prognosis of UIP being worse than that of NSIP. Although HRCT has a key role in diagnosis, the HRCT pattern may also be prognostically informative.

The typical features of UIP are bilateral, subpleural basal honeycombing which mirrors the macroscopic appearances (7-9). Ground glass opacity is sometimes seen but is not a dominant feature. Additional features include traction bronchiectasis and bronchiolectasis (reflecting tractional dilatation of segmental and subsegmental airways). As individuals are often cigarette smokers, co-existing emphysema is often present. Reactive lymphadenopathy is a common ancillary feature. As there is an increased risk of lung cancer in IPF, careful scrutiny for lung nodules or masses is important. Some individuals with IPF demonstrate an accelerated clinical decline and the cardinal imaging features include new areas of ground glass and consolidation. In the presence of typical features, a confident correct diagnosis of UIP can be made on HRCT, obviating the need for biopsy. However, atypical features may occur in approximately one third of cases, and overlapping patterns with NSIP and chronic hypersensitivity pneumonitis are well-recognized, requiring histopathological confirmation.

NSIP is characterized by predominant basal ground-glass opacity on HRCT, with features of fibrosis including reticular pattern, volume loss and architectural distortion with traction bronchiectasis. Generally, honeycombing is not present. Somewhat confusingly however, the HRCT pattern may change over time to resemble UIP. Distinction between histopathologically-proven UIP and NSIP may therefore not be straightforward, even for experienced thoracic radiologists.

14:30 HRCT: smoking related diseases

Screaton, N.
Papworth Hospital NHS Trust, Cambridge, UK

TUESDAY

No abstract supplied.

15:00 HRCT: Micronodular Disease

Vlahos, J.

St George's Hospital, London, UK

No abstract supplied.

14:00 – 15:30

Masterclass: Head and neck imaging

14:00 An imaging approach to infections in the head and neck

Colley, S.

New Cross Hospital, Wolverhampton, Worcestershire, UK

PURPOSE: Infections in the extra-cranial head and neck are relatively common, and can affect a variety of age groups. Cross sectional imaging is important in the initial work up to identify a source, and assess the presence of deep infection or abscess that may require emergent surgery.

This talk will cover some of the more common infectious processes, covering the cross sectional appearances. An emphasis will be placed upon neck anatomy, as familiarity with the fascial layers is important in assessing the extent, origin and potential routes of spread of infective processes.

14:30 An imaging approach to skull base tumours

Herwadkar, A. V.

Hope Hospital, Stockport, UK

No abstract supplied.

15:00 Imaging in neuro-ophthalmology

Miszkiel, K.

The National Hospital for Neurology & Neurosurgery, London, UK

No abstract supplied.

14:00 - 15:30

Refresher course: Upper limb MRI

14:00 Shoulder MR arthrography

Kainberger, F.

University of Vienna, Vienna, AUSTRIA

No abstract supplied.

14:30 Elbow MRI

McCarthy, C.

Nuffield Orthopaedic Centre NHS Trust, Oxford, UK

No abstract supplied.

15:00 Wrist and hand MRI

Calleja, M.

Royal National Orthopaedic Hospital, Middlesex, UK

No abstract supplied.

14:00 - 15:30

Tricky situations in the abdomen

14:00 Imaging the acute abdomen in pregnancy

Zealley, I. A.

Ninewells Hospital, Dundee, UK

This talk will review the causes of acute abdomen in pregnancy, discussing variations in presentation and highlighting the commonest pathologies. The role of the radiologist in this clinical scenario is to facilitate a prompt and confident diagnosis. For obvious reasons ionizing radiation tests are ideally avoided but this is not always possible and may not be in the best interests of the patient. The risks of ionizing radiation to the foetus will also be discussed as this information helps to inform clinical discussions about the various diagnostic test options available.

14:30 Post-op hepatobiliary imaging

Ryan, S.

King's College Hospital, London, UK

PURPOSE: To Demonstrate the Imaging Appearances of Patients Post Hepatobiliary Surgery, with Emphasis on Unusual and Difficult Imaging Problems

MATERIALS/METHODS: Examples of cases post liver resection, radiofrequency ablation, Whipples, and cholecystectomy will be provided.

RESULTS: Imaging of the normal and complications of the post operative period to be discussed. Ischaemic liver, transected ducts, blind loop syndrome, ischaemic efferent loop, pseudoaneurysm formation, bile leak, gastric outlet obstruction, etc, will also be shown, with reference to anatomical variants to be aware of in the pre operative phase.

There will be a combination of axial imaging and fluoroscopic findings.

CONCLUSION: A broad analysis of all hepatobiliary surgery, plus common imaging conundrums post operatively, will be presented.

15:00 Post-op imaging of the GIT

Callaway, M.

Bristol Royal Infirmary, Bristol, UK

No abstract supplied.

14:00 - 16:00

Elastography

14:00 MR elastography

Sinkus, R.

ESPCI, Paris, FRANCE

Manual palpation has ever since been used as a diagnostic tool in the domain of breast cancer and liver fibrosis to qualitatively

assess pathological abnormalities. Intuitively it is obvious that tissue alterations at the molecular level modulate the mechanical properties at the macroscopic clinical length scale. MR-Rheology is a recent non-invasive MR method which allows to acquire quantitatively the viscoelastic properties of tissue. The method is based upon the intrinsic link between the propagation properties of mechanical shear waves and the underlying viscoelastic properties of the material. In a nut-shell : when vibrating in steady-state mono-frequently, the local wavelength changes depending on the stiffness of the material. Hence, the measurement of the waves via motion-sensitized phase-locked MR sequences allows to recuperate in a post-processing step maps of the local viscoelastic properties of the tissue.

Clinical results for the staging of liver fibrosis are presented and compared to other existing methods (Fibroscan, APRI blood test). Confounding factors like inflammation and steatosis are discussed. Recent results on breast cancer characterization are presented in the context of multi-frequency MR-Rheology. Here, MR sequence developments towards a coverage of the entire organ (breast/liver) are presented. In this context results from a new MR-Rheology sequence based upon FLASH and fractional frequency encoding techniques are shown. Regarding the application to brain, new results on the relation between de-myelination effects in the corpus-calossum and mechanical properties in a mouse study are presented. The application of this method to humans is at hand. Finally, results on two colon tumour models in mice under anti-vascular treatment are shown and discussed in relation to DWI and histology (cellularity and blood vessel density).

14:30 Breast elastography: nine years of clinical experience

Svensson, W.

Imperial College Healthcare NHS Trust, London, UK

Palpation is the oldest method of detection of abnormal tissue pathology. Variations in palpation characteristics and ease of deformation of a lesion reflect the elasticity of the lesion and its surrounding tissues. Elasticity imaging is a very different imaging method, technique and appearance to learn, but increasing skill in interpretation appears to be providing greater accuracy in diagnosis.

The physics of elasticity, based in mechanics relates to the distortions which occur when matter is subjected to an external force. A variety of approaches are now used in elasticity imaging resulting in differences in information obtained.

Freehand comparative compression elastography (Strain imaging), which has been most widely used, determines the relative elasticity (stiffness) of different tissues by comparing degrees of deformation when a changing external force is applied to tissues. The information obtained from different methods of strain application and stress measurement RESULTS in variation between ultrasound systems which utilise external compression.

Shearwave elastography imaging utilises ultrafast imaging to track an ultrasound induced low frequency shearwave as it

passes through tissues, changes in shearwave velocity are a measure of tissue stiffness.

The stiffness footprint of shear wave elastography can differ from the low deformation footprint of freehand compression strain elastography due to differences in the mechanical physics of the two techniques. Differences of applied stress (compression force) result in different elastography RESULTS: due to factors such as non-linearity of tissue stiffness with variation of applied force and strain boundary conditions at anatomical boundaries and regions of changes in stiffness.

14:50 Surgical applications of elastography

Uff, C.

The Royal Free Hospital, London, UK

Ultraosund elastography is a technique for imaging the stiffness of soft tissues. Its main application is in the non-invasive diagnosis of cancer however its use in intraoperative surgical guidance has a different motivation because the patient is already committed to an invasive procedure. The brain and spinal cord are unique in that they are only amenable to ultrasound examination during surgery because of the skull and bony spine. All other organs in the body are accessible to percutaneous insonation and the brain is the only organ where intraoperative ultrasound elastography has been reported.

Ultrasound is widespread in neurosurgery because it remains the only real-time intraoperative imaging modality and we have used ultrasound elastography for tumour surgery in the brain and spine, and cortical dysplasia resections for epilepsy. Quasistatic ultrasound elastography is semi-quantitative but can be used for intraoperative localization and characterization of tumour boundaries with respect to their adherence to the surrounding brain, and characterization of lesion stiffness prior to surgical exploration. In the spine some tumours may be effectively diagnosed by their adherence (astrocytomas vs ependymomas, meningiomas vs neurofibromas) so the presence of a mobile lesion boundary may also be of diagnostic value.

Shear wave elastography has recently allowed quantitative measurements of both the normal and abnormal brain with the possibility of detecting residual tumour based on its Young's modulus.

We present our experience with ultrasound elastography in neurosurgery and discuss possible future applications of this technology.

15:10 Elastography in the liver

Cross, T.

Derriford Hospital, Plymouth, UK

No abstract supplied.

15:35 Thyroid elastography

Richardson, D.

Newcastle upon Tyne Hospitals NHS Foundation Trust, UK

AIM: To compare the Ultrasound (US) elastography features with the pathology and assess correlation between the "hardness"

and “softness” of nodules (when measured by US elastography) with the ultimate pathological diagnosis.

METHOD: 200 consecutive patients requiring thyroid US and cytological sampling were examined by conventional US (Hitachi 6500) as well as elastography before the sampling was taken in the usual way.

The strain pattern produced by gentle pressure is demonstrated by a colour map on a split screen. Additional software was available later in the study to allow “strain ratios” to be calculated, comparing the strain in 2 parts of the image i.e. nodule and normal.

RESULTS: Elastography patterns were divided into 3 groups: Hard (blue), soft (green) and intermediate (mixed colour map) and compared with the Thy cytological classification.

There is a significant relationship between the nodule having a hard appearance and Thy classification 3-5 (when surgery would be performed) ($P < 0.0001$) with high specificity (99%) and PPV (90%) but lower sensitivity (33%) and NPV (82%).

Comparing a soft elastography (c.f. not soft) with benign cytology (Thy 2) again was significant ($P < 0.0001$) with higher sensitivity (90%) but lower specificity (60%); PPV=84%, NPV=70%.

Comparing strain ratios (of 2 or less with >2) with the Thy 2 and Thy 3-5 classifications was also significant ($P = 0.0009$) with sensitivity = 100%, specificity = 80%, PPV = 60% and NPV = 100%.

CONCLUSION: Compression elastography provides a new feature to differentiate benign from malignant thyroid nodules.

14:00 - 16:05

Consultant and advanced practice: It's not all about reporting

14:00 Clinical role development - does 1 consultant radiographer = 1 skill set?

Snaith, B.
Pinderfields General Hospital, West Yorkshire, UK

No abstract supplied.

14:25 The research radiographer in a diagnostic imaging department

Reid, K.
Norfolk & Norwich University Hospital, Norwich, UK

The NHS has an increasingly strong focus on evidence based medicine to underpin policy making and the development of a culture of evaluation and learning. Good quality research is the foundation for this ethos.

Radiology and imaging are established methods of obtaining accurate and reproducible results for supporting research outcomes for many clinical trials, therefore the knowledge and skills of diagnostic radiographers are a crucial contribution, enhancing the multi-professional elements of research and its management.

Research is not an activity reserved only for those who work

in specialist centres. All radiographers have a responsibility to understand research, and many are in a position to engage with research, which adds to the body of knowledge and furthers the profession as a whole.

Highlighting the importance of the diagnostic research radiographer role in clinical research can unite the profession and ultimately deliver improved patient care providing expertise to the ever expanding developments of research and clinical trials in the NHS environment.

This presentation will describe one trust's experience of developing the role of the diagnostic research radiographer. All aspects of the role will be evaluated, including the barriers preceding its development, advantages to the radiology department, and its usefulness for effectively managing and delivering all aspects of the clinical research process.

14:50 Breaking through the glass ceiling - consultant practice in nuclear medicine

Farrell, S.
Derriford Hospital, Plymouth, UK

The Consultant Post in Nuclear Medicine in Plymouth is the first in the country, although Nuclear Medicine Technologists have been working in extended roles for some time.

This presentation aims to discuss the emerging role: -

- Personal background
- Brief outline of Nuclear Medicine training routes
- Limitations to practice only found within the Nuclear Medicine speciality
- Application of the 4 tier system in Nuclear Medicine. Enhanced, Advanced and Consultant Practice
- Impact on the patient pathway

15:15 Managing both a clinical and research role

Turner, C.
Addenbrooke's Hospital, Cambridge, UK

Although the majority of jobs in Radiography are purely clinical, there are a number of opportunities for combining clinical and research roles in the field of imaging. The ability to manage both relies largely on flexibility, good communication and good working relationships with all involved.

There is a large research department within the University of Cambridge based in Addenbrookes's Hospital, which covering all aspects of Neurosurgery. This role combines work within the Clinical Ultrasound Department with both the Clinical and Research Departments of Neurosurgery. The main focus of the role is in the field of Neurovascular Surgery, particularly the carotid arteries and intracranial aneurysms.

With the likelihood of a number of patient visits from both clinical and research aspects, the combined role has the potential for both increased protocol compliance and patient satisfaction. Whilst the role does provide variety and potential for developing expertise in other areas, there is an aspect which needs to be

considered. The majority of research posts are for a fixed term period whilst clinical posts are generally permanent. However it is likely that the benefits outweigh the drawbacks.

15:40 Success of the SoR's accredited practice scheme

Fell, M.

Milton Keynes Hospital, Milton Keynes, UK

CPDNow enables planning and recording CPD activities. Activities can be accredited by the College of Radiographers through CPDNow; enabling meeting the regulatory CPD requirement to maintain Health Professions Council (HPC) registration.

Remember: you have been doing CPD since first qualifying.

CPDNow facilitates recording, processing and planning it in a structured and helpful way, putting you in control of your professional development.

CPDNow was developed to empower meeting the range of requirements impacting on practice since 2005 onwards: including the HPC's CPD Standards - from 2006 radiographers have been required to testify that they have maintained an up-to-date CPD portfolio as a condition of HPC registration. The system provides a quick method of drawing together evidence to meet an HPC audit, something radiographers can now be subject to.

Using CPDNow and meeting the College's standards a personal Certificate of Accreditation for CPD can be claimed; showing evidence for meeting the Professional Body's minimum standard for CPD.

CPDNow also has Advanced and Consultant accreditation, choosing at least six pieces of evidence (of the twelve required for CPDNow accreditation) evidencing:

- Four core functions of higher level practice with at least two pieces supporting the core function of 'expert practice' in the context of the applicant's role.
- Following submission, the applicant invites two peers to review the evidence, and subsequently College Accreditation, following the peer review.
- The process of application for Advanced or Consultant Practice requires invaluable reflection on CPD and provides valid accreditation - reinforcing the CV and personal empowerment.

14:00 - 16:00

Veterinary radiology

14:00 Advanced small animal imaging

Llabres, F.

Davies Veterinary Specialists, Hertfordshire, UK

Current Use Of Diagnostic Imaging In A Small Animal Veterinary Referral-Only Institution

PURPOSE-MATERIALS: A pictorial mainly presentation will demonstrate the current use of diagnostic imaging techniques in a veterinary referral-only centre. Images from recent patients

will be shown. The presentation will concentrate, although not exclusively, in the following scenarios: portosystemic shunting and migrating foreign bodies. These are chosen as they are believed to be of didactical value for those interested in comparative aspects of the application of diagnostic imaging techniques.

METHODS: Following a brief clinical description of these two clinical scenarios, the history, diagnostic imaging findings and outcome of several cases will be described.

RESULTS: Radiologists and surgeons' personal preferences, caseload management preferences, pet owners' financial constraints and diagnostic imaging technique availability determine the particular approach to these cases in each veterinary centre. As an example, the speaker's institution uses a combination of ultrasound and fluoroscopy-aided intraoperative portal venography in cases of suspected single congenital portosystemic shunting, whereas in other centres CT angiography has now become the standard diagnostic method. On the contrary, CT or MRI constitute the main diagnostic imaging modalities in cases with suspected, or known, penetrating or migrating foreign bodies, undergoing referral. The supposed anatomical location of the foreign material, the suspected length of affected areas and the presence of concurrent neurological deficits constitute the main defining factors at the time of choosing CT or MRI.

CONCLUSION: Advanced imaging techniques are playing a fundamental role in diagnosis and therapy-guiding at referral only veterinary centres.

14.30 Equine imaging

Powell, S.

Rossdales Equine Diagnostic Centre, Newmarket, UK

Equine diagnostic imaging has developed rapidly in the last half century, mirroring that in human imaging. Over the years computed radiography, diagnostic ultrasound, nuclear medicine, and, more recently magnetic resonance and computed tomographic imaging systems have become available and have increased our diagnostic potential immeasurably.

The risk of general anaesthesia (real or perceived) has meant resistance to anaesthetizing horses purely for diagnostic purposes and the challenge for horse handlers and imaging companies alike has been to minimise movement blur from patient motion, an endemic problem with any imaging technique used in the un-anaesthetized horse. This challenge is being played out currently in the ongoing development of the Hallmarq Standing Equine MRI System, surely the break-through technique of recent times. This low-field magnet is capable of imaging horses understanding sedation. Due to its developing use to detect pre-fracture pathology in racing Thoroughbreds (pioneered by centres here in the UK) this system has increased our capacity for early detection, and thus avoidance, of some catastrophic fractures in the racehorse, just as nuclear scintigraphy did in the 1980s.

The increasing availability of portable systems and, in the case

of MRI and CT, systems capable of imaging horses without the need for general anaesthesia, has led to an exponential increase in the number of horses undergoing diagnostic imaging. However, technological advances have not been limited to the imaging systems themselves, the use of DICOM formats and PACS is now widespread and has facilitated the assimilation and dissemination of knowledge amongst the veterinary profession.

15:00 Brachytherapy treatment of periocular squamous cell carcinoma in horses: the potential for the application of radiation therapy in the veterinary sphere - results of an Australian national survey

Surjan, Y.¹•Milross, C.²•Warren-Forward, H.¹
¹The University of Newcastle, Newcastle, AUSTRALIA, ²Royal Prince Alfred Hospital, Sydney, AUSTRALIA

PURPOSE: Following a literature review into the treatment benefits of interstitial brachytherapy (IB) for periocular squamous cell carcinoma (PSCC) in horses, a National Australian Survey of practicing Veterinary Surgeons was conducted to identify the perceived needs for radiation therapy input and expertise in this area.

METHODS: The Australian Survey was structured on literature on the efficacy and successful use of IB in PSCC. It included quantitative and qualitative questions, reflecting on the benefits of IB in the treatment of PSCC and gave participants the opportunity to provide information in areas including; current treatment options, radiation safety knowledge, radiation therapy technique knowledge and preferences for treating PSCC.

RESULTS: Of the respondents, 33% considered IB to be well known. The current treatment options for PSCC include a combination of surgery (100%) and cryotherapy (50%), immunotherapy (8.3%) and chemotherapy (41.7%). **RESULTS** indicated 33% had used brachytherapy in the past but no longer used it due to the lack of availability of the radioactive sources. Radiation safety issues were highlighted as 36% of responses indicated radiation monitoring was not used within clinics despite 100% of participants owning and using radiation producing equipment.

CONCLUSION: : The knowledge of and expertise in applying IB is under-developed within Australian veterinary practices. The radiation therapy fraternity could be providers of expertise in the areas of brachytherapy treatment, radiation safety, design and implementation of treatment protocols and sourcing of radioactive materials for brachytherapy.

15:30 Biomedical imaging in farm animals

Gardner, D.
School of Veterinary Medicine and Science, Nottingham, UK

Animals have been used in medical research for centuries (Lavoisier used guinea-pigs ca. 1770's) and their use has led to the award of many Nobel prizes. For a number of reasons, mainly practicable but also ethical and scientific, larger animal models have been less utilised by the medical community. Since

the sequencing and annotation of the mouse genome coupled with the ability to knock-out and knock-in specific genes, the mouse has offered the greater potential for mechanistic scientific studies. However, in many areas, subsequent translation of these studies into clinical practice has proved disappointing, resulting in calls for more animal-based research in 'larger animal models' prior to Phase-I clinical trials. Whilst the non-human primate has only been used to model certain conditions (often neurological) because of ethical concerns, the pig has become accepted as a viable, translational biomedical animal model and is used widely for cardiac, renal and metabolic research with the added potential for xenotransplantation (organ allometry is very similar to human). However, for materno-fetal physiology and obstetric studies, the sheep has been the large animal model of choice since the 1940's. Scientific work with farm animals is costly, requires specialist facilities and experienced personnel; thus, longitudinal studies offering greater statistical power results in less animals being used and minimising costs. Such experimental designs benefit from non-invasive imaging modalities and in my presentation i shall illustrate how i have used CT, scintigraphy, ultrasound and dual-energy X-ray absorptiometry to augment other physiological data acquired in farm animals.

**16:00 – 17:00
 GE Healthcare**

16:00 GE Healthcare: Innovations in CT using new technologies to improve patient pathways

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

No abstract supplied.

16:20 GE Healthcare: Innovations in CT using new technologies to improve patient pathways

Maher, M.
Cork University Hospital, Cork, UK

No abstract supplied.

16:40 GE Healthcare: Innovations in ct using new technologies to improve patient pathways

Walsh, G.
Royal Berkshire NHS Foundation Trust, Reading, UK

No abstract supplied.

16:00 - 17:30

Imaging of brain tumours

16:00 A rational imaging approach to intracranial mass lesions

Pretorius, P.

John Radcliffe Hospital, Oxford, UK

No abstract supplied.

16:30 An overview of primary brain tumours in adults

Hadley, D.

Institute of Neurological Sciences, Glasgow, UK

17:00 An overview of primary brain tumours in children

Batty, R.

Royal Hallamshire Hospital, Sheffield, UK

No abstract supplied.

16:00 - 17:30

Masterclass III: Nodules and scientific session

16:00 Pulmonary nodules: current management

Murchison, J. T.

Royal Infirmary of Edinburgh, Edinburgh, UK

PURPOSE: Pulmonary nodules are commonly visualised on thoracic multislice CT scans, more so with newer generation chest CT scans when thin section collimation is used and particularly when deliberately sought. Lung cancers can begin life as small nodules and the underlying concern is that a lung nodule detected at CT may turn out to be an early malignancy. There is a resulting temptation to closely follow all pulmonary nodules for at least two years to identify signs of growth. Such a policy is costly in time, resources and in patient radiation dose. The great majority of pulmonary nodules are benign with very few follow up scans actually detecting a cancer. Nodules of different sizes and configurations have varying degrees of malignant potential and the detection of nodules in different patient groups also have different levels of significance. Imaging protocols adopted to follow up these nodules should reflect these differences.

16:20 Computer aided diagnosis: nodule detection and volumetry

Roddie, M.

Charing Cross Hospital, London, UK

No abstract supplied.

16:40 Incidental findings at CTPA in a series of 416 patients from one centre in UK

Qureshi, M. • Sahu, A. • Thiagarajah, R. • Riordan, R.

Plymouth Hospitals NHS Trust, Plymouth, UK

PURPOSE: As the field of view of Computed Tomography Pulmonary Angiography (CTPA) includes the thorax and upper abdomen, it is not surprising that these studies can reveal incidental intra and extrathoracic abnormalities. The purpose of this study is to determine the prevalence of these incidental findings.

METHODS/MATERIALS: 416 CTPA studies were reviewed over a 5 month period. Presence of PE and any additional pathology with special attention to incidental pathology, or pathology unsuspected but significant enough to change patient management was recorded. Data was obtained from CRIS/PACS systems and reports specifically reviewed for whether the word 'incidental' was used. Note was also made if patients needed any further studies as a consequence of these findings.

RESULTS: PE was demonstrated in 94 (22.6%; 95% CI 18.7% to 26.9%) out of 416 patients. Additional pathology (including coronary calcification, aortic disease, degenerative spinal disease, goitre, breast mass, adrenal adenoma, renal calculus and liver cyst) was seen in 373 studies (89.7%; 86.3% to 92.4%), of which 58 (15.6%; 12.0% to 19.6%) were reported as incidental. 43 cases (10.3%) went on to require further investigation or follow-up. 110 cases (26.4%) demonstrated no PE but an alternative diagnosis.

CONCLUSION: The study emphasizes the value of CTPA in supplying further diagnostic data in patients with suspected PE and the importance of seeking additional pathology on these studies which may be easily overlooked and be more relevant; in some cases completely altering patient management.

16:50 Imaging findings in patients with the new swine flu influenza a (H1N1) infection

Bakhshayeshkaram, M. • Saidi, B. • Tabarsi, P. • Zahirifard, S.
NRITLD, Tehran, IRAN, ISLAMIC REPUBLIC OF

PURPOSE: Swine flu influenza is a very contagious respiratory tract infection. The aim of this study was to evaluate the chest X-ray and CT scan of patients with influenza A (H1N1) virus (S-OVI) infection.

MATERIALS/METHODS: 31 patients (16 men and 15 women), with documented H1N1 infection confirmed by RT-PCR from November to December 2009 were included. 10 of these patients had CT scans. The initial radiography obtained from the patients was reviewed regarding pattern (consolidation, ground glass, nodules and reticulation), the distribution (focal, multifocal, and diffuse) and the lung zones involved. CT scans were also reviewed for the same abnormalities. The patient files were studied for their possible underlying disease. LDH and CPK level was available for 22 and 24 patients respectively.

RESULTS: The mean age was 37.97 ± 13.9 years. 17 (54.8%) patients had Co-existing condition (8 Respiratory, 5 cardiovascular, 2 Immunodeficiency, 2 Cancer, 4 others). 12 (38.7%) patients required ICU admission. 5 (16.1%) patients died. 8 (25.8%) had normal initial radiographs. The most common radiographic abnormality was consolidation (12/31;

38.7%) in the peripheral region (11/31; 35.5%) followed by peribronchovascular (10/31; 32.3%) which was most commonly observed in the lower zone (left 61.3%; right 45.2%). The patients admitted to the ICU were more likely to have two or more lung zones involved ($p=0.005$).

CONCLUSION: In patients with the novel swine flu infection the most common radiographic abnormality observed was consolidation in the lower lung zones. Patients admitted to ICU were more likely to have two or more lung zones involved.

17:10 Subtle mediastinal pleural thickening on computerised tomography as a predictor of mesothelioma

Roy, A. A. • Ellis, S. • Iyngkaran, T.
Bart's and the London NHS Trust, London, UK

PURPOSE: Malignant Pleural Mesothelioma (MPM) has a poor prognosis and is usually advanced at diagnosis. Computerised Tomography (CT) is the principal modality utilised in its evaluation. Findings suggestive of MPM include unilateral pleural effusion, irregular nodular pleural thickening and volume loss. Diagnosis is made via biopsy, either thoroscopically or percutaneously if the pleura is sufficiently thickened. We have identified that subtle mediastinal pleural thickening ($\leq 4\text{mm}$) in the presence of an ipsilateral unilateral pleural effusion is associated with MPM and should prompt attempts to obtain definitive histology.

MATERIALS/METHODS: Patients who underwent pleural biopsy (2006-2009) with contemporaneous CT imaging were retrospectively examined. Imaging findings included subtle mediastinal pleural thickening, volume loss, concurrent parenchymal lung malignancy and nodal enlargement.

RESULTS: Of 126 patients included in the retrospective analysis, malignant disease was found in 54 (43%) of which 36 were MPM (29%). Comparing MPM with other malignant causes, subtle mediastinal pleural thickening was observed in 29/36 MPM cases (sensitivity= 81%) but also 14 malignant non-mesothelioma cases (specificity= 22%, PPV= 67%, NPV= 36%). When distinguishing between malignant and benign causes, subtle mediastinal pleural thickening was seen in 43/54 malignant cases (sensitivity= 80%) but also in 36/71 benign cases (specificity= 49%, PPV= 54%, NPV= 76%).

CONCLUSION: In patients with unilateral pleural effusion who have undergone pleural biopsy, the presence of subtle mediastinal pleural thickening is a useful adjunctive indicator of underlying pleural malignancy. In patients without a confirmed diagnosis, the presence of this feature should encourage more invasive investigative methods including pleural biopsy.

16:00 - 17:30 Masterclass: Liver and pancreatic imaging

16:00 MR of the pancreas
Amin, Z.
University College London Hospital, London, UK

No abstract supplied.

16:30 Basics of abdominal diffusion weighted imaging

Punwani, S.
University College Hospital London, London, UK

No abstract supplied.

17:00 Hepatocellular carcinoma: diagnosis and management

Yu, D.
Royal Free Hospital, London, UK

No abstract supplied.

16:00 - 17:30 Refresher course: Lower limb MRI

16:00 Ankle MRI
Sampson, M.
Southampton General Hospital, Southampton, UK

No abstract supplied.

16:30 Hip MRI
Hide, G.
Freeman Hospital, Newcastle upon Tyne, UK

No abstract supplied.

17:00 Sports injuries of the lower limb (muscle and bone)

Marshall, T.
Norfolk and Norwich University Hospital, Norwich, UK

No abstract supplied.

16:15 - 17:30 History of Radiology

16:15 Introduction & Marie Curie: the centenary of her second Nobel Prize

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

No abstract supplied.

16:30 The Sri Lankan radiography oral history project

Ferris, C.
Sheffield Hallam University, Sheffield, UK

No abstract supplied.

16:50 Frank Farmer

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

No abstract supplied.

17:10 Radiology in Argentina

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

No abstract supplied.

16:20 - 17:30**Emerging technologies scientific session****16:20 Physics tests for mammography tomosynthesis systems**Oduko, J. M.¹•Bouwman, R.²•Young, K. C.¹•Van Engen, R.²•Strudley, C.¹¹National Coordinating Centre for the Physics of Mammography, Guildford, UK, ²LRCB, Nijmegen, NETHERLANDS

PURPOSE: A UK protocol for testing three-dimensional performance of mammographic tomosynthesis systems has not yet been established. As some commercial systems are now installed there is an urgent need for appropriate testing. Some tests are described and illustrative results are presented.

MATERIALS/METHODS: Object thickness and kV compensation were evaluated by imaging a 10mm sphere of 100% glandularity material, embedded within layers of PMMA and polyethylene of total thickness 20-80mm. Missed tissue was measured at heights 0-60mm above the table. For z-resolution, small high-contrast spheres were imaged, placed at heights 0-60mm within PMMA. The FWHM of profiles in the z-direction were determined from reconstructions in the vertical plane. Homogeneity and reproducibility were evaluated from ten images of 45mm PMMA; surface plots of signal, standard deviation and SNR were produced.

RESULTS: For a Siemens system, CNR ranged from 2.5 at 20mm PMMA thickness to 1.0 or 0.8 at 60mm thickness (auto-segmentation on/off respectively). Corresponding entrance air kerma were 1.5mGy for 20mm, and 17.9 or 12.5 mGy respectively for 60mm thick. Missed tissue in the reconstruction was 3mm at the chest wall and 0-30mm at the sides. The mean FWHM of profiles in the z-direction was 3.0mm for a 1.0mm diameter object. The mean SNR at the standard position was 106±2 (28W/Rh, 139mAs) and maximum deviation from the mean was 5%.

CONCLUSION: The tests described yielded useful measures of performance for mammographic tomosynthesis systems. Experience with such tests could help towards the development of a UK testing protocol for tomosynthesis systems.

16:30 Observer study to investigate the detection of microcalcification clusters in digital mammography images of different image qualityWarren, L.¹•Mackenzie, A.¹•Dance, D.^{1,2}•Given-Wilson, R.³•Wallis, M.⁴•Cooke, J.⁵•Bosmans, H.⁶•Zanca, F.⁶•Jacobs, J.⁶•Young, K.¹¹NCCPM, Royal Surrey County Hospital NHS Foundation Trust, Guildford, UK, ²University of Surrey, Guildford, UK, ³St Georges Hospital, Guildford, UK, ⁴Addenbrookes Hospital, Cambridge, UK, ⁵Jarvis Breast Screening Centre, Guildford, UK, ⁶University Hospital Leuven, Leuven, BELGIUM

PURPOSE: To compare the detection of microcalcification clusters in CR and DR digital mammography images obtained at differing dose levels and image processing.

MATERIALS/METHODS: Microcalcification clusters extracted from high magnification images of excision samples were inserted into 81 normal breast DR images from 81 patients. The majority of these microcalcification clusters were relatively difficult to detect. These images and a further 81 normal DR images were adjusted mathematically to simulate the appearance of CR images taken at the same dose level and at half this dose level. The images were also adjusted to simulate the appearance of DR images at half and quarter the original dose level. All images were processed with Agfa Musica 2 and Hologic image processing. Three observers inspected the images and marked the location of any suspicious regions, assigning a 5-point score both for confidence that a cluster is present and whether the cluster should be recalled. The **RESULTS** were analysed using JAFROC statistical analysis.

RESULTS: This is work in progress. Initial analysis of partial data shows an important difference between the detection of microcalcifications in CR and DR images. For the three readers the TPF is 10-49% higher for DR than CR for a middle decision level. With a full dataset JAFROC analysis will provide information on the overall performance.

CONCLUSION: Differences are seen in preliminary data between microcalcification detection in CR and DR images and at differing dose levels. By the conference a full data set will have been collected and analysed.

16:40 Elastically deformable anthropomorphic breast phantom for use in mammographic imaging researchSmith, H. R.¹•Smith, J. J.¹•Hogg, P.¹•Mercer, C.²•Szczepura, K.¹¹The University of Salford, Salford, UK, ²Bolton Royal Infirmary, Bolton, UK

PURPOSE: To create anthropomorphic breast phantoms, with and without lesions, having similar elastic and x-ray attenuation properties to human female breast.

METHOD: Using a well-established freeze-thaw technique, polyvinyl alcohol (PVAL) hydrogels of two different weight-volume ratios (w/v) were created. The 7% PVAL concentration matched both attenuation and elastic properties of breast, whereas the 20% concentration only matched the elastic properties of breast lesions, therefore barium chloride (BaCl₂) doping was used to alter the attenuation properties, validated using CT (in Hounsfield Units HU). Moulds based on breast prosthesis were used to create breast volumes, 7mm spherical lesions were placed within the volumes during freezing. The phantom was coated with latex and adhered to a semi flexible backing plate attached to a rigid torso. Between the semi flexible backing plate and phantom were a series of rubber connectors which permitted a level of mobility similar to pectoral muscle and fascia. The surface was covered with latex, restricting breast movement comparable to skin. The phantoms were imaged under increasing compression forces.

RESULTS: A linear relationship between BaCl₂ concentration in the 20% PVAL and attenuation was found enabling production of tumours with varying attenuation properties (HU +10-50).

7% PVAL had an average HU (-14.2) representing female breast tissue. Compression characteristics correlated well with patient data ($r=0.999$). The BaCl₂ doped 20% PVAL lesions were detectable within the 7% PVAL breast (average contrast 1.18).
CONCLUSION: Phantom represents human breast tissue well. Further work: developing more complex lesions; introducing density variation to simulate glandular and fatty tissues.

16:50 Chest tomosynthesis : teaching a new dog old tricks

Galea, A.¹•Gay, D.²•Riordan, R.²•Dubbins, P.²
¹Radiology Academy, Plymouth, UK, ²Plymouth Hospital, Plymouth, UK

Digital tomosynthesis (DTS) is a novel modality, which has a wide and growing number of applications. It is a type of limited angle tomography where an arbitrary number of slices are generated retrospectively from a sequence of projections acquired during a single motion of the X-ray tube. It offers the potential for improved diagnostic performance over conventional radiography by eliminating anatomical noise. To date research on the validity of tomosynthesis has been largely focused on breast imaging, however chest applications have been described, particularly for the detection of lung nodules.

Over 50% of missed lung cancers on CXR are hilar in location. DTS provides improved visibility of the hila, including small masses. We describe our initial experience using DTS as part of our workup of suspicious lung lesions. Patients with equivocal CXRs are referred for DTS. Once the opacity is confirmed on DTS the patient is then referred for CT for further evaluation, and staging.

DTS has an effective dose of 0.1mSv, affording a reduction in dose when compared to CT. We propose an algorithm for the evaluation of suspected hilar masses and describe our protocol for the follow up of nodules previously identified by CXR or CT.

DTS is a new version of an old technique which provides enhanced resolution and better distinction of normal anatomy from pathological processes thus providing many of the tomographic benefits of CT with a much reduced dose and cost. You may have to resurrect some of your old radiological anatomy textbooks!

17:00 Characterising heterogeneity of stage 1 cervical cancers using histogram analysis from diffusion weighted images

Downey, K. L.^{1,2}•Riches, S. F.^{1,2}•Morgan, V. A.^{1,2}•Giles, S. L.^{1,2}•Simpkin, C.^{1,2}•Barton, D. P.^{1,2}•deSouza, N. M.^{1,2}
¹The Royal Marsden Hospital NHS Trust, London/Surrey, UK, ²The Institute of Cancer Research, London/Surrey, UK

PURPOSE: To establish whether histogram analysis of apparent diffusion coefficients (ADCs) derived from diffusion-weighted magnetic resonance imaging differentiates cervical tumours according to their histological characteristics.

MATERIALS/METHODS: 60 consecutive patients with histologically proven cervical cancer at punch biopsy, cone biopsy or large loop excision of transformation zone (LLETZ)

were scanned at 1.5T (Phillips Intera) using an endovaginal coil. T2-W and diffusion-weighted (5b-values 0-800 s/mm²) images were acquired. Regions of interest were drawn around the tumour on ADC maps by an expert observer. ADC histograms obtained from the entire tumor had their 10th, 50th and 90th-centile pixel values and skewness recorded. An independent samples t-test compared differences in mean centile ADC and distribution skew between squamous cell carcinomas (SCCs) vs. adenocarcinomas (ACs), well/moderately-differentiated vs. poorly-differentiated tumours and the absence vs. the presence of lymphovascular space invasion (LVSI).

RESULTS: There was no significant difference in ADC centiles in SCCs (n=26) vs. ACs (n=13) although histogram skewness was significantly different ($p=0.02$). The 50th-centile ADC values were significantly higher in well/moderately-differentiated (n=18) than in poorly-differentiated (n=22) tumours ($p=0.049$). There was no significant difference between any parameter with regards to absence or presence of LVSI.

CONCLUSION: Increased skewness of histograms in ACs is likely to reflect the mixture of glandular and cellular content of these tumours. The increased cellularity of poorly-differentiated tumours is reflected in their lower median ADC. ADC does not appear to be associated with LVSI. Histogram analysis is useful in differentiating some poor prognostic histological features of cervical cancer.

17:10 Quantitative measurement of perfusion of renal cell carcinoma pre and post radiofrequency ablation (RFA) with dynamic contrast enhanced MRI: a pilot study

Wah, T.¹•Sourbron, S.²•Wilson, D.¹•Magee, D.³•Selby, P.¹•Buckley, D.²
¹St. James's University Hospital, Leeds, UK, ²Academic Department of Medical Physics, Leeds, UK, ³University of Leeds, Leeds, UK

AIM: This study aims to evaluate the feasibility of using quantitative measurements of perfusion of renal cell carcinoma pre and post RFA with dynamic contrast enhanced MRI and to assess perfusion change within the zone of ablation post RFA.

MATERIALS/METHODS: Five patients undergoing percutaneous RFA of their renal cell carcinomas were prospectively evaluated with dynamic contrast enhanced MRI immediately before and at one month post RFA as part of their routine post treatment follow up protocol. The dynamic contrast enhanced MRI was performed with volume acquisition during spontaneous breathing and an individual arterial input function was measured in each study. PMI (0.4) software and a maximum slope technique were used to assess the data and perfusion of the renal cell carcinoma pre and post RFA was estimated as plasma flow in ml/100ml/min.

RESULTS: All five patients were successfully assessed with the dynamic contrast enhanced MRI protocol and PMI (0.4) software. Perfusion of the five renal cell carcinomas decreased markedly after treatment with a mean value of 131 (+/- 9) ml/100ml/min and 5 (+/- 1.5) ml/100ml/min pre and post RFA, respectively.

CONCLUSION: It is feasible to measure quantitatively the perfusion of renal cell carcinoma pre and post RFA using dynamic contrast enhanced MRI and the diminished perfusion pattern in the ablation zone can also be quantified for the assessment of treatment effect.

16:30 - 17:20

Service delivery scientific session

16:30 Career transition theory - a new perspective on the journey from advanced to consultant practitioner

Nightingale, J. M.¹•Hardy, M.²

¹University of Salford, Salford, UK, ²University of Bradford, Bradford, UK

PURPOSE: The concept of non-medical consultants was first introduced in 1998 yet uptake in nursing and allied health has been poor. Attrition from nursing consultant posts within the first year of appointment has been greater than expected and, within the radiography profession, applicants are often insufficiently prepared for the consultant role. This on-going study seeks to explore the period of transition from advanced to consultant radiographer practice.

MATERIALS / METHODS: In 2009 a longitudinal evaluation of the Advanced to Consultant practitioner journey commenced. To date, five radiographers have been recruited and the 'consultant trainees' have been facilitated to develop attitudes, goals and behaviours commensurate with consultant level practice. The progress and experiences of this group have been monitored through planned self-reflection activities and semi-structured interviews at 3, 6 and 12 months.

RESULTS: Initial findings suggest that the transition from advanced to consultant practitioner is professionally and emotionally demanding. However, the reported initial experiences of 'euphoria' and 'crisis', followed by a recovery period of 'self-development' and 'redefinition', both of themselves and their role, clearly map to existing theories of career transition.

CONCLUSION: Knowledge of career transition models provides a unique perspective on the potential emotional and professional journey experienced by radiographers during transition from advanced to consultant practitioner. Awareness of the transition characteristics will ensure that appropriate support mechanisms can be planned and activated at appropriate times to maximise transition success. This presentation will explore aspects of career transition theory and identify its relevance to the radiography career progression framework.

16:40 A case study of consultant radiographers and their leadership function using the NHS LQF

Henwood, S. M.¹•Booth, L.²

¹Unitec, Auckland, NEW ZEALAND, ²University of Cumbria, Carlisle, UK

PURPOSE: This study explores the leadership function of consultant radiographers. 8 staff agreed to participate in an 18 month study. The LQF was used as a baseline of leadership skills

and attributes. This paper discusses the key findings from the LQF and the qualitative data, which looks at the establishment of those roles, role establishment, difficulties experienced and any support, as well as exploring the personal drivers of those staff.

MATERIALS/METHODS: A case study philosophy was used as a framework for this study. A number of data collection methods were then used to triangulate data and increase validity. An objective measure (the LQF) was used as a baseline measure, which involves a 360 degree assessment, providing further triangulation of the data for rigour of leadership assessment. Interviews and observations and notes from a one to one leadership coaching session, provided as part of the study, were also included.

RESULTS: The initial findings are that consultant radiographers are highly driven, with a core desire to impact on patient care and service delivery. Roles were often established in response to local need often with support by key individuals. The LQF shows some interesting similarities between the consultants. Interesting findings also show in some cases a lack of preparation for the role and a concern over succession planning for future potential role holders.

CONCLUSION: This paper shares some key findings to enable the profession to look in a new way at the consultant role and raises some key questions that require further research.

16:50 Assistant practitioners in imaging services - evaluating impact and progression

Miller, L. R.

Institute for Employment Studies, London, UK

KEY LEARNING OBJECTIVES: Following a scoping exercise in 2004 NHS Education for Scotland (NES) funded the training of 41 support workers to take on Assistant Practitioner (AP) roles in Imaging Departments in Scotland. The predominant route to qualification was through a Higher National Certificate (HNC). The APs qualified in 2009 and in 2010 NES commissioned the Institute for Employment Studies and the University of Hertfordshire to evaluate the impact of introducing these posts in imaging departments. The aims of the work are to investigate the ongoing development of the role in NHS Scotland; to identify future career aspirations of the Diagnostic Radiography APs; measure the impact on radiographic services; and explore the patient experience.

DESCRIPTION: The evaluation included interviews with service managers, an online survey of staff in imaging departments and case study visits to six sites.

CONCLUSION:

- many APs are interested in further progression, but the present lack of part-time education pathways to registration limit the further advancement of this predominantly older group of workers and learners
- impact on quality is both direct and indirect: while deployment of APs can lead to a more streamlined service, there is an additional indirect route to service quality due to the new supervisory and/or mentoring role leading radiographers

to a more reflective approach to practice; in addition their introduction has led to the freeing up of radiographer time to participate in CPD

- while assistant practitioners can help increase capacity and service quality, supervisory requirements can limit flexibility in deployment

17:00 Training of a musculoskeletal sonographer to provide ultrasound guided subacromial corticosteroid injections. How we did it!

Riley, S. J.^{1,2}•Groves, C. J.¹•Chandramohan, M.¹•Dixon, A.²
¹Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UK, ²University of Leeds, Leeds, UK

PURPOSE: Between 2006 and 2008 the number of ultrasound guided corticosteroid injections doubled placing increased demands on the radiologists and increased waiting times for the patients. This presentation gives a summary of the training of an experienced musculoskeletal sonographer to provide ultrasound guided subacromial corticosteroid injections within a quality assured service.

MATERIALS/METHODS: A training programme was established with an educational route via the image guided interventional procedures module at University of Leeds; and a clinical route with structured departmental training and an audit of effectiveness using patient questionnaires based on the recognised Oxford shoulder score. Relevant provision was also made to ensure local indemnity/schemes of work.

RESULTS: The sonographer was trained over a 6 month period to carry out ultrasound guided subacromial corticosteroid injections: 15 procedures were performed on a phantom, 10 cases were performed under direct supervision by a musculoskeletal radiologist. Thirty cases were performed under limited supervision with an audit of effectiveness of each procedure. This audit showed that the sonographer guided injections were as effective as the radiologist guided injections.

The sonographer has completed the agreed training programme and is now working independently without supervision.

CONCLUSION: A structured training programme enables role extension for sonographers in musculoskeletal ultrasound intervention, providing the Trust with a flexible service whilst maintaining high standards.

17:15 Is radiographer 'hot' reporting cost effective?

Hardy, M.¹•Snaith, B.²
¹University of Bradford, Bradford, UK, ²Mid Yorkshire Hospitals NHS Trust, Wakefield, UK

BACKGROUND: Radiographer reporting is now seen as an essential image reporting service within many hospitals, particularly in relation to trauma radiography. However, despite the introduction of immediate reporting of trauma radiographs being advocated by the Audit Commission and Professional bodies to reduce image interpretation errors within the emergency department and inform patient management, such a service is rarely routinely available. One possible barrier to its implementation is perceived service costs.

METHOD: 1502 patients with musculoskeletal trauma were recruited into a multi-centre randomised controlled trial. All patients were asked to complete an EQ-5D questionnaire at presentation and 8 weeks post hospital ED attendance to determine change in perceived health status. Service costs of operating a radiographer hot reporting service were compared to a standard reporting model taking account of patient recall to clinics, unnecessary clinic referrals and impact on ward admission.

RESULTS: No statistically significant difference in patient perceived health status was identified between the immediate and standard reporting arms suggesting that the change in reporting structure did not negatively impact on patient perceived health outcomes. Analysis of service costs is ongoing. The information contained in this presentation will inform future service and

Scientific programme abstracts Wednesday 8 June

08:30 – 10:30

Cancer Imaging Masterclass: quantitative imaging for the future

08:30 PET and novel radiotracers to predict and measure tumour response

Groves, A.
University College London, London, UK

No abstract supplied.

09:00 CT perfusion Imaging

Miles, K.
Brighton & Sussex Medical School, Brighton, UK

CT Perfusion Imaging quantitatively assesses tumour vascularity through analysis of temporal changes in attenuation in blood vessels and tissues during a rapid series of images acquired with intravenous administration of iodinated contrast material. Commercial Perfusion CT software allows pixel-by-pixel calculation of a range of validated physiological parameters with depiction as parametric maps. Clinical studies support the use of perfusion CT as a surrogate for physiological and molecular processes underlying tumour angiogenesis.

Perfusion CT has been used as a biomarker of drug action in early phase trials for treatment of a range of cancers. The technique benefits from wide availability, low cost, ease of standardization of acquisition and processing protocols, and straightforward incorporation into current imaging assessments of tumour response. International consensus guidelines for the use of perfusion CT in assessing tumour vascularity have recently been developed. Recommendations encompass CT system requirements and quality assurance, radiation dosimetry, patient preparation, administration of contrast material, CT acquisition parameters, terminology and units, data processing and reporting.

Perfusion CT has reached technical maturity for use in therapeutic trials in oncology and emerging associations between change in perfusion CT parameters on treatment and subsequent clinical outcome suggest a future role in clinical evaluation of tumour response.

9:30 Quantitative PET

Pike, L.
King's College London, London, UK

Positron emission tomography (PET) is a quantitative imaging technique. Indices obtained from PET data can be directly related to physiological and biological processes dependant on the radiotracer used. In order to demonstrate PET as an important biomarker for monitoring therapy response in various oncological indications, early phase clinical trials need to produce data which is objective and reproducible. The

outcomes from these trials can then be applied in late stage clinical trials spanning multiple sites and large numbers of patients before being widely adopted into routine clinical use. Visual analysis of PET scans alone is not sufficient to achieve this due to the interobserver variability encountered and should be complemented with numerical indices which can be derived objectively from the PET data. As PET is a complex imaging modality, however, many factors can affect the RESULTS of quantitative measurements. In order to minimise these effects and to improve the reliability of PET measurements it is important to standardise all aspects of the imaging protocol including the PET acquisition and reconstruction parameters as well as the method of analysing the PET data. This talk gives an overview of the physics principles behind quantitative PET imaging from the use of simple semi-quantitative analysis, such as standardised uptake values (SUV), through to absolute quantitative imaging using full kinetic modelling. It further includes a summary of the technological and methodological factors which can affect the accuracy and reproducibility of these quantitative measures and advises on how to minimise these in practice.

10:00 Quantitative functional MRI

Leach, M.
Royal Marsden NHS Trust, Sutton, UK

No abstract supplied.

08:30 – 09:30

Chest pain

8:30 Imaging in acute chest pain

Mittal, T.
Brompton Hospital, London, UK

No abstract supplied.

09:00 Chest pain in the emergency department: implications of NICE

Manghat, N. E.
Derriford Hospital, Plymouth, UK

No abstract supplied.

08:30 – 09:20

Developments in CR and DR; Science and applications**8:30 Developments in CR and DR**Kotre, J.
Freeman Hospital, Newcastle-upon-Tyne, UK

No abstract supplied.

8:55 The impact of the developments on practiceDash, R.
Teeside University, Middlesborough, UK

No abstract supplied.

8:30 - 9:30

Paediatric emergencies**08:30 Neurological emergencies**Foster, K.
Birmingham Children's Hospital Nhs Trust, Birmingham, UK

PURPOSE: To review the causes and imaging findings of neurological emergencies in children.

This lecture will focus on the more common causes of decreased consciousness in children, that may present to a district general hospital. An imaging strategy regarding the best use of CT and MR to aid prompt diagnosis and treatment will be discussed. Topics will include intracranial haemorrhage, arterial and venous thrombosis, infection and inflammation. "Pearls and pitfalls" of imaging will be highlighted.

09.00 The acute abdomenPatterson, A.
Royal Belfast Hospital for Sick Children, Belfast, UK

Acute abdominal pain is a common presenting symptom requiring children to attend their local Emergency Department. The differential diagnosis for this symptom is wide but is age-based, and can reflect both underlying surgical and medical problems. This lecture will look at some of the commoner conditions encountered by paediatric radiologists, with emphasis on the underlying clinical history and physical examination findings. The importance of ultrasound as a first line imaging investigation will be stressed.

Trauma and neonatal emergencies will not be discussed.

8:30 - 10:00

Masterclass: Pelvic malignancy imaging**08:30 Imaging of recurrent rectal cancer**Tolan, D. J.
Leeds Teaching Hospitals, Leeds, UK

No abstract supplied.

09:00 Imaging of uterine malignancySwift, S.
Leeds Teaching Hospitals, Leeds, UK

No abstract supplied.

9:30 Imaging in prostate cancerCarey, B.
Cookridge Hospital, Leeds, UK

No abstract supplied.

09:00 – 10:00

GI scientific session**9:00 The use of pre-operative CT in the assessment of the acute abdomen**Weir-McCall, J.¹•Shaw, A.¹•Arya, A.¹•Knight, A.¹•Howlett, D. C.²¹*Guys and St Thomas' Trust, London, UK, ²Eastbourne District General Hospital, East Sussex Hospitals' Trust, Eastbourne, UK*

PURPOSE: There is a paucity of research in CT diagnoses of the acute surgical abdomen. This study assesses the diagnostic accuracy of CT in patients with an acute abdomen in a district general hospital.

MATERIALS/METHODS: All patients who underwent emergency laparotomy from 2008-2010 at our hospital were identified, and clinical records were reviewed for preoperative CT. The CT report was compared with the laparotomy and histology findings. Where a discrepancy existed, the original scans were reviewed by a senior consultant for final decision on correlation.

RESULTS: 196 emergency laparotomies were performed over the 2 year period with 112 patients undergoing a preoperative CT. 14 patients were excluded due to missing notes. In the remaining 98 patients, 80 CT reports correlated with the final operative diagnosis giving a diagnostic accuracy of 82%. On retrospective review by a senior consultant this increased to 91 correlations yielding an accuracy of 93%. Of the final non-correlates, 6 were false negatives - missing 4 perforations with abscess formation, and 2 ischaemic bowels; and one false positive, incorrectly identifying an obstructing mass. The oncall registrar was the initial reporter in 37 CTs with a diagnostic accuracy of 78%. 7 patients had significant findings other than the main diagnosis, the most common of which was an abdominal aortic aneurysm.

CONCLUSION: : On first reporting CT misses 18% of causes of the acute abdomen. Reducing the threshold for early consultant review or for requesting a second report by a gastrointestinal radiologist can increase diagnostic accuracy by 11%.

9:10 Radiologically inserted biodegradable (SX-ELLA) oesophageal stents to treat dysphagia due to benign or malignant oesophageal strictures

Gregory, C. J. •Griffiths, E. A. •Pursnani, K. G. •Ward, J. B.

•Stockwell, R. C.
*Lancashire Teaching Hospitals NHS Foundation Trust,
Preston, UK*

PURPOSE: Biodegradable (BD) oesophageal stents have only been available commercially since 2008 and previous published research is limited. Our aim was to review the use of BD stents to treat dysphagia in benign or malignant oesophageal strictures. **METHODS:** Patients were identified from a prospective interventional radiological database. BD stents were inserted radiologically under fluoroscopic control.

RESULTS: 18 BD SX-ELLA stents were inserted in 13 males and 3 females. The median age was 68 (range 54-80). Indication for BD stent was dysphagia from benign strictures (n= 6), or in patients due to have neoadjuvant chemotherapy awaiting oesophagectomy (n= 7), radical chemo-radiotherapy (n= 4) or palliative chemotherapy (n=1). Median dysphagia score before stent insertion was 3 (range 2-4) compared to 1 post stent insertion (range 0-2). There was a statistically improved dysphagia score after stent insertion (p= 0.001). There were no insertional related complications. Technical success was 94% and clinical success was 76%. 6 patients required subsequent metallic stent insertion. In the neoadjuvant chemotherapy group, 4 patients had irresectable disease and 3 patients were unfit for surgery.

CONCLUSION: : BD stents provide good dysphagia relief for the life time of the stent. They may avoid the use of feeding tubes in patients having radical chemoradiotherapy or awaiting oesophagectomy. They do not require removal or interfere with radiotherapy planning imaging. However, the reintervention rate is high after the stent dissolves. Patients with severe dysphagia who are potential surgical candidates require careful re-staging.

09:20 The outcome of radiologically inserted self-expanding metallic stents (SEMS) to treat malignant gastroduodenal obstruction

Miller, B. H. •Griffiths, E. A. •Pursnani, K. G. •Ward, J. B. •Stockwell, R. C.
*Lancashire Teaching Hospitals NHS Foundation Trust,
Preston, UK*

PURPOSE: Our aim was to review the outcome of patients who underwent radiological insertion of self expanding metallic stents (SEMS) for malignant gastric outlet obstruction.

METHODS: Patients were identified from a prospectively collected interventional radiological database.

RESULTS: Between December 2000 and September 2010, 105 SEMS were inserted in 59 males and 36 females. The median age was 73 (range 39 - 89) years. SEMS were inserted trans-orally (n = 61) or trans-gastrically (n= 44). Site of obstruction was the stomach (n = 39), duodenum (n = 54) or gastroenterostomy (n = 12). Seven (6.7 %) patients required concomitant biliary stents. Technical success was 86.7% for all patients, 83.6% for transoral insertion and 90.9% for transgastric insertion. In eight patients the procedure failed due to the inability to pass a guidewire. Ten patients developed complications from stenting. Median gastric

outlet obstruction severity score was 1 before stent insertion and 2 after stent insertion. Median survival was 41.5 days (range 1 - 624). Median length of hospital stay was 13 days (range 1 - 153) days. Eight (8.6%) patients required repeat SEMS insertion due to tumour ingrowth.

CONCLUSION: The technical success rate for the insertion of palliative SEMS is high. Insertional technique can be tailored to the individual patient depending on the location of the obstructing tumour and whether it is possible to access the stomach percutaneously. Patients with gastric-outlet obstruction have a limited life expectancy and a very poor prognosis.

9:30 Automated software quantitation of small bowel motility on cine capture MRI: initial validation

Menys, A. •Odille, F. •Ahmed, A. •Punwani, S. •Atkinson, D. •Hawkes, D. •Halligan, S. •Taylor, S.
University College London, London, UK

PURPOSE: To validate new software quantifying small bowel wall motility on cine capture MRI.

METHODS: The software uses non-rigid registration to track motion changes over time in any region of interest (ROI) across the bowel lumen, providing automated measurement of bowel wall displacement (BWD) (mm). Coronal cine-motility sequences (T2- balanced SSFP, 10mm slice, 700 ms/frame, 15-20s breath-holds) were analysed from 10 Crohn's patients undergoing MR enterography. In 5 datasets two observers placed 200 ROIs across the bowel lumen redrawing and re-measuring each ROI across each time frame to manually measure BWD. Agreement with software derived BWD was tested using Bland-Altman statistics. In a second 5 datasets, two radiologists in consensus placed 50 ROIs and subjectively categorised bowel wall motion from 1-4 (1=normal, 4=static). Software quantified BWD (expressed as the s.d. of the mean across the cine loop) within each ROI was compared across and between categories using one-way ANOVA, and Tukey-Kramer statistics.

RESULTS: There were high levels of agreement between manual and automated measures of BWM, (95% Limits of agreement = -1.8 to 1.6mm)

There was a significant difference in automated BWM measure across the subjective motility scores (p=0.003). There was also a significant difference between automated BWM measurement in category 1 and both category 3 and 4 (p=0.01, p=0.007 respectively).

CONCLUSION: Automated quantitation of bowel wall motility during cine MRI is robust and correlates well with radiologist assessment.

9:40 Quantified small bowel motility during MR enterography in Crohn's disease as a marker of inflammatory activity

Menys, A. •Ahmed, A. •Punwani, S. •Odille, F. •Steward, M. •Atkinson, D. •Hawkes, D. •Halligan, S. •Taylor, S.
University College London, London, UK

PURPOSE: To investigate the relationship between software

derived small bowel motility index and conventional MRI markers of Crohn's disease activity.

MATERIALS/METHODS: Bowel wall motion quantification software was applied to a coronal breath-hold cine FISP sequence (20s breath-hold, TR 4ms, TE1.7ms, slice thickness 10mm, 1 slice/0.8sec) through the terminal ileum (TI) in 16 patients (5 female, mean age 31) undergoing MR enterography. The validated software uses non-rigid registration to quantify motion changes over time in a manually placed polygonal region of interest within the bowel, providing automated estimation of bowel wall displacement, expressed as the standard deviation of Jacobian determinant (motility index). Two observers graded TI disease activity using conventional MRI markers (wall thickness, T2 signal, perimural oedema, enhancement, all scored 0-3, and enhancement pattern (1=homogenous, 2=mucosal 3=layered). The scoring system has been previously validated against a histological reference. On statistical advice correlation between the motility index and activity score was performed using Kendall's rank correlation.

RESULTS: The mean motility index and activity score was 0.31 (range 0.07-0.53), and 4 (range 0-11) respectively. There was a significant negative correlation between the motility index and activity score (Kendall tau -0.50 (95% CI -0.81 to -0.18), p=0.01.

CONCLUSION: Quantified small bowel motility is negatively correlated with conventional MRI scores of disease activity suggesting it may be a new quantitative marker of inflammation.

9:00 - 11:00

BAMRR: MRI without frontiers

09:00 3T Intra-operative MRI

Hughes, G.
Alder Hey Children's NHS Foundation Trust, Liverpool, UK

No abstract supplied.

9:30 MRI safety update

McLean, J.
NHS Greater Glasgow and Clyde, Glasgow, UK

No abstract supplied.

10:00 Upright MRI

Kaur, M.
The London Upright MRI Centre, London, UK

MRI has proved itself to be a powerful diagnostic tool which provides excellent soft tissue detail. However, conventional MRI scanners are designed so that the patient is lying in a horizontal / supine position, which means the dynamic or postural nature of pathology may be underestimated. In these circumstances UPRIGHT MRI may provide the answer. The ability of this scanner to provide images in different positions, adds significantly to the diagnostic accuracy of MRI

examinations. Patients can be scanned sitting/standing, in flexion or extension, or even in the position of pain. Moreover, the scanner is beneficial to claustrophobic, weight-challenged and those patients who cannot tolerate lying flat.

10:30 Non-contrast vascular imaging

Puni, R.
Birmingham Heartlands Hospital, Birmingham, UK

PURPOSE: Most of the major MRI vendors provide a non vascular imaging technique. This abstract describes our experience with non contrast vascular imaging for the evaluation of artery stenosis in the renal, carotid and peripheral vasculature using two basic techniques; Fresh Blood Imaging (FBI) and Time SLIP angiography. The latter technique is useful for evaluating hemodynamic velocity, functional assessments and visualization of vascular structures and is useful for imaging complex vessels flowing in multiple directions eg renal arteries, portal venous system and pulmonary arteries.

Fresh Blood Imaging (FBI) is an ECG gated 3D Fast Advanced Spin Echo technique which acquires both arterial and venous flow.

MATERIALS/METHODS: Over 200 non contrast examinations have been carried out using a Toshiba 1.5T Excelart MRI scanner and where appropriate comparison was made with DSA/ Contrast Enhanced MRA. The FBI technique was used in the assessment of peripheral vascular disease, whilst the TimeSlip method was used in the renal arteries and carotids to look at artery stenosis.

RESULTS: The non contrast imaging techniques were well tolerated by majority of our patients. The TimeSlip techniques produced very robust imaging techniques with good reproducibility. The FBI technique was very comparable to the DSA / CE-MRA techniques with small lesions being detected.

CONCLUSION: Both the FBI and TimeSlip techniques are accurate ways to assess arterial vascular disease avoiding using contrast agents. This can be a major advantage when considering patients with renal impairment and given the dangers of nephrogenic systemic fibrosis, contrast nephropathy and contrast reactions.

10:00 - 11:45

Does PACS provide for the needs of clinicians?

10:00 Overview - the challenges

Beckmann, L.
Lanmark, Bucks, UK

The purpose of this overview is to introduce some of the challenges and issues that exist in providing PACS solutions that meet the needs of the range of clinicians outside radiology in a hospital.

Historically non imaging clinicians were limited to a report and occasional films. Since PACS and the introduction of healthcare

solutions across the hospital environment radiological imaging information has become available to clinicians outside the radiology department.

This distribution of images and data has provided clinicians with significant additional information about their patients, but has largely been provided as a subset of what is provided within the radiology environment.

In considering whether PACS provides for the needs of clinicians it is necessary to consider what image data and information clinicians need? Do non imaging clinicians have different needs from the PACS data to those in the radiology department - if so why?

Where these needs are different it is important to define what they are and evaluate whether current PACS systems meet them.

10:25 A radiotherapy perspective

Sheikh, H.

The Christie Hospital, Manchester, UK

No abstract supplied.

10:45 A surgeon's perspective

Watt-Smith, S.

John Radcliffe Hospital, Oxford, UK

No abstract supplied.

11:05 A cardiology perspective

Ray, S.

University Hospital of South Manchester, Manchester, UK

No abstract supplied.

11:25 A MDT perspective

Britton, P.

Addenbrooke's Hospital, Cambridge, UK

No abstract supplied.

10:00 - 11:30

Refresher course: Paediatric imaging

10:00 Marrow imaging in children

Irwin, G.

Royal Hospital for Sick Children, Glasgow, UK

No abstract supplied.

10:30 Follow-up and long-term complications of paediatric oncology patients

McHugh, K.

Great Ormond Street Hospital, London, UK

The short-term, and to a lesser degree the long-term, follow-up of paediatric oncology patients is generally governed by formal

protocols set out by the various paediatric oncology international collaborative studies. Patients in the UK are mainly treated under the auspices of trials run by the International Society of Paediatric Oncology (SIOP), which tend to rely on CXR's, ultrasound (US) and MRI's for follow-up of most tumour patients. Little harmful irradiation therefore takes place during surveillance. Of note, in the USA, the Children's Oncology Group, however, recommend repeated abdominal CT after curative surgery for Wilms' tumour.

Approximately 2/3 of long-term survivors of paediatric cancers develop a treatment-related late side-effect. Up to 40% of these are endocrine in aetiology. These include poor growth due to CNS radiation, and reduced fertility due to chemotherapy. Many of these late side-effects would not merit radiological surveillance. In addition, other conditions such as cardiac toxicity from doxorubicin (adriamycin) would be largely dealt with by another specialty, cardiology in this example, with little input from radiology. Complications which would warrant evaluation with imaging will be discussed in some detail in this lecture. Examples of complications from graft versus host disease, varied infective and fungal problems related to neutropenia will be highlighted. Skeletal complications including the risk of second tumours will be addressed. Examples of hepatic and pulmonary fibrosis, veno-occlusive disease, thyroid disorders and vascular complications due to radiotherapy will be demonstrated.

11:00 Abdominal MRI

Moholkar, S.

Birmingham Children's Hospital, Steelhouse Lane, UK

BACKGROUND: Magnetic Resonance Imaging is an important tool in the evaluation of the paediatric abdomen, due to excellent soft-tissue contrast and the lack of ionizing radiation.

PURPOSE: This talk will focus on patient preparation and image optimisation techniques, which are vital for adequate assessment, diagnosis and timely management.

The indications for abdominal imaging, including imaging of abdominal and pelvic tumours, hepatobiliary MRI and MR enterography will be discussed, with a review of the common cases.

10:00 - 12:00

Refresher course: Spine MRI and scientific session

10:00 Nerve compression

Hughes, R.

Buckinghamshire Hospitals NHS Trust, Buckinghamshire, UK

No abstract supplied.

10:30 Spondyloarthropathy and spinal infection

Tins, B.

RJAH Orthopaedic and District Hospital, Oswestry, UK

No abstract supplied.

11:00 Metastases, osteoporotic collapse and pars defects

Dick, E.

St Mary's Hospital, Imperial NHS Trust, London, UK

The clinical and radiological importance of these topics in spinal imaging will be considered with the aim of giving the radiologist valuable understanding which will be useful not only when reporting but particularly in the setting of a Spinal Multidisciplinary Meeting : The key features of metastatic and osteoporotic collapse on MRI will be reviewed and the clinical relevance of correctly identifying the cause of vertebral collapse will be addressed. Aetiology, anatomy, symptoms, and treatment of pars defects will be discussed and a systematic review of all of the associated imaging features will be included.

11:30 Implications of serum metal ions based metal-on-metal (MoM) hips surveillance on clinical radiology service

King, A. C.

University Hospital of Wales, Cardiff, UK

PURPOSE: To establish the relation of conclusive Metal Artefact Reduction Sequence (MARS) hip MRI with serum metal ions for Adverse Reactions to Metal Debris (ARMD) based on Medicines and Healthcare products Regulatory Agency (MHRA) guidance.

MATERIALS/METHODS: A retrospective review of investigation for painful MoM hips with MARS-MRI and serum metal ions over two year period.

RESULTS: Eighty nine patients had MARS-MRI and serum metal ions measured for investigation of painful MoM hips. Median Serum Cobalt and Chromium level were 3.66 µg/L (0.06 -335.6) and 3.66 µg/L (0.24-163.0) respectively. Thirty six (40.44%) scans were positive for ARMD. Thirty one patients had abnormal joint fluid collection, four had solid lesion and one patient had both on MARS-MRI. Increased serum metal ions based on MHRA guidance had Sensitivity of 50%, Specificity of 73.58%, Positive predictor value of 56.25%, Negative predictor value of 68.42% and Accuracy of 64%.

CONCLUSION: : In the presence of emerging evidence about ARMD in MoM bearings hip device, there is an urgent need of an effective surveillance programme. A threshold of raised serum metal ions for cross sectional imaging remains an important issue due to implications of cost and resources. These results identify that serum metal ions are not adequate screening tool for ARMD. The clinicians should have a low threshold for obtaining MARS-MRI in symptomatic MoM hips even in the presence of low serum metal ions. Given the increased number of MoM hip procedures in recent past; this can cause an immense work-load pressure on radiology service provision.

11:40 Use of ultrasound in the diagnosis of adverse reaction to metallic debris following metal on metal hip replacement

Raju, P. •Singiseti, K. •Merreddy, P. •Nargol, A. V.

University Hospital of North Tees, Stockton on Tees, UK

PURPOSE: Adverse Reaction to Metallic Debris (ARMD) is an emerging problem with metal on metal (MoM) hip replacements. ARMD is an umbrella term encompassing metallosis, pseudo-tumors and aseptic lymphocytic vasculitis associated lesions (ALVAL). The role of imaging in the diagnosis of this complex problem is still unclear. A prospective study was undertaken to evaluate the efficacy of ultrasound in the diagnosis of ARMD.

MATERIALS/METHODS: The study group included 35 patients with a clinical and histological diagnosis of ARMD. The control group included 10 asymptomatic patients of metal on metal hip replacements with low blood metal ions levels. All ultrasound procedures were performed preoperatively with a high frequency probe of 9-13 MHz.

RESULTS: All patients diagnosed with ARMD had abnormalities identified on ultrasound. Fluid inside the joint (Group A) was noted in 30 (85.7 %) and outside the joint (Group B) in 33 (94.3 %). In Group B, 32 had fluid in anterior aspect of the hip including iliopsoas bursa and 30 had similar finding laterally including trochanteric bursa. Echogenic effusions were noted in 31 out of 35 procedures (88.6 %). The findings in ARMD group were statistically significant when compared to the control group.

CONCLUSION: Whilst many centres use Magnetic Resonance Imaging (MRI) for diagnosing ARMD in painful MoM hip arthroplasty, this study demonstrates the efficacy of ultrasound in such diagnosis. Echogenic fluid collections around the hip joint following metal on metal (MoM) hip replacements are highly suggestive of ARMD.

11:50 Results of ultrasound guided steroid injection for the treatment of trochanteric bursitis

Chaganti, S. •Galea, A. •Gafoor, A. •Suresh, S. •Gay, D.

Derriford Hospital, Plymouth, UK

PURPOSE: To assess the results of ultrasound guided steroid injection in the treatment of trochanteric bursitis. To assess the role of operator dependent variation in the outcome

MATERIALS/METHODS: A pain diary questionnaire was supplied to all patients who underwent ultrasound guided steroid injection for trochanteric bursitis at our institution. Patients were explained to record pain score at specified intervals (1hr, end of 1day, 2 weeks and four weeks) following the injection. 74 pain diaries were received between July 2008 and March 2010. Of these 14 injections were performed by two registrars with special interest in musculoskeletal radiology and the rest by consultant musculoskeletal radiologists. Data collection and analysis was performed using Microsoft excel.

RESULTS: 72 % (N=52) of patients had clinically significant improvement in pain level, which was defined as a reduction in the visual analogue score \geq 30%. There was 52% average reduction in pain before versus after treatment (mean VAS 7.54 Vs 3.66) which is comparable to the published literature. There was no significant operator dependent variation in the outcome.

CONCLUSION: There was no significant operator dependent variation in the outcome of the procedures performed by musculoskeletal

radiologists, and also between consultants and registrars. The results of our study were comparable to published literature.

10:00 - 11:00

Masterclass: Cardiac radiology - which is the right investigation?

10:00 What CT has to offer in ischaemic heart disease?

Padley, S.
Chelsea and Westminster Hospital, London, UK

No abstract supplied.

10:20 What CMR has to offer in ischaemic heart disease?

Peebles, C.
Southampton University Hospitals, Southampton, UK

No abstract supplied.

10:40 Non ischaemic cardiomyopathy

Roditi, G.
Glasgow Royal Infirmary, Glasgow, UK

No abstract supplied.

10:45 - 12:15

Vascular/interventional scientific session

10:45 The measurement of abdominal aortic aneurysms

Ginder, L. M. • Asquith, J. • Cowling, M. • Wong, J.
University Hospital of North Staffordshire, Stoke on Trent, UK

PURPOSE: Ultrasound is used as the first line investigation for diagnosis and follow-up of abdominal aortic aneurysm (AAA) size. Treatment is generally performed when AAA size exceeds 5.5cm. CT is increasingly used prior to treatment both to confirm size and assess anatomy. This study examines the differences in AAA measurement obtained by US and CT.

METHODS: A retrospective analysis of AAA imaging for 83 patients (92 examinations) comparing CTA vs US. The maximum diameter perpendicular to the longitudinal axis on CTA was used as the gold standard for comparison with US. The difference in size of AAA was recorded along with the examination date. Examinations performed more than three months apart were excluded. A Bland-Altman plot was used to assess the ability of US to represent accurately CTA findings.

RESULTS: 35 patients were excluded due to interval exceeding 3 months. US was found consistently to underestimate AAA size relative to CTA. The mean reporting bias was -3 mm with a range of +/- 6 mm (95% confidence interval).

CONCLUSION: There is good correlation between CTA and US. However there is some disagreement between the

modalities with a negative reporting bias. There are implications for deciding the timing of AAA treatment as it could be argued that waiting until AAA diameter on US has reached 5.5cm causes treatment delay. This will be further discussed within the context of the published evidence. Institutions should determine the reporting bias locally and decide if the difference is sufficient to be clinically relevant.

10:55 Analysis of stenosis asymmetry index by using MDCTA

Saba, L.¹ • Mallarini, G.¹ • Montisci, R.¹ • Suri, J. S.²
¹AOU Cagliari, Cagliari, ITALY, ²Idaho State University, Pocatello, Idaho, USA

PURPOSE: Extracranial carotid artery stenosis is accepted as a significant risk factor for cerebrovascular events. The purpose of this work was to compare the stenosis asymmetry index (SAI) in symptomatic and asymptomatic patients.

METHODS: 75 consecutive symptomatic (males 49; median age 64) patients and 75 consecutive non symptomatic patients matched for gender and age, were analyzed by using a 40-detector-row CT angiography. Each patient was analyzed by injecting 80 ml of contrast material at a 5 ml/sec flow rate. Stenosis degree of 300 carotids was calculated according to NASCET method. For each patient, the ratio between the most severe stenosis and the contralateral was calculated to obtain the SAI. Wilcoxon test was applied to evaluate difference between asymmetry index in symptomatic and asymptomatic group. ROC curve was also calculated.

RESULTS: Results of our study indicate a mean SAI of 1.48 (95% CI 1.38 -1.57) in asymptomatic group and a mean SAI of 1.7 (95% CI 1.57 -1.85) in the symptomatic group with a statistically significant difference (p value = 0.0026). The ROC curve analysis indicated that an SAI value of 1.8 has a specificity of 85% presence of cerebral symptoms whereas to have a sensitivity of 85% we should use a 1.2 AI.

CONCLUSION: Results of our study indicated that the SAI should be used as further parameter to stratify the stroke risk related to carotid artery.

11:05 Usefulness of carotid doppler imaging in predicting the prevention of post-op strokes in patients undergoing cardiac surgery

Mahatma, A.
Harefield Hospital, Harefield, Middlesex, UK

PURPOSE: Carotid artery imaging (CAI) with Doppler is commonly used pre-operative screening test to evaluate risk of stroke in patients undergoing cardiac surgery. We evaluate its usefulness and its impact on performance of carotid endarterectomy (CEA) and postoperative outcome.

METHODS: We retrospectively collected data in patients who underwent cardiac surgery at Harefield Hospital in a 12 month period (Nov'08 - Nov'09). CAI was performed in patients considered to be at high risk of stroke followed by CT angiogram (CTA) in those with indeterminate stenosis or occlusion. Patients were divided into different severity categories based on standard

criteria. Subsequent surgical management and patient outcome were assessed from the clinical notes. Outcome of patients who did not undergo CAI and/or CEA was also identified.

RESULTS: Total no. of patients who underwent cardiac surgery were 892 with mean age of 67.8 years. CAI was performed in 332 patients. The scan was reported normal in 281 (84.6%) cases, moderate stenosis (50-69%) in 19(4.2%), significant stenosis (>70%) in 11(2.8%) patients and rest had mild stenosis. In the severe stenosis group, 5 patients underwent CEA, of which 3 had a transient or permanent stroke. 2(0.34%) patients with CAI reported being normal/mild stenosis and 8(1.4%) patients in which no imaging was performed, also had a stroke.

CONCLUSION: We concluded that pre-op carotid artery imaging does not significantly predict the probability of postoperative strokes in patients undergoing cardiac surgery. Hence the role of CEA in these patients may be uncertain.

11:15 Deep venous thrombosis- clot evolution on sequential MRI scans

Karuppiah, A. S.^{1,2}•Psatha, M.¹•Wu, Z. Q.¹•Redpath, T. W.¹•Ashcroft, G. P.¹•Watson, H.¹•Meakin, J. R.¹•Aspden, R. M.¹•Gilbert, F. J.¹

¹Aberdeen University, Aberdeen, UK, ²Norwich Radiology Academy, Norwich, UK

PURPOSE: To describe the evolution of incidental deep venous thrombosis in patients undergoing sequential MRI examinations in a muscle biomarker imaging study.

MATERIALS/METHODS: Eligible patients with a below knee cast following an ankle fracture were recruited after written informed consent. Patients were invited for 10 MRI examinations of the lower limb over a 3 month period. On suspicion of vein thrombus, referral to a Hematologist with detailed history, examination, WELLS scoring, D-dimer test and compression ultrasound (USS) was performed.

RESULTS: 18 patients had MRI (8 male, 10 female, age: 43±15yr) and deep venous thrombosis (DVT) was detected in 4 (22%) (2 male and 2 female, age: 45±8yr). All had negative USS examinations. 2/4 patients with DVT had risk factors (BMI >30; HRT usage). Two patients developed symptoms - calf pain at day 0 and swollen leg on day 57 in the other patient.

On retrospective review thrombus was seen on day 5 (2) and on day 8 (1) and on day 43 (1). The thrombus initially had increased T2W signal and then showed signal drop out centrally. In 3 patients the thrombus showed an increase in length over several examinations with proximal progression and regression and fragmentation subsequently.

CONCLUSION: This study demonstrates that DVT may be common in both symptomatic and asymptomatic patients with lower limb immobilisation with or without risk factors. MRI may be a more sensitive technique than USS in the detection of early lower leg DVT.

11:25 Venous findings in MRI using a blood pool contrast agent in patients with vascular disease

Christie, A.
Southern General Hospital, Glasgow, UK

PURPOSE: Conventional MR angiography using gadolinium has evolved as the modality of choice in assessing peripheral arterial disease. However, due to the rapid elimination of contrast from the arteries, there is a narrow window for image acquisition. This can also lead to unwanted venous enhancement, causing significant image degradation. This problem has been largely overcome by using blood pool contrast agents, which have a prolonged intravascular half- life, allowing high resolution imaging of arteries and veins without compromising arterial interpretation. The aim was to evaluate this additional venous data.

MATERIALS/METHODS: Patients investigated with MRA using the blood pool agent Vasovist were identified. All reports, and relevant images, were reviewed to specifically identify vascular findings additional to the direct arterial clinical question.

RESULTS: 248 patients were involved, 234 with peripheral arterial disease and 14 with venous malformations. Significant DVT was identified in 6%. The high resolution images could also assess the suitability of the patient's vein for by-pass grafts, and very clearly analysed graft patency post-operatively.

Further venous findings included varicosities, incompetent perforators, duplicated veins, and also varicoceles and enlarged ovarian veins. Also, detailed depiction of complex arteriovenous malformations aided interventional treatment.

CONCLUSION: In addition to the principal role of analysing arteries, valuable venous information is provided by using a blood pool contrast agent. The intrinsically higher spatial resolution allows arteries and veins to be readily distinguished, unlike standard gadolinium based agents. Displaying veins is no longer contaminating interpretation, but provides facts that will influence patient management.

11:35 Technique and outcomes of isolated limb infusion (ILI) for locally advanced malignant melanoma

Chun, J. •Hussain, M. •Powell, B. •Belli, A.
St George's Hospital, London, UK

PURPOSE: Isolated limb infusion (ILI) is a novel, minimally-invasive technique for delivering high-dose regional chemotherapy in patients with inoperable, locally advanced melanoma of the extremity. The aim of this study was to review our single-centre experience in treating eleven patients. We emphasize the role of radiologists in setting up this service, including pre-treatment workup and placement of vascular catheters.

MATERIALS AND METHODS: We performed a retrospective analysis of 11 patients who underwent 12 procedures between 2005 and 2009. Pre-procedural staging computed tomogram (CT), CT angiogram and duplex studies were performed. All patients received a cytotoxic combination of melphalan and actinomycin-D via radiologically placed arterial and venous catheters in the affected limb under hyperthermic and hypoxic conditions. The outcome measures include response rates, limb toxicity, complications and survival.

RESULTS: All patients were female with a mean age of 72 years. Three patients had American Joint Committee on Cancer (AJCC) stage IIIB melanoma, seven had stage IIIC melanoma and one had stage IIIB Merkel cell tumour. Complete response was seen in five patients (46%), partial response in four (36%) and progressive disease in two (18%). One patient developed grade 4 toxicity requiring a fasciotomy and another experienced systemic toxicity.

CONCLUSION: These outcomes are comparable to previous studies and shows that ILI is effective in locoregional control of unresectable melanoma. It is a relatively safe procedure but not without risk. Our experience shows the importance of radiological input to ensure safe and effective delivery of services.

11:45 Thiel soft-embalmed cadavers with simulated functions as a research and training model for interventional radiology

Toomey, R. J.¹•Immel, E.¹•Fernandez-Gutierrez, F.¹

•Gueorguieva, M.¹•de Vries, K.¹•Bücker, A.²•Houston, G.³

•Eisma, R.⁴•Melzer, A.¹

¹Institute for Medical Science and Technology, University of Dundee, Dundee, UK, ²Klinik für Diagnostische und Interventionelle Radiologie, Universitätsklinikum des Saarlandes, Homburg, GERMANY, ³Department of Clinical Radiology, Ninewells Hospital and Medical School, Dundee, UK, ⁴Centre for Anatomy and Human Identification, University of Dundee, Dundee, UK

PURPOSE: Realistic models are required for training and research in radiology; however, existing models (e.g. animal, patient, fresh / formalin preserved cadavers) may present anatomical, ethical and safety concerns. This research aims to develop Thiel soft-embalmed cadavers, which retain life-like flexibility and colour, as a suitable model with simulated physiological (vascular and respiratory) functions. Results to date are reported and future work briefly described.

MATERIALS/METHODS: Antegrade and retrograde access were established in the femoral and popliteal arteries respectively of two female Thiel-embalmed cadavers, producing a closed segment of artery. Loss of fluid via side branches from the vessel was minimised using compression and embolisation techniques. Fluids were passed through this segment at different physiologically-relevant pressures, and rates of flow measured. Fluoroscopic and magnetic resonance imaging techniques have been applied to image this flow.

RESULTS: Flow has been established in the superficial femoral arteries of multiple cadavers at pressures of up to 80mmHg, with a maximum flow rate achieved of 800ml/min. Digital Subtraction Angiography and Magnetic Resonance Angiography have successfully been employed to image this flow. Work in automated respiration is ongoing and shows promise.

CONCLUSION: Vascular flow in the superficial femoral artery may be simulated in Thiel-embalmed cadavers and imaged using multiple modalities. The cadavers are suitable for performance of interventional procedures. Further research is ongoing to create automated physiologically-correct pulsatile flow and

simulated respiration. The Thiel cadaver model shows promise as a research and training tool in interventional radiology and other fields.

11:55 Non-elective percutaneous nephrostomy (PCN) insertion: is there a role for initial risk stratification?

Liong, S. Y.¹•Tuck, J.¹•Bradley, A.

University Hospital of South Manchester, Manchester, UK

PURPOSE: To evaluate the utility of patient risk stratification for a non-elective 24-hour PCN insertion service provided by a urology centre.

METHODS: A prospective audit for 1 year (Jan -Dec 2009). Urologists compiled data on each PCN. Based on clinical and laboratory data, patients were stratified at time of referral into three risk groups: PCN to be undertaken in < 6 hours (group A, n=5), 6-24 hours (group B, n=27) and 24-72 hours (group C, n=19). Patient profile, timing of insertion, correlation with Urological stratification, and consequences were documented.

RESULTS: 51 (72.9%) of 70 PCN performed in 2009 were non-elective insertions. Group A consisted of five patients with ureteric stone; 4 with sepsis. Indications for PCN in Group B included ureteropelvic calculus (n=11, sepsis in eight), obstruction related to malignant disease (n=12) and other causes (n=4). Indications in Group C included obstruction related to malignant disease (n=11), calculus (n=3, sepsis in one), and other causes (n=5). 43 (84.3%) procedures were performed between 09.00 and 17.00, Monday-Friday, with the remaining 8 (3 group A, 5 group B) cases performed out-of-hours, but none after 23.00. 14 PCNs were performed < 6 hours of referral, 25 between 6-24; 11 between 24-72 hours, and one at 91 hours after referral. Concordance with Urological stratification occurred in all but 2 cases. No patient suffered significant adverse outcomes from delay in PCN placement.

CONCLUSION: Risk stratification, together with availability during daytime 7 days a week, allows appropriate timing of PCN, without detriment to the patient.

12:05 Core interventional radiology training, biopsies and drainages: Are we failing our trainees?

Bashaeb, K. O.¹•Rowley, T.²•Kasthuri, R.³•Moss, J.³

¹Glasgow Royal Infirmary, Glasgow, UK, ²University of Glasgow, Glasgow, UK, ³Gartnavel General Hospital, Glasgow, UK

PURPOSE: To assess a) the level of training in core interventional radiology procedures (biopsy and percutaneous drainage), and b) obstacles to training.

MATERIALS/METHODS: The total number of biopsy and drainage procedures performed in hospitals within the West of Scotland Training Scheme over one year was retrieved from the Radiology Information System. A questionnaire based survey into the competence and confidence level of the trainees in performing image-guided biopsies and drainages was also carried out.

RESULTS: 2328 biopsies were performed, 83% (1952) by

consultants and 17% (376) by trainees. 504 drainages were carried out, 62% (310) by consultants and 38% (194) by trainees. The percentage varied between hospitals, consultants performing 72-98% of biopsies and 36-100% of percutaneous drainages. Trainees performed 5-28% of biopsies and 0-63% of drainages. Senior trainees (4th and 5th year) could independently perform US-guided biopsies (58%), CT-guided biopsies (42%) and percutaneous drainages (83%). Reasons perceived by trainees as a cause for lack of experience included; being scheduled for something else (63%), busy lists (41%), lack of assistance or reluctance of consultants (41%) and a small number being performed (41%).

CONCLUSION: Proficiency in performing core interventional procedures is not being achieved as required by the specialty-training curriculum. The numbers of procedures are more than enough for training and for consultants to maintain their expertise. Trainees performed relatively few of these procedures to gain core practical experience. Further study is required to assess core interventional radiology training in other U.K. training centres.

11:00 - 12:00

MR imaging of the liver - radiological surgical correlation

11:00 Liver MR for the masses

Blakeborough, T.
Royal Hallamshire Hospital, Sheffield, UK

No abstract supplied.

11:30 What I need from radiology - perspectives from a hepatobiliary surgeon

Lodge, P.
St James's Hospital, Leeds, UK

No abstract supplied.

11:30 - 12:15

CoR Stanley Melville Lecture

11:30 What can imaging learn from endoscopy?

Valori, R.
Department of Health, London, UK

No abstract supplied.

12:30 - 14:00

Hands-on workshop: Cardiac CT I

Facilitator

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

No abstract supplied.

12:30 - 13:15

BIR-AGFA Mayneord Lecture

12:30 Cancer reform: the importance of imaging

Richards, M.
Department of Health, London, UK

No abstract supplied.

14:00 - 16:00

Masterclass: MR technology - developments in MRI

14:00 Understanding functional connectivity MRI

Brookes, M.
The University of Nottingham, Nottingham, UK

No abstract supplied.

14:30 Specialised application engineering and physics for MR systems

Paley, M.
University of Sheffield, Sheffield, UK

Conventional MRI systems feature a cylindrical closed bore magnet with a magnetic field strength of 1.5T and are aimed at routine diagnosis of clinical pathology. A range of specialised MRI systems and applications have now been developed which feature open design, compact size and are moveable. This allows a new range of applications such as intra-operative image guidance, weight bearing studies, imaging of extremities, neonates and patients who would not fit within a standard closed MR system. In addition, new ancillary equipment enables imaging of structures that were not previously possible with MR, such as ligaments and tendons. These include mechatronic magic angle location devices and ultra-short echo time gradient inserts. Hyperpolarisation of gases and fluids outside the magnet using optical or microwave methods has opened up the possibility of imaging lung spaces or observing in vivo biochemistry in real time. Specialised low field MR systems can be developed to take advantage of the fact that signal to noise ratio (SNR) is independent of field strength with use of hyperpolarised agents. Also use of cryogenic coil cooling can improve SNR at relatively low field strengths. Parallel slice and phase encode imaging sequences can be used to speed up image acquisition times and new system design options for whole body screening may be possible using magnets with multiple homogeneous regions. The range of specialised systems and applications currently available as well as future possibilities will be reviewed.

15:30 Applications of DWI and perfusion beyond stroke

Parker, G.
University of Manchester, Manchester, UK

Diffusion and perfusion MRI are examples of advanced MRI

methods that have generated enormous research outputs and impacted on radiological practice. Historically a major interest in both techniques was in application to stroke. However, applications in other neurological settings and outside the head have also proved to be important. Examples will be given of leading diffusion and perfusion (contrast and non-contrast) MRI methods in understanding structure and function in diverse anatomy such as the brain, kidney, lungs and in cancer.

15:30 Clinical applications of compressed sensing

Atkinson, D.
University College London, London, UK

Compressed Sensing holds the potential of not having to acquire all the data needed for an image, but instead to measure less data in a 'compressed' form. This data is reconstructed using some prior knowledge about the expected images. Under certain conditions, these methods can faithfully reproduce the underlying image even from very limited quantities of data. In the context of MRI, this holds the possibility of being able to acquire reduced k-space in a faster time, and use knowledge about MR images to guide the reconstruction. The method is complementary to parallel imaging (which uses information from multiple coils), leading to the possibility of significant reductions in acquisition time. The two primary conditions for compressed sensing are sparsity and sampling. Sparsity means that the image can be represented in some domain where there are a lot of entries at, or close to, zero. Examples include the image domain for angiograms (bright vessels, dark background), time series data where not everything changes in each frame (interventions, DCE, cardiac imaging), and a wavelet transform applied to images (similar to digital-camera JPEG compression). The sampling condition says that the effect of under-sampling k-space must give artefacts in the sparse domain that look like noise. An example of this would be random sampling of k-space that gives noise-like aliasing in images.

With multiple examples of sparsity in MRI, and easy control of k-space sampling using existing hardware, MRI is well placed to benefit clinically from the benefits of compressed sensing.

14:00 – 15:00

HRCT expert panel: How we do it – unknown cases

Panel

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

No abstract supplied.

Panel

Padley, S.
Chelsea and Westminster Hospital, London, UK

No abstract supplied.

Panel

Grubnic, S.
St. George's Hospital NHS Trust, London, UK

No abstract supplied.

13:30 – 15:30

Interventional radiology

13:30 Intervention in critical limb ischemia

Ettles, D.
Hull Royal Infirmary, Hull, UK

No abstract supplied.

14:00 Fibroid embolization - 'the evidence'

Belli, A.
St George's Hospital, London, UK

Uterine Artery Embolization (UAE) for the treatment of symptomatic fibroids has been available for 16 years and unlike many other interventional radiological procedures has good evidence in the form of randomised controlled trials (RCT) rather than simply case series and registry data. It has been investigated by NICE and been deemed safe and efficacious.

The RCT's have compared UAE with surgical treatment which is traditionally hysterectomy, but with a few myomectomies. The findings have been consistent in that quality of life improves equally with either treatment, there is shorter hospital stay with UAE, there are similar adverse event rates but with a difference in their timing in that surgical complications occur within 30 days, whilst after UAE they can occur up to 1 year later. UAE is cost effective but has a higher incidence of requiring a further intervention, with approximately 1 in 5 women requiring a further intervention in 5 years. Despite this, UAE remains cost effective out to 5 years.

Women actively seeking fertility have been excluded from UAE because of the uncertain effect on fertility with regard to causing placental insufficiency, abnormal placentation, endometrial distortion and decreased ovarian reserve. The evidence on fertility relies on small case series, one underpowered RCT and a meta-analysis, and shows a possible increased trend for first trimester miscarriage but no effect on foetal growth. However further research for women wishing to maintain or improve their fertility is required comparing UAE with other uterine sparing procedures.

14:30 Abdominal and thoracic stentgrafting

Morgan, R.
St. George's Healthcare NHS Trust, London, UK

PURPOSE: To learn about stentgrafting in the thoracic and abdominal aorta. The lecture will be aimed at radiologists with limited experience of aortic endografting.

MATERIALS/METHODS: The lecture will provide a brief

overview of the indications, patient selection, available devices, device selection, techniques, outcomes, complications and follow-up method for endografting of diseases of the thoracic and abdominal aorta. The lecture will be illustrated with examples. Basic and advanced techniques will be covered. The collaborative role of interventional radiologists and surgeons will be discussed.

15:00 State-of-the-art- Percutaneous Renal Intervention and Pre-procedural Planning

Patel, U.
St Georges Hospital, London, UK

No abstract supplied.

13:45 - 15:00

Masterclass: Non-accidental injury

13:45 Skeletal injuries

Fairhurst, J.
Southampton University Medical NHS Trust, Southampton, UK

No abstract supplied.

14:10 Head injuries

Avula, S.
Alder Hey Children's Hospital NHS Trust, Liverpool, UK

No abstract supplied.

14:35 Imaging protocols and follow-up imaging

Sprigg, A.
Sheffield Childrens Hospital, Sheffield, UK

In 2008 there was a joint publication by RCR and RCPC on how to image children with suspected non-accidental injury. This was a benchmark event and established accepted practice to ensure similar imaging occurred in all hospitals.

There is still significant variation in imaging between hospitals, but overall imaging standards improved considerably after this publication.

SKELETAL: Presenting part: Adequate radiography?

Skeletal survey: How do we do oblique chests? How do we image the limbs? Spine and hands/feet.

Do we still need a SXR?

Follow up: Always do a CXR at 2-3 weeks. What follow up do we need - nothing? a repeat survey? selected views? Nuclear medicine? CT/MR of skeleton? Who organises and directs follow up?

NEURO: CT is the first imaging modality

MR has progressed significantly since 2008 protocol.

MR is now available in most hospitals, but sedation vs GA facilities vary.

How is the baby kept still?

What can be agreed for protocols?

Image the brain and spine.

Essential brain:

T1 and T2 axial.

Sag T1 useful for posterior fossa.

FLAIR?

Focal brain change - ADC/DWI etc

Acute effusions vs chronic subdural haemorrhage.

Spinal imaging for vertebrae and cord.

Do we need follow up MR?

There has to be a balance between length of procedure and information needed.

REPORTING: Double report - but how?

Regional referral?

FORENSIC vs CLINICAL and the benefit of hindsight.

14:00 - 15:50

Improving cancer diagnostic services & SD scientific session

14:00 How can we do this?

Williamson, J.
Cancer Services Collaborative Improvement Partnership, Leicester, UK

No abstract supplied.

14:20 Why do we need to do this?

Stewart, D.
Cancer Reform Strategy Group, UK

No abstract supplied.

14:40 Why we should use proformas for cancer reporting

Brown, G.
Royal Marsden Hospital, Sutton, UK

No abstract supplied.

15:00 The use of a novel IT solution to improve radiologist's throughput

Boxer, D. I. • Bhagat, A.
West Hertfordshire Hospitals NHS Trust, Watford, UK

KEY LEARNING OBJECTIVES: Innovative IT solutions can enable new ways of working which may have widespread advantages to Radiology Departments.

DESCRIPTION: In 2008 a new radiologist reporting system was introduced. Traditional session based reporting for CT, MRI, Nuclear Medicine and plain films were replaced by a generic worklist system. This is managed by an innovative computer programme ("WIZRAD") which assesses on a weekly basis the time each radiologist has within their job plan for modality reporting. Examinations are then allocated to electronic worklists on the radiology information system, based on a pre-

selected ratio of the modalities and sub-speciality interests. This has resulted in an increase in reporting capacity due to more efficient time management as well as providing detailed departmental capacity information. This is preferred by the radiologists as it allows flexibility and is seen as being equitable. Departmental management has been simplified as imaging lists no longer have to be organised around specific radiologists.

CONCLUSION: The development and adoption of a novel computer programme has enabled our department to move from a session based to a generic reporting system which has proven highly advantageous

15:10 Performance management in clinical radiology

Doyle, G. J. • Baird, R. • Joy, J.

Countess of Chester Hospital, Chester, UK

PURPOSE: This study demonstrates qualitative and quantitative management of a radiology practice.

MATERIALS/METHODS: Quantitative management-

- 1) An audit was conducted in 2007 to estimate radiologist's reporting capacity.
- 2) The information was combined with job plans to produce targets for individual radiologists.
- 3) Dedicated CT or MR lists were abolished. A "Radiologist of the Week" was created who manages protocols for these lists and deals with urgent clinical enquiries. The remaining radiologists report from PACS generated mixed work lists.
- 4) A panel of support radiologists was created to increase capacity through the employment of recently retired radiologists, senior trainees and remote reporting services.

Qualitative management-

- 1) Monitoring reporting discrepancies both on an ad hoc basis and systematically by routine sampling .
- 2) Each discrepancy is reviewed by a panel of radiologists weekly . If an error is identified it is filed for reflection and appraisal.
- 3) A radiologist detected discrepancy percentage rate was calculated by dividing the discrepancies by workload.

RESULTS: Quantitative reporting performance was calculated for each radiologist on a monthly basis and expressed as a percentage under or over target. This varied from 34-170%. Qualitative reporting performance was calculated by measuring the detected discrepancy rate and dividing it by the workload.- This varied from 0.05-0.8%.

CONCLUSION: Calculating reporting capacity and using quantitative reporting targets assists workforce planning and underpins consistency of reporting output. Calculating the detected radiologist discrepancy rate is an important parameter of quality, balances quantitative measurement, informs appraisal and should be standardised.

15:20 Can we quantify the value of radiologists in non-cancer MDTs in terms of patient care and cost effectiveness?

Hedges, W. P. • Khan, S. H.

East Lancashire Hospitals NHS Trust, Blackburn, UK

PURPOSE: Pilot study to analyse the value of radiologists' input at non-cancer MDTs, the benefits to patient care and value for money provided.

METHODS: Prospective review of two MDTs in neurology and rheumatology, consisting of 29 patients and 55 imaging studies, with input from one radiologist. Improvement in quality of care was analysed by recording: imaging study interpretation errors found by the radiologist; cases where diagnosis or treatment was altered due to radiologist input; cases where further investigations were requested by the radiologist.

The cost-efficiency of radiologist involvement in MDTs was compared to normal image reporting data available in the literature. This was determined using 'relative value' rating scales from Australia, Canada, New Zealand and the USA, which assign numerical values for different types of imaging study reported, depending on the time/difficulty involved in each.

RESULTS: 50% of the 55 imaging studies reviewed in both MDTs were found to have errors in their interpretation. 75% of the 29 cases reviewed had alterations in diagnosis or management due to radiologist input. In all relative value rating scale systems the workload of the specialist radiologists in MDTs was better than normal reporting workloads at our hospital.

CONCLUSION: This pilot study demonstrates significant improvement in patient care. The radiologist's input in MDTs is a very cost effective use of resources when compared to workload data available in the literature. 'Relative value' systems are an excellent way of quantifying and assessing the cost-effectiveness of radiologists at MDTs and benchmarking according to international standards.

15:30 Provision of interventional radiology (IR) services in England

Zagorski, C. J.¹ • Wivell, G.¹ • Cavanagh, P.² • Denton, E.¹

*¹Norfolk and Norwich University Hospital, Norwich, UK,
²South West NHS Trust, Taunton, UK*

PURPOSE: A report from the National Imaging Board [1] states appropriate, timely IR saves lives and enhances patient experience. IR offers gains in clinical outcome, productivity, and length of stay. Access to IR services across England is very variable [2]. This survey looked at out-of-hours (OOH) provision of IR services in NHS trusts in England.

METHODS: 167 NHS trusts were invited to complete an online survey of 11 questions, based on RCR guidelines [3], about current, OOH, IR provision, plans for the future, and given an opportunity to explain what is/is not working well. Data was gathered on procedures, staffing and equipment between 1st September and 1st November 2010.

RESULTS: 73 hospitals responded. Just over a quarter had a full service and more than half a limited service. 20.3% had no OOH IR service.

66% had no formal OOH rota. Comments indicated that most of the consultant, and radiographer cover was ad-hoc and unpaid, relying on the goodwill of the staff. Nurses were often seconded

from other areas, with variable radiology experience.

Data was analysed on the range and frequency of OOH procedures. Almost all reported having <25% of their IR procedures available OOH. 59.3% did not expect to have an OOH IR rota in place by April 2011.

CONCLUSION: The 'typical' hospital trust operates a limited OOH service, without a formal rota. Most departments offer OOH cover on an ad-hoc basis, with variable consultant availability and the range of procedures available dependant on who is providing the cover.

15:40 3.0T in the DGH setting

Griffin, K. M.

Medway Maritime Hospital, Gillingham, UK

Convincing the purse holders that a second magnet should be a 3.0T is not easy in a cash strapped DGH. The business case was complex and convoluted, rewritten several times, but did eventually succeed. What were the lessons learned from this process and now, six months after going live, was it all worth it? Some think that 3.0T has no convincing role in the District General Hospital setting. This presentation explores the benefits (and pitfalls) of such an installation with observations on quality, workflow and the effect on the reporting Radiologists and Radiographers.

14:00 - 15:40

Oncological PET CT in 2011

14:00 Contrast enhanced PET-CT in oncology

Hany, T.

University Hospital, Zurich, SWITZERLAND

Anatomical information is an additional benefit in co-registered PET/CT imaging and improves localization of pathological FDG uptake. Different CT systems (single or multi-slice spiral CT scanner) are used in hybrid PET/CT system. Since the application of contrast media is a standard procedure in CT, application of contrast has been also mandated in co-registered imaging. The beneficial use of intravenous contrast is dependent on tumour type, e.g. for certain indications like melanoma or lymphoma, intravenous contrast are not needed. For other malignancies, especially abdominal malignancies, single - up to triple phase intravenous contrast enhanced CT protocols including arterial, portal venous and late phase imaging are implemented depending on the tumour type. Especially in the evaluation of the liver in primary liver tumours like hepatocellular carcinoma or metastases from neuroendocrine carcinoma of the gastrointestinal tract (GIT) as well as in the evaluation of pancreatic cancer, arterial phase imaging is a standard procedure. Also in the ENT-tract, intravenous enhanced CT helps to delineate the primary tumour and especially necrotic, cystic lymph node metastases.

Positive as well as negative oral contrast agents are used for

delineation of the gastro-intestinal tract (GIT) from adjacent structures. Recently, liquid low density oral contrast agents as a mixture of locust bean gum and mannitol for CT have been demonstrated to be favorable in the use for PET/CT.

Technical issues, indications and implications in the use of positive as well as negative oral contrast agents and intravenous contrast enhancement in PET/CT imaging are discussed.

14:30 Not everything that glitters is gold - pitfalls and perils of FDG PET-CT in oncology

Chowdhury, F.

Leeds Teaching Hospitals NHS Trust, Leeds, UK

No abstract supplied.

15:00 Emerging oncological PET tracers

Aboagye, E.

CRUK-EPSRC-MRC-NIHR Comprehensive Cancer Imaging Centre, London, UK

No abstract supplied.

15:30 Is 18F-FDG PET better than 111In-leucocyte scintigraphy in the diagnosis of fever of unknown origin (FUO)? - Prospective comparison

Sonoda, L. I.¹•Seshadri, N.²•Lever, A. M.²•Balan, K. K.²

¹Strickland Scanner Centre, Mount Vernon Hospital, Northwood, UK, ²Addenbrooke's Hospital, Cambridge, UK

PURPOSE: To compare the diagnostic performance of 18F-FDG-PET (PET) and 111In-labelled leucocyte scintigraphy (LS) in the work-up of patients with fever of unknown origin (FUO).

METHODS/MATERIALS:

Twenty-one consecutive patients with FUO were prospectively studied using whole-body LS and PET within a week of each other. Performance of the two modalities for identifying the aetiology of FUO was evaluated. Final diagnosis was based on biopsy, microbiological tests, and clinical and imaging follow-up.

RESULTS: Abnormal tracer uptake was seen on LS in 3/21 (14%) patients and on PET in 8/21 (38%) patients, suggesting a higher sensitivity for the latter (McNemar's test, $p < 0.01$). All LS positive cases were identified on PET and confirmed as infection. The causes of FUO on PET in others were: benign ($n=2$), infection ($n=2$) and vasculitis ($n=1$). Of 13 patients with normal investigations, 10 made a spontaneous recovery during the follow-up period and no definite cause for FUO was found following further investigations. One patient was diagnosed with Still's disease, one polymyalgia rheumatica and another died of meningoencephalitis.

CONCLUSION: PET has a higher sensitivity than LS in the assessment of FUO. By virtue of its uptake in various conditions causing PUO such as infection, inflammation and malignancy, 18F-FDG-PET has the potential to replace other investigations for this indication in the future.

15:30 - 16:30

Cardiac scientific session

15:30 The impact of NICE guidelines for the investigation of stable chest pain on radiology services

Patterson, C. M.¹•Nicol, E. D.²•Bryan, L.³•Bell, D.¹•Padley, S. P.¹

¹Imperial College, London, UK, ²Royal Brompton Hospital, London, UK, ³Chelsea and Westminster Hospital, London, UK

PURPOSE: The National Institute for Health and Clinical Excellence (NICE) have released guidelines for the investigation of chest pain of recent onset. There is concern that the guidelines will increase the burden on imaging services, requiring service reconfiguration and investment. This study was performed to assess the impact of the guidelines on in-patient and out-patient radiology services. **METHODS:** 198 consecutive patients attending the acute medical unit (AMU) and 200 consecutive patients attending rapid access chest pain clinic (RACPC) over six months preceding release of the NICE guidelines were risk stratified using NICE criteria. Preliminary investigations recommended by NICE were compared with existing practice.

RESULTS: In AMU NICE would have recommended 158 (80%) patients for discharge, 3 (2%) for cardiac computed tomography (CCT), 10 (5%) for functional imaging and 17 (9%) for invasive coronary angiography (ICA). Relative to existing practice there would have been a reduction in CCT (-86%; $p < 0.001$) and ICA (-50%; $p < 0.001$). In RACPC NICE would have recommended 171 patients (86%) for discharge, 3 (2%) for CCT, 3 (2%) for functional imaging and 23 (12%) for ICA, representing a reduction in functional imaging (94%; $p < 0.001$) but an increase in ICA (+475%; $p < 0.001$).

CONCLUSION: This study suggests implementation of the NICE guidelines will require investment in imaging services, particularly ICA. It will be necessary to establish and maintain CCT for relatively few patients; also to establish and maintain functional imaging even though referrals may decline. Individual hospitals should assess their local populations and current practice prior to service reconfiguration.

15:40 Cardiac MR and cardiac CT: How, when and why?

Durran, A.

Royal Cornwall Hospital, Truro, UK

No abstract supplied.

15:50 Referral advice for CT coronary angiography (CTCA): encouraging questions helps provide answers

Clayton, B.¹•Coles, D. R.¹•Gosling, O.²•Roobottom, C.¹•Morgan-Hughes, G.¹

¹Derriford Hospital, Plymouth, UK, ²Peninsula Medical School, Exeter, UK

PURPOSE: CTCA is now recommended for the assessment of chest pain, but does not always provide images of diagnostic quality. This might be improved by considering factors known to be associated with image quality at referral. An audit was

performed to identify such factors, both at referral and at scan. **METHODS:** A retrospective audit examined all angiograms for the investigation of suspected cardiac chest pain over a 6 month period. Patients with known coronary artery disease were excluded. CTCA was performed utilising 64-slice scanners with aggressive heart rate (HR) control, including IV metoprolol, to facilitate prospective gating. A review of CTCA reports was performed to identify non-diagnostic scans along with reasons.

RESULTS: 313 patients underwent CTCA. 57 scans were non-diagnostic (18%) due to: absence of controlled, regular heart rate ($n=23$), failure to comply with breath hold ($n=21$), image artefact ($n=4$), technical problem ($n=4$), no defined reason ($n=5$). There were no significant differences in patient demographics, exposure settings, radiation dose or calcium score. There was a significant difference in both baseline and acquisition HR between diagnostic and non-diagnostic groups ($p=0.050$ and <0.001 respectively). Furthermore, patients with diagnostic scans were more likely to have received intravenous beta-blockers prior to angiography ($p=0.002$).

CONCLUSION: Clinicians considering patients for CTCA should ensure that the patient can comply with simple breath hold instructions and has suitable heart rate and rhythm control prior to referral. We suggest either a resting HR <65 bpm, or <75 bpm in the absence of contra-indications to beta-blockade.

16:00 CT coronary angiography (CTCA) - what might the future hold?

Raju, V. M.^{1,2}•Shaukat, A.²•Meegada, M.²•Wotton, F.²•Morgan-Hughes, G.²•Roobottom, C.²

¹Peninsula Radiology Academy, Plymouth, UK, ²Derriford Hospital, Plymouth, UK

PURPOSE: In March 2010 NICE published guidelines for evaluation of chest pain of recent onset, placing CT scanning centre stage for the low to intermediate risk group. Around the UK services are being set up to meet this requirement. Cardiac CT service at Plymouth NHS Trust (PHNT) is uniquely placed to serve as a model on which realistic future predictions can be made in that a CTCA service has been in place since 2003. Local and regional Cardiologists from 5 hospitals in the South West England access the service. We audited our CTCA activity and referral patterns and believe the **RESULTS** give insights into the future for those with new cardiac CT services.

MATERIALS/METHODS: This retrospective audit assessed the referral origin and indication in 1000 consecutive patients who underwent CTCA in 2010 at PHNT. The radiology information system and CTCA database was used in data collection.

RESULTS: The service demand is steadily increasing year on year. The majority of the work is in keeping with NICE guidelines, however 35% of patients had indications outside the current new NICE guidelines.

CONCLUSION: New CTCA services can expect a steady and rapid increase in referral numbers following institution. Locally available services will be accessed far more than services at neighbouring hospitals. A new service may initially

expect to receive referrals broadly as suggested by the new NICE guidelines. However as the service matures new referral patterns will emerge including up to 20% of patients may have established CAD or have already been revascularised.

16:10 Iterative dose reduction for cardiac CT

Irwan, R.

Toshiba Medical Systems, Zoetermeer, NETHERLANDS

PURPOSE: to reduce the radiation dose while maintaining highest image quality possible in cardiac CT.

MATERIALS/METHODS: Prospective CTA is used as a acquisition method with the following scan parameters: collimation 320x0.5mm, 100 kV, tube current is BMI-dependent, iterative dose reduction, and smooth kernel. Here, an iterative dose reduction algorithm will be explained in depth. The reconstruction time of with and without use of this algorithm will be compared for coronary CTA. Image quality will be assessed using SD in the raw data instead of placing ROI on the image. This will avoid any biased measurement.

RESULTS: Two RESULTS will shown which confirm a dose saving of about 70%. Sub 0.5 mSv images are shown without plastic-look. The additional reconstruction time is about 10%, with an average time of about 12 seconds for 320 images.

CONCLUSION: iterative dose reduction algorithm may be the solution to reduce the radiation dose in the future.

16:20 Radiographer assessment of coronary calcium scores

McKavanagh, P. • Baird, C. • McMillen, U. • Taylor, L. • Ball, P. • Donnelly, P. M.

Ulster Hospital, Belfast, UK

PURPOSE: The 2010 NICE guidance for the assessment of chest pain suggested an important “gatekeeper” role for coronary artery calcification assessment. In the NICE algorithm calcium scores (CS) determine which further cardiac imaging techniques are required in low risk patients. The aim of this study was to determine the feasibility and accuracy of radiographer’s CS assessment.

MATERIALS/METHODS: 70 patients with chest pain had Agatston scores prospectively determined by two experienced cardiac radiographers. All CT examinations were performed on a Philips Brilliance 64 detector system, using a standard non-contrast enhanced prospective gated protocol (120kV, 3mm slice thickness). All images were anonymised and transferred to an off-line workstation for interpretation. A semi-automated algorithm identified areas of coronary artery calcification. The radiographers’ assessments were compared to the scores obtained by a consultant cardiologist with 8 years cardiac CT experience. Descriptive statistics and ANOVA were used for this analysis.

RESULTS: The mean Agatston score was 376 (range 1.4 - 3900). There were no significant differences between total Agatston scores between readers ($p = 0.98$). There was a non-significant trend to score variance with increased CS, for those with scores >1000 ($p = 0.45$). Further analysis revealed that image noise

contributed to 98% of this absolute score variance. Interestingly no significant difference was found in the calcium score quartile allocated to subjects.

CONCLUSION: Radiographer assessment of CS is feasible and accurate. If the NICE guidance is to be implemented it is likely that this can only be achieved with an extended role for radiographers.

14:15 – 16:15

Beyond PACS; The future for clinical data management

14:15 Redefining PACS - the drivers for change

Bull, C.

CJ Technical Consulting, Wokingham, UK

No abstract supplied.

14:35 Help! PACS is costing me a fortune

Werb, S.

Acuo Technologies, Bloomington, MN, USA

No abstract supplied.

14:55 Help!-I need to see the patients clinical data!

Robson, A. J.

Carestream Health UK Ltd, Hemel Hempstead, UK

No abstract supplied.

15:15 PACS vendor ‘neutral archives’ - are they neutral?

Condron, M.

McKesson Medical Imaging Group, Warwick, UK

This presentation outlines considerations for successful Clinical Data Management beyond PACS.

As today’s healthcare providers look to reduce IT operational costs through system consolidation and to have a single point of EMR integration for clinical data, they also understand that they need to successfully manage their data both through this migration and for any future system consolidations. Reducing the impact of the costly and time-consuming deployment may be achieved by mitigating future migrations with an open, standards-based architecture that is highly scalable and offers a cost effective solution to those facilities requiring a complex storage and image management solution.

Participants in this session will hear why particular attention should be paid to data management and data retention - based on both clinical and non-clinical factors when considering a new archive architecture. Why data exchange - based both on standards such as DICOM, HL7, XDS, etc and non-standard data formats are key to keeping data current and synchronized between systems is an important consideration. How data distribution or image sharing can be enabled with both existing and legacy systems with intelligent data exchange engines. And

finally, participants will hear why system scalability - for both the volume of data and number of systems attached - and system stability should not be ignored.

This presentation discusses the options available and the considerations needed when deciding to move to an enterprise archive and for success clinical data management.

15:35 The virtual MDT- accommodating the MDT process with data sharing

Dugar, N.
Doncaster Royal Infirmary, Doncaster, UK

No abstract supplied.

15:55 Sharing clinical data across healthcare communities

Harvey, D.
Medical Connections, Swansea, UK

Despite recent problems in England, much of the rest of the world is continuing to move forward slowly with the transition to electronic healthcare records, which enable them to be shared (subject to suitable information governance constraints) between different organisations. This sharing can take many forms including “push”, “pull” and increasingly, 3rd party repositories as managed by Google, Microsoft etc.

The following issues are reviewed:

- The need for unique patient identification
- Distribution and storage strategies
- Patient access and “ownership”
- Standards for the encoding of the data and meta-data
- Structured vs. Unstructured data
- Means of handling very large data such as radiological images
- Real world experience

14:30 – 16:00

Hands-on workshop: Cardiac CT II

Facilitator

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

No abstract supplied.

15:30 - 17:00

Refresher course: Thoracic vascular disease

15:30 CTPA in pregnancy

Eady, A.
North Bristol NHS Trust, Bristol, UK

Pulmonary embolism (PE) is a major cause of maternal mortality during pregnancy. In patients without deep venous thrombosis choice of investigation to diagnose PE is complicated by concerns about radiation dose to both the mother and foetus. There is growing consensus that in patients with a normal chest x-ray,

perfusion scintigraphy poses the least risk, minimising maternal breast and foetal dose, and has an excellent diagnostic yield. For patients with abnormal chest x-rays CTPA is the investigation of choice. However, CTPA quality is often impaired in this patient group as a result of their hyperdynamic circulation and physiological changes to respiration in the gravid state, thus scan technique needs to be tailored specifically in order to ensure that RESULTS are diagnostic. Methods for optimising CTPA scan quality and minimising dose will be discussed.

16:00 Imaging pulmonary hypertension

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

Imaging plays an important role in the diagnosis and management of pulmonary hypertension. This has been well recognised in the setting of chronic thromboembolic disease. However, with greater emphasis now on the medical treatment of pulmonary hypertension regardless of cause, imaging is becoming increasingly useful in the management of patients with other causes of raised pulmonary artery pressure.

This presentation will briefly review the clinical aspects of pulmonary hypertension and describe in more depth the radiographic and CT signs of pulmonary hypertension. The role that these and other imaging tests play in the work up of pulmonary hypertension will also be reviewed.

16:30 Acute aortic imaging

Morgan, R.
St. George's Healthcare NHS Trust, London, UK

PURPOSE: To provide an overview of acute aortic imaging.

MATERIALS/METHODS: The lecture will describe the pathophysiology and the imaging of diseases of the thoracic and abdominal aorta. The discussion will include a description of penetrating aortic ulcer, intramural haematoma, acute and chronic aortic dissection, thoracic aneurysm, thoracoabdominal aortic aneurysm, juxtarenal aortic aneurysm and infrarenal aortic aneurysm. Basic information on the treatment of these lesions will also be provided. CONCLUSION: CTA is the optimal imaging modality for imaging of the aorta.

15:45 - 17:00

Paediatrics film viewing and scientific session

15:45 Childrens perception and understanding of x-ray examinations and radiography

Davis, M. D. J. •Roe, A. L.
University College Dublin, Dublin, IRELAND

The purpose of this research is to describe how children appear to view the x-ray environment including what an x-ray is and the people associated with x-rays. A wealth of valuable qualitative

data, in the form of pictures and comments will be collected.

This data will be collected through the “draw and write technique” (Bradding & Horstman, 1999). The ‘draw and write’ technique involves the child drawing a picture in response to a given theme or topic and writing down any ideas. This tool is gaining popularity amongst health professionals as it generates powerful qualitative data, which can be used in its original form to provide immediate information and analysis for emerging themes. The investigative tools were chosen for their child - friendly nature and the fact that they were relatively encumbered by an adult perspective, whilst acknowledging that no method cannot be completely reliable at giving a ‘pure’ reflection of a child’s thoughts, views and perspectives (Bradding & Horstman 1999.)

The anonymous data will be interpreted using a coding frame, the coding frame will be developed and designed deductive to the data collection, one coding frame will be used to analyze both drawings and comments. The coding frame will take into account whether or not the child has or has not had an x-ray before.

15:55 A CT based finite element model for investigating mechanisms of injury in child abuse

Emerson, N.¹•Carre, M.¹•Reilly, G.¹•Morris, H.¹•Offiah, A.^{1,2}
¹University of Sheffield, Sheffield, UK, ²Sheffield Children’s Hospital NHS Foundation Trust, Sheffield, UK

PURPOSE: To investigate whether the geometry and material properties of mid-shaft cortical bone calculated via CT imaging can be used to determine the location of fractures under prescribed test conditions in an FE model.

MATERIALS/METHODS: Four porcine tibiae were imaged with a spiral CT (GE VCT 64 multi-slice) scanner and FE models created for each bone. Endplates were drawn in a CAD package and amalgamated with the cortical bone at the start of the metaphyseal region to replicate the constraints used in laboratory testing and to isolate the mid-shaft region.

FE test **RESULTS** were validated by comparison with matched loading tests of each scanned bone within a laboratory setting. The loading tests were conducted by the application of (measured) torsional forces to each bone specimen until fracture occurred.

RESULTS: Finite element model predictions of torsional rigidity correlated significantly with experimental torsional rigidity, validating the modelling process for future testing methods.

CONCLUSION: The use of FE analysis to determine failure mechanisms has great potential for use as a tool in fracture studies. Having validated the technique on a porcine model, we shall now conduct tests based on CT images of infants and children in order to improve our current understanding of mechanisms of injury in infants. In particular the technique may ultimately prove to be important for the validation of mechanisms of injury put forward by carers in the context of suspected child abuse, not only for shaft fractures, but also for fractures at other sites.

16:05 Mechanisms of injury in children under three years presenting to an emergency department

Hume, J.¹•Gibbs, S.²•Sprigg, A.²•Burke, D.²•Offiah, A.^{1,2}
¹University of Sheffield, Sheffield, UK, ²Sheffield Children’s NHS Foundation Trust, Sheffield, UK

PURPOSE: To improve our understanding of the mechanisms of accidental injury in children less than three years of age presenting to an Emergency Department (ED).

MATERIALS/METHODS: Prospective interview of consented carers accompanying children less than three years old to our ED, collecting a wide range of information regarding family background, current and past medical history and mechanism of injury (including but not limited to whether the incident was witnessed and by whom, height of fall, number of stairs, nature of surface on which the child landed etc). **RESULTS** of any laboratory tests performed are also being recorded. Two consultant radiologists (experts in child abuse) are independently reviewing all images in order to allow correlation between mechanism of injury and resultant fracture(s) - if any.

Local Research Ethics Committee approval was obtained.

RESULTS: We are on target to recruit 250 cases by the end of March 2011. We will correlate resultant injury with described mechanism and presence of an underlying pathological condition for each type of fracture (skull, long bone etc). We shall present the prevalence of particular fractures in three age groups (<1, 1 to 2 and 2 to 3 years) as well as the mechanisms by which they occur within the individual age categories. Descriptive statistical data and observer reliability for fracture detection (kappa) will be presented.

CONCLUSION: Results will be useful to clinical radiologists and expert witnesses, helping to inform the veracity of mechanisms of injury put forward by carers in cases of suspected child abuse.

16:15 When should treatment for developmental delay of the infant hip be commenced?

Jackson, M. R. •Wilkinson, S. •Wilkinson, A.
 Royal Hospital for Sick Children, Edinburgh, UK

PURPOSE: Supportive harness treatment for developmental dysplasia of the hip is a well-established therapy with a good evidence base. However, controversy exists concerning the optimum time to commence treatment. This study sought to clarify the optimum time to start harness therapy.

MATERIALS/METHODS: Retrospective analysis of cases was conducted covering a 6-year period. 307 individuals recalled for a follow-up pelvic radiograph at one year of age were identified. Radiographs were anonymised and independently assessed for features of developmental dysplasia by two radiologists using a standardized scoring proforma. Following scoring the treatment status of each individual was established and data analysis performed.

RESULTS: Radiographic evidence of hip dysplasia was found in 13 of 92 untreated patients (14%) and in 25 of 166 patients in whom treatment had been commenced before 8 weeks of age (15%). In those treated after 8 weeks of age, abnormalities

were found in 24 of 49 cases (49%), with abnormalities found in 82% of those treated after 12 weeks of age. Chi square analysis demonstrates significantly fewer abnormal radiographs in those treated before the following ages compared to after: 6 weeks ($p<0.001$), 8 weeks ($p<0.0005$) and 12 weeks ($p<0.0005$).

CONCLUSION: A much higher proportion of radiographically abnormal hips was found in individuals treated after 8 weeks of age with a further increase seen after 12 weeks. Our data suggests treatment should be commenced before 8 weeks of age when possible.

Notes

Scientific Poster Exhibition

Advances in Technology E-Poster

E101

SAR calculations and Spatial Gradients for MR compatible devices

Buckley, C.

Siemens Healthcare, Frimley, UK

PURPOSE/MATERIALS: Patients undergoing surgical implantation of medical devices prior to MR imaging has an impact on safe limits and thus monitoring and safety is crucial. With the advent of MR compatible implants and devices, understanding monitoring schemes of SAR, and spatial gradients is becoming more critical, this paper outlines in more detail how SAR is monitored in Siemens MAGNETOM systems and the available documentation

METHODS: SAR cannot be measured directly. Instead one can monitor and thus also limit the transmitted RF power. With knowledge about the hardware components within the transmit chain (e.g. loss), detailed knowledge about the transmit/receive coil (e.g. loss, B1 field distribution) and also the knowledge of the application of the transmit/receive coil (e.g. head coil) it is possible to determine the SAR

RESULTS: Magnetom system designed for scanning of people Hardware and software monitors to prevent running outside IEC guidance

Hardware monitors integrated in system and cannot be disabled Software monitors embedded into Syngo MR software (can be disabled with password and agreement)

Two areas monitored (RF Power deposition and Magnetic field variation)

CONCLUSION: SAR monitoring of clinical MR systems adhere to strict IEC guidelines in the UK, however these are above implant manufacturers recommendations, so understanding and monitoring SAR and the knowledge of spatial gradient and force product maps are crucial for minimizing patient risk

E102

Sleep patterns and change blindness. Preliminary results of a radiology flicker test.

Mucci, B.¹•Mexa, D.²•Simmons, D. R.²•Biello, S. M.²

¹*Southern General Hospital, Glasgow, UK,* ²*University of Glasgow, Glasgow, UK*

PURPOSE: Change Blindness is where large changes in an image go unnoticed by observers. This applies to radiographs particularly when comparing images or when scrolling through image stacks. This is a potential source of error in radiological reporting. To assess the effect of tiredness and other influences in observers we have developed a radiographic "Flicker Test" which allows a quantitative assessment of Change Blindness. We hope to use this to assess radiologists under differing

conditions and have trialled a small set of good and poor sleepers to test the functionality of the test and give a baseline for future experiments.

MATERIALS/METHODS: A group of 8 poor and 10 good sleepers were identified using a number of validated sleep measures. Subjects then participated in a Flicker Test composed of 6 radiographic images. The details of the test set are presented separately.

RESULTS: Response in detecting changes was slower in poor sleepers, with no difference in one case but poor sleepers slower in 5. In this pilot study it was not statistically significant. The p value being 0.289

CONCLUSION: Change blindness may be a neglected but important phenomenon for radiological error. The influence of sleep disruption, for example post on call working requires further investigation. In our preliminary study we show that a flicker test of radiographs can be used to assess susceptibility to change blindness and show that sleep may be a related factor. Clearly larger studies are needed but this presentation demonstrates the test in operation and provides some preliminary results.

E103

Update on radiation exposure from CT: Early progress in the third UK CT dose survey

Meeson, S.^{1,2}•Shrimpton, P. C.²•MacLachlan, S. A.²•Golding, S. J.¹

¹*University of Oxford, Oxford, UK,* ²*Health Protection Agency, Chilton, UK*

KEY LEARNING OBJECTIVES: National surveys since 1990 have shown a marked trend for increasing UK population exposure from computed tomography (CT). Continuing concerns for patient protection have prompted a new dose survey to review current multidetector CT practice in the UK. This study is presently ongoing but we will demonstrate survey coverage, early results and some of the planned data analysis.

DESCRIPTION: Data collection started in October 2010, with the aim of providing updated national reference doses for a wider range of key CT procedures on adult patients and head examinations on children. For adults the survey covers a variety of diagnostic examinations, including disorders of the head and neck, chest, vasculature, abdomen and pelvis, bowels, and urology. As the use and application of CT continues to grow we need to revise national reference doses, since they act as the baseline for potential dose constraints in follow-up optimisation studies. Using survey data we will also assess changes since the last survey in 2003 and provide guidance for some recently established examinations. After statistical analysis HPA will later prepare a report covering all aspects of the survey. This will summarise national practice and allow participants to compare local and national practice for an indication of relative performance.

CONCLUSION: The survey aims to identify good practice and

provide data on typical patient doses. This will help improve professional standards in CT by encouraging users to monitor scanned patient data, giving guidance on typical dose levels, and suggesting how to optimise patient dose.

E104

Does MRI have a role in the diagnosis and follow-up of osteomyelitis - a correlation with clinical symptoms and blood markers

Rajaratnam, V. • George, J. • Jayaprasagam, K.
University Malaya, Kuala Lumpur, MALAYSIA

KEY LEARNING OBJECTIVES: To describe the spectrum of MRI findings in patients with pyogenic vertebral osteomyelitis on diagnosis and on completion of 6-8 weeks of antibiotic treatment and to identify the specific MR imaging parameters that are in agreement with patients' clinical status and biochemical markers.

DESCRIPTION: 13 patients with vertebral osteomyelitis and 31 noncontiguous levels were reviewed. The MRI parameters that best correlated with clinical status on follow up were identified. Resolution of the epidural component, paraspinal component and formation of end plate to be the three MR imaging parameters those were in moderate to good agreement with patients' clinical status. The overall follow-up imaging findings were categorized as improved, equivocal or worse based on a simple grading system focused on the soft-tissue component.

RESULTS: Only 2 patients imaging MR findings that did not match the true clinical scenario.

8 of the 11 patients with improved MR finding showed clinical and biochemical improvement (accounting for 64%). 3 of the 11 patients with worsened imaging findings were subjected to surgery and confirmed poor control of infection. Hence, this validated the accuracy of the follow-up MR findings

CONCLUSION: Follow up MR imaging findings do correlate with the clinical status and biochemical markers when done during the 6 to 8 weeks follow up. Combination of parameters rather than relying on a single parameter should be used to monitor therapeutic response. Awareness of the atypical pattern and signal intensity of pyogenic vertebral osteomyelitis on the MRI is important to avoid delay in management.

E105

MR diffusion: a pictorial exhibit

Saba, L.¹ • Mallarini, G.¹ • Suri, J.²
¹*AOU Cagliari, Cagliari, ITALY*, ²*Idaho State University, Pocatello, ID, USA*

KEY LEARNING TECHNIQUES: Diffusion-weighted Imaging (DWI) is an extremely popular sequence in MR and its traditional uses is to evaluate infarction and abscesses. However, restricted diffusion can be seen in other conditions of lymphoma, trauma and hyper-acute multiple sclerosis plaques. DWI is a useful adjunct to other MR sequences and clinical history to form a more focused differential diagnosis. In this exhibit our purpose

is to review the biochemistry behind restricted diffusion and the principles and physics of Diffusion-Weighted Imagine (DWI), To illustrate clinical scenarios in which DWI may help tier a differential diagnosis and to depict restricted diffusion in cases other than traditional infarction and abscesses.

DESCRIPTION: In this exhibit we will review the basic biochemical principles of cell membrane function and cytotoxic edema as well as the basic physics and principles behind DWI. We will discuss the different type of DWI and their applications. Moreover selected cases illustrating restricted diffusion in infarction, lymphoma, DAI, abscesses, and hyperacute multiple sclerosis plaques will be presented.

CONCLUSION: DWI provides unique information about various pathological changes of the brain. DWI is sensitive for the detection of hyperacute infarcts, and useful in distinguishing acute or subacute infarcts from chronic infarcts moreover DWI is an extremely useful sequence to further characterization of several other pathological conditions like, abscesses, lymphoma, trauma and hyper-acute multiple sclerosis plaques. DWI is useful in differentiating cystic or necrotic tumors from abscesses or epidermoids. DWI can discriminate nonenhanced tumor infiltration from vasogenic edema, and differentiate dysmyelination from demyelination.

E106

CT perfusion in the management of acute ischaemic stroke

Navaratne, S. • Wan, M. S. • Jarosz, J.
Department of Neuro Radiology, Kings College Hospital, London, UK

KEY LEARNING OBJECTIVES:

- Demonstrate the method of data acquisition of CT perfusion (CTP) of the brain using our local protocol as example
- Illustrate the significance of the parameters assessed by CTP (MTT, CBF, CBV) and how these are used to assess the pathophysiology of acute ischaemic stroke in vivo
- Showcase real life examples of how CTP maps helps in decision making in the management of acute stroke, including typical examples and pitfalls
- Explore the current evidence base, limitation and controversies surrounding the use of CTP in stroke imaging.

DESCRIPTION: The introduction of thrombolytic agents in the routine clinical management of acute ischaemic stroke has fundamentally changed how it is managed. Accurate diagnosis and careful patient selection is central to maximizing its therapeutic benefit and reducing the occurrence of intracranial haemorrhage. CTP is a powerful technique which has been proven to be useful in this setting. It has been shown to increase the diagnostic sensitivity and confidence of acute ischaemic stroke. CTP findings have been shown to correlate with ischaemic core and penumbra and may predict outcome of acute stroke patients. It can be performed using existing infrastructures of radiology departments of most acute hospitals. The routine use of CTP in our hospital has extended the thrombolysis window to 6 hours in carefully selected patients and is useful in problem solving.

CONCLUSION: Our presentation provides a basic introduction to anyone hoping to advance their stroke service in their department by introducing CTP, a powerful and yet perhaps underutilised technique in UK departments.

E107

The milestones and current frontiers of musculoskeletal radiology

Menon, S. • Bhatti, W.
UHSM, Manchester, UK

BACKGROUND: Musculoskeletal radiology has come a long way since William Roentgen radiographed his wives hand in 1895. One is better poised to challenge new frontiers and invent, when one has a comprehensive understanding of the road he has travelled and the milestones achieved.

AIM: This exhibit aims to highlight the milestones in the growth of musculoskeletal radiology, in conventional radiography, from the days of wet reading of films to digital radiography,

in use of ultrasound in studying peripheral tendon pathology, and percutaneous intervention.

in CT from days of Godfrey Hounsfield to dual source scanners in MR from 0.2 Tesla scanners to 3T scanners with echo planar imaging, MR spectroscopy, Quantitative T2 imaging, T1 rho, and Ultra short TE scanning.

in Intervention from blind tendon injections to radio frequency ablations, cryoablations, vertebroplasty and balloon kyphoplasties.

This pictorial review discusses and illustrates the physics and clinical applications of frontier technologies with special emphasis on MR and Intervention musculoskeletal radiology.

CONCLUSION: It is imperative that we realise, especially in the current climate; that radiology is engaged in a stiff turf war with non-imagers, and is in danger of becoming extinct. It is hoped that this exhibit reminds us of our achievements, especially with respect to musculoskeletal radiology and reiterates the necessity to remain at the cutting edge of technology to thrive.

E108

Higher order spectra-based classification algorithm for B-mode ultrasound carotid plaque images into asymptomatic and symptomatic

Saba, L.¹ • Acharya, R.¹ • Nicolaidis, A.² • Suri, J.³
¹AOU, Cagliari, ITALY, ²AOU Cagliari, Cagliari, ITALY, ³Idaho State University, Pocatello, ID, USA

PURPOSE: Classification of carotid atherosclerosis into either symptomatic or asymptomatic is crucial in terms of diagnosis and treatment planning for cardiovascular diseases. This paper presents a computer-aided diagnosis (CAD) system which analyzes ultrasound images and classifies them into symptomatic and asymptomatic.

METHODS: Data include 146 carotid bifurcation plaques from 99 patients, 75 males and 24 females. Mean age was 68 years old (41-88). 102 plaques were identified as asymptomatic while

44 have shown symptoms. Images were normalized and seven features consisting of Higher Order Spectra (HOS), Discrete Wavelet Transform features and texture features were extracted. A SVM classifier with different kernels was used to classify the data. A Symptomatic Asymptomatic Carotid Index (SACI) was calculated based on the features.

RESULTS: SVM classifier with Radial Basis Function Kernel gave the best results in terms of accuracy (89%), sensitivity (89.1%) and specificity (89.6%). We determined that the HOS features and texture features were crucial for improved accuracy. The SACI showed significant difference between asymptomatic and asymptomatic.

CONCLUSION: Results of our study show that even with limited image based parameters, our CAD system using the SVM classifier provided ~90% accuracy. Further increase in accuracy, sensitivity and specificity of the classifier is possible using more relevant features. The SACI index can be used in a clinical setting for quick diagnosis

E109

Dosalyzer - A radiation exposure dose data analysis tool

Pisharody, S.
Hull and East Yorkshire Hospitals NHS Trust, Hull, UK

PURPOSE: The Ionising Radiations (Medical Exposures) Regulations 2000 requires employers to establish diagnostic reference levels (DRLs) for radio-diagnostic examinations. The aim of this project was to enable quick and efficient processing of exposure doses from various radiological examinations and procedures across the Trust, to ensure compliance with National and Local DRLs.

MATERIALS/ METHODS: Dosalyzer is a multi-user database application that provides a user-friendly interface to easily manage and analyse large amounts of exposure dose data. Examinations and rooms can be set up and grouped for analysis, specifying national and local DRL values for compliance-checking. Data for analysis may be filtered using an array of options including selecting a range from a histogram plot of the data. Reports can be easily generated for internal data quality and compliance checks as well as for submission to national regulatory bodies. Analysis results and reports can also be exported to Excel.

RESULTS: Dosalyzer is currently being trialled for routine data monitoring and analysis use by the Radiation Protection team at the Trust. Using a database has enabled quick and easy access to data across several months and a customisable analysis module has provided the ability to tailor audits as per requirements.

CONCLUSION: Implementation of a software tool to analyse dose data has freed up valuable man-hours for data analysis rather than processing. Reports generated from the system have helped enhance the understanding of radiology staff regarding patient dose for various examinations and procedures and make them aware of the need for accurate dose recording.

Advances in Technology Poster

P101

ROCView: prototype software moving toward easier data collection in JAFROC analysis

Thompson, J. D.¹•Hogg, P.²•Thompson, S. M.³
¹Furness General Hospital, Barrow-in-Furness, UK, ²University of Salford, Greater Manchester, UK, ³Independent Software Developer, Bury St. Edmunds, UK

The value of an imaging modality can be judged by a combination of physical and human perception measures. Jack-knife alternative free-response receiver operating characteristic (JAFROC) methods have developed as a suitable model for evaluating perceptual measures. JAFROC methods are advancement to traditional ROC analysis; JAFROC requires the reader to provide the precise localization of a lesion and to give a confidence (rating) scale response. This is known as a 'mark-rating' pair. A recent study of CT dose optimization and lesion localization prompted the creation of ROCView. ROCview is a web-based software prototype which facilitates accurate data recording in JAFROC studies. It allows multiple readers to view, localize and score confidence in the presence of suspected lesions across multiple modalities and cases. It also allows multiple localization opportunities per case. The focus is on making the reader accurately locate pathology and compare them to the true status of each case. To comply with guidance, reader responses are classified as a lesion localisation/true positive or non-lesion localisation/false positive via an acceptance radius that is built into ROCView. The reader does this by making mouse clicks on each case to indicate position and score confidence in their decision.

Reader responses are recorded into two reports as required for JAFROC analysis: true positive and false positive. Only minor manipulation of data is required before it can be analyzed with currently available JAFROC and Dorfman Berbaum Metz Multi Reader Multi Case (DBM-MRMC) software.

P102

Large scale dose audits using RIS systems in the North West, Service Delivery

Pike, A., Charnock, P.
 IRS Limited, Liverpool, UK

PURPOSE: The methodology for large scale dose audit using data from RIS has previously been published and demonstrated to be successful on individual hospitals and solely on plain film examinations. This study applies the methodology to multiple hospitals in the North West and includes other modalities such as fluoroscopy, interventional and CT. The aim was to replicate the reports produced by the HPA approximately every 5 years.

METHOD: Records were collected from RIS systems and processed in a statistical package. Impossible data was removed and statistical analysis was performed to remove suspect records.

The room mean was then calculated for each examination per hospital and compared to reference data from HPA and IPEM.

RESULTS: Following refinement of the data there was 271608 plain film records, 31456 fluoroscopy, and 52386 CT records from six large hospital trusts over an 18 month period. A regional DRL was established for this group of hospitals for all modality areas except interventional and compared to the national reference data.

CONCLUSION: This is the first time this methodology has been applied to a multi-centre study. Interventional was the only area that was unsuccessful. This was due to a non uniform convention of naming examinations. With some refinement of the process this method will be used to establish regional DRLs more frequently and with larger data sets than is currently done.

P103

Patient dose estimation in half-fan cone-beam CT by MC simulations

Hughes, M. •Mutch, S. •Lynch, J. •Cocker, M.
 Oxford Radcliffe Hospitals NHS Trust, Oxford, UK

PURPOSE: The introduction of Cone-Beam CT (CBCT) for image-guided radiotherapy can result in significant additional doses to radiosensitive organs. It cannot be assumed that these organ doses can be reliably predicted by the widely used ImPACT calculator as this software uses the results of a series of Monte Carlo simulations of fan-beam CT scanners. Particular difficulties arise with the Varian OBI (on-board imaging) as the half-fan acquisition method has the potential to significantly alter dose distributions.

MATERIALS/METHODS: Half-fan CBCT doses from Varian OBI 1.4 were estimated using an Excel VBA macro to simulate a series of planar exposures using the radiography dose software PCXMC. The results of these simulations were compared both with estimates produced using the ImPACT calculator and doses measured directly in a Rando phantom using thermoluminescent dosimeters (TLDs).

RESULTS: For a single 'low dose thorax' CBCT exposure the VBA/PCXMC calculator estimated heart, lung and spine doses to be 8.0, 8.1 and 9.9 mGy respectively. The ImPACT Calculator estimated heart and lungs doses of 10.0 and 9.9 mGy. TLD measurements of doses to the Rando phantom were 9.3, 7.5 and 5.6 mGy for the heart, lung and spine.

CONCLUSION: Head and lung doses agree well across the three methods, and all doses agree to within the order of magnitude requirements of patient dosimetry for imaging exposures. This suggests that existing tools may be sufficient for dosimetry of on-board CBCT for thorax exposures.

P104

Adaptive statistical iterative reconstruction (ASIR): redefining computed tomography (ct) dose reduction strategies

Olubaniyi, B. O. •Ninan, T. M. •Vardhanabhuti, V. •Roobottom, C. A.

Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES:(1) Brief description of ASIR (Adaptive Statistical Iterative Reconstruction) physics. (2) Compare diagnostic quality of CT scan images performed without and with ASIR. (3) Demonstrate various clinical applications of ASIR.

DESCRIPTION: Diagnostic x-rays account for the largest artificial source of exposure to ionizing radiation and CT represents the greater proportion. Traditionally, reducing CT dose result in an increase in image noise and a compromise on image quality. ASIR, on the other hand utilizes complex algebraic calculations to lower image noise and CT dose without loss of anatomical detail.

ASIR has been shown to reduce CT doses by up to 50%. A study conducted in our institution comparing the Dose Length Products (DLPs) of CT pulmonary angiogram scans performed in the same patients without and with ASIR showed statistically significant reduction in dose of up to 42% without compromising diagnostic accuracy (445.87 vs 257.59). This educational poster provides a brief description of how ASIR works. It also shows the diagnostic quality of images obtained with ASIR by comparing similar images of the same patients without ASIR. Thirdly, the various ways in which ASIR can be utilized will be discussed.

CONCLUSION: ASIR effectively lowers CT doses without compromising diagnostic quality. Radiologists need to be conversant with recent developments in CT dose lowering strategies such as ASIR and various ways in which it can be utilized clinically.

P105

Optimisation of CT Pulmonary Angiography Protocols on a 128 slice CT scanner

Zou, M.¹•Negus, I. S.²•King, S. J.³

¹University of Bristol, Bristol, UK, ²University Hospitals Bristol NHS Trust, Bristol, UK, ³Weston Area Health NHS Trust, Weston-Super-Mare, UK

PURPOSE. CT Pulmonary Angiography is a key imaging technique in the management of pulmonary embolism, but it involves a significant radiation dose to the patient. Breast dose to younger patients is of particular concern. This study evaluated measures to minimise radiation dose while maintaining diagnostic accuracy.

MATERIALS / METHODS. The scanner was a 128 slice Siemens Definition AS+. The existing scan protocol used 120 kV and mA modulation with reference Effective mAs of 110 and an estimated effective dose of 5 mSv. Three dose reduction measures were evaluated: Bismuth breast shields, setting 100 kV and 80 kV. Organ doses were measured using TLDs in an Alderson RANDO phantom. Image quality was assessed using an Alderson lung / chest phantom. A graded scoring scheme was used to assess the visibility of pulmonary arteries and simulated pneumonia.

RESULTS. Bismuth shields reduced breast dose by 25% with no change in overall DLP and no reduction in graded image quality. Reducing the kV to 100 and applying mA modulation reduced

breast dose by 35% and DLP by 40%. The image quality was slightly higher than for the standard protocol. Selecting 80 kV reduced breast dose by 60 % and DLP by 65% with graded image quality similar to 120 kV.

CONCLUSION: Reducing the tube voltage to 80 kV or 100 kV gave significant dose reductions with equal or better image quality. The optimum setting for the phantom was 100 kV, but this will vary with patient size and clinical validation is required.

P106

Save Our Skins - Identification and follow-up of patients at risk of skin injury from cardiac catheterisation procedures

Belfield, A.¹•Guest, S.²•Holt, E.³•Kelsall, J.⁴•Mashinini, T.³•Mitchell, C.³•Prow, K.⁵•Sweetman, L.⁶•Walker, B.⁷
¹Stockport NHS Foundation Trust, Stockport, UK, ²BMI The Alexandra Hospital, Cheadle, UK, ³University Hospitals of South Manchester NHS Foundation Trust, Manchester, UK, ⁴Blackpool, Fylde and Wyre Hospitals NHS Foundation Trust, Blackpool, UK, ⁵Wrightington, Wigan and Leigh NHS Foundation Trust, Wigan, UK, ⁶The Christie NHS Foundation Trust, Manchester, UK, ⁷Central Manchester University Hospitals NHS Foundation Trust, Manchester, UK

PURPOSE: Percutaneous coronary interventions have become more complex in recent years. Prior to 2008, skin injuries from these procedures had not been reported in the UK and were only seen in text books from cases in the USA. No specific, structured protocols were in place for the monitoring or prevention of these effects in patients in UK catheter labs. In 2009, a hospital in the North West received its first notification of a patient who developed skin necrosis after a PCI procedure.

MATERIALS/METHODS: North West Cardiac Catheter Labs established a high skin dose group to develop a standard policy for the region. Local oncologists and medical physicists were consulted to determine a suitable definition for a 'high' skin dose and also the relationship between dose-area product and skin dose. Consent and follow-up procedures were devised as well as a mechanism for providing patients with appropriate post-procedure information.

RESULTS: A flow-chart was developed for use in the cath lab, identifying the steps to take in case of low (<3 Gy), medium (3-5 Gy) and high (>5 Gy) skin doses. An information card was designed to issue to patients at greatest risk, advising them of potential side effects. Follow-up has been undertaken on 13 patients assessed to have received high skin doses. Minor skin changes have been seen in one patient.

CONCLUSION: A protocol for the identification and follow-up of patients at risk of skin injury from fluoroscopically-guided PCI procedures has been developed and successfully implemented in North West cardiac catheter labs.

P107

Cardiac computed tomography radiation doses in a mature clinical service

Iyengar, S.¹•Gosling, O. E.¹•Loader, R.¹•Mayo, L.²•Morgan-Hughes, G.¹•Roobottom, C.³ Raju, V.¹
¹Plymouth Hospitals NHS Trust, Plymouth, UK, ²Plymouth

Hospitals NHS Trust (Honorary), Plymouth, UK, ³University of Plymouth, Plymouth, UK

PURPOSE: CTCA use will increase in the UK with the implementation of the new NICE guidelines. Initially CTCA resulted in a high radiation dose to the patient; however the development of new technologies has led to a substantial drop in the effective dose. We aimed to examine the effective dose from CTCA within a mature service at a university teaching hospital and evaluate the affect of physician training and implementation of dose saving technologies.

MATERIALS/METHODS: A retrospective analysis of all scans performed between 09/2007 & 08/2010. The total DLP for the examination was included. To calculate the effective dose a cardiac specific conversion factor of 0.028 mSv(mGy.cm)-1 was applied to the DLP; rather than a chest conversion factor (0.014) which we have demonstrated significantly under-estimates the effective dose.

RESULTS: Over 3 years 1736 scans were performed.

Retrospective gating was exclusively used during the first 6 months. The mean radiation dose was 29.6 mSv.

With the introduction of prospective ECG gating (March 2008) the mean radiation dose halved to 13.6 mSv. In March 2009 the scanner parameters was set to zero padding and 100 KV reducing the dose to 7.4 mSv.

The mean radiation dose for all CTCA scans during the final 6 months was 5.9 mSv; this figure incorporates all scan using a variety of different protocols.

CONCLUSION: The introduction of dose saving technologies and algorithms alongside physician training and experience has led to the effective dose for all CTCA examinations reducing to a fifth of the original dose.

P108

Improved resolution, with no dose penalty compared to invasive coronary angiography and conventional cardiac CT, can be achieved with high definition CT scanning

Iyengar, S. E.¹•Gosling, O. E.¹•Loader, R.¹•Morgan-Hughes, G.¹•Roobottom, C.²•Raju, V.¹
¹Plymouth Hospitals NHS Trust, Plymouth, UK, ²University of Plymouth, Plymouth, UK.

PURPOSE: CTCA now has an established place in the investigation of patients with chest pain. High levels of calcification can present a challenge due to a "blooming" artefact, leading to a reduction in specificity. One technique to reduce the affect of calcification is the use of HD scanning; however the improvement in spatial resolution comes with a higher radiation cost. We aimed to compare the radiation doses between CTCA with HD, IR (iterative reconstruction), SFB-P (standard filtered back- projection) and IA (invasive coronary angiography).

MATERIALS/METHODS: Patients scanned with prospective gating in a clinical service were included. CTCA scans were performed on a Lightspeed VCT or HD750 (GE) and IA with a Phillips Allura system.

To calculate the effective dose a cardiac specific conversion factor of 0.028 mSv(mGy.cm)-1 was used rather than a chest conversion factor (0.014) as these significantly under-estimates the effective dose.

The effective dose for invasive coronary angiography was calculated with a conversion factor (0.24 mSv/Gy cm²) applied to the DAP.

RESULTS: The median radiation dose for CTCA using HD scanning was 5 mSv, there was no significant difference between HD scanning and the older technique of SFB-P (median 5.4 mSv p=0.747) nor was there a significant difference between HD scanning and IA. However the radiation dose for scans using IR was significantly lower.

CONCLUSION: In patients with a high level of coronary calcification HD scanning improves image resolution with no radiation dose penalty compared with other techniques. When possible scanning with IR significantly reduces the radiation dose from CTCA.

P109

Effective dose estimation for members of the public and staff around 125I seed brachytherapy patients

Navarro, C. •Doggart, A. •Crossman, J. •Nyekiöva, M.
Royal Berkshire Hospital, Reading, UK

PURPOSE: To measure dose rates at different distances from the patient surface for the safety of staff, general public and family members around brachytherapy patients treated for prostate tumours using permanent 125I seed implants.

MATERIALS/METHODS: The dose rate was obtained from 12 patients at four different distances in the plane of the prostate above the patient immediately after the implantation and at one point laterally to that plane where the Urologist or Oncologist stands. The measurements were performed with the Unfors solid state survey meter in the R/F mode which has an uncertainty of 10%. By summing that value in quadrature with the mean uncertainty in distance, the total error in dose rate measurement was estimated as 21%.

RESULTS: The mean dose rate at the surface of the patients was 91.2µGy/h (range: 16-180) falling to the dose rate 5.25µGy/h (range: 2-8) at 50cm. The data closely fitted a logarithmic trend curve (R²=0.9941). The dose rate at the doctors' position was 9.3µGy/h (range: 2.9-13).

CONCLUSION: An algorithm, that included occupancy factors, transmission through tissue, and decay of the source, was derived to calculate the lifetime effective doses to the grandchildren, pregnant daughter, sleeping companion and doctor; they were 0.75mSv, 0.41mSv, 1.70mSv and 0.08mSv respectively. The results are in close agreement with previous studies and show that the doses to the general public and staff are within the dose limits. Specific recommendations are given to keep doses as low as possible, with special regard of young children and pregnant women.

P110

Shielding requirements for protection against scattered radiation produced by dental cone beam computed tomography

Sweetman, L.¹•Walker, A.¹•SEDEXCT Project Consortium²

¹The Christie NHS Foundation Trust, Manchester, UK, ²The University of Manchester, Manchester, UK.

PURPOSE: Dental cone beam computed tomography (CBCT) installations have rapidly increased recently. A survey of the scattered radiation produced by this type of radiographic equipment was carried out to determine typical shielding requirements to limit the doses in adjacent areas.

MATERIALS/METHODS: The scattered radiation arising from the use of dental CBCT systems was measured in two ways. An active measurement with a dose rate meter during scans of artificial, tissue-equivalent scattering material and a passive measurement where thermoluminescent dosimeter were used to measure the cumulative dose over a period of weeks of routine clinical use. Users were asked to provide information on typical and maximum weekly workloads in the previous 12 months.

RESULTS: Active measurements were carried out on 10 different models of CBCT. The maximum dose per scan at a distance of 1 m from the CBCT was 47 μ Sv. Passive measurements were carried out in 6 locations. Predicted annual doses at a distance of 1 m from the equipment were 2 - 7 mSv. The range of workloads was 3 - 27 patients per week. To keep the dose in adjacent areas below an annual constraint of 0.3 mSv for a typical facility, shielding equivalent to 0.5 mm of lead would be required.

CONCLUSION: Significant radiation doses can be encountered in the vicinity of dental CBCT systems. Purchasers of such equipment should seek the advice of qualified experts and be aware that additional shielding will often be required to limit doses in adjacent areas.

P111

Use of table top simulations as part of a multi-disciplinary radiation safety initiative

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

PURPOSE: To provide a mechanism for demonstrating and improving awareness of radiation safety issues for workers in radiology and radiotherapy

MATERIALS/METHODS: In an attempt to improve feedback and understanding from previous radiation incidents, a programme of table top simulations was initiated. Small multidisciplinary groups of around 6 persons were invited to partake. These included radiographic, nursing, clerical and scientific staff. Sessions of around 60 minutes were facilitated by a single individual (DJR). Sessions consisted of a number of fictional but realistic scenarios ("plays") in which radiation safety had been compromised in one or more ways. Initial, further and final elements of each play were introduced in sequence. At

each stage players were asked to suggest appropriate actions and outcomes all of which were recorded on a flip chart. Each play ended with a summative discussion and consensus on outcomes. At the end of the session players were asked to evaluate their learning experience.

RESULTS: In preliminary trials, all players evaluated their experience positively

CONCLUSION: The technique may be a useful addition to radiation safety management.

P112

The role of PET-CT in chronic infection

Caddick, L.¹•England, A.¹•Vinjamuri, S.²
¹University of Liverpool, Liverpool, UK, ²Royal Liverpool & Broadgreen University Hospitals NHS Trust, Liverpool, UK

PURPOSE: With the role out of PET-CT across the UK non-oncological applications are rapidly being considered. There are emerging reports within the radiological community discussing the potential role for PET-CT in chronic infection. The aim of this report is to discuss the diagnostic opportunities for 18F-fluorodeoxyglucose positron emission tomography combined with computed tomography (PET-CT) in the detection and management of patients with chronic infection.

FINDINGS: Review of the literature combined with our institutional experience has identified six conditions in which PET-CT has demonstrated clinical utility. These include the evaluation of chronic osteomyelitis, complicated lower-limb prostheses, vascular prosthesis infection (VPI), complicated diabetic foot, pyrexia of unknown origin (PUO) and Acquired Immunodeficiency Syndrome (AIDS) related infection. FDG is highly sensitive to increased metabolic activity that occurs at the site of infection. Combined PET-CT can accurately identify, localise and characterise FDG positive infective foci. Reports on the evaluation of orthopaedic infections, including those relating to diabetes, suggest that PET-CT may become the imaging modality of choice.

CONCLUSION: Combined FDG PET-CT has an increasing role in the evaluation of chronic infection. It has been proven to be highly sensitive for identifying underlying infection which may not be detectable by conventional imaging procedures.

P113

Melanoma: The master of disguise - pictorial review of current status of the role of FDG PET/CT

Rowlands, J. •Searle, J. •Hagan, I. •Shaw, M. •Brown, E. •Wittkop, B. •Lyburn, I.
Cheltenham Imaging Centre, Cheltenham, UK

INTRODUCTION: Metastatic and recurrent melanoma is a master of disguise and can present in any organ system often without any symptoms.

BACKGROUND: The incidence of Melanoma is rising worldwide and the incidence in the UK is over 4 times higher than it was in the 1970's. FDG PET/CT is being increasingly

used in the evaluation of patients with malignancy. Melanoma has the potential to metastasize to a wider range of anatomical sites than most neoplasms. As melanoma is usually FDG avid, FDG PET/CT can be utilised in a number of clinical scenarios in which melanoma metastases are suspected. These include initial staging of high risk patients being considered for surgery, restaging patients with potentially surgical resectable lesions and equivocal lesions on other imaging modalities. From our database of > 5000 PET/CT scans carried out for oncological indications we present a range of cases illustrating these points. KEY LEARNING POINTS: 1. FDG PET/CT is vital for staging melanoma accurately.

2. Melanoma may metastasise to surprising locations and FDG PET/CT can sensitively detect these unsuspected lesions.

P114

A quality comparison study between 2 post processing algorithms for bone SPECT images

Nader, K. • Alam, K. • Strouhal, P. D.

Royal Wolverhampton Hospitals Trust, Wolverhampton, UK

AIM: To compare SPECT bone scintigraphic image quality generated after applying ASTONISH (Philips proprietary iterative reconstruction resolution recovery software) and Filtered Back Projection (FBP) reconstruction algorithms.

METHOD: 115 consecutive patients were scanned using Philips Brightview dual-headed gamma camera. Both ASTONISH and FBP images were produced for each patient generating two image datasets. Two assessors independently scored the quality of images: 1 as poor, 5 as excellent scored for image quality in four anatomical regions; a system piloted by the two assessors for consistency. Each SPECT bone scan was compared, with the third researcher subsequently scoring then reviewing the quality assessment and matching it to the appropriate algorithm. The quality data comparison of the two independent assessors was then analysed.

RESULTS: Review of images was concordant between all 3 observers in 97% cases: 104 cases (90%) ASTONISH generated better images; in 4 cases (3.5%) FBP was better; and in 4 cases (3.5%) both images were scored equally. For 3 cases (2.5%) the assessors were discordant but 2 scored the ASTONISH images as superior.

CONCLUSION: The ASTONISH reconstruction algorithm produces a far superior quality image when compared to FBP in SPECT Bone Scintigraphy with excellent interobserver agreement.

P115

MRI Visible FePt - nanoparticles for catheter localization in 1.5T

Rube, M.¹ • Samraj, P.¹ • Immel, E.¹ • Andre, P.² • Melzer, A.¹

¹University of Dundee, Dundee, UK, ²University of St Andrews, St Andrews, UK

PURPOSE: MRI provides valuable capabilities as superb soft tissue contrast, multiple contrast mechanisms, arbitrary

plane orientation and no exposure of any radiation. However the need of compatible instruments and devices localization is a fundamental problem during interventions. Therefore a robust, save and efficient method based on FePt nanoparticles is proposed for catheter localization. During MRI acquisition these markers appear as signal void due to their susceptibility artefact.

MATERIALS/METHODS: Six markers of a solvent with 5% FePt nanoparticles and nail polish was directly applied to a catheter using a micropipette and a scalpel for shaping. The overall performance has been tested using 0.9% NaCl solution phantoms in a clinical 1.5T MRI system (Signa, GE Medical Systems, Milwaukee, WI, USA) with a standard headcoil.

RESULTS: Different sequences, parameters and catheter orientations in respect to the main magnetic field showed proper visualization results. Overall the markers showed good device to background contrast in all phantom experiments. Handling tests showed that the increased diameter of the catheter by the markers is negligible for handling and mechanical performance. CONCLUSION: The catheter is a key device for cardiovascular interventions and visualization during imaging is required. We have demonstrated that FePt Nanoparticles are suitable for MR guidance, due to their good visibility, minimal size, absence of RF heating and no need for major adjustments to use the markers in different field strengths. However the susceptibility artefact dependency has to be taken into account. Further reliability qualification is required before any clinical evaluation. This work is in progress.

P116

Alternating reconstruction and registration for digital breast tomosynthesis

Yang, G.¹ • Hipwell, J. H.¹ • Tanner, C.^{1,2} • Clarkson, M. J.¹ • Hawkes, D. J.¹ • Arridge, S. R.¹

¹University College London, London, UK, ²Computer Vision Laboratory, ETH Zurich, Zurich, SWITZERLAND

PURPOSE: The demand for detecting changes associated with malignancy has become a necessary for mammography, and digital breast tomosynthesis (DBT) plays an auxiliary role to produce a more accurate comparison for temporal datasets using the added depth information. The aim of this project is to obtain an enhanced reconstructed volume, which advantages the registration accuracy concurrently by alternating the reconstruction of a pair of DBT acquisitions with their temporal registration.

MATERIALS/METHODS: Three experiments were performed. Firstly, a 3D toroid phantom was created, and then affine transformed, to simulate a pair of DBT data. Secondly, the same transformation was applied to an uncompressed 3D breast MRI. Lastly, we applied our method on a pair of DBT simulations with real in-vivo breast compressions. Two sets of limited angle X-ray acquisitions were created at different times using typical DBT geometry. We solved this combining problem by alternating an incomplete reconstruction optimisation for each

acquisition at each time point with the affine registration of the two current estimates. After each registration, and before next reconstruction iteration, we updated the first reconstruction using the affine transformation of the second. This outer-loop of reconstruction followed by a registration was repeated. The reconstruction and registration were solved by nonlinear-conjugate-gradient and hill-climbing optimisation respectively.

RESULTS: Compare to traditional method of registering two reconstructed volumes sequentially, we obtained better reconstructions and smaller mis-registration error (8.6mm vs 4.6mm).

P117

The effect of automatic exposure compensation algorithms in the technical evaluation of full field digital mammography X-ray units - work in progress

Koller, C. •Thompson, D. •Fenton, A. •Paisley, E. •Eatough, J.
UHNS NHS Trust, Stoke-on-Trent, UK

PURPOSE: For clinical breast imaging, automatic exposure compensation (AEC) algorithms are used to optimise the exposure. Technical evaluations of the units are undertaken by Physics using a breast phantom. The breast phantom can confuse the AEC algorithm creating non-clinical exposure factors.

MATERIALS/METHODS: Technical evaluation tests, according to NHSBSP 0604, were undertaken on four Siemens and two Hologic digital mammography X-ray units. Tests were then repeated using different AEC options to determine the effect on the reported results.

In addition tests were also undertaken using differently shaped breast phantoms

RESULTS: When using the recommended breast phantom, the effect of AEC algorithm is to increase post mAs by between 15% to 85% depending upon field size selected. Effect of phantom shape is still being explored, but initial results indicate that this is significant.

CONCLUSION: Full field digital mammography X-ray units in the UK breast screening program undergo a technical evaluation to determine if they meet the relevant European standard. The AEC option used can greatly influence the exposure factors chosen that impacts on the dose and image quality results obtained by the technical evaluation. This can influence whether or not the unit meets the required standards.

P118

Introduction of volume ultrasound for the assessment of gallbladder function. Our early experience

Yeung, A. •Tuckett, J. D. •Elliott, S. T.
Freeman Hospital, Newcastle upon Tyne, UK

PURPOSE: Volume ultrasound (VU) is a new technique in diagnostic imaging offering exciting clinical applications such

as multiplanar reconstruction and volumetric analysis. VU has been utilised in our institution to assess gallbladder function (GF) and diagnose gallbladder dysmotility. This poster aims to describe the technique and demonstrate how patient management is influenced by VU-assessed GF.

MATERIALS/METHODS: Case records of all VU GF assessments performed at Freeman Hospital (April 2006 - June 2010) were reviewed and correlated with test findings and subsequent clinical management. Ejection fraction of <35% was regarded as abnormal GF. Fisher's exact test was used to test significance.

RESULTS: 17/51 (33%) patients had abnormal GF. There was no significant difference in the proportion experiencing abdominal symptoms during the test between normal and abnormal GF groups. 13/17 (76%) patients with abnormal GF vs. 8/34 (24%) with normal GF underwent cholecystectomy (p=0.001). In the abnormal GF group 5/13 (39%) who underwent surgery reported symptom improvement. This proportion was similar in the normal GF post-cholecystectomy group. 1/17 (6%) patients with abnormal GF underwent further investigations vs 10/34 (29%) with normal GF (p=0.075). 1/17 (6%) with abnormal GF vs. 18/34 (53%) with normal GF were discharged without surgery (p=0.002).

CONCLUSION: VU is routinely utilised in the assessment of GF in our institution. Clinicians appear to act on the results of the test, with those found to have abnormal function more likely to proceed to surgery. Those with abnormal GF underwent fewer subsequent additional investigations. Symptom improvement rate was similar in both groups.

P119

Does radiology department contribute in nosocomial and cross infection incidents within a hospital?

Dawood, A.
Shaukat Khanum Memorial Cancer Hospital & Research Centre, Lahore, PAKISTAN

PURPOSE: The purpose of this study was to investigate if X-ray cassettes used during portable radiography could be a potential source of causing nosocomial and cross infection within the hospital environment.

MATERIALS AND METHODS: The study involved the swabbing of X-ray cassettes in a Radiology Department of a local hospital in Pakistan. The X-ray cassettes used during mobile radiography in Intensive Care unit (ICU), emergency and inpatient were considered for this research. Fifty cassettes were swabbed to look for any bacterial contamination, also for the presence or absence of methicillin-resistant *Staphylococcus aureus* (MRSA). A mapping exercise was completed following the location of an X-ray cassette typically used in mobile radiography. The exercise noted the level of direct contact with patient's skin and other possible routes of infection.

RESULTS: Results revealed that there were large levels of growth of samples taken from cassettes and developed in the Microbiology Department of the hospital. The mapping

exercise in which the route of a 35/43 cm cassette used for mobile radiography was tracked, demonstrated that contact with patient's skin and potential pathogens or cross infection was a common occurrence while undertaking mobile radiography.

CONCLUSION: The study concludes that X-ray cassettes are often exposed to pathogens and they are possible routes of cross infection since patient's skin often comes directly in contact with it. Therefore, x-ray cassettes are a potential source of cross infection and Radiology Department does partly contribute in the occurrence of nosocomial or cross-infection incidents in the hospital.

P120

Applications of positional MRI

Tyler, P. A. • Rajeswaran, G. • Butt, S.
Royal National Orthopaedic Hospital, Stanmore, Middlesex, UK

Open MRI has an established role in imaging claustrophobic and obese patients. Open positional MRI has the additional benefit of allowing dynamic scanning of patients in different positions, and is of particular use in the spine, where spondylolisthesis, disc protrusions and facet joint cysts, with secondary spinal canal or neuroforaminal narrowing may only be apparent in the sitting or standing positions, and not be present on a standard supine scan. We demonstrate striking examples of position-dependent pathology in the spine, and review new uses of positional MRI, including positional brain MRV.

Service Delivery E-Poster

E201

Reducing MRI demand in rheumatology

Wallis, D.¹ • Wallis, A. G.²
¹*Royal National Hospital for Rheumatic Diseases, Bath, UK*,
²*Bristol Royal Infirmary, Bristol, UK*

PURPOSE: To review musculoskeletal MRI requests made by a rheumatology team, with a view to reducing unnecessary scans and associated costs in a hospital which is under pressure from increasing demand.

MATERIALS/METHODS: Over a two month period, the number of patients seen in clinic, and the number of outpatient MRI requests made by all rheumatology doctors, was counted. 100 consecutive requests were reviewed for name and grade of requestor, named consultant, region to be imaged and reason for request. Results were discussed at a staff meeting and sent out to all doctors. The process was then repeated over a further two month period.

RESULTS: In the first period, one MRI request was made per 24 patients seen in clinic (141 requests). Of 100 requests reviewed, 67 were requested by consultant, 27 by registrar and 6 by SHO. 22 doctors requested scans; numbers per doctor varied from 1-21. Most frequently requested were lumbar spine (36 requests), sacroiliac joints (15 requests) and hips (11 requests). In the second period, one request was made per 36 patients

seen (73 requests) - a reduction of one third. **CONCLUSION:** It appears that simply discussing the topic of large numbers of MRI requests may have a positive impact on reducing demand. Based on the average monthly attendance of 1513 patients and a tariff of £233 for MRI, in our hospital this translates to a monthly reduction from 63 to 42 MRIs, saving £4893 per month.

E202

An audit to assess A&E physicians' reporting accuracy of CT heads and compliance with local NICE-based out of hours protocol for the investigation of clinically important brain injury

Chaudhary, H. • Imalingat, H. M. • Newton, T. • Nakhuda, Y.
East Lancashire NHS Trust Hospitals, Blackburn, UK

PURPOSE: At The Royal Blackburn Hospital, the Directorates of Radiology and Emergency Medicine have collaborated to introduce direct requests and provisional interpretation by emergency department staff. Out of hours, middle/senior grade A&E physicians can directly request a non-contrast CT head without radiologist input if agreed protocol criteria based on the NICE guidelines are met. This was partly to aid compliance with the European Working Time Directive (EWTD). We aimed to assess protocol compliance and reporting accuracy of the A&E physicians.

METHODS: Data collected retrospectively over 6 months from April 2010-October 2010. 50 cases were selected for further analysis. Radiology information system was reviewed for clinical details. Patient case notes were assessed for the level of A&E documentation. Quantitative analysis was performed to establish key trends within the cohort.

RESULTS: 78% of requests met the NICE guidelines compared to 2004 national average of 64%. Of the cases that failed 36% were due to non-specific or inaccurate/misleading documentation of the GCS value. 90% of cases were scanned within 1 hour. In 32% of cases there was no documented CT head interpretation by the A&E physician. In 14% of cases the A&E physician missed clinically significant findings although there were no adverse consequences for the patients.

CONCLUSION: We have shown that cross-directorate training has resulted in high concordance between A&E and radiology reporting of out of hours CT head imaging. This protocol aids EWTD compliance. Documentation is currently unsatisfactory and is being addressed via electronic requesting and further training.

E203

Discrete choice experiment - a method of valuing patient preference

Hathorn, J. • Oliver, H. • Khanna, K. • Cahir, J.
Norfolk and Norwich University hospital, Norwich, UK

PURPOSE: A patient preference for a radiology department, from waiting time to who sees them is important. A discrete choice experiment is a method of ascertaining patient preferences

and the trade offs they are willing to make enabling the focus of provisions.

MATERIALS/METHODS: We are undertaking a DCE in our department looking at patient preference's of 4 attributes of appointment timing and choice. These attributes have different levels ascribed to them. Using an orthogonal array a representative fraction of the attributes and conclusions pertaining to all the choices can be made. The participants will make a choice between two combination's of attributes. Some of these will force them into sacrificing one attribute to preserve another. For example some participants might state that the wait until their appointment is as important as being seen on time, but when forced to make a decision they may agree to a two hour wait to be seen the next day.

RESULTS: The results of a DCE are in a form that not only shows how each attribute ranks compared to the other but also the degree to which each attribute is valued. Which, when you combine it with the demographic data provides information that allows you to tailor your services to your different populations.

CONCLUSION: Discrete Choice Analysis is an under used and relatively new method of ascertaining how patients value aspects of service. Our study in progress demonstrates the methods and benefits this information can provide to your department to improve future patient satisfaction.

E204

Out-of-hours imaging an audit of the current practice at University Hospitals of Leicester NHS Trust

Ranga, N.

University Hospital Leicester, Leicester, UK

BACKGROUND: Radiology departments across the country are increasingly expected to perform routine investigations for inpatients during out of hours. This expectation will perhaps become a necessity once 'hospital at night' is implemented. This audit looks at out-of-hours imaging performed for patients in Emergency Medical Unit (EMU).

METHODS: All 'out-of-hours' (Weekdays 1700 to 0900 hrs and Weekends/bank holiday) imaging performed for EMU in April 2010 were included and patient notes were reviewed for the following locally set standards.

- All imaging performed out of hours should have a direct impact on patient management and this should occur prior to next available in-hours examination.
- All discussion with on call radiologist regarding cross sectional imaging should be documented.

RESULTS: A total of 266 investigations were performed during this period (Plain films-195, Ultrasound-3, Computed Tomography-66 and MRI-2). Of these, 159 (60%) had a direct measurable impact on patient management before the next available in-hours investigation. These included discharge (34), interventional procedure(22), urgent referral to other specialty(28) and starting of new treatment in 99 patients. Please note some patients had overlap of different management changes.

Ninety five percent of case notes had a documented entry of discussion with the radiology team and all cross-sectional imaging reports were conveyed by the radiologist to the clinical team.

CONCLUSION: A significant amount of out-of-hours imaging does not have any direct impact on patient management. There is good communication between the clinical and radiological team. A change in current practice is recommended by focussed training/teaching of junior doctors and radiographers.

E205

Diagnostic ultrasound in physiotherapy, what they are using it for and how we can help

McKiernan, S., Chiarelli, P., Warren-Forward, H.

School of Health Sciences, University of Newcastle, Callaghan, AUSTRALIA

KEY LEARNING OBJECTIVES: The presentation will discuss how physiotherapists use diagnostic ultrasound to provide biofeedback to patients and therapist on contraction of abdominal and pelvic floor muscles. In addition, information will be provided on how the radiology community can help physiotherapists who are seeking additional training.

DESCRIPTION: Diagnostic ultrasound is traditionally and extensively used within the radiology department however in recent years its use has expanded outside this traditional area into health professions such as physiotherapy. As members of the radiology community we are considered experts in the field, and as such we need to be aware of this expansion of use into other healthcare professions and be in a position to guide and mentor physiotherapists in the appropriate use of ultrasound. An Australian survey has identified areas that physiotherapists consider necessary to increase their skills. These areas include imaging anatomy, the use of machine controls and scanning the pelvic floor, abdominal muscles and shoulder.

CONCLUSION: Physiotherapists are using diagnostic ultrasound and its use in this profession is expanding however they need and want help. For members of the radiology community to guide and mentor physiotherapists in diagnostic ultrasound they must have an understanding of what physiotherapists are using the modality for and their perceived needs.

Service Delivery Poster

P201

"Don't let it cost you an arm and a leg" The use of safety checklists in interventional radiology

Chittal, R.¹•Ricketts, J. A.¹•Chapman, P.¹•Hornby, S.¹•Miles, R.²

¹Peninsula Radiology Academy, Plymouth, UK, ²Derriford Hospital, Plymouth, UK

LEARNING OBJECTIVES: To provide an overview of the WHO Surgical Safety Checklist in Interventional Radiology and emphasise the importance of a team-based approach in implementing these guidelines.

DESCRIPTION: Approximately 230 million people undergo surgical procedures every year. 7 million of these patients will suffer an adverse event as a result of their surgery, and 1 million of them will die as a result. In an attempt to minimise these numbers, the World Health Organization (WHO) developed a Surgical Safety Checklist which quickly gained international acceptance.

As interventional radiology grows as a specialty, it is increasingly important that we to adhere to the same standards of safety as our surgical colleagues. Consequently the Royal College of Radiologists (RCR) has developed the WHO Surgical Safety Checklist for Radiological Interventions.

This poster highlights the value of checklists in reducing preventable adverse events, thereby increasing patient safety and providing robust and reproducible standards.

CONCLUSION: The WHO Surgical Safety checklist for Radiological Interventions is a concise, easy to use, and valuable document, which when used effectively can reduce adverse outcomes and improve patient safety

P202

Developing a robust confidential alert report failsafe process for radiology supporting NPSA no16

Twist, D. • Anslow, L. • Anwyl, D.
St Helens & Knowsley Teaching Hospitals NHS Trust, St Helens, Merseyside, UK

PURPOSE: To replace fax based 'alert' coded radiology reports and paper based tracking process with an electronic solution. It was recognised that an electronic solution may help improve compliance with the NPSA requirements and improve governance processes with a robust audit trail.

MATERIALS/METHODS: Pilot use of 'Communicator TM' Healthcare Software Systems (HSS) an industry standard e-mail and SMS messaging system for a period of 12 months. Supported by HSS development staff we established a user group of 10 GPs and Consultants. A copy of the coded alert report was dispatched by secure e-mail to each referrer at a pre-determined time following the completion of a daily statistical report using the scheduler facility of HSS CRIS. During the trial we maintained use of manual system for comparison and as a safety net. 100% of users at the end of the trial indicated that the system was more secure and reliable and wanted to continue using it. We expanded the database to include all GPs, Consultants and AHPs.

RESULTS: As of 1/12/2010, 611 actual users (90% of our referrers) receive a copy of the full alert report within 24 hours of verification via secure e-mail. A response initiated by replying to the e-mail updates the database confirming to radiology the report has been actioned. Very little manual input is needed to keep the system operating.

CONCLUSION: Each report has a clear audit trail enabling radiology to ensure unexpected findings are dealt with in a timely and auditable manner conforming to NPSA no 16.

P203

How we do it - Radiology discrepancy meetings in a DGH

Prowse, S. J. • Etherington, R.
Countess of Chester Hospital, Chester, UK

KEY LEARNING OBJECTIVES: (1) To describe the way in which regular discrepancy review meetings have been implemented in a DGH setting. (2) To review the numbers of modality specific discrepancies. (3) To summarise time implications of the review process.

DESCRIPTION: Regular discrepancy meetings were implemented in 2004. Cases for review are identified incidentally or by systemic review (each radiologist is given 6 examinations per month to review - 3 CR, 1 US, 1 CT, 1 MR). Incidental cases can be submitted by any health care professional. Attendance at the meetings is recorded for appraisal. Reviewed cases are categorised and a risk rating is attached if appropriate according to the perceived severity of the radiological error. A clinical incident for the hospital system is generated where a significant abnormality that may compromise patient outcome is discovered. Since 2004 811 cases have been recorded including 52 cases for interest/teaching only. The cases included 90 MR, 344 CT and 322 CR. Examples of these discrepancies will be demonstrated to emphasise common errors. Average attendance over the last 5 year is 5 consultants corresponding to 257 SPA hours per year.

CONCLUSION: Implementation of a regular, well attended discrepancy meeting has allowed us to review a large number of cases. The frequency of meetings exceeds the RCR recommendations. Our weekly one hour meeting is regarded as an important learning process and provides evidence of quality review and good clinical governance.

P204

Common misconceptions of the ionising radiation (medical exposure) regulations within the radiology department

Maclachlan, S. A.
Health Protection Agency, Chilton, Oxfordshire, UK

KEY LEARNING OBJECTIVES: To improve understanding within the radiology department of the Ionising Radiation (Medical Exposure) Regulations (IR(ME)R).

DESCRIPTION: Having robust and practical IR(ME)R procedures in place to ensure safe practice is an essential regulatory requirement but becomes a practical safeguard as service delivery becomes more challenging in the UK. This regulation has been in place for 10 years and understanding around its meaning has matured as clinical practice has evolved. Whilst recent guidance on understanding IR(ME)R in radiotherapy has been published, there has been no equivalent for the diagnostic or nuclear medicine community. It has been highlighted that there are some common areas of misconception which require an explanation. Examples of these are; • The need for active entitlement of duty holders based on competency with regard to records of staff roles and training. • Clarity regarding

who is the practitioner for each exposure, particularly in emergency situations

CONCLUSION: IR (ME)R has its basis in radiation protection processes but is designed to focus on patient safety. Comprehensive procedures that match local practice are important to ensure a standardisation of practice and therefore improved patient safety. Clear understanding of what the legislation requires would assist departments in ensuring that their procedures are not only robust and practical but meet the requirements of the regulations. These are of paramount importance in ensuring patient safety as pressures on radiology departments increase.

P205

Reducing CT and MRI scans delayed due to language barriers

Zacharkiw, A. • Modi, S. • Keaney, C.

Sandwell and West Birmingham NHS Trust, Birmingham, UK

PURPOSE: With widespread cultural diversity within the UK, it is increasingly important to consider language barriers in Radiology Departments, especially when explaining risks of MRI and/or contrast administration. The aim of this audit was to reduce the number of delayed CT/MRI scans by highlighting the availability of an interpretation service.

METHODS: Prospective audit was carried out in 2009 to collect data concerning scans rebooked due to language barriers. Appointment letters sent to patients were then amended to include a specific paragraph asking patients to contact the radiology department if the interpreting service was required. Following this, re-audit was carried out in 2010.

RESULTS: The initial audit concluded that 1 outpatient scan was re-booked every 5 days. This resulted in average of 4 days delay for repeat CT and 14 days for MRI.

Following change to the outpatient appointment letters, there was an overall reduction in the number of scans cancelled to 1 in every 9 days.

CONCLUSION: Amendments to appointment letters and increasing availability of information regarding interpreting services are inexpensive methods of reducing the number of scans rebooked due to language barriers. This prevents unnecessary waste of limited resources, patient inconvenience and delay in diagnosis. There is need for the department to be aware in advance when these services are required. We propose that all appointment letters for radiological investigation make clear the availability of interpreting services. A further possible intervention to consider would be the availability of this information provided in a variety of languages.

P206

Multicentre trial of interruptions during ct reporting sessions

Butt, N. A.¹ • Samshuddin, S.¹ • Hinksman, L.² • Al-Sam, R.³ • Bashaeb, K. O.⁴ • Iqbal, A.⁵ • McLeery, M.⁶

¹Western Infirmary, Glasgow, UK, ²Stirling Royal Infirmary, Stirling, UK, ³Hairmyres Hospital, Glasgow, UK, ⁴Wishaw General Hospital, Wishaw, UK, ⁵Institute of Neurological Sciences, Glasgow, UK, ⁶Glasgow Royal Infirmary, Glasgow, UK

PURPOSE: CT reporting session is an integral part of a radiologist's work. This task is important, demanding and requires uninterrupted concentration. Unfortunately, a reporting session is frequently interrupted with both clinical and non-clinical issues. These interruptions have received limited attention in the published literature and departmental workflow planning. A radiologist should not be interrupted while reporting a case/scan. However, if interruptions are necessary such as simultaneous role of duty radiologist, interruptions should be audited to plan impact on reporting sessions.

MATERIALS/METHODS: Interruptions during CT reporting sessions were monitored for one week in 7 different imaging centres in west of Scotland. Reporting radiologists were asked to note all interruptions; record nature and approximate duration of interruptions. Additional note was made whether radiologist was interrupted while reporting a scan or in between scans.

RESULTS: A total of 70 reporting sessions during a working week were included in the audit. Maximum and minimum numbers of interruptions were 21 and 1 respectively. Total maximum cumulative duration of interruptions was up to 2 hours 50 minutes, which was considered very significant. Average interruption time was 55 minutes in one session. Majority of interruptions came from clinical teams. Second commonest were queries regarding scan planning/priority presented by radiographers. Others included advice to radiology trainees, secretarial staff and telephone calls.

CONCLUSION: Impact of interruptions during radiological reporting has been downplayed in the past but in a rather demanding radiological environment and increasing workload on a radiologist, these should be taken into consideration for planning of departmental workflow.

P207

Our experience of the nurse led gastrostomy care service and its impact of patient care

Thind, G. • Wilbraham, L. • Laasch, H.

The Christie Hospital, Manchester, UK

PURPOSE: The open access nurse led gastrostomy after care service was set up to improve patient care, reduce complications and infection rates. We have reviewed the impact of the service in its first 2 years since the first patient was treated in October 2008.

METHOD: Data was collected prospectively on patient details, reason for referral, investigations and treatments carried out as well as the outcome of each visit.

RESULTS: Over 150 patients have accessed the service on a total of 478 occasions. The data has been analysed for reasons of referral, treatment carried out, infection rates, admission rates cost effectiveness of the service and thus the savings made. We were almost always able to treat the patients on an outpatient basis with only 2 patients requiring admission during the review period.

CONCLUSION: The service had led to a significant reduction in inpatient admissions for complications of gastrostomy,

reduction in post procedure infection rates, and has improved the patient care and experience. The service provides direct access for patients, which allows for smoother more rapid delivery of care and has proved to be cost effective.

P208

The use of pre biopsy MRI of the prostate to increase the number of patients meeting the 62 day pathway for prostate cancer

Hughes, D. • Parr, N. • Simpson, H.

Wirral University Teaching Hospital, Wirral, UK

PURPOSE: We present an effective method of performing pre-prostatic biopsy MRI; this reduces the waiting time between GP referral and treatment and increases the number of patients meeting that target.

MATERIALS/METHODS: A search of PACS was performed identifying all patients undergoing a pre-biopsy MRI of the prostate in the 4 months before and after the introduction of pre biopsy MRI.

The time interval from referral to treatment and between request and MRI scan were noted along with the extra demand on the MRI department by introducing pre-biopsy MRI prostate. The number of patients who underwent an MRI with benign pathology at TRUS biopsy (who would have otherwise had a scan) was also recorded.

RESULTS: 85 patients underwent an MRI and prostatic biopsy. The number of patients who had a post-biopsy MRI after positive TRUS biopsy was 33. The number of patients who had a pre-biopsy MRI and positive TRUS biopsy was 30. 22 patients underwent an MRI Prostate and had a negative TRUS Prostate biopsy.

Under the old method of performing MRI post-biopsy, 40% of patients were within the 62-day target. Under the new method of performing MRI pre-biopsy, 58% of patients were within the 62-day target. 42% of patients under the new method of performing MRI pre-biopsy subsequent had negative TRUS biopsies. The additional demand on the MRI department was 5.5 scans per month.

CONCLUSION: The introduction of pre-biopsy MRI Prostate had a clear positive impact on the number of patients meeting the 62-day target. The additional demand on the MRI department was small.

P209

Unnecessary imaging of prostate cancer patients: time to tighten our belts?

Dumonteil, S.¹ • Rottenberg, G.¹ • Mandegaran, R.² • Cahill, D.¹
¹*Guy's and St Thomas' NHS Foundation Trust, London, UK,*
²*Kings College London, Medical School, London, UK*

PURPOSE: The increasing number of prostate biopsies being performed by the trust has led to a concomitant increase in demand for related imaging, particularly bone scanning. Local

and NICE guidelines define set criteria based on risk factors to determine which patients diagnosed with prostate cancer would benefit from further imaging. The aim of the study was to assess the level of adherence to these guidelines.

METHODS: All patients undergoing TRUS guided prostate biopsy in 2009 were identified and their electronic records examined to determine the result of their biopsy. Patients with a diagnosis of cancer had their records searched for related imaging and data was collected on risk factors for metastatic disease including PSA level and Gleason score.

RESULTS: 318 patients underwent prostate biopsy. 198 (62%) were diagnosed with prostate cancer and 108 (55%) patients underwent a subsequent bone scan. Of these, 72 (67%) met the defined criteria and 13 (12%) were found to have metastatic bone disease. 36 (33%) patients underwent a bone scan despite not meeting the criteria and in every case the result was found to be negative.

CONCLUSION: A third of patients receiving bone scans did not meet the threshold criteria and of these patients, none had a positive scan. Furthermore, follow up imaging for equivocal scans in these patients was also negative. Unnecessary bone scans and related imaging leads not only to potentially avoidable radiation exposure but also constitutes a significant cost to the health service which given the current financial climate it can ill afford.

Breast E-Poster

E301

Mammographic architectural distortion created by digital manipulation as a vigilance stimulus and assessment tool

Mucci, B. • Al-Adhami, A.

South Glasgow University Hospitals, Glasgow, UK

KEY LEARNING OBJECTIVES: (1) Discuss the vigilance challenge presented in detection of mammographic architectural distortion. (2) Demonstrate how "threat image projection" (TIP) helps in a similar situation in baggage screening. (3) Show how images can be created to introduce TIP into mammographic reading situations.

DESCRIPTION: In airline baggage screening by radiography the incidence of real weapons is uncommon and the objects can be contained within complex images. As a stimulus to maintain vigilance and to provide feedback for operator's images are randomly projected simulating threats. The situation is very similar in mammographic film reading for architectural distortion. Incidence is low and any feedback is often delayed: both contribute to lower levels of vigilance over time. By showing methods of producing distortion on mammographic images we suggest how created or inserted distortion could be used in a way similar to TIP in baggage screening.

Using photographic manipulation software architectural distortion can be created on an image. This can be done by projecting a real pathological image onto a mammogram using a clone tool, or distortion can be created using inbuilt distortion

tools available on commercially available software packages. Our poster illustrates examples of each and discusses how this could be incorporated into PACS images as a vigilance stimulus and test.

CONCLUSION: Vigilance for infrequently occurring events can be improved by random insertion of stimuli and immediate feedback. This could be done for mammographic distortion using inexpensive digital manipulation software.

E302

An analysis of readout compressed breast thickness versus measured thickness on a range of mammography machines

Hogg, P.¹•Hauge, I. H.²•McGill, G.³•Mercer, C.⁴•Szczepura, K.¹•Connolly, P.⁵

¹Salford University, Salford, UK, ²Oslo University College, Oslo, NORWAY, ³The Christie Hospital, Manchester, UK, ⁴Bolton Royal Hospital, Bolton, UK, ⁵IRS, Liverpool, UK.

BACKGROUND: Mean glandular dose (MGD) for women is estimated from breast thickness readouts given by mammography machines. **PURPOSE:** To determine accuracy of thickness readout on mammography machines.

METHOD: A thickness measuring device (TMD) was constructed and tested; this was then used in conjunction with a breast phantom. This phantom had compression characteristics similar to human female breast tissue. The phantom was compressed, and the thickness was measured using TMD and machine readout. Measurements were performed on a range of different mammography models (8 units in total; 6 different models/manufacturers) for two different sized paddles and compression forces (6 daN and da10 N).

RESULTS: TMD measures and thickness readouts were different for the duplicate units from two different models/manufacturers. The difference between machine readout and TMD for non-flexible paddles, applying 10 daN compression force was smallest for the Siemens Mammomat Inspiration (18 cm x 24 cm paddle: -0.9%, 24 cm x 30 cm paddle: -2.5% (p<0.01)) and largest for a GE Senographe DMR+ (18 cm x 24 cm paddle: +7.0%, 24 cm x 30 cm paddle: +13.1% (p<0.01)). For flexible paddles with 10 daN compression force the smallest difference occurred for the Hologic Lorad Selenia (18 cm x 24 cm paddle: -0.4%, 24 cm x 30 cm paddle: -0.8% (p<0.01)) and largest difference occurred for the Hologic Selenia Dimensions (18 cm x 24 cm paddle: -10.7%, 24 cm x 30 cm paddle: -15.7% (p<0.01)).

CONCLUSION: A correction is needed for the thickness when estimating the MGD for most units.

E303

Breast lesions incidentally detected on CT - what a general radiologist should know!

Jain, A. •Harris, O.

Whiston Hospital, Prescot, UK

KEY LEARNING OBJECTIVES: To familiarise the reporting general radiologist with

- Commonly encountered benign and malignant breast lesions.
- Post operative changes and complications.
- Ancillary findings which may aid in the diagnosis.

DESCRIPTION: Soft tissue of the chest wall, and in particular breast, is one of the important review areas when reporting a CT of the chest. It is vital that the reporting radiologist is familiar with the appearance of various common pathologies which can be encountered in the breast on a CT examination.

If misinterpreted they can cause unfavourable outcome in the form of either false reassurance or triggering a cascade of unnecessary investigations.

With our pictorial review we will familiarise the reporting Radiologist with

- 1) Frequently encountered benign and malignant breast lesions and their specific imaging findings on CT.
- 2) Various commonly encountered post operative changes and their CT appearance such as those of breast reconstruction, seromas. Furthermore the various complications encountered such as abscess formation, complication associated with prosthesis and reconstruction, tumour recurrence etc.
- 3) Other associated findings and review areas.

CONCLUSION: Reporting breast lesions on CT can pose a diagnostic challenge. It is important for general radiologists to recognise and report abnormal findings with confidence.

Breast Poster

P301

Ultrasound classification of the axilla during pre operative staging of invasive breast carcinoma

Findlay, J. L. •Yeang, H.

Wirral University Teaching Hospital, Wirral, UK

KEY LEARNING OBJECTIVES: Present our local axillary lymph node image classification.

DESCRIPTION: NICE recommend all patients with a proven invasive breast carcinoma should undergo a pre-treatment ultrasound assessment of the ipsilateral axilla. If an abnormal node is identified then needle sampling should be performed.

Since 2001 the National Breast Screening Programme has recommended a M1-5 and U1-5 scoring system for both mammography and ultrasound. In our department this is used routinely which quickens and facilitates the MDT discussion. Following the introduction of a staging axillary ultrasound we introduced an axilla A1-5 score for all patients with imaging or pathology consistent with invasive carcinoma.

We performed a peer literature review. Studies have correlated imaging with malignant potential, but a scoring system has yet to be published. Our department devised the following scoring system.

A1 No visible lymph nodes

A2 BENIGN

Normal size and architecture /morphology of lymph nodes

A3 INDETERMINATE

Longitudinal length > 1cm, longitudinal/transverse ratio<2,

normal cortical thickness.

A4 SUSPICIOUS

Cortical thickness >2.5mm or focally thickened,

A5 HIGHLY SUSPICIOUS

Cortical thickening >4mm +/- distorted fatty hilum. Complete loss of normal morphology, i.e. rounded echo poor node.

This poster presents the descriptive and sonographic pictures of our individual ultrasound classification and the characteristic findings for each of the scores 1-5.

CONCLUSION: Our new A1-5 scoring standardizes needle sampling among our radiologists and has improved communication at our MDT discussions. It is our aim to further validate the literature review by correlating the scoring system with our own department's data

P302

Practitioner variability of breast compression in mammography

Mercer, C. E.¹•Hogg, P.²•Lawson, R.³•Diffey, J.⁴

¹Royal Bolton Hospitals NHS Foundation Trust, Greater Manchester, UK, ²University of Salford, Manchester, UK, ³Central Manchester University Hospitals NHS Foundation Trust, Manchester, UK, ⁴Westmead Hospital, Wentworthville, AUSTRALIA

PURPOSE: To determine whether breast compression force varies between and within mammography practitioners.

MATERIALS/METHODS: Ethical approval granted for 500 clients; 488 met the inclusion criteria. Clients were imaged by 14 different practitioners. Collated data included: BI-RADS® density, breast volume, breast thickness, compression force and practitioner code.

RESULTS: Breast volumes and BI-RADS® densities imaged varied between practitioners. ANOVA found a highly significant difference in the mean compression values used by different practitioners, even for the same BI-RADS® density ($p < 0.0001$ for each BI-RADS® density). However, further analysis demonstrated three practitioner groups who did use similar compression to other members of the group. Six practitioners showed a significant correlation ($p < 0.05$) between compression force and BIRADS grade, with a tendency to apply less compression force with increasing BI-RADS® density. When compression was analysed by breast volume there was a wide variation in compression force for a given volume; even for practitioners within the same group. The general trend was the application of a higher breast compression force to larger breast volumes by all three practitioner groups. The slopes of the trend lines for each group were very similar with compression increasing by 1.6 daN per 1000cm³.

CONCLUSION: Compression force used by practitioners was analysed by BI-RADS® densities and breast volume; neither showed consistency amongst all practitioners, though it clearly identified three distinct groups using low, medium and high compression values. A multi-centre analysis, using a larger practitioner group, may prove useful.

Chest E-Poster

E401

Aortopulmonary window: A pictorial review of normal radiological anatomy and pathology not to miss

Madani, H.¹•Ganguly, A.²•Haworth, A.¹•Curtis, J.¹

¹Aintree University Hospitals NHS Foundation Trust, Liverpool, UK, ²Royal Liverpool Hospital NHS Foundation Trust, Liverpool, UK

LEARNING OBJECTIVES: To provide a pictorial review of the normal anatomy and common pathology within the Aortopulmonary (AP) window and to provide a systematic approach to lesion detection and differential diagnosis.

DESCRIPTION: Detection of pathology using chest radiography and Computed tomography provides diagnostic advantages but also many pitfalls, no more so than detection and diagnosis of aortopulmonary window pathology. Careful evaluation of this mediastinal region is important because it is a common site of varied forms of developmental, neoplastic, inflammatory, infective and vascular pathology, that can easily be misdiagnosed or simply missed. A sound knowledge of anatomy and a systematic approach to detection during screening is crucial to successful early diagnosis.

CONCLUSION: A pictorial review of normal anatomy and a systematic approach, highlighting important pathology is presented, to educate trainees on how best to successfully detect the key radiological features of common lesions within the AP window and minimise the common pitfalls faced in this crucial region of the chest.

E402

The CT features of Acute respiratory distress syndrome and its mimics

Reid, J.¹•Murchison, J.²•van Beek, E.²•Harper, J. C.²

¹Borders General Hospital, Melrose, Roxburghshire, UK, ²New Royal Infirmary of Edinburgh, Edinburgh, UK

Acute respiratory distress syndrome (ARDS) describes a relatively common and frequently lethal syndrome at the severe end of the spectrum of acute lung injury. Onset of symptoms is usually within 72 hours of the inciting event and complicates a wide variety of clinical disorders, such as severe sepsis (both intra- and extra-pulmonary) and inhalational injury.

Within the clinical setting of such recognized causes, ARDS may be defined as resistant hypoxaemia associated with bilateral pulmonary infiltrates in the absence of left atrial hypertension.

Due to the severity of illness, patients are mostly managed in high-dependency areas therefore bedside investigative techniques are often employed. Chest radiographs are most commonly used despite their lack of specificity. Common conditions such as acute pulmonary oedema can mimic ARDS as may others such as acute eosinophilic pneumonia and some interstitial lung diseases. Computed Tomography (CT) is often able to differentiate these from ARDS, yet it is underused.

As employing the optimal imaging technique can lead to earlier

diagnosis and treatment, an understanding of the CT features of ARDS and the conditions that mimic it is pertinent. An appreciation of the limitations of the frequently used alternative imaging technologies is essential if the patient is to be optimally managed.

LEARNING OBJECTIVES: (1) To become familiar with the pathophysiology of ARDS; (2) To understand the limitations of alternative imaging techniques in diagnosing ARDS; (3) To appreciate the CT features of ARDS; (4) To understand how to use CT features to differentiate ARDS from similar conditions.

E403

Cracking the code of HRCT - A pictorial review of the Fleischner Society Glossary of Terms for thoracic imaging

Wallis, A. G.

University Hospitals Bristol NHS Foundation Trust, Bristol, UK

KEY LEARNING OBJECTIVES: Understand the role of the Fleischner Society Glossary of Terms in defining the appearance of pulmonary pathology.

Enable the radiologist to crack the code of HRCT by providing an anatomical and analytical approach to HRCT interpretation.

DESCRIPTION: HRCT of the chest allows detailed evaluation of the lung parenchyma. The complex range of imaging appearances, disease classification and nomenclature often causes confusion. Whilst the key to the correct diagnosis lies often with the clinical context the radiologist must be able to accurately define the anatomical location and distribution as well as the pattern of pulmonary involvement demonstrated on HRCT in order to arrive at a useful differential diagnosis.

A comprehensive pictorial review of the pulmonary pathologies demonstrated on HRCT will be presented. The appearance of bronchiectasis, consolidation, cystic lung disease, emphysema, interstitial pneumonias, mosaic attenuation, mycetomas, nodules, pleural disease and small airway disease will be demonstrated. Important differentials will be given. Common areas of confusion will be highlighted and tips given on how to avoid them.

CONCLUSION: The Fleischner Society provides a Glossary of Terms which help the reporting radiologist crack the code of HRCT. The range of appearances will be reviewed and the radiologist will be provided with a structured approach to HRCT interpretation.

E404

Artefacts simulating pathology on CXR

Chaganti, S. • Konala, P. K. • Brown, S. • Riordan, R.

Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: Familiarise with various artefacts simulating pathology on chest radiographs, To develop a system of interpreting abnormalities that helps differentiating artefacts from real pathology and Direct further imaging in equivocal cases

DESCRIPTION: Chest radiographs are performed for a variety

of indications in a wide range of clinical settings. Radiographers obtain the best possible radiographs taking in to account of the patient's clinical status and mobility. This results in a variety of modifications to the traditional PA chest radiographs, for example, AP, semi-supine, supine and portable radiographs. As the radiographs are only two dimensional representations of the anatomical structures, structures that are outside the thoracic cavity can project on the lungs and can simulate pathology, for example hair braids and skin folds. With this in mind we aim to present a pictorial review of some interesting artefacts that simulate pathology using clinical cases from our institution.

CONCLUSION: It is important to recognise artefacts from real pathology on radiographs. Chest radiographs pose a special challenge in this regard as they are done in different clinical situations and obtaining an optimal radiograph may not always be possible to radiographers. Familiarity with the commonly encountered artefacts and adherence to basic principles help delineate artefacts from pathology and save unnecessary radiation exposure to patients and cost to the already burdened NHS.

E405

Acting on unexpected significant radiological findings: how to avoid a delay

Jibri, Z. • Adams, H.

University Hospital Llandough, Cardiff, UK

KEY LEARNING OBJECTIVES: Delays in communicating unexpected significant radiological findings may have serious consequences for the patient. Using a series of lung cancer cases, we demonstrate some of the factors which may lead to a delay in patient management following the detection of unexpected radiological findings. This aims to draw the reader's attention to potential pitfalls that may lead to a delay in the initiation of treatment.

DESCRIPTION: The failure of clinicians to act upon radiological imaging reports was recognised by the Royal College of Radiologists and the National Patient Safety Agency in 2007 and a number of recommendations for effective communication were made. The radiological report should clearly convey the important imaging features and a reliable system for effective communication of unexpected findings should be established. By using a number of cancer cases, we aim to demonstrate some of the factors which may lead to a delay in patient management following unexpected radiological findings and the subsequent clinical consequences. Recommendations for structuring of the initial radiological report and its communication to the referrer are drawn from several key documents.

CONCLUSION: There is a shared responsibility between the referrer and the radiologist to ensure that appropriate action is taken when there are unexpected significant radiological findings. Prompt action is paramount in avoiding missed opportunities for early treatment and to avoid litigation. All radiologists should be aware of the current guidance for communicating urgent or unexpected radiological findings.

E406**Routine post-thoracocentesis chest radiograph - retrospective study and literature review**Konala, P.¹•Vardhanabhuti, V.¹•Olubaniyi, B. O.¹•Gnanasambandam, S.²•Malghan, L.³•Roobottom, C.¹
¹Peninsula Radiology Academy, Plymouth, UK, ²Royal Devon and Exeter NHS Trust, Exeter, UK, ³Derriford Hospital, Plymouth, UK

PURPOSE: Routine chest radiograph following thoracocentesis is a common clinical practice. Our aim is to examine current practice at Derriford hospital and to evaluate the clinical value of chest radiograph following thoracocentesis. A review of literature is also undertaken to seek best practice.

METHODS: CRIS and PACS data collected from 100 consecutive patients who underwent thoracocentesis between Dec 2009 and Jan 2010 was retrospectively analysed. Comparison is made with current literature findings. 20 patients were excluded because they had additional procedures along with thoracocentesis.

RESULTS: A total of 80 cases were analysed. 53 % of these were male. The mean age of the study group is 71.9 years. All patients were asymptomatic prior to having a chest radiograph. The indication stated by clinician in all cases was to rule out pneumothorax. The incidence of pneumothorax is 5% (4/80). 3 of these occurred in patients who underwent diagnostic thoracocentesis and 1 in a patient who underwent therapeutic thoracocentesis. None of these patients required tube thoracostomy or further management. This data is consistent with other published data.

CONCLUSION: Routine chest radiograph to exclude complications (pneumothorax, haemothorax, and re-expansion pulmonary oedema) is still widely practiced. However our study and review of literature do not support this practice. The most recent guidelines from British Thoracic Society (Aug 2010) recommends a chest radiograph after a simple thoracocentesis only if the procedure was difficult and in symptomatic patients. There is also increasing evidence to support the use of real-time ultrasound guidance in thoracocentesis to reduce complications.

E407**The many faces of pulmonary sarcoidosis**Patel, S.•Chin, J.•Colledge, J. D.•Adams, A.•Aziz, Z.
Bart's and the Royal London, London, UK

PURPOSE: (1) To demonstrate the spectrum of imaging findings of pulmonary sarcoidosis. (2) To illustrate how the radiographic expression of sarcoid may mimic other pulmonary pathologies. (3) To provide histopathological correlation with the imaging presented.

Content organisation:

- Pathophysiology of sarcoid
- Spectrum of imaging findings with sample cases including:
 - Classical presentation with pulmonary nodules
 - Large nodular lesions
 - Miliary nodules, mimicking metastases

Perilobular pattern of disease
Calcified parenchymal nodules
Perihilar fibrosis

- Histopathological findings presented concurrently for the spectrum of presentations outlined above
- The differential diagnoses to consider with each presentation
- Summary

CONCLUSION: (1) Sarcoidosis has a multitude of typical and atypical presentations and should be included in the differential diagnosis of many radiological presentations. (2) A number of atypical presentations are highlighted with histopathological findings presented concurrently.

E408**Recognising and assessing iatrogenic devices on chest radiographs**Naaseri, S.¹•Graeme-Baker, S.¹•Annan, B.¹•Sadigh, S.¹
•Kazmi, F.²•Rubens, M.³
¹Chelsea and Westminster Hospital, London, UK, ²Chelsea & Westminster Hospital and Royal Brompton Hospital, London, UK, ³Royal Brompton Hospital, London, UK

AIM: To present a pictorial review of iatrogenic devices encountered on chest radiographs and familiarise the reader with the correct siting of such devices.

CONTENT:

- Introduction
- Case series of radiographs including cardiac, vascular, respiratory, gastrointestinal and chest wall iatrogenic structures.
- Self-assessment quiz

SUMMARY: With the advances in medical technology, radiologists are being presented with an ever increasing array of unfamiliar iatrogenic devices on chest films. Our review, collated from a series of radiographs carried out at a tertiary centre for cardiorespiratory disease, aims to demystify these and emphasise their correct positions to assist in the reporting of such radiographs.

E409**A pictorial review of cavitating pulmonary lesions**Fawcett, R.•Hunt, R.•Chandratreya, L.
Southmead Hospital, Bristol, UK

KEY LEARNING OBJECTIVES: The radiological definition of a cavity is a lucency within a zone of pulmonary consolidation, a mass, or a nodule. It is predominantly plain radiography and computed tomography (CT) that forms the basis of chest imaging and these modalities can be useful in differentiating among the aetiologies of cavitating pulmonary lesions. With reference to our case-series we present x-ray and CT appearances of a range of such lesions, aiming to educate on the potential diagnoses and how to differentiate between them.

DESCRIPTION: Our pictorial review demonstrates the appearance of a variety of cavitating pulmonary lesions. Cavitation detected by plain radiography has been noted in 7 to 11% of primary lung cancers. Other primary tumours in the lung,

such as lymphoma and Kaposi's sarcoma, may present similarly. Bacterial infection is a common culprit. Staphylococcus aureus is known to cause cavitation on plain x-ray and CT in both adults and children. Mycobacterium tuberculosis is classically associated with cavitating pulmonary disease, while aspergillus and histoplasma may cause similar appearances. HRCT can demonstrate cavitation within lung nodules and infiltrates seen in multisystem diseases such as Wegener's granulomatosis and Sarcoidosis. Pulmonary infarction and necrosis may also show cavitation. The nature of the cavity, such as wall thickness and the presence of fluid, combined with other radiological features in the surrounding tissues provide the means of diagnosis.

CONCLUSION: The spectrum of diseases associated with pulmonary cavities is daunting, but narrowing the differential diagnosis can be facilitated by a careful review of radiological appearances.

E410

Effectiveness of Valsalva manoeuvre in increasing pulmonary artery opacification during CTPA in pregnancy

Williams, J. W. • Moghaddam, A.

Mater Hospital, Brisbane, AUSTRALIA

PURPOSE: Non-diagnostic CTPA in pregnancy may reflect the increased flow of non-opacified blood from the pelvis, which is exacerbated by deep inspiration. The purpose of this study was to investigate the impact on pulmonary artery attenuation of infusing contrast after maximum inspiration (during a Valsalva manoeuvre), rather than during inspiration.

MATERIALS/METHODS: 20 patients were assessed between weeks 19-39 of pregnancy.

75 mls of Ultravist (300 mgs/dl) was injected at 4 mls/sec with a chase bolus of 50 mls of saline, either during (Group A) or after (Group B) inspiration

Imaging at suspended inspiration was obtained on a Philips 'Brilliance 64' at 64 x 0.625 mm, and a pitch of 0.89, with reconstruction interval of 1.0mm.

Mean attenuation values were measured 2 cm proximal to the bifurcation of the main pulmonary artery. The number of studies reported as of limited diagnostic value, and non-diagnostic was recorded.

RESULTS: Though the attenuation differences did not reach statistical significance, studies in Group B had lower mean pulmonary artery attenuation (204 vs. 227 H.U.), and were associated with increased risk of a non-diagnostic study (2 vs 0 studies) or a study of limited diagnostic utility (7 vs 3 studies).

CONCLUSION: Using a Valsalva manoeuvre to reduce venous return from the pelvis before contrast injection is associated with reduced attenuation of blood in the main pulmonary artery, and increased risk of a non-diagnostic CTPA study.

E411

Radiofrequency Ablation of primary and secondary lung cancers: our experience

Ng, M. • Arora, P. • Rajashanker, B.

Manchester Royal Infirmary, Manchester, UK

PURPOSE: Radiofrequency ablation of lung tumours is a service which has been introduced at Manchester Royal Infirmary starting in April 2009. We performed an audit to assess how successful radiofrequency ablation has been in controlling local disease and distant metastases.

MATERIALS/METHODS: The data was collected from patient notes, CRIS and PACS. These sources were scrutinised for the dates of the radiofrequency ablations and whether follow-up CT examination had shown any evidence of local or distant metastases. The patient notes were also scrutinised for additional therapies (eg. chemotherapy, radiotherapy) in conjunction with radiofrequency ablation.

RESULTS: Out of 8 patients, 4 patients have shown no evidence of local or distant metastases which is a positive finding thus far. 3 of the 4 patients had radiofrequency ablation only. We are awaiting the results of CT examinations of further patient's post-radiofrequency ablation.

CONCLUSION: Our experience so far has been positive with half of patients showing good disease control.

Chest Poster

P401

Pictorial review of asbestos related pleural disease

Chaganti, S. • Konala, P. K. • Riordan, R.

Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: Recognize the varied radiological appearances and the spectrum of manifestations of asbestosis related pleural disease on CXR

Direct further imaging in equivocal cases and suspected malignancy

DESCRIPTION: Asbestos related thoracic disease mainly involves the lung and pleura and is predominantly caused by amphibole fibres. Amosite (brown asbestos) and Crocidolite (blue asbestos) are notable examples of the amphibole variety which are biopersistent due to their structure and shape. Even though the amphibole variety of Asbestos is prohibited in early 70's, owing to the long latency period between the exposure and onset of disease, we still continue to see Asbestos related thoracic diseases. In this pictorial review we concentrate on the spectrum of pleural manifestations using clinical cases from our centre.

Asbestos related pleural disease range from benign pleural effusions to malignant mesothelioma all of which may have a varied appearance. Benign pleural disease manifests on imaging as pleural effusions, pleural plaque, and diffuse pleural fibrosis and round atelectasis (Blesovsky syndrome). Familiarity with varied radiological appearances of pleural disease is important to differentiate between benign and malignant conditions. Radiologist needs to be accurate with the terminology used to describe the pleural abnormality as it has clinical and medico-legal implications. Further imaging with CT and PET/CT is invaluable in equivocal and suspected cases of mesothelioma.

CONCLUSION: Knowledge of the pathological process and

familiarity with the spectrum of imaging appearances of the varied conditions facilitates the recognition and accurate characterization of the range of asbestos related pleural disease.

P402

A pictorial review of the pleuro-pulmonary manifestations of rheumatoid disease

Massey, H. L. •Mortimer, A. •Edey, A.
Southmead Hospital, Bristol, UK

KEY LEARNING OBJECTIVES: We aim to provide a comprehensive imaging review of the pulmonary and pleural complications of rheumatoid arthritis.

DESCRIPTION: Rheumatoid arthritis is a relatively common multisystem disease associated with significant mortality and morbidity. Thoracic disease, both pleural and pulmonary, is a frequent extra-articular manifestation of rheumatoid arthritis and is responsible for approximately 20% of rheumatoid associated mortality. Rheumatoid and its associated therapies can affect all compartments of the lung inciting a range of stereotyped pathological responses and it is not infrequent for multiple pathologies to co-exist. In some instances development of pulmonary complications may precede the clinical presentation of rheumatoid disease and be the first indication of an underlying connective tissue disease.

We present a range of complications highlighting both the rare and common manifestations, providing a clear summary and illustrated examples of potential radiological signs as an educational guide for the trainee and consultant.

CONCLUSION: Pleuro-pulmonary manifestations of rheumatoid arthritis are common and potentially fatal. It is important that the Radiologist is aware of the range of complications in order to guide management.

P403

New swine flu influenza A (H1N1) infection on computed tomography

Bakhshayeshkaram, M. •Saidi, B. •Tabarsi, P. •Zahirifard, S.
NRITLD, Tehran, IRAN, ISLAMIC REPUBLIC OF

PURPOSE: The aim of this study was to evaluate the computed tomography scan of patients with documented influenza A (H1N1).

MATERIALS/METHODS: Thirteen patients (6 men and 7 women), with documented H1N1 infection confirmed by RT-PCR from November 2009 to January 2010 were included in our study. The computed tomography scans of the patients were reviewed regarding pattern (consolidation, ground glass, nodules and reticulation), the distribution (focal, multifocal, and diffuse) and the lung zones involved. The patient files were studied for their possible underlying disease. LDH and CPK level was available for 9 and 10 patients respectively.

RESULTS: The mean age was 35.54. Eight patients had Co-existing condition (2 Respiratory, 2 cardiovascular, 1 Immunodeficiency, 1 Cancer, 3 others). 6 (46.2%) patients

required ICU admission. 3 (23.1%) patients died. The most common radiographic abnormality was ground glass opacities (10/13; 76.9%) followed by consolidation (6/13, 46.2%) in the peribronchovascular region (8/13; 61.5%) which was most commonly observed in the upper zones (left 76.9%; right 76.9%). (figure1) Six (46.2%) patients had more than 3 lung zones involved. 7 (53.8%) patients had pleural thickening or effusion. 2(15.4%) patients had hilar or mediastinal adenopathy. CPK was high in 3/10 and LDH in 9/10.

CONCLUSION: In patients with the novel swine flu infection the most common computed tomography manifestation in our centre was ground glass opacities in the upper lung zones.

P404

Endobronchial ultrasound

Kibriya, N.¹•Pandey, A.¹•Abhyankar, M.¹•Irion, K.¹•Giles, T.²•Smyth, C.²•Mohan, K.¹•Binukrishnan, S.¹
¹Liverpool Heart and Chest Hospital, Liverpool, UK, ²Royal Liverpool University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: To understand Endobronchial Ultrasound (EBUS) and its applications.

DESCRIPTION: EBUS is a bronchoscopic technique with a curved linear array ultrasound probe at its distal end which in addition to B mode scanning has colour and power Doppler capabilities. The camera is set at an angle to accommodate for the ultrasound. A 21/22G needle under preformed suction can be inserted through a side port to obtain direct image guided tissue sample or fluid aspiration.

Lung cancer is the world's second most common cancer. Accurate diagnosis and staging is crucial in treatment. 70 % of cases can be diagnosed by bronchoscopy but the remaining cases need other methods which include CT guided biopsy and EBUS. CT Staging has a sensitivity of 60 % and specificity of 80 %. Around 40 % of enlarged nodes are benign and 15% of non enlarged nodes are malignant. PET has a high negative predictive value but poor positive predictive value. Thus tissue is required which can be provided by EBUS and has an accuracy of 98%.

EBUS is also useful in diagnosis of other mediastinal and hilar masses like in sarcoid, tuberculosis, lymphoma and cysts. These diagnoses were traditionally made by performing invasive mediastinoscopy. The ability to access multiple nodal stations in EBUS is superior to other techniques such as mediastinoscopy and EUS.

CONCLUSION: EBUS is a minimally invasive outpatient technique which is crucial in the accurate diagnosis and staging of lung cancer in addition to the diagnosis of other mediastinal masses.

P405

VQ-SPECT in pulmonary embolism: a district hospital experience

Yeung, A. •Jefferson, E. •Mackie, A.
University Hospital of North Durham, UK

KEY LEARNING OBJECTIVES: (1) To describe and discuss the relatively new tomographic technique of ventilation perfusion single photon emission computed tomography (VQ-SPECT) in the diagnosis of pulmonary embolism (PE). (2) To describe our experiences of being one of the first nuclear medicine departments to introduce VQ-SPECT into the PE diagnostic pathway in the UK.

DESCRIPTION: PE is a common condition with a high mortality rate in the undiagnosed. Planar VQ imaging has, for many years, been utilised for the diagnosis of PE. However, this has a relatively low specificity and produces a considerable number of non-diagnostic scans. In recent years, computed tomography pulmonary angiography (CTPA) has, with its superior depiction of anatomical detail, largely superseded planar VQ imaging. Concerns regarding radiation dose and the inherent risks surrounding iodinated intravenous contrast have led to interest in the development of VQ-SPECT as an additional diagnostic tool. VQ-SPECT allows tomographic evaluation of the chest and has been shown to be superior to planar imaging in the detection of PE particularly in the subsegmental vessels. VQ-SPECT may also be utilised in the presence of other pathologies such as pneumonia and heart failure with these processes exhibiting characteristic VQ-SPECT patterns.

CONCLUSION: VQ-SPECT is a relatively new technique for PE diagnosis offering high sensitivity with a relatively low radiation burden in comparison to CTPA. An overview of VQ-SPECT will be presented along with our experiences of this technique since it was first adopted in our district hospital department in December 2006.

P406

Audit of CT guided chest biopsy 2003-2009

Parekh, P.●Jones, T.●Hill, S.

Newcross Hospital, Wolverhampton, UK

PURPOSE: To assess the effectiveness of 425 CT guided biopsy between January 2003 and December 2009. To ensure the incidence of complications were within recommended guidelines.

MATERIALS/METHODS: 425 CT guided biopsies were carried out by one Consultant on a Toshiba Asteon 4 slice CT scanner using a 18G coaxial biopsy needle. The location of the thoracic lesion and any complication that occurred post procedure was documented. Equivocal histological reports were followed-up to determine the incidence of false negatives.

RESULTS: 327/398 lesions biopsied(82.2%)were positive for malignancy, giving a positive predictive value of 100%. 68/398 lesions showed no definite histological evidence of malignancy on core biopsy, of which 30/398 were subsequently proven to be false negatives. This equates to a sensitivity of 91.6%, specificity of 100% and negative predictive value of 55.9%.

336/398(84.8%) biopsies did not result in a complication. 49/398 developed a pneumothorax(12.1%). The incidence was significantly higher ($p<0.0001$) following biopsy of intrapulmonary (47/162)than peripheral lesions (2/236). Chest

drain insertion was necessary in 16/398 cases. 12/398 biopsies (3.0%) resulted in haemorrhage, of which 10/162 followed intrapulmonary biopsies and 2/236 were peripheral lesions. Empyema followed biopsy in 2 peripheral lesions. No deaths were attributable to the procedure.

CONCLUSION: The complication rates for CT guided biopsy over the five year period were well within recommended guidelines. The complications are higher in the intrapulmonary thoracic lesions as the needle passes through a greater area of lung parenchyma. Although the false negative incidence is low (30/398,7.5%), a high proportion of those biopsies were subsequently proven to be malignant neoplasms(30/69, 43.5%).

Cardiac E-Poster

E501

Sinus of valsalva: embryology, anatomy, and pathology

Saba, L.¹●Sanni, S.¹●Mallarini, G.¹●Suri, J.²

¹AOU Cagliari, Cagliari, ITALY, ²Idaho State University, Pocatello, ID, USA

KEY LEARNING TECHNIQUES: The 3 sinuses of Valsalva are located in the most proximal portion of the aorta, just above the cusps of the aortic valve. The sinuses correspond to the individual cusps of the aortic valve. The sinuses end in the area of the sinotubular junction, and the tubular portion of the aorta begins here. In this exhibit our purpose was to evaluate (1) Developmental anatomy of the sinus of Valsalva. (2) Revisit the typical insidious nature of aneurysms of the sinus of Valsalva and when to suspect their presence. (3) Signs and symptoms of acutely presenting aneurysms of the sinus of Valsalva, which are usually due to rupture. (4) Non-aneurysmal pathology affecting the sinuses of Valsalva.

DESCRIPTION: the content organization the following: 1) Embryology and anatomy of the sinuses of Valsalva 2) Epidemiology and prevalence of congenital and acquired aneurysms of the sinus of Valsalva. 3) MDCT illustrative cases of insidious and acutely presenting aneurysms of the sinus of Valsalva 5) Non-aneurysm pathology cases including complications of post valvular or aortic root repair and trauma 6) Aneurysm rupture complications including left to right shunts, fistulas, and regurgitation.

CONCLUSION: Aneurysm of a sinus of Valsalva is a rare congenital cardiac defect that can rupture, causing heart failure or other catastrophic cardiac events. If the aneurysm remains unruptured, it occasionally causes obstruction of cardiac flow resulting from compression of normal structures. Dissection of the aneurysm into the cardiac tissues may occur, causing obstruction or destruction of local structures.

P502

Cardiac MR for dummies

Durrant, A. C.¹●Simpkins, C. J.¹●Iyenger, S.²●Macanovic, M.¹●Roobottom, C.²●Mitchell, G.²

¹Royal Cornwall Hospital, Truro, UK, ²Derriford Hospital, Plymouth, UK.

KEY LEARNING OBJECTIVES: (1) To identify the common indications for cardiac MR (2) To explain the sections and planes acquired during cardiac MR (3) To simplify and rationalise the sequences obtained

DESCRIPTION: Cardiac MR (CMR) is rapidly evolving as a first-line, non-invasive investigation into cardiac disease. CMR has a myriad of applications and is often employed in clinical practice to investigate congenital heart disease, cardiac tumours, cardiac structure, cardiac perfusion and function. Radiologists need to understand the indications for CMR and its advantages over alternative imaging modalities such as cardiac CT, echocardiography, angiography and nuclear medicine.

This presentation aims to provide a basic knowledge regarding the sections and planes of the images acquired and the technical sequencing of said images essential for day to day practice. Further comprehension of the rationale behind obtaining specific sequences and using certain cardiac drugs is paramount and is revisited in this presentation.

CONCLUSION: The most obvious advantage of CMR above other modalities is the absence of ionising radiation but CMR's strengths of high temporal resolution, sequences to assess flow, function and morphology will establish CMR as the preferred future imaging modality for many cardiac diseases, and thus future radiologists will need basic understanding of its application.

P503

Cardiac CT for dummies

Durrant, A. C.¹•Simpkins, C. J.¹•Macanovic, M.¹•Hollings, N.¹•Roobottom, C.²
¹Royal Cornwall Hospital, Truro, UK, ²Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: (1) To identify the common indications for cardiac CT (2) To explain the protocols and pharmacology associated with cardiac CT (3) To simplify and demonstrate the images obtained

DESCRIPTION: Coronary heart disease is the number one cause of death in the UK. Cardiac CT is increasingly recognised as the non invasive test of choice in the investigation of ischaemic heart disease.

The sub millimetre spatial resolution, ECG gating, beta-blocker administration and breath hold techniques utilised by cardiac CT enable accurate evaluation of the coronary vessels and associated structures. Advanced software allows thin slab curvilinear and multiplanar reconstructions to further enhance the images obtained.

This pictorial review identifies the indications for cardiac CT and explains the protocols, including retrospective and prospective cardiac gating and the pharmacopoeia utilised. We explain the common indications for cardiac CT and the necessity for multidisciplinary involvement.

The benefit of cardiac CT over coronary angiography is the additional anatomical information provided. This includes coronary artery anomalies, incidental cardiac findings such

as pericardial thickening and myocardial bridging and extra-cardiac pathology.

CONCLUSION: Cardiac CT is no longer the remit of tertiary referral centres. The wide availability of high performance multislice CT combined with an increasing prevalence of cardiac disease suggests that every radiology department be competent in the acquisition and interpretation of cardiac CT images.

P504

Evaluation of cardiac anatomy and normal variants on multi-detector CT - a pictorial review

Chittal, R. R. •Purayil, T. •Sahu, A. •Vardhanabhuti, V. •Ninan, T. •Roobottom, C.
Peninsula Radiology Academy, Plymouth, UK

LEARNING OBJECTIVES: (1) To give an overview of recent advances in multi-detector computed tomography (MDCT) that enables evaluation of cardiac anatomy. (2) To provide a spectrum of cardiac anatomy and normal variants using line diagrams and CT images. (3) Highlight the standard anatomical terminologies used when reporting cardiac CT.

DESCRIPTION: A thorough knowledge of cardiac anatomy and its variations is paramount when reporting cardiac CT. Traditionally, detailed coronary anatomy was difficult to appreciate on standard CT. With availability of MDCT combined with multiplanar post-processing, volume rendering as well as specific acquisition technologies, excellent depiction of fine structural cardiac anatomy is now possible and has revolutionized cardiac imaging to an extent that it is now an essential tool in routine clinical practice. In this presentation, we will describe anatomy of normal coronary arteries, cardiac chambers, and cardiac valves with the aid of line diagrams and CT images (including MPR, MIP and 3D volume-rendered images). Normal variants including anomalous origins of coronary arteries will also be reviewed. We will examine post-processing techniques, imaging planes and common pitfalls while interpreting cardiac CT. In addition, standard terminologies used while reporting anatomy of cardiac CT will be discussed.

CONCLUSION: We hope to have availed the observer with a concise pictorial review of CT cardiac anatomy enabling quick and accurate interpretation. Knowledge of cardiac anatomy is crucial for precise assessment and interpretation of cardiac CT and we believe this presentation will stimulate general radiologists and trainees to develop further interest in cardiac imaging.

P505

Normal cardiac anatomical variants misinterpreted as pathology - gated cardiac CT as a problem solving tool

Pollentine, A. •Tagg, C. •Hicks, W. •Shaw, M. •Garrett, M.
Cheltenham General Hospital, Cheltenham, UK.

KEY LEARNING OBJECTIVES: Gated cardiac CT (CCT) is highly accurate in evaluating cardiac, pericardial and mediastinal anatomy and differentiating prominent normal

structures from pathological processes. Knowledge of these variations in normal cardiac anatomy is key to differentiating pathological from benign entities with potentially significant impact on patient management.

DESCRIPTION: Using a large CCT database, a series of 15 significant errors in other cardiac investigations were identified. We present a pictorial review highlighting CCT as a tool in elucidating normal cardiac and pericardial anatomical structures initially interpreted as pathological entities by other investigations. These include:

- Examples of prominent pericardial recesses misinterpreted as significant nodal disease on oncology imaging and as aortic root abscess on echocardiography.
- Examples of possible aortic root dissections on echocardiography shown to be normal on gated CT and due to reverberation artefact.
- A prominent crista terminalis mimicking a right atrial mass.
- Hiatal hernias and a prominent transverse sinus misinterpreted as left atrial masses on echocardiography.
- A prominent pulmonary venous confluence presenting as a pseudomass on chest radiography.
- Unusual liver cysts presenting as right sided juxta-atrial masses on echocardiography.

CONCLUSION: Anatomy of the heart and pericardium anatomy varies widely. Particular attention must be paid to the variation in imaging appearances of the pericardial recesses which can mimic pathology. Gated CCT is an ideal modality to clarify potential cardiac and pericardial masses and anomalies identified by other imaging modalities.

P506

Cutting the mustard. Transposition of the great arteries: corrections and complications for the baffled

Main, C. • Fletcher, A. • Brown, I. • Harden, S. • Peebles, C. • Shambrook, J.
Southampton University Hospitals NHS Trust, Southampton, UK

KEY LEARNING OBJECTIVES: (1) Discussion of the anatomy of Transposition of the Great Arteries. (2) Diagrammatic and cross-sectional imaging of current and historical Transposition of Great Artery repair procedures. (3) Review of post-operative complications and the role of CT and MR in their investigation.

DESCRIPTION: Transposition of the Great Arteries (TGA) is a common congenital cardiac malformation with an estimated incidence of 1 in 3500 to 5000 live births. Infants with TGA, characterised by atrioventricular concordance and ventriculoarterial discordance, rarely survived beyond the first year of life until the introduction of atrial switch procedures by Senning and Mustard in 1958 and 1963 respectively. With further advances such as the arterial switch by Jatene from 1975, surgically corrected patients now have a mortality of 10% at age 15 with most surviving well into adulthood. Restoration of two circuit circulation with or without morphologically appropriate ventricles can result in late complications such as distortion of

the pulmonary arteries, systemic ventricular failure, coronary stenoses, aortic regurgitation and dilatation of the neo-aortic root. This educational poster aims to provide a review of this condition, repair appearances and complications likely to be encountered by the radiologist with accompanying diagrams to illustrate the imaging findings.

CONCLUSION: Accurate imaging and interpretation provides functional and morphological assessment in TGA follow up and management. With such improved survival rates, a sound knowledge of post-operative appearances and complications is therefore essential.

P507

Pictorial review of tetralogy of fallot and associated post operative complications

Manimaran, S. • Patel, S. • Wood, A.
University Hospital of Wales, Cardiff, UK

LEARNING OBJECTIVES: (1) To demonstrate anatomical abnormalities in patients with Tetralogy of Fallot (TOF). (2) To illustrate the different types of corrective surgery. (3) To highlight the post operative complications in patients with TOF.

DESCRIPTION: Tetralogy of Fallot is characterised by four main anatomical abnormalities 1) Pulmonary stenosis (PS) 2) Ventricular septal defect (VSD) 3) overriding aorta 4) right ventricular hypertrophy (RVH). Right sided aortic arch is a common associated extracardiac anomaly. MRI is used for follow-up of these patients as regular follow up is needed and it avoids the risk of radiation. Post operative complications include pulmonary regurgitation, right ventricular dilatation and are readily detected on MRI along with accurate measurement of right ventricular function.

Familiarity with the anatomy, type of surgical repair and the post operative complications are important for interpretation of MR in this condition. The information obtained is critical in re-intervention.

CONCLUSION: Tetralogy of Fallot is the most common cyanotic heart disease. Echocardiogram is the imaging modality of choice in children. Cardiac MRI is increasingly important in the assessment of postoperative complications as patients survive into adulthood and require intervention.

P508

The GUCH

Simpkins, C. J. • Durran, A. C. • Roobottom, C.
Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: The Grown Up Congenital Heart (GUCH) is becoming increasingly familiar in current cardiology and cardiac radiology practice. Due to advances in neonatal and paediatric cardiac surgery and medical management, patients with congenital cardiac malformations are frequently surviving to adult age. This poster gives examples of congenital cardiac disease and the sequelae in the 'grown up' population. Pathology is illustrated with plain radiographs and

cardiac CT examples.

DESCRIPTION: This picture-based poster will include examples of:

- Ventricular Septal Defect
- Atrial Septal Defect
- Patent Ductus Arteriosus
- Coarctation of the aorta
- Tetralogy of Fallot
- Transposition of the great arteries
- Total Anomalous Pulmonary Venous Return

CONCLUSION: This poster utilizes cardiac CT examples with multiplanar and 3D reformats to illustrate examples of the GUCH.

P509

A pictorial review of the MDCT appearances of the coronary artery bypass grafts and their 3D reconstructions

Pandey, A. • Kibriya, N. • Abhyankar, M. • Irion, K. • Fewins, H. • Bragadeesh, T. • Binukrishnan, S. • Holemans, J.
Liverpool Heart and Chest Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: (1). To understand the technique of performing CT coronary angiogram in grafts. (2). To understand the radiology of various graft surgical techniques and appearances and to demonstrate these as 3 Dimensional images. (3). To explain a simple method of assessing the grafts.

DESCRIPTION: The scan field starts from the neck, which is different to the native vessel assessment. Further calculations of contrast dosage and scan timings are based on this.

CT coronary angiogram is indicated in assessment of coronary artery bypass grafts in symptomatic patients and in patients before undergoing aortic valve surgery.

The various conduits for CAGB surgery can be divided into arterial and venous grafts. The commonly used arterial grafts are LIMA, RIMA and radial artery grafts. Saphenous vein is the vein of choice for the venous grafts. The arterial grafts are relatively less likely to form plaques and stenosis. The grafts are implanted as a direct connection or as jump grafts in a certain order.

Full assessment of the grafts include assessment for thrombosis, graft malposition or kinking, graft aneurysm, graft stenosis and occlusion

CONCLUSION: Invasive coronary angiogram is not always successful in evaluating the grafts as cannulation of the grafts can be difficult, despite the knowledge of the order in which they are implanted. This is especially true for LIMA grafts. MDCT coronary angiogram is a non-invasive method of assessing the grafts with a good success rate. The 3D reconstructions are used to demonstrate this to the clinicians.

P510

Invasive coronary angiography - what every radiologist should know

Hamilton, S. C. • Iyengar, S. • Gosling, O. • Chhatani, S. • Chittal, R. • Roobottom, C. A. • Morgan-Hughes, G.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: This presentation outlines the essentials of invasive coronary angiography (CA) interpretation necessary to equip both the general radiologist and the cardiac imaging specialist with the tools to fully understand all the information available and facilitate communication within the cardiac multidisciplinary environment.

DESCRIPTION: With the increasing prevalence of coronary arterial disease and move towards minimally invasive cardiac intervention, the demand for accurate cardiac imaging is increasing. Imaging of the heart has traditionally been the remit of cardiologists, with CA and echocardiography being performed and interpreted within cardiology. Consequently radiologists have little experience of these procedures or their interpretation. With increasing accuracy of non-invasive imaging such as CT coronary angiography and cardiac MR there is a shift of focus towards radiology. An understanding of CA is important for radiologists to appreciate the information available, guide imaging appropriately and maintain professional credibility.

This presentation outlines the anatomy of the coronary arteries and indications for CA, before detailing acquisition of the CA including access, catheterisation and imaging. It explains the nomenclature used, and outlines a standard report with a section detailing limitations and indications for further imaging.

CONCLUSION: There is an increasing demand for radiologists to provide cardiac cross-sectional imaging services. It is important that radiologists are able to readily interpret information from CA to both optimally interpret cardiac cross-sectional images, and maximize their role within the multidisciplinary team.

P511

Prospective study of cardiac CT angiography (CTCA)- impact on bed days and cost?

Beale, A. M. • Corrigan, A. • Foley, P. • Findlay, R. • Wilson, D.
Great Western Hospital NHS Foundation Trust, Swindon, UK

PURPOSE: NICE guidance (CG95) has emphasised the role of CTCA in the management of chest pain. Many centres are now setting up CTCA services. The cost savings (or costs) of this service in the DGH setting are needed to clarify the role of CTCA and to aid business case preparation. We undertook to prospectively evaluate the financial implications by assessing the reduction in further investigations and the effect on length of stay (LOS) in patients undergoing CTCA.

METHOD: We prospectively collected data on 100 consecutive OP and IP CTCA's performed in our department. At the time of CTCA the patients were reviewed by a consultant cardiologist as to the likely alternative investigations that would have been required if CTCA had been unavailable and the time taken to undertake them. By using National Tariffs a calculation was made of the potential cost savings. An estimate of the potential discharge date was made taking into account waiting times of alternative investigations. The reduction in LOS was then calculated against actual discharge date.

RESULTS: Indications included chest pain of indeterminate origin, graft occlusion, failed coronary angiography and

indeterminate exercise tests. There were 77 OP CTCA's and 23 IP. There was considerable savings in both further investigations and a significant reduction in LOS.

CONCLUSION: CTCA is now altering the management of cardiac patients. There is a cost in setting up a CTCA service but we have shown a considerable saving by the reduction both in alternative investigations and in LOS.

P512

Radiation-reduction strategies in cardiac computed tomographic angiography

Ilyas, S. • Lloyd, S. • Vardhanabhuti, V. • Ninan, T. • Roobottom, C. A. *Derriford Hospital, Plymouth Hospitals NHS Trust, Plymouth, UK*

KEY LEARNING OBJECTIVES: To present an in-depth analysis of dose reduction strategies in patients undergoing cardiac CT angiography (CTA).

DESCRIPTION: Cardiac CTA has traditionally been associated with high radiation dose but recent technologies and acquisition techniques have allowed for significant dose reduction. Being one of the leading centres in the UK, we will share our experiences in dose reduction using real examples of diagnostic images diagrams and photographs to explain dose reduction strategies which can be classified as:

ECG-linked tube current modulation:

- Application of max tube current during mid-diastole (60%-80% of R-R interval). This allows dose reduction by up to 37% (stable heart rate)

Prospective axial gating:

- The importance of heart rate control and regularity. The merits of aggressive beta-blockade will be discussed
- 'Step and shoot' technique with advantage of Improved resolution (z-axis) as well as drawback such as risk of step artefacts
- The concept of 'padding' to allow for patients with tachycardia/unstable heart rate

Attenuation-dependent tube modulation:

- Recently, there has been a shift to modulating tube voltage (kV) from traditional value of 120kV to closer to the k-edge of iodine (80kV). This has allowed for significant dose reduction with increase in patient contrast but patient selection is important
- Recent developments:
- Iterative reconstruction
- Garnet detector technology
- High-pitch spiral acquisition

CONCLUSION: Use of various strategies based on the use of new technology combined with patient factors can help in dose reduction during cardiac CTA.

Vascular E-Poster

E601

Different patterns of delayed enhancement on cardiac MR

Pinglay, P. A. • Pakkal, M. *University Hospitals of Leicester NHS Trust, Leicester, UK.*

LEARNING OBJECTIVES: (1). To understand the pharmacokinetics of gadolinium based paramagnetic contrast agents. (2). To present different patterns of delayed enhancement on Cardiac MR. (3). To understand the role of the different patterns of enhancement in diagnosis

DESCRIPTION: Cardiac MR is the most sensitive and non-invasive test to diagnose different myocardial pathologies. Delayed enhancement is performed by administering gadolinium based paramagnetic contrast intravenously and images are obtained after optimum time of 10-20 minutes post injection. Patterns of myocardial wall enhancement are often but not always pathognomonic for pathologies affecting the heart. There are four main patterns of delayed myocardial enhancement, the first being subendocardial (e.g ischaemic), midwall (fibrosis, cardiomyopathies), epicardial (myocarditis), transmural (ischaemic) and patchy enhancement (infiltrative disorders). There is some overlap between enhancement patterns and pathologies. Hence clinical correlation is necessary.

This poster will describe the pharmacokinetic of gadolinium and describe the different typical patterns of myocardial enhancement in different pathologies.

CONCLUSION: Delayed enhancement patterns on cardiac MR are an excellent tool in diagnosing and managing many cardiac pathologies.

E602

Improvement of the circulation of the lower extremities by means of a CT-guided lumbar sympathectomy in patients with PAOD

Bombor, I.¹ • Kamusella, P.² • Wissgott, C.² • Andresen, R.² *¹University Clinic of Rostock, Institute for Diagnostic and Interventional Radiology, Rostock, GERMANY, ²Institute for Diagnostic and Interventional Radiology/Neuroradiology, Westküstenklinikum Heide, Akademik Teaching Hospital of the Universities Kiel, Lübeck and Hamburg, Heide, GERMANY*

PURPOSE: Investigation of the influence of lumbar sympathectomy on somatic regional oxygen saturation, temperature and the arterial flow velocity in the lower extremities

MATERIALS/METHODS: 60 patients with stage IIb to IV PAOD according to Fontaine were treated with CT-guided lumbar sympathectomy after interventional or surgical therapy. 18 patients (30%) were in stage IIb, 9 patients (15%) in stage III and 33 patients (52%) in stage IV. Somatic regional oxygen saturation in the distal lower extremities was recorded peri-interventionally with a near infrared spectroscopy system (INVOS 5100C). Before and after intervention, the temperature of the feet was measured using an infrared thermometer (BRAUN ThermoScan 6021) and the peak flow and end-diastolic flow

velocity in the Ateria dorsalis pedis was determined by means of colour-coded duplex sonography (LOGIQ 5 Expert, GE Healthcare).

RESULTS: The most pronounced results were the changes in stage IIb with an increase in regional oxygen saturation of 9.5 percentage points, in temperature of 1.7 °C, in the peak flow of 12 cm/s and of the end-diastolic flow of 15 cm/s. In stage III patients, regional oxygen saturation rose by 9.4 percentage points, temperature by 1.5 °C and end-diastolic flow by 13 cm/s. The smallest changes were displayed in stage IV, where regional oxygen saturation rose by 5.7 percentage points, temperature by 1.2 °C and end-diastolic flow by 7 cm/s.

CONCLUSION: In patients with PAOD, CT-guided lumbar sympathectomy carried out in addition to interventional or surgical therapy leads to a measurable improvement in arterial blood flow.

E603

Is it possible to identify a carotid artery stenosis threshold in mm that is associated with cerebrovascular symptoms?

Saba, L.¹•Sanfilippo, R.¹•Sannia, S.¹•Famiglietti, L.¹•Mallarini, G.¹•Suri, J.²
¹AOU Cagliari, Cagliari, ITALY, ²Idaho State University, Pocatello, ID, USA

PURPOSE: The purpose of this paper was to determine if it is possible to identify a reliable carotid stenosis threshold, measured in millimetres, that is associated with cerebrovascular symptoms.

Methods and Material: One-hundred seventy-eight consecutive patients (males 106; mean age 67 years) were studied for suspected carotid arteries pathology by using a 40-detector-row CT scanner. Bolus tracking technique was used to calculate the correct timing of the scanning. In each patient, carotid artery stenosis was quantified by using mm-method. Continuous data were described as the mean value ± Standard Deviation (SD) and they were compared with Student t test. ROC curve was calculated in order to test the hypothesis and identify specific mm-stenosis threshold. Logistic regression analysis was also performed. A p value less than 0.05 was considered to indicate statistical significance.

RESULTS: Twenty-four patients were excluded. Of the remaining, seventy-nine patients suffered cerebrovascular symptoms. There was a statistically significant difference between patients with symptoms (1.28 mm ± 0.56 mm SD) and without symptoms (1.71 mm ± 0.59 mm SD) in the mm-carotid stenosis (p value = 0.0012). Multiple logistic regression analysis confirmed that symptoms are more frequent in those patients with mm-stenosis (p = 0.002). Moreover, ROC curve (Az = 0.703; ± 0.049 SD; p = 0.0007) indicate that a 1.6 mm stenosis is associated with a sensitivity of 77%.

E604

Measurement of carotid artery stenosis: comparison between percent-based and direct-mm methods

Saba, L.¹•Sanfilippo, R.¹•Montisci, R.¹•Suri, J.²•Mallarini, G.¹
¹AOU Cagliari, Cagliari, ITALY, ²Idaho State University, Pocatello, ID, USA

PURPOSE: The purpose of this study was to compare three percentage carotid artery measurement methods (NASCET - ECST - CSI) and one mm-method (mm direct measurement) in order to evaluate the difference and correlation between them.

Methods and Material: 834 patients (609 males; mean age 63 years; age range 32-91 years) studied by using a multi-detector row CT scanner for a total of 1668 carotid arteries, were retrospectively analyzed. Each carotid stenosis was measured according to four measurement methods (NASCET - ECST - CSI - mm direct measurement). Carotids with near-occlusion condition were excluded. Comparison of derived ratio-percent methods was performed by using Bland-Altman plots and ROC curves were calculated. Correlation coefficients were also calculated by using nonparametric Spearman correlation.

Results: 456 carotid were excluded and in the remaining 1212 ones, a strength correlation according to quadratic regression between NASCET and ECST methods was observed (Spearman' rho coefficient = 0.945; p < 0.0001). An inverse correlation according to linear regression was observed between NASCET and direct-mm measurement (Spearman' rho coefficient = -0.966; p < 0.0001); CSI index shows a quadratic regression with NASCET, a linear regression with ECST and an inverse linear regression with direct mm-measurement (Spearman' rho coefficient = 0.942, 0.929 and -0.932 respectively). Cut-off values for 50% and 70% NASCET stenosis were 2.35 and 1.51 respectively.

CONCLUSION: Our study results indicate that the direct mm measurement of stenosis, by using appropriate equations, can reliably predict NASCET-type, ECST-type and CSI-type percent stenosis.

E605

Pathology of the aortic wall : a multi-detector-row CT analysis

Saba, L.¹•Norwing, E. C.²•Grenst, S.³•Mallarini, G.¹
¹AOU Cagliari, Cagliari, ITALY, ²New York University, New York, NY, USA, ³JF, Melbourne, AUSTRALIA

KEY LEARNING TECHNIQUES: The pathology of aortic wall is an important cause of morbidity and mortality in the western world. The purpose of this exhibit is (1) To review the anatomy and histology of the aortic wall (2) to discuss pathologic entities which affect these layers (3) To review MDCTA technique with emphasis to post-processing procedures (4) to explain and review MDCTA findings in case of aortic wall pathology.

DESCRIPTION: This exhibit will be categorized as follows: 1) Review of aortic wall histology 2) Review of pathologic processes which involve each layer 3) DESCRIPTION of pathologic entities with imaging: Atherosclerosis, Ruptured plaque, Aneurysm, Penetrating ulcer, Intramural Hematoma, Dissection, Psuedoaneurysm, Aortic Rupture 4) MDCTA post-processing techniques : MIP, MPR, CPR and VR. 5) Limits of MDCTA. 6) analysis of radiation dose. For this paper we will

use images from our database of more than 1000 of CTA exams performed for the study pathology of the aortic wall.

CONCLUSION: The correct analysis and characterization of the pathology affecting the aortic wall is extremely important. Nowadays the reference standard for the study of the aortic wall pathology is considered the MDCTA. After this exhibit the reader should be able to: 1. Identify the morphologic characteristics of the aortic wall layers 2. Identify entities affecting these layers and how they progress. 3. Understand the potentialities of MDCTA (with multi-planar reformations) in the diagnosis of these entities

E606

The imaging features of pulmonary arteriovenous malformations and their mimics

Gill, S. S. • Roddie, M. E. • Jackson, J. E.
Imperial College Healthcare NHS Trust, London, UK

KEY LEARNING OBJECTIVES: (1) To review the imaging appearances of the various forms of pulmonary arteriovenous malformations (PAVMs). (2) To demonstrate the imaging appearances of vascular and non-vascular pulmonary abnormalities which may mimic PAVMs and to highlight those features which allow their true nature to be appreciated.

DESCRIPTION: PAVMs are congenital abnormal communications between the pulmonary arteries and veins which allow a right-to-left (R-L) shunt with resultant hypoxemia, the severity of which will depend upon the size and number of lesions. They are a cause of serious morbidity and mortality largely related to cerebrovascular complications secondary to paradoxical embolization but outcome can be significantly improved by transcatheter embolization. In a tertiary referral centre offering treatment by embolization there will be several patients referred for management every year in whom the diagnosis of a PAVM, based upon plain film or CT appearances, is incorrect. Their true nature of these 'PAVM mimics' is, however, usually easily appreciated on CT. This educational imaging review serves to highlight the features of these abnormalities that allow their differentiation from PAVMs.

E607

A pictorial guide to dialysis access sonography

Kodur, R.¹ • Littler, P.¹ • Wilcox, A.¹ • Cullen, N.² • Powell, S.²
¹Aintree University Hospital, Liverpool, UK, ²Royal Liverpool University Hospital, Liverpool, UK

LEARNING OBJECTIVES: (1) Scanning technique of Dialysis access. (2) Role of ultrasound in vein mapping and assessment of maturing fistula. (3). Sonographic appearances and assessment of dysfunctional fistula. Imaging findings and sonographic tips will be included with angiographic correlation where appropriate.

Specific scenarios will include the following.

1. Vein mapping
2. Fistula stenosis
3. Intest intimal hyperplasia

4. Pseudoaneurysms

5. Fistula thrombosis

6. Intraoperative ultrasound

DESCRIPTION: Doppler ultrasound is an accurate, readily available, portable, real time and non-ionizing imaging modality used widely in dialysis access. It is a dynamic test complementary to angiography.

Ultrasound provides additional information on causes of fistula dysfunction, demonstrating the morphology and degree of stenosis, changes in flow rates and altered waveforms.

Doppler ultrasound is used in vein mapping prior to placement of hemodialysis access, in detection of access dysfunction and as an intra-operative tool in guiding catheter and wire placement.

CONCLUSION: This poster will provide the radiologists and sonologists with a methodological approach of scanning dialysis access and highlight the sonographic findings of common pathologies.

E608

Changing trends in a decade of vascular radiology - the impact of MRI and CT for non-invasive angiography

Cowell, G. W. • Reid, A. W. • Roditi, G. H.
Glasgow Royal Infirmary, Glasgow, UK

PURPOSE-MATERIALS: Establish the impact on conventional angiography and endovascular intervention of contrast-enhanced Magnetic Resonance angiography (CE-MRA) and contrast-enhanced Computed Tomography angiography (CE-CTA), on a background of evolving technology & clinical requirements in a referral vascular centre.

METHODS: Angiographic and vascular interventional caseload was prospectively recorded between 1997 and 2010, along with the CE-MRA and CE-CTA numbers in the same time period. Changes in waiting times and the marginal cost analyses of elective CE-MRA and CE-CTA versus conventional angiography for 2001 and 2009 were also established.

RESULTS: Conventional diagnostic angiographies declined from a peak of over 800 per year to now just over 100 per year while endovascular interventions continue in similar numbers. CE-MRA increased from effectively none in the first year to now approximately 600 per year while CE-CTA has currently risen to approximately 400 per year. Total diagnostic study numbers have increased but at lower overall cost. Various influences are clear including on site modality availability, capability & accuracy along with impact of new therapies (e.g. EVAR) research studies (e.g. ASTRAL) and adverse events (e.g. NSF).

CONCLUSION: Vascular imaging has undergone a significant metamorphosis in little over a decade due to the non-invasive imaging techniques of CE-MRA and CE-CTA. With waiting times significantly less than at the start of the study period and the cost effectiveness of both CE-MRA and CE-CTA as primary diagnostic investigations established, further development of these services is inevitable.

E609

Implantations of a resonant vena cava filter in a Thiel embalmed cadaver under MRI guidance

Immel, E.¹•Eisma, R.²•Melzer, A.¹

¹IMSaT, University of Dundee, Dundee, UK, ²College of Life Sciences, University of Dundee, Dundee, UK

PURPOSE: Experiments in MRI guided deployment and retrieval of resonant vena cava filters (VCFs) were carried out in Thiel embalmed human cadavers. Resonant VCFs are designed to increase the MR signal. This allows the susceptibility and RF artifacts of the implant to be overcome. Thiel embalmed human cadavers, as opposed to formalin fixed ones, retain their natural colors and flexibility, features which are of considerable interest in interventional MR guided procedures.

MATERIALS/METHODS: Resonant VCFs, designed as a coil and coated with biocompatible insulation, was laser cut from a Nitinol tube and tuned for the 1.5T MRI system. A vascular access point was created in legs of a Thiel cadaver by inserting two 16F sheaths in the vein. VCF was deployed in vena cava filled with 0.9% NaCl solution, under MR guidance. GE SignaHDx1.5T, FastGRE, TR/TE=2.7/1.8ms, 30°flipangle were used.

RESULTS: The increase of the MR signal in the VCF was clearly visible. Due to the good physiological condition of the Thiel embalmed cadaver's vascular system (e.g. elasticity) resonant VCF was successfully released and retrieved repeatedly under X-ray and MRI. VCF could be visualized in MRI

CONCLUSION: The reported results demonstrate the benefits of using the resonant technology when performing vascular interventions under MR guidance. The enhancement of the MR signal was sufficient for successful tracking of the catheter and visualization of the VCF implants.

The experiments showed that the Thiel embalmed human cadavers are an excellent simulator in both research and development of MR guided vascular interventions.

Vascular Poster

P601

Acute thoracic aortic syndrome: what the radiologist needs to know

Abbas, A. •Murday, D. C. •Idriz, S. •Brown, I. W. •Peebles, C. R. •Harden, S. P. •Shambrbrook, J. S.
Southampton University Hospitals NHS trust, Southampton, UK

KEY LEARNING POINTS: (1) To describe the role of different imaging modalities in the diagnosis and classification of acute thoracic aortic syndrome ("AAS"). (2) To illustrate the key radiological features of the different pathologies that encompass AAS including aortic dissection, intramural haematoma, and penetrating atherosclerotic ulcer. (3) To illustrate the management of AAS.

DESCRIPTION: The term "acute thoracic aortic syndrome",

first coined in 2001, comprises a heterogeneous group of patients with a similar clinical profile presenting with one of several non-traumatic potentially life threatening thoracic aortic pathologies. These include aortic dissection, intramural haematoma and penetrating atherosclerotic ulcer. These different pathological entities can be indistinguishable on clinical grounds alone and may be confused with other causes of chest pain including myocardial infarction. Multiplanar CT is the current modality of choice for imaging AAS with a sensitivity and specificity approaching 100%. Early diagnosis and accurate radiological classification is associated with improved mortality in AAS. Prognostically, patients with AAS may be classified into two groups depending on the aortic segment involved. Those that involve the ascending aorta and arch (Stanford classification type A) usually require urgent surgery. Those that involve the descending aorta distal to the origin of the left subclavian artery (Stanford classification type B) sometimes require treatment with either surgery or endovascular stenting but are often managed conservatively with medical therapy.

CONCLUSION: We illustrate the characteristic radiological features of the different pathologies that encompass AAS and highlight the role of imaging in determining the management of this life threatening condition.

P602

Acute aortic syndrome

Durran, A. C.¹•Simpkins, C.¹•Macanovic, M.¹•Roobottom, C.²

¹Royal Cornwall Hospital, Truro, UK, ²Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: (1) To appreciate the radiological appearances of acute aortic syndrome. (2) To differentiate between the subtypes. (3). To identify subtle imaging appearances that indicate when immediate intervention is required

DESCRIPTION: Acute aortic syndrome describes four unique, potentially fatal entities, which often present emergently with similar clinical histories, but require different treatment, thus quick accurate radiological diagnosis is crucial.

Non traumatic acute aortic syndrome encompasses four subtypes; aortic dissection, aortic aneurysm leak and rupture, intramural haematoma and penetrating atherosclerotic aortic ulcers. These cases can be fatal if diagnosis and treatment is delayed. The role of the radiologist is vital in the initial management, thus knowledge regarding the distinguishing imaging features is paramount.

This pictorial review exhibits the cardinal CT features associated with each entity, elaborating upon the critical imaging findings that suggest the condition is life threatening.

CONCLUSION: The subtypes of acute aortic syndrome are indistinguishable clinically. Helical CT enables diagnosis of thoracic dissection with a sensitivity of almost 100% and identifies an intimal flap in 70% cases. It is empirical that radiologists are able to differentiate between these subtypes and further classify into Stanford Type A and B to guide future management.

P603

The radiology of thoracic aortic dissections

Williams, F.
North Bristol NHS Trust, Bristol, UK

KEY LEARNING OBJECTIVES: To study the emerging role of multidetector-row CT (MDCT) in the diagnosis of acute aortic dissections, their classification and determination of extent and complication.

DESCRIPTION: Aortic dissection is the most common non-acute aortic syndrome with high mortality rates, especially in complicated dissections. The symptoms are often minimal or highly suggestive of other pathology leading imaging to be foremost in the diagnosis of aortic dissections. The process can also affect any of the major aortic branch vessels leading to a plethora of complications, all of which must be accurately documented by radiology for adequate treatment to be implemented. We present examples of presentation of such syndromes and their complications with reference to MDCT technique, pitfalls and diagnosis of complications.

CONCLUSION: MDCT is now foremost in the diagnosis of acute thoracic aorta dissections. Its rapid acquisition times and superb multiplanar capability make it crucial in the diagnosis, staging and detection of extent and complications.

P604

Computed tomography angiography follow-up of craniocervical dissection: when should we do it?

Bashaeb, K. O.¹•Butt, N. A.²
¹Glasgow Royal Infirmary, Glasgow, UK, ²Western Infirmary, Glasgow, UK

PURPOSE: To establish guidelines on Computed Tomography Angiography (CTA) follow-up of patients with occluded craniocervical arteries following dissection.

MATERIALS/METHODS: The Radiology Information System (RIS) was used to identify all cases of CTA's for dissection of craniocervical arteries. The RIS records and patients' notes were analyzed to identify the cases where these arteries were found to be occluded at the first CTA. All such cases were further evaluated on follow up CTAs. Number of follow-up CTAs and time interval was noted.

RESULTS: A total of 83 cases were identified to have vessel dissection based on dissection criteria on CTA. 48 cases were shown to have an occluded vessel and were included in the study. Vertebral arteries were dissected in 28(58.3%) cases while internal carotid arteries were dissected in 20(41.7%) cases. The average interval to the second CTA was 3.75 months (range 1-8 months) while the average time interval to the third CTA was 9.4 months (range 2-14 months) from the index CTA. Dissected arteries were found to have recanalised in 28(58.3%) cases on the second CTA with another 5(10.4%) cases on further follow-up.

CONCLUSION: The time interval varied widely for CTA follow-up in cases of craniocervical arterial dissection. In our

experience, a CTA at three months has shown recanalisation of craniocervical artery dissection in 58% cases and this follow up is recommended. If the craniocervical artery remains occluded after the first follow-up, then a second follow-up CTA should be offered after a further 6 months.

P605

Pictorial review of non-atheromatous renal artery stenosis and interventional approaches

Jacob, P. •Maskova, J. •Flont, B.
Aberdeen Royal Infirmary, Aberdeen, UK

KEY LEARNING OBJECTIVES: To be aware of the causes of renal artery stenosis and the diagnostic and therapeutic options for treating renal artery stenosis in Fibromuscular dysplasia (FMD)

DESCRIPTION: Renovascular hypertension can be secondary to atheromatous or non atheromatous renal artery stenosis. The main cause of non-atheromatous renal artery stenosis in young patients is FMD. FMD is a noninflammatory, nonatherosclerotic disorder that leads to arterial stenosis, aneurysm, and dissection. It has been observed in nearly every arterial bed. The most often involved arteries are the renal and internal carotid arteries, and less often the vertebral, iliac, subclavian, and visceral arteries. Renal artery stenosis can be evaluated by USG, CECT, Dynamic Gd enhanced MRA and conventional angiogram.

CONCLUSION: In patients with fibromuscular dysplasia, balloon angioplasty remains the preferred form of therapy; however, medical therapy alone may be appropriate in patients with well-controlled hypertension who are compliant with medical therapy. Although no data from randomized trials are available, data from a single-center case series suggest high rates of improvement in blood pressure with angioplasty among patients with fibromuscular dysplasia, and many patients are able to discontinue all antihypertensive medications. Predictors of a favorable outcome of angioplasty include an age younger than 40 years at diagnosis, duration of hypertension of less than 5 years, and a systolic blood pressure of less than 160 mm Hg.

P606

Performance characteristics of modern self-expanding nitinol stents indicated for SFA

Wissgott, C.¹•Schmidt, W.²•Behrens, P.²•Schmitz, K.²•Andresen, R.¹
¹Institution of Diagnostic and Interventional Radiology/Neuroradiology, Westküstenklinikum Heide, GERMANY,
²Institute for Biomedical Engineering, University of Rostock, GERMANY

PURPOSE: To evaluate performance characteristics of currently available superficial femoral artery (SFA) stents and stent delivery systems (SDS). The challenge for stent designers is to balance flexibility, radial force, and shortening on deployment.

MATERIALS/METHODS: Six 7mm/80mm stent systems were included: Biotronik Astron Pulsar (4F), EDWARDS LifeStent FlexStar, ev3 PROTÉGÉ Everflex, CORDIS Smart Control,

BARD E-Luminexx, Guidant Absolute (all 6F). The SDS were evaluated for profile, flexibility in the stent region, trackability and pushability through a tortuous vessel model and release force during deployment. Stents were evaluated for flexibility, radial force during expansion and compression, and shortening. RESULTS: The 4F system had the lowest profile (1.45mm) followed by the 6F stent systems (1.96-2.10 mm). The Astron Pulsar was most flexible (195 Nmm²) compared to 334-972 Nmm² for the 6F systems. The track force of the stiffest system (FlexStar, 0.314N) was higher than that of the Astron Pulsar (0.273N) but lower than of the other systems (0.387-0.579N). Release force was 1.69N (Absolute Stent), 2.05N (Astron Pulsar) up to 13.00N (FlexStar). The radial force at 6 mm stent diameter was during expansion from 3.95N (Absolute) and 3.99N (Astron Pulsar) up to 7.22N (FlexStar) but higher while compressed.

CONCLUSION: The 4F system had the best flexibility and trackability. Release force was high in most systems with release handles. Radial force of all tested stents deversify in a high range. These results could be helpful to find the best stent for different lesions.

P607

A whistle-stop guide to transcatheter arterial chemoembolisation (TACE) of malignant hepatic lesions

Yap, K. S. • Puppala, S.

Leeds Teaching Hospitals NHS Trust, Leeds, UK

KEY LEARNING OBJECTIVES: Hepatic malignancies which are unresectable and patients who are suffering symptoms of rapidly enlarging tumours may benefit from this minimally invasive procedure to control the pressure effects and even making lesions resectable, in some cases. Hence, it is important to be aware of the inclusion criteria, the technique, outcomes and complications of this procedure, which will impact on the quality of patient's palliative care.

DESCRIPTION: The patients with hepatic malignancies may have co-existing cirrhosis, making assessment and work-up difficult. By knowing the vascular anatomy and the common variations, the procedural indications and contraindications, serious pitfalls can be avoided or anticipated more readily. There are steps to improve the procedural efficiency, which includes a systematic review of essential team roles, equipments, embolic agents, contrast agents, chemotherapy and other drugs. A review of the salient points for informed consent; such as the outcomes, complications, post-procedural care and patient follow-up (Including interval scans) will be helpful for radiologists.

CONCLUSION: Transcatheter arterial chemoembolization (TACE) is a minimally invasive procedure which may be the only revenue for symptomatic control and potentially making a hepatic lesion resectable. Therefore, the awareness of the salient aspects of the procedure may help to identify suitable patients, who will benefit from optimised palliative care and also better prepare the radiologist to manage this unique patient group.

P608

CFD modelling to elucidate the role of contrast media viscosity at a range of injection rates in altering vessel wall shear stress and relation to the risk of contrast extravasations.

Sakellariou, S.¹ • Paul, M.² • Roditi, G.¹

¹Glasgow Royal Infirmary, Glasgow, UK, ²School of Engineering, University of Glasgow, Glasgow, UK

PURPOSE: Osmolality and viscosity of contrast media have been found to affect the risk of adverse contrast reactions. Our clinical observations suggest that the incidence of contrast extravasation increases when higher viscosity media is used at higher flow rates (as in Cardiac CT). Our hypothesis stipulates that this occurs due to altered wall shear stress in relation to the higher contrast viscosity. We aim to prove this experimentally.

METHODS: The flow of contrast within an upper limb vein is modelled using computational fluid dynamics software (CFD) for 18G and 20G cannulae, at flow rates ranging from 3ml/sec-7ml/sec for five commonly used non-ionic contrast media of different viscosities but similar osmolalities. Comparisons of local wall shear stress profiles are performed at flow rates generating equal iodine fluxes.

RESULTS: For Iodine fluxes ranging from 1.5-2.2 gI/sec the least viscous contrast media generated the least wall shear stress in all simulations despite generating higher total pressures. Flow rates directly affected total wall pressures; however wall shear stress appears mostly affected by the media viscosity. In addition, flow rate appears to be a minor factor in the latter, with higher flow rates of less viscous media generating less shear stress than lower flow rates of more viscous media.

CONCLUSION: Simulation data suggests that our hypothesis is valid and supports our clinical observations on the risk of extravasation. Viscosity of contrast media should be considered when designing protocols for contrast studies with high risk of extravasations such as cardiac CT.

Gastrointestinal E-Poster

E701

Atypical clinical and imaging findings - think of NET

Haworth, A. E. • Nedumaran, A. • Paravasthu, D. • Madani, H.

• Chetcuti, K.

University Hospital Aintree, Liverpool, UK

KEY LEARNING OBJECTIVES: Our pictorial review aims to familiarise general radiologists and radiologists in training with the importance of considering gastroenteropancreatic neuroendocrine tumours (GEP-NET's) as a differential diagnosis in day to day practice and highlight the importance of nuclear medicine and hybrid imaging in diagnosis and treatment.

DESCRIPTION: GEP-NET's are a heterogeneous group of tumours arising from a diffuse endocrine system characterised by the ability to produce biogenic amines and polypeptide hormones. They most commonly occur in dispersed endocrine cells within the aero-digestive tract or pancreas where they

are categorised into two subgroups; carcinoids and pancreatic endocrine tumours (PET's), also known as islet cell tumours. Other sites include the thyroid, parathyroid, pituitary and adrenal glands.

RESULTS: Most tend to progress slowly (but inexorably), present late and vary greatly in location between patients. This presents problems in both diagnosis and treatment with cases often presenting to multiple specialities (GI, colorectal, respiratory) prior to a unifying diagnosis being made.

We intend to review the diversity of locations and imaging findings associated with GEP-NET's and raise awareness of the important role that nuclear medicine (SPECT, MIBG, Octreoscan) and fusion imaging (PET-CT) have in diagnosis, monitoring and individualised therapy.

CONCLUSION: GEP-NET's are a relatively rare, but important group of tumours which are often difficult to diagnose with standard imaging. Once identified, they present a radiological challenge in staging and monitoring. Radiologists must be aware of the varying imaging appearances and consider GEP-NET's as a unifying diagnosis in complex cases.

E702

The influence of MRCP in gallstone pancreatitis

Warner, J. • Duncan, T. • Chang, D.
East Lancashire Hospitals Trust, Blackburn, UK

KEY LEARNING OBJECTIVES: The guidelines for the management of severe acute gallstone pancreatitis suggest intervention with ERCP and sphincterotomy within 72 hours of presentation (1). With MRCP becoming a mainstream investigation, the use of ERCP in the setting of severe acute pancreatitis has altered significantly. The aim of this retrospective study was to assess the influence of MRCP in guiding the use of ERCP in the setting of severe acute gallstone pancreatitis.

DESCRIPTION: Patients who were admitted to our institution with severe acute gallstone pancreatitis between January 2007 and 2010 had an Ultrasound scan plus or minus a MRCP, plus or minus an ERCP as further radiological or therapeutic procedures. A comparative study was performed looking at patients who had MRCP and ERCP, versus patients who had either MRCP or ERCP alone.

138 patients were admitted. Of the patients who had an MRCP 59% did not then require an ERCP. 41% of patients underwent a MRCP and subsequently an ERCP and 10% of patients underwent an ERCP only. Of those in whom solely an ERCP was performed 42% did not show bile duct stones and subsequently no therapeutic intervention was performed.

CONCLUSION: Performing an ERCP carries a 10% risk of worsening pancreatitis. Guidelines for imaging in severe gallstone pancreatitis need reviewing. It is clear that there is a subgroup of patients with severe gallstone pancreatitis who don't warrant ERCP and the extra risk associated with the procedure.

(1)- UK guidelines for the management of acute pancreatitis. *Gut* 2005;54(Suppl III):iii1-iii9

E703

CT enterography: a pictorial review of common pathologies

Walker, P. S.¹ • Albazaz, R.¹ • Self, A.²
¹Leeds Radiology Academy, Leeds, UK, ²Newcastle Upon Tyne Hospitals, Newcastle, UK

KEY LEARNING OBJECTIVES: Recognise typical and atypical CT enterography findings of common small bowel pathologies.

DESCRIPTION: Low dose techniques in combination with excellent spatial and temporal resolution has allowed CT enterography to offer a viable alternative to traditional fluoroscopy in the diagnosis and monitoring of small bowel pathology. Furthermore, CT enterography gives information regarding extra-enteric complications. CT enterography has a key role in imaging inflammatory bowel disease; especially differentiating between active and chronic Crohn disease as well as allowing diagnosis of small bowel tumours, occult haemorrhage and coeliac disease.

CONCLUSION: We present typical and atypical CT enterography findings in a number of common small bowel pathologies, including IBD, Coeliac disease, carcinoid, GIST and lymphoma. We highlight the imaging characteristics of each pathology, associated complications and some of the common pit falls.

E704

Small bowel on CT- do we pay enough attention - a trainee review

Paravasthu, D. M. • Chetcuti, K. • Adapala, R. K.
Arrowe Park Hospital, Wirral, UK

KEY LEARNING OBJECTIVES: The objective of this presentation is to highlight the importance of interrogating the small bowel on non-dedicated CT scans.

The pictorial review illustrates, to trainees in particular, the various conditions arising from the small bowel and mesentery, with confirmation by means of a dedicated study when deemed appropriate.

DESCRIPTION: We present a pictorial review of a wide range of acute and non acute small bowel pathology with a brief review of the pathophysiology, imaging findings and differential diagnosis.

The cases range from entities such as jejunal diverticulosis, bowel ischaemia to internal hernias and primary and secondary small bowel tumours.

CONCLUSION: Diagnosis of small bowel pathology remains a deductive radiological process where observations need to be integrated with the clinical picture to formulate a meaningful differential diagnosis.

Assessing the small bowel in a non tailored study is a diagnostic challenge, particularly in training. This review would illustrate and reiterate the importance of assessing the small bowel, particularly in patients with an uncertain diagnosis, the majority of who are encountered when "on call".

E705

"On call CT of a post operative abdomen." A common conundrum!

Jain, A. • Slaven, K.
Whiston Hospital, Prescot, UK

KEY LEARNING OBJECTIVES: To familiarise the reporting registrar with

- Postoperative anatomic changes.
- Commonly and less commonly encountered complications.

DESCRIPTION: On call 'post operative' abdomen CT scans are a commonplace request in hospitals nationwide. It can be a daunting task for the newbie on call Radiology registrar. With our pictorial review we will familiarise the reporting on call registrar with (1) Postoperative anatomical changes - such as bowel resection or anastomoses. (2) Commonly encountered complications and their appearances on CT such as anastomotic leakage, intra-abdominal collections, bowel obstruction or ischemia, intraabdominal bleeding, wound complications. (3) Other less common complications such postoperative pancreatitis, retention of surgical foreign bodies, diffuse peritonitis or other visceral organs infections.

CONCLUSION: Reporting on call scans on a postoperative abdomen is a challenging competency that needs to be gained by every Radiology Registrar.

E706

Radiologically guided insertion of gastrostomy. A pictorial review of methodology and complications

Kodur, R. • Badar Bin Bilal, S. • Tuson, J. • Ogrady, E. • Camenzuli, A.
Aintree University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: (1). To review the methodology and precautions taken in performing a radiologically inserted gastrostomy (RIG). (2). To describe and illustrate the complications associated with radiologically inserted gastrostomy (RIG) in line with the NPSA safety guidelines.

DESCRIPTION: Radiologically inserted gastrostomy (RIG) is performed to aid feeding. The common indications include prior to head and neck surgery for malignancies and in patients with impaired swallowing. About 15,000 gastrostomies are inserted annually in the UK. Depending on the insertion method gastrostomies are called RIG (radiologically inserted gastrostomy), PEG (percutaneous endoscopic gastrostomy) or PIG (per-oral image guided gastrostomy).

RIG is associated with a variety of complications like peritonitis, infection, large bowel perforation, injury to the solid intra abdominal viscera like left lobe of the liver and pancreas, haemorrhage and aspiration pneumonia. This pictorial review will reflect our experience in performing and further management of this procedure.

CONCLUSION: This educational exhibit would enable the radiologist and the radiology trainees to recognize the appearances of important complications associated with RIG and initiate appropriate action promptly.

E707

Computed tomography of oesophageal injuries

Gummow, A. D. • Mohankumar, R. • Rudralingam, V. • Sukumar, S. • Gallaway, S.
University Hospital of South Manchester, UK

KEY LEARNING OBJECTIVES: Oesophageal injuries are an important group of pathologies that require a quick and accurate diagnosis. Any delay or inaccurate diagnosis can have devastating consequences, ranging from stricture to life threatening sepsis. Clinical features of oesophageal injuries can be non specific, resembling myocardial infarction, acute aortic dissection or intra-abdominal pathologies like acute pancreatitis. Though contrast oesophagography used to be the imaging technique of choice, Computed Tomography (CT) is largely replacing it as the initial imaging modality. Due to the non specific presenting features, CT has the advantage of diagnosing other pathologies. This poster aims to evaluate the clinical and imaging findings of oesophageal injuries; to assess the utility of CT in the diagnosis and management of oesophageal injuries, and to discuss the CT imaging findings of the range of oesophageal injuries.

DESCRIPTION: The spectrum of imaging findings of oesophageal injuries ranging from Mallory Weiss tear, intramural dissections and haematomas to Boerhaave's syndrome are discussed. Imaging findings like extraluminal air and/or contrast, intraluminal air and haematoma, focal oesophageal thickening, mediastinal inflammation and pleural effusion are demonstrated with the help of Multidetector CT (MDCT) images. The importance of CT in identifying intramural dissection, in particular, is discussed, which confirms the diagnosis of oesophageal injury in an otherwise non specific clinical presentation.

CONCLUSION: CT is invaluable in the diagnosis of oesophageal injuries, ranging from mucosal lacerations to transmural perforations. Urgent imaging also enables accurate management of the patients, with reduction in morbidity and mortality.

E708

Comparison of side-effect profiles of two different CT colonography faecal tagging regimes.

Klimczak, K. J. • Hunt, R. • Mortimer, A. • Pollentine, A. • McCoubrie, P.
Southmead Hospital, Bristol, UK

PURPOSE: Previous investigation into image quality obtained using two different faecal tagging protocols for CT colonography (CTC) at our institution demonstrated significant benefit to using a 3 day low residue diet plus 5mg of bisacodyl BD for 3 days, 20mls of Gastrografin and 50mls of Microcat for 2 days (regime A) over a regime combining 3 days of low residue diet and 100mls of Gastrografin over the 24hours prior to scan (regime B). Regime A results in better tagging and less residual stool. We aimed to compare the side effect profile of the two different protocols.

MATERIALS/METHODS: 100 patients who underwent CTC (50 using regime A and 50 using regime B) were asked to fill out a seven point questionnaire regarding their experience using the different tagging protocols. Views of 50 patients who underwent barium enema after full bowel prep were evaluated for control purposes. The Mann-Whitney U test was used to compare parameters statistically.

RESULTS: Barium enema preparation side effects were significantly more troublesome than for either of the CTC regimes for general disruption to daily life, discomfort, diarrhoea, thirst and headache ($p < 0.001$). No statistical significance between the two CTC regimes for these parameters, nor for abdominal pain, nausea, vomiting, anal irritation or hunger.

CONCLUSION: No significant difference was noted in the side effect profiles of the different regimes. This supports the use of regime A that combines laxative, Barium and Gastrografin, which has been shown previously to result in improved image quality.

E709

Hepatic arteries analysis in 2130 patients: An analysis by using MDCTA

Saba, L.¹•Sannia, S.¹•Sanfilippo, R.¹•Mallarini, G.¹•Suri, J.²
¹AOU Cagliari, Cagliari, ITALY, ²Idaho State University, Pocatello, ID, USA

PURPOSE: The knowledge of celiac trunk vascularization and hepatic arteries configuration is extremely important in several condition like surgery in the hepato-biliary pancreatic area, as well as in interventional radiological treatments. Our purpose was to evaluate the incidence of anatomic variation of arterial liver vascularization by using MDCTA in a large, homogeneous, population.

METHODS AND MATERIALS: 2130 patients (1275 men; mean age, 62.8 years who underwent MDCT between January 2004 to August 2010 were retrospectively analyzed. Hepatic arterial configuration was classified according Michels classification. Image quality was graded according to an ordinal scale.

Results: Of the 2130 examined patients, 307 (154,4 %) were excluded because of sub-optimal image quality. In the remaining 1803 patients (1012 men; mean age, 61.1 years \pm 8 [SD]; age range, 19-90 years) 701 patients with anatomic variations were detected (38.87%).

CONCLUSION: MDCTA allowed to analyze arterial liver configuration and demonstrated the presence of a significant incidence of arterial variants (38.87%) in the examined population.

E710

Watch out for that thrombus! A multimodality pictorial review of portal vein obstruction

Varadpande, M.¹•Mullett, R.¹•Adapala, R.¹•Paravasthu, D. M.²
¹Arrowe Park Hospital, Wirral, UK, ²University Hospital Aintree, Liverpool, UK

KEY LEARNING OBJECTIVES: We present several cases

of portal vein obstruction of different aetiologies. We describe the imaging findings which aided diagnosis of this clinically important condition.

DESCRIPTION: Portal vein obstruction is a condition with multiple aetiologies, the most common being hepatic parenchymal disease and intra-abdominal sepsis. It is a clinically important condition, with the most important complication being haemorrhage from secondary varices. Portal vein obstruction can be diagnosed using several modalities, most commonly ultrasound and CT. We present several cases where portal vein obstruction occurred due to different underlying pathologies. For example: primary liver malignancy, pancreatitis and intra-abdominal sepsis secondary to diverticular abscess. Using CT, ultrasound and MRI images we describe the various findings that lead to the diagnosis in our cases. We also discuss the findings which can differentiate between the different causes and demonstrate this with a case in which both tumour and haematological thrombus is present.

CONCLUSION: Portal vein obstruction is an important finding which may be difficult to appreciate using conventional imaging modalities. We present some of the many pathologies in which obstruction can occur, along with imaging findings to look for when interpreting CT, MRI and ultrasound.

E711

Imaging liver tumours following image-guided therapy

Naaseri, S.¹•Khan, N.²•Graeme-Baker, S.¹•Kazmi, F.³
¹Cheslea and Westminster Hospital, London, UK, ²Cheslea & Westminster Hospital and Royal Marsden Hospital, London, UK, ³Cheslea & Westminster Hospital and Royal Brompton Hospital, London, UK

AIM: To illustrate the spectrum of imaging findings on CT and PET related to the treatment of liver malignancies using interventional radiological procedures.

Content: - The current role of interventional radiology in the management of liver tumours

- Patient selection criteria
 - Appearances of liver tumours post intervention including radiofrequency ablation, chemo-embolisation, yttrium-90 radioembolisation, microwave ablation and cryotherapy.

Summary: Advances in medical technology have enabled the use of radiologically guided percutaneous and endovascular techniques in the management of patients with liver tumours. With the increasing role of these therapies in the management of such cases, it has become essential for the general radiologist to be acquainted with the typical post-intervention appearances and recognise any potential complications.

E712

Don't forget the bowel on abdominal ultrasound

Hattab, A. •Haq, R. R. •Johnson, G. •Sukumar, S. •Rudralingam, V.
 University Hospital of South Manchester, UK

KEY LEARNING OBJECTIVES: 1. To describe the characteristic imaging features of benign and malignant bowel

pathology on US. 2. To demonstrate the bowel ultrasound findings with CT and MR correlation.

DESCRIPTION: Ultrasound is often the initial imaging tool used in a wide clinical setting due to the availability, absence of ionising radiation and non invasive nature. The diagnostic role of ultrasound and appearances of diseases in the solid abdominal organs is well recognised, however fewer are familiar with the pattern of abnormal bowel on ultrasound.

We present the sonographic appearances of a spectrum of inflammatory, infective and neoplastic bowel pathology. Common benign pathologies include acute appendicitis and Crohn's disease. Less common inflammatory conditions on ultrasound include right sided diverticulitis and infective colitis such as *Clostridium difficile*. The real time nature and the ability to localise peritoneal signs at the examination is of significant value. Through the series of cases, we will discuss features that help distinguish normal from diseased bowel highlighting important technical details.

Neoplastic lesions include polyps, cancer and lymphoma. We highlight useful signs on ultrasound and make appropriate reference to CT and MR imaging.

CONCLUSION: Knowledge of ultrasound features of common benign and malignant bowel pathology is essential to the operator to ascertain prompt diagnosis. We recommend assessment of the bowel as part of a complete ultrasound study of the abdomen.

Gastrointestinal Poster

P701

Pictorial review: top ten upper gastrointestinal fluoroscopy cases: the oesophagus

Partington, K. J.¹•Briggs, R.²

¹Leeds Teaching Hospital Trust, Leeds, UK, ²Calderdale and Huddersfield NHS Foundation Trust, Huddersfield, UK

KEY LEARNING OBJECTIVES: To outline the "top ten" spot diagnoses of upper gastrointestinal fluoroscopy that the radiology trainee will encounter.

DESCRIPTION: Fluoroscopy is traditionally a topic that has become largely ignored in place of cross-sectional imaging and hybrid techniques by many radiology trainees. It is however part of the radiology curriculum, and thus an element of the FRCR 2B examination.

This review aims to demonstrate the "top ten" upper GI fluoroscopic diagnoses through pictorial review with accompanying brief explanations of pathology and treatment. There is something for all levels of radiology trainee, with examples spanning oesophageal webs and pouches to intramural diverticulosis.

CONCLUSION: We present a pictorial review of upper gastrointestinal fluoroscopic pathology that a trainee may encounter in both his/her day to day practice and the FRCR 2B examination.

P702

The last meal: implications in the declining use of the barium meal

Wilson, D. W.¹•Ridley, N.¹•Gill, D.²•Corrigan, A.¹

¹Great Western Hospital, Swindon, UK, ²Oxford University, Oxford, UK

BACKGROUND: There has been a steady decrease in the number of barium meals performed over the last decade. This is likely to have a number of implications, including loss of expertise and training opportunities.

OBJECTIVE: To investigate the changes in the indications and number of barium meals since 2003 in a District General Hospital, and consequent effects on training opportunities and skill acquisition for junior radiologists.

METHODS: All barium meals performed in 2003 and 2009 were reviewed, with the corresponding indications and findings recorded.

RESULT: 203 barium meals were performed in 2003 compared to 37 in 2009, representing a more than fivefold decline in annual incidence. The main indications in 2003 were dyspepsia, pain, anaemia, nausea, vomiting and weight loss, whereas in 2009 it was failure to tolerate endoscopy, patient preference to have a barium meal and incomplete endoscopy (e.g. peptic gastric outflow obstruction).

CONCLUSION: There has been a significant decline in the number of barium meals performed over the last eight years, with the indications for this procedure also changing. This reflects a gradual preference for the use of endoscopy, and, in turn, training opportunities and confidence in performing the barium meal has decreased. Anecdotal evidence suggests junior radiologists are not being satisfactorily trained in this technique. As it seems that the requirement for the barium meal will remain, we propose that measures be taken to ensure that the quality of training offered is maintained despite reductions in the use of this modality to prevent skill loss amongst radiologists.

P703

Review of laparoscopic gastric banding complications

Chin, T.•Kumar, A.•Katti, A.

University Hospital Aintree, Liverpool, UK

KEY LEARNING OBJECTIVES: (1). Review of radiological appearances of early and late complications of adjustable gastric banding. (2). Assessment of complications using upper GI fluoroscopic studies.

DESCRIPTION: Gastric banding surgery involves an inflatable silicone band being placed around the top portion of the stomach, via laparoscopic surgery, in order to treat obesity. Morbid obesity has become a commonly encountered problem in today's society and has proved to be refractory to conservative treatment. Ever since its first introduction in 1993, laparoscopic gastric banding has gained a major role as first-line surgical treatment for morbid obesity. It usually results in shorter hospital stay, faster recovery, smaller scars and less pain

than open surgical procedures. It has an acceptable success rate and relatively low morbidity. However this technique is still associated with multiple complications that occur in both early and late phases of post-operative recovery. Early complications include misplacement of band, perforation, and early slippage with secondary pouch dilatation. Late complications include band herniation, erosion of the gastric wall and migration of the band.

CONCLUSION: Since its introduction, laparoscopic gastric banding has been subject to many studies. With increase in experience of the surgeons and progress in the surgical technique, the rates of complications have drastically reduced. However, different complications may present in similar ways but require different treatments to give a definitive diagnosis. We demonstrate different examples of complications as a learning tool for radiologists to be aware of the different types of complications and how to detect them on upper GI fluoroscopic studies.

P704

Please exclude pancreatic cancer. Is a portal venous phase CT sufficient?

Rowlands, J. • Searle, J. • Elyan, S. • Shaw, M.
Cheltenham General Hospital, Cheltenham, UK

PURPOSE: To identify if a single phase CT acquired in the portal venous phase post intravenous contrast is adequate to diagnose adenocarcinoma of the pancreas.

MATERIALS/METHODS: A total of 171 patients with pancreatic malignancy were identified using the 3 Counties Cancer Registry between the dates 1st January 2009 to the 31 May 2010. The diagnostic CT obtained on multislice CT scanners was reviewed. Data was obtained regarding the number of phases of image acquisition post intravenous contrast, on which phases the malignancy was visible as well whether the patient had undergone a negative CT in the preceding 6 months.

RESULTS: 105 out of 117 pancreatic cancers were diagnosed with CT. In 92/105 (88%) the diagnosis was made on a single phase portal venous CT of the abdomen and pelvis. 11/105 (10%) had a 3 phase CT of the pancreas. In these 11 patients the malignancy was visible on the portal venous images. 2/105 (2%) had no intravenous contrast. No patients had had a recent negative CT.

CONCLUSION: With the advent of multislice CT technology, image acquisition in the portal venous phase is sufficient to diagnose adenocarcinoma of the pancreas. An arterial phase CT is still advocated to assess for liver metastases, to assess resectability as well as in the diagnosis of pancreatic endocrine tumours.

P705

Ultrasound-guided transplant pancreas biopsies - our experience at the University Hospital of Wales

Martin, D. J. • Stephens, M. • Ellis-Owen, R. • Yong, A.
University Hospital of Wales, Cardiff, UK

PURPOSE: To assess the feasibility of ultrasound-guided transplant pancreas biopsies by assessment of adequacy of histological specimen and post-procedure complication rates.

MATERIALS/METHODS: We undertook a retrospective audit of all ultrasound-guided transplant pancreas biopsies carried out at our institution. The clinical information regarding post procedure complications was obtained from the transplant surgical team records. The following information was recorded: 1) gauge of needle 2) number of passes 3) immediate complications 4) late complications 5) whether the sample was histologically adequate for diagnosis.

RESULTS: All of the attempted biopsies done to date were included. 26 biopsies were attempted of which 24 were completed. One was not attempted due to overlying bowel gas and one was terminated due to patient discomfort. There were no immediate complications. The late complication rate = 4% was due to one patient developing post procedure pancreatitis. Of the completed biopsies there was a 92% success rate of obtaining an adequate sample for histological analysis.

CONCLUSION: There are currently no RCR guidelines to assess our results against. However, in comparison with ACR guidelines and larger studies, our complication rate and histological success rate are comparable. Ultrasound-guided pancreatic transplant biopsy is feasible and safe. We expect the need for this procedure to increase given the ongoing increase in the number of pancreas transplants and the lack of an accurate, reliable alternative when assessing rejection.

P706

The spleen; striking imaging appearances

Khan, M. K. • Gandhi, S.
Frenchay Hospital, Bristol, UK

Spleen is one of the most complex and largest organs of the lymphoreticular system. The white pulp follows the branching central artery and it is responsible for immunological function of spleen. The red pulp takes part in the removal of defective erythrocytes WCC & platelets from the bloodstream. Knowledge of the pathologic features of the spleen and their appearance on different imaging modalities can lead to early recognition of disease patterns and improved patient care. In this review we demonstrate the imaging appearance of a spectrum of entities involving spleen. We present anatomical variants, which may simulate disease and appearance of pathologic categories such as: infections, cysts, benign and malignant tumours, vascular and other pathologies. These validated cases show that Ultrasound and Computed Tomography (CT) are most widely used modalities to assess splenic lesions. Role of Magnetic resonance (MR), Positron Emission Tomography (PET) and Interventional Techniques is also discussed. MR is a good problem solving tool as it offers better tissue characterisation. PET may help further in differentiation between benign, malignant and infectious lesions of the spleen.

P707

A retrospective analysis of the use of urgent computer tomography (CT) in patients presenting with a non-traumatic acute abdomen in a district general hospital (DGH)

Morgan, R. D. •Kelley, T. •D'Costa, H.
Horton Hospital, Oxford Radcliffe Hospitals NHS Trust, Banbury, Oxon, UK

OBJECTIVES: the use of CT is becoming more widespread despite concerns about the associated radiation exposure. We retrospectively assessed the use of urgent CT scans in non-traumatic acute abdomen in a standard DGH.

METHODS: 129 patients had an urgent CT scan in Accident & Emergency (A&E) for a non-traumatic acute abdomen between May 2006 and September 2010. There were 61 male and 68 female patients; aged between 8 and 94 years (mean: 54. 1). The time between presentation at A&E and CT scan was less than 10 hours for all patients. Only those patients with a specific differential diagnosis (eg perforation) were included. We assessed the effectiveness of CT to: 1) confirm the differential diagnosis (ie a true positive) and, 2) refine the end diagnosis. We also compared the true positive rate in A&E doctors and general surgeons.

RESULTS: in 47% of patients the differential diagnosis was confirmed by CT (range: 0-67%). CT findings correlated with the end diagnosis in 85% of cases. No pathology was detected in 11 patients. Overall, 64% of conditions may have been diagnosed with ultrasound. No statistically significant difference occurred in the frequency of true positives between A&E doctors and general surgeons ($p>0.05$).

CONCLUSION: CT is more influential in the diagnosis of non-traumatic acute abdomen than doctor's accrument. The question is: have we become too reliant upon CT?

P708

Imaging in small bowel obstruction- a pictorial review

Litton, K. J. •Trainer, V. •Eynon, A.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: To understand the typical imaging features of a range of different aetiologies of small bowel obstruction and recognise the important CT imaging characteristics of closed loop obstruction/ small bowel ischaemia.

DESCRIPTION: Small bowel obstruction is a common presentation on the general surgical intake. CT is increasingly used in making an accurate diagnosis and enabling progression to appropriate surgical intervention, if required. The role the radiologist plays in determining the site, cause and complications of small bowel obstruction using CT can be invaluable to facilitate the surgeon in their pre-operative planning. We present and review a selection of cases from our practice that demonstrate a variety of causes and complications of small bowel obstruction, and try to identify features 'not to miss', in particular changes suggestive of ischaemia/ closed loop obstruction.

CONCLUSION: This pictorial review revisits the CT imaging findings seen in small bowel obstruction highlighting features and complications that when recognised can allow early, appropriate surgical management.

P709

Pictorial review of complications and presentation of Meckel's diverticulum on CT

Gupta, C. •Pai, D.
Scunthorpe General Hospital, Scunthorpe, UK

KEY LEARNING OBJECTIVES: Meckel's diverticulum is the most common congenital abnormality of the gastrointestinal tract and is seen in approximately 2% population. Patients usually present with complications. In this pictorial review, we discuss the different clinical presentations and complications of Meckel's diverticulum and should be considered in the differential of atypical presentation of acute abdomen.

DESCRIPTION: Meckel's diverticulum is usually not the first diagnosis in patients presenting with acute abdomen, however it can have a wide range of clinical presentation including bowel obstruction, enterolith formation and retention of foreign bodies, acute diverticulitis, perforation and neoplasm.

CONCLUSION: Meckel's diverticulum and its complications are an important cause of acute abdomen and can be easily missed. Familiarity of the radiologist with this pathology enables an accurate diagnosis in patient presenting with acute abdomen. Mutidetector CT with reformats are extremely helpful in the diagnosis and should be used in all cases to assess the presence of a blind-ending pouch in the distal small bowel, especially when appearances are atypical of common conditions.

P710

Right iliac fossa pain - A pictorial review

Chari, B.¹ •Ramaswamy, R.² •Biswas, S.¹ •Mohsin, N.¹
¹*Whiston Hospital, Prescot, UK, ²Mid Yorkshire Hospitals NHS Trust, Dewsbury, UK*

KEY LEARNING OBJECTIVES: Right iliac fossa (RIF) pain is not always appendicitis and there is a spectrum of diseases that mimic appendicitis. We present a pictorial review of the common and rare right iliac fossa pathology encountered in two district general hospitals in north of England.

DESCRIPTION: RIF pain is a relatively common presenting symptom, representing about 50% of abdominal pain and 2% hospital admissions. The causes of RIF pain subdivide into surgical, medical and gynaecological disorders, and each can be further divided by their underlying pathological processes. Clinicians often face a dilemma of whether to hospitalise these patients or not and if required hospitalisation, which speciality referral is the most appropriate. Imaging is paramount in this group of patients to determine the course of management. This pictorial review is an attempt to elaborate on few such pathologies seen on plain film, ultrasound and cross sectional images mainly CT scan. The spectrum includes a variety of

common conditions like appendicitis, appendicular mass, caecal carcinoma, Crohn's disease, salpingitis, ruptured ovarian cyst, (? this is not common) sigmoid diverticular disease, strangulated inguinal hernia and caecal volvulus and uncommon conditions like Meckel's diverticulum, neuroendocrine tumor and intussusception.

CONCLUSION: Diagnostic imaging plays a major role in the evaluation of patients with RIF pain. Knowledge of normal radiological and pathological appearance of RIF is essential for accurate diagnosis of the pathology. As the pathology could arise from various organs, a multisystem/multi-organ approach is ideal.

P711

Leak or no leak? - review of imaging features of bowel anastomotic leaks and potential pitfalls

Miles, G. •Giles, K. •Williams, M. P.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: Identification of important post-operative complications following large bowel resection and primary anastomosis. Recognition of the variation in the normal appearances of the bowel anastomosis.

DESCRIPTION: As the number of low rectal tumours excised by anterior resection increases with advancing surgical technique, there is a significant incidence of both symptomatic and occult large bowel anastomotic leaks. Hence requests for the appropriate imaging by the concerned surgical team are familiar. Radiologists should have an understanding of the spectrum of imaging findings as a result of anastomotic leaks and the potential persistent abnormalities in the pelvis and presacral area. The use of rectal contrast is essential in the accurate identification of leaks; however, it can cause potential confusion in some circumstances. We present a selection of characteristic and unusual findings seen in the post-operative period on CT.

CONCLUSION: Knowledge of the characteristic and unusual imaging features following large bowel anastomotic leaks presented here will help to prevent delay or misdiagnosis of this familiar yet potentially devastating complication.

P712

'I wouldn't want to do your job.' Reasons for performing the defaecating proctogram

Clark, A. J. •Gurgar, N.
University Hospital Of North Staffordshire, Stoke on Trent, UK

KEY LEARNING OBJECTIVES: To understand why the defaecating proctogram is performed, how it is performed, what can be seen and what is the significance of the findings.

DESCRIPTION: Fluoroscopic defaecating proctography is performed to explain defaecatory problems such as obstructed defaecation syndrome and incontinence. The examination requires important room and patient preparation and will reveal findings such as rectal mucosal prolapse, rectocele and enterocele all of which can be surgically cured.

CONCLUSION: Definitely not the most glamorous imaging investigation, the defaecating proctogram has an important role in diagnosing and managing defaecatory problems.

P713

Imaging findings of retrorectal presacral lesions - A multimodality pictorial review

Pollentine, A. •Shaw, M. •Hopkins, R.
Cheltenham General Hospital, Cheltenham, UK

KEY LEARNING OBJECTIVES: The presacral space requires careful and dedicated evaluation when reporting cross sectional imaging of the pelvis. It is a site where clinically occult malignant and benign lesions can develop with often subtle findings that are easily overlooked.

Knowledge of the wide variety of lesions presenting as presacral masses as well as their key imaging features allows the radiologist to form an appropriate differential and often give a definitive diagnosis based on their imaging characteristics.

DESCRIPTION: We present a pictorial review of a wide range of pathologies occurring in the presacral space. A range of imaging modalities are presented including plain radiography, ultrasound, CT, MRI and PET. We will highlight important tips in establishing the correct diagnosis and hints in avoiding potential pitfalls in interpretation. Illustrated cases include:

- Primary and secondary sacral neoplasms including chordoma, sacrococcygeal teratoma, plasmacytoma and metastases.
- Fatty lesions - distinguishing the benign from the malignant with reference to cases of liposarcoma, myelolipoma and pelvic lipomatosis.
- Differentiating rectal cancer recurrence from fibrosis and post-radiotherapy changes.
- Pelvic abscesses and inflammatory masses
- Benign rectal masses including dermoid and duplication cyst.

CONCLUSION: Presacral masses are an eclectic group and encompass both benign and malignant entities with radiologists playing a key role in their characterisation.

P714

Bowel related complications of radiotherapy: An overview of the radiological findings.

Partington, K. J. •Johnstone, A.
Leeds Teaching Hospital Trust, Leeds, UK

KEY LEARNING OBJECTIVES: An overview of the multi-modality spectrum of radiological findings of bowel related complications of radiotherapy that the radiologist should be aware of in his/her day to day practice.

DESCRIPTION: The first radiation induced intestinal injury was reported in 1897; just two years after Roentgen discovered x-rays. It is estimated the 300,000 patients undergo pelvic radiotherapy every year worldwide with the incidence of chronic radiation bowel injury published at 1-5%, with the sigmoid, rectum and

ileum most commonly affected due to their pelvic location and thus presence within the radiotherapy field. Radiation enteritis may manifest acutely secondary to epithelial necrosis, sub-acute or chronic secondary to obliterative endarteritis, with the radiological findings mirroring the pathological picture.

Traditionally radiological findings of bowel related radiation injury have been described on contrast studies, but are now becoming more recognised on CT and MRI.

CONCLUSION: We present a multi-modality pictorial review of the spectrum of radiological findings of bowel related complications of radiotherapy that the radiologist should be aware of.

P715

Gadolinium-ethoxybenzyl-diethylene triamine penta-acetic acid (Gd-EOB-DTPA) enhanced magnetic resonance imaging of the liver: Timing of T1 and T2-weighted sequences

Hersey, N. O. • Musson, R. • Blakeborough, A.
Sheffield Teaching Hospitals NHS Trust, Sheffield, UK

PURPOSE: To compare the signal intensity and relative enhancement of liver parenchyma at set time intervals following injection of Gadolinium-ethoxybenzyl-diethylene Triamine Penta-acetic Acid (Gd-EOB-DTPA) in both T1 and T2-weighted breathhold sequences.

MATERIALS/METHODS: We performed a retrospective analysis of all patients at our institution during an 18 month period undergoing Gd-EOB-DTPA enhanced liver MR imaging. All patients with repeat imaging or abnormal liver function tests were excluded. Each patient underwent T1 and T2-weighted breathhold sequences at 3, 6, 10 and 20 minutes post injection of Gd-EOB-DTPA, as well as pre contrast. Signal to noise ratio was determined for each patient at each time interval and relative enhancement calculated.

RESULTS: 101 patients were eligible for the study with a mean age of 51years. The relative enhancement increased incrementally at each time interval on the T1-weighted imaging, with a 64% mean increase by 20minutes. Between 10 and 20minutes post contrast, the relative enhancement increased by 20%. In contrast, there was a small decrease in the relative enhancement of the liver parenchyma on all post contrast T2-weighted sequences. The mean fall in relative enhancement was 11.1%, 11.8% and 16% at 3,6 and 20 minutes respectively.

CONCLUSION: Only a modest reduction in relative enhancement following Gd-EOB-DTPA administration on T2-weighted imaging is seen with a mean reduction of 11.8% at 6 minutes. Consequently, it would seem reasonable to perform T2-weighted sequences post contrast, particularly within the initial 6 minute period, without having a detrimental effect on the image quality of the liver parenchyma.

P716

Comparison of ultrasound requests for groin hernia between primary and secondary care with reference to GP-based commissioning

Lewis, M.¹ • Sage, W.² • Williams, S. M.¹
¹Norwich Radiology Academy, Norwich, UK, ²University of East Anglia, Norwich, UK

PURPOSE: The yield from ultrasound to identify groin hernia in clinically equivocal cases may be expected to vary depending upon patient selection factors. With GP-based commissioning, emphasis has been placed on direct access to imaging as a means of reducing onward hospital outpatient referral. We seek to identify differences between the number, quality and results between requests for inguinal ultrasounds from primary and secondary care.

MATERIALS/METHODS: 1000 consecutive patients who underwent groin ultrasound from April 2008 to April 2010 and had reference to hernia in the request text were identified. The results were recorded and a further sub-analysis was performed by dividing the cases into periods of 3 months by referral date; the sub-analysis was included to investigate changes in referral numbers and costing over the study period.

RESULTS: Out of the 1000 ultrasounds reviewed 225(22.5%) were identified to have a hernia with one equivocal result (0.1%). Of the 1000, 468 of the requests came from primary care with the remaining 530 from secondary care. 93(19.9%) of those from primary care and 132(24.9%) of those from secondary care were reported with a positive result. Sub-analysis showed referrals increased progressively from primary care from 13 to 117. This increase comes with a cost increase of £6,188 to the primary care trust.

CONCLUSION: There was no difference shown between either of the referral categories in the yield of groin hernias. The overall yield remained consistent despite an increase in referrals from primary care (referrals from secondary care remained fairly consistent).

Uroradiology E-Poster

E801

Ultrasound imaging of complications of renal transplants - a pictorial review

Conway, O. J.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: To outline grey-scale sonographic evaluation of the transplanted kidney.

To describe the evaluation of renal dysfunction through the use of intrarenal Doppler sonography.

To highlight through case examples the commonly encountered complications of renal transplantation including perinephric collections, vascular compromise, and collecting system dilatation

DESCRIPTION: The use of ultrasound in the evaluation of the renal transplant has been well documented. However, as a junior radiologist, carrying out a thorough assessment of a suspected failing kidney can be a daunting task. The aim of this poster is to outline a simple protocol for grey-scale and intra-renal doppler sonography including the doppler resistive index (RI), and to

highlight through pictorial case study examples the commonly encountered complications of renal transplantation.

CONCLUSION: In dedicated centres, renal transplantation is becoming increasingly common and therefore it is expected of junior radiologists, particularly out of hours, to independently carry out a thorough ultra sonographic evaluation of potential renal dysfunction. This poster aims to aid them in this task through a pictorial review of the complications associated with renal transplant as well as providing a clear and simple guide to the assessment of renal function through ultrasound.

Uroradiology Poster

P801

The transplanted kidney - a pictorial review

Chaudhry, M. A. • Chawla, S. • Belfield, J. • Griffin, C.
Royal Liverpool University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES:

- Ultrasound imaging techniques used for the transplanted kidney.
- Imaging of graft complications: Immediate, intermediate, late.
- Parenchymal, vascular and urological complications.

DESCRIPTION: As continuous improvements in graft survival rates occur, there is general acceptance of renal transplantation as the preferred treatment of patients with end-stage renal failure. Post-transplantation, ultrasound (B-mode and Colour & Spectral Doppler) accurately demonstrates and characterises many complications. The operator should be familiar with immediate, intermediate and late complications that may arise; these can be divided into parenchymal, vascular and urological. When performing ultrasound, the operator must examine cortical echogenicity, corticomedullary differentiation, pelvicalyceal dilation and any perirenal fluid collections. Colour Doppler is necessary to assess perfusion throughout the transplant including assessment of the interlobar arteries running alongside the medullary pyramids. By the use of spectral Doppler gating over these vessels, the resistive index (RI) can be measured. The normal transplant has a low-resistance arterial bed with $RI < 0.7$. Higher values (>0.8) represent intrinsic renal disease (e.g. rejection) but cannot identify disease type. The main renal artery should be assessed looking for renal artery stenosis or renal vein thrombosis.

This poster aims to provide a pictorial review of renal transplant ultrasound imaging, including potential complications.

CONCLUSION: Improvements in surgical techniques and immunosuppressive drugs have resulted in increased survival of patients with renal grafts. Substantial complications can occur post-operatively and it is important to be aware of these and how they appear on ultrasound.

P802

CT in potential live renal transplant donors - What the laparoscopic transplant surgeon wants to know

Mortensen, C. • Geach, R. • Massey, H. • Mortimer, A. • Kadi, N.

• Collin, N. • Thornton, M. • Loveday, E. • Jones, L.
Southmead Hospital, Bristol, UK

KEY LEARNING OBJECTIVES: A guide to the radiologist reporting potential live donor MDCTs, detailing the relevant information regarding anatomy prior to potential laparoscopic resection.

DESCRIPTION: As the regional transplant centre, we carry out approximately 42 live kidney donor transplants a year, and an increasing number of donor resections are being carried out laparoscopically. MDCT is an accurate modality for the pre-operative assessment of live renal donors and we routinely use this to document anatomical characteristics, detailing relevant information for the transplant surgeon. It is vital that specific information is conveyed as this allows accurate treatment planning. This includes 1) renal size discrepancy 2) arterial anatomy including number of vessels, distance of accessory vessels from the main renal artery and length, defined by the distance from aortic wall to the first arterial bifurcation 3) number of veins, their location, the length of the right renal vein, and the major tributaries 4) ureters and pelvicalyceal tract: number of ureters, structural characteristics and any signs of obstruction 5) perinephric fat density 6) incidental findings. We provide a pictorial guide with examples of these features.

CONCLUSION: MDCT is a fundamental investigation as part of the pre-transplant donor assessment. It is vital that radiologists are aware of the salient features in order to guide the transplant surgeon. The evaluation of anatomical variations allows donors to be appropriately selected for laparoscopic resection.

P803

The role of percutaneous radiofrequency ablation in treating renal tumours: a systematic review

Muthukumarasamy, S. • Ahmed, K. • Anthanasious, T.
Imperial College University of London, UK

PURPOSE: The systematic review aims to determine the effectiveness of percutaneous radio-frequency ablation in the treatment of renal tumours.

MATERIALS/METHODS: The Medline database was systematically searched until July 2010 using the search terms 'percutaneous radiofrequency renal efficacy' and 'percutaneous radiofrequency renal review'. References from reviewed articles were also reviewed to broaden the search.

Studies were limited to those that purely looked at percutaneous use (ie not laparoscopic or open surgical use) of RFA in an oncological setting. Case reports, letters and bulletins were excluded from this study.

Oncological outcomes assessed were tumour progression and the presence of metastatic disease.

RESULTS: The review included 30 studies which were classified as level 4 evidence. These studies represented a total of 1031 renal lesions that were treated with percutaneous radio frequency ablation in 896 patients. Tumour recurrence rates varied from 0% (n=4) to 25% (n=1). Two factors have shown

to be key in oncological outcome; tumour size and tumour location. Studies with 0% tumour recurrence rate treat lesions that had a mean tumour size of 1.7cm - 3.3cm, and avoided centrally located tumours.

CONCLUSION: Lesions likely to recur after RFA in studies that had more than one tumour recurrence had a mean size greater than at least 3.5cm. Centrally located tumours confer poor tumour recurrence rates. Multicentre, randomised and prospective studies are needed to compare long term outcomes with other ablative therapies and nephron sparing surgery.

P804

Functional MRI in prostate cancer-is it worth it?

Williams, F. • McCoubrie, P.

Southmead Hospital, North Bristol NHS Trust, Bristol, UK

PURPOSE: Prostate cancer represents an enormous healthcare burden, affecting over 30,000 men in the UK each year. Precise anatomical staging is crucial in the planning of the most appropriate therapy with radical prostatectomy being reserved for gland-confined disease. MRI is playing an increasing role in the diagnosis, staging and planning of treatment. Functional MRI representing T1-weighted gadolinium enhanced sequences and diffusion-weighted (DW) sequences are suggested to augment the anatomical information and increase both the sensitivity and specificity of MRI as a diagnostic tool.

METHODS: All patients undergoing pelvic MRI scanning for prostate cancer staging and surveillance over a 1 year period from October 2009 in our institution were reviewed. Demographic data, PSA score, Gleason score and initial pre-scan stage were recorded. The influence of the functional sequences was recorded including the tumour only being visible on one or both sequences, the position being confirmed, metastases only being visible on functional imaging and TNM stage change.

RESULTS: 137 patients were included in the study. The position was confirmed on functional sequences in 96 (70%). In 12% of cases the tumour was visible on the functional images only. In a further 8% metastases were seen to advantage on functional studies. TNM stage change was recorded in 13% of cases. Furthermore, in 11% of cases where there was significant post-biopsy haemorrhage functional scanning proved valuable in tumour detection.

CONCLUSION: Functional MRI augments anatomical imaging is a quick, easy technique allowing for more precise staging and problem solving.

P805

The added value of the diffusion weighted sequence for MRI of the prostate.

Clark, A. J. • Gurjar, N. • Koller, C. • Grima, M.

University Hospital of North Staffordshire, Stoke on Trent, UK

KEY LEARNING OBJECTIVES: To understand the added value of the diffusion weighted sequence for imaging the prostate.

DESCRIPTION: We share our experience, images and histological correlation from two years practice of performing diffusion weighted imaging of the prostate on around 280 patients. We have optimized the sequence for external and endorectal acquisition. As well as helping identify prostate cancer, particularly that involving the central zone or in cases when repeat biopsy is negative but PSA is raised. We have found it useful to add confidence when deciding local stage, identifying mimics of cancer such as haemorrhage and in confirming the neoplastic nature of incidentally identified extraprostatic abnormalities such as in the ureters or bladder.

CONCLUSION: Diffusion weighted images of the prostate are quick and easy to acquire and read. We have found they add significant value to image interpretation.

P806

A bag of balls

Durran, A. C.¹ • Simpkins, C.¹ • Macanovic, M.¹ • Freeman, S.²
¹Royal Cornwall Hospital, Truro, UK, ²Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: (1) To revisit the anatomy of the scrotum. (2) To identify and characterise common scrotal pathologies. (3) To create a simple diagnostic flow chart for dealing with US findings

DESCRIPTION: High resolution ultrasound is a quick, non-invasive and highly sensitive imaging tool for evaluating abnormalities within the scrotum and is the first line of investigation in patients with scrotal symptoms.

This pictorial review aims to provide a comprehensive illustration of scrotal abnormalities, covering intratesticular and extratesticular lesions, cystic and solid tumours, common benign findings, inflammatory and traumatic conditions, and provide an easy to use diagnostic flow chart for dealing with suspicious lesions.

CONCLUSION: Ultrasound is considered the gold standard for diagnosing testicular lesions and differentiating between those which require surgical excision such as seminoma, compared to those commonly encountered benign intrascrotal conditions including epididymal cysts and hydrocoeles, with the added benefit of confirming an anatomically normal underlying testicle. It is paramount that radiologists are competent at diagnosing such pathologies, as subsequent management is ultimately directed by imaging findings.

Gynaecology/Obstetrics E-Poster

E901

Non-trophoblastic placental tumors: chorioangioma

Vicente, C. • Suarez, V. • Valdez, M. N. • Delfina, C. • Cynthia, M. • Dagum, M.

Diagnóstico Médico, Buenos Aires, ARGENTINA

KEY LEARNING OBJECTIVES: To familiarize radiologists with ultrasonographic characteristics of chorioangioma in order to achieve a correct diagnosis and a proper treatment selection.

DESCRIPTION: Among non-trophoblastic placental tumours, chorioangioma is the most common. The reported prevalence of this benign arteriovenous malformation is approximately 1%, though the exact prevalence is unknown, because these lesions are usually misdiagnosed in routine examinations, due to its small size.

Chorioangiomas are not usually linked to maternal and/or fetal complications except when they are larger than 5 cm in diameter or multiple (chorioangiomas). The diagnosis is often incidental and the differential diagnosis includes partial hydatidiform mole, placental haematoma, teratoma and leiomyoma. Because most of these tumours are asymptomatic, the conduct usually is expectant, monitoring with Doppler and ultrasound periodically. In cases where there is fetal haemodynamics deterioration, the conduct must be invasive.

Ultrasound examination reveals the presence of a hypo or hyperechoic circumscribed mass with cystic areas within. This tumour classically protrudes into the amniotic cavity from the fetal surface near the umbilical cord insertion. Colour Doppler evidences vascular channels within the tumour.

In cases where ultrasound findings are unspecific for chorioangioma, the MRI is a very useful method to solve this problem.

CONCLUSION: Although the chorioangioma is a rare tumour with good perinatal prognosis in most cases, it is essential that the radiologist be aware of the sonographic features that allows, not only to reach the definitive diagnosis, but also to choose the appropriate conduct to prevent the development of future complications.

Gynaecology/Obstetrics Poster

P901

The "on-call" ectopic pregnancy: A radiology trainee methodical approach

Partington, K. J.

Leeds Teaching Hospital Trust, Leeds, UK

KEY LEARNING OBJECTIVES: To provide a methodical approach and pictorial review for the trainee of the ectopic pregnancy pelvic ultrasound.

DESCRIPTION: Ectopic pregnancy presents a major health problem for women of child-bearing age and is the diagnosis of exclusion in any woman presenting with acute symptoms and a positive pregnancy test. Without timely diagnosis and treatment, ectopic pregnancy can become a life-threatening situation. No clinical findings can distinguish between an ectopic pregnancy, intra-uterine pregnancy or miscarriage, and thus can be a commonly asked for clinical indication for pelvic ultrasound out-of-hours.

Pelvic ultrasound, particularly transvaginal ultrasound can strike fear into many radiology trainees, even more so in the pregnant patient. The early pregnancy and its complications display a wide range of sonographic findings, which the trainee should be familiar with and be able to extrapolate into a radiological report.

CONCLUSION: The nature of this review of the ectopic pregnancy, is to simplify the approach to the request, the preparation of the patient and machine and the spectrum of ultrasound findings, with particular emphasis on the final radiological report.

P902

Imaging features of unusual uterine and cervical neoplasms and mimics of uterine malignancy

Lambie, H. • Spencer, J. A. • Swift, S.

St James's University Hospital, Leeds, UK

KEY LEARNING OBJECTIVES: (1) To recognise the imaging features of unusual uterine and cervical malignancies. (2) To recognise the imaging features of benign processes which can mimic uterine and cervical malignancy

DESCRIPTION: Endometrial cancer of the uterus is now the commonest female genital malignancy although uterine cervical cancer has reduced in incidence following screening. In this poster we present the imaging features of unusual uterine and cervical neoplasms and mimics of uterine malignancy drawn from the multidisciplinary team meeting (MDTM) of the largest gynaecological cancer network in the UK. The MDTM sees over 600 new cases of gynaecological malignancy per annum and acts as a referral point for many more complex cases which turn out to be mimics of malignancy.

We illustrate the features of uncommon malignancies such as neuroendocrine carcinoma, carcinosarcoma, sarcoma and lymphoma of the uterus and cervix as well as mimics of malignancy including actinomycosis and other complex benign conditions.

CONCLUSION: Some uncommon malignancies of the uterine corpus and cervix have pathognomonic appearances and other features that alert to the possibility of an uncommon diagnosis.

P903

FDG PET/CT in endometrial carcinoma: a pictorial review

Jayaprakasam, V. • Trainer, V. • Fielding, P. • Rees, J.

PETIC, Wales Research and Diagnostic Positron Emission Tomography Imaging Centre, Department of Radiology, University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: To review the indications for FDG PET/CT in endometrial carcinoma and the range of imaging appearances in endometrial cancer on FDG PET/CT.

DESCRIPTION: Endometrial carcinoma is the most common gynaecological malignancy in western countries. Accurate staging is vital to provide the best possible outcome. There is some evidence to suggest additional value of FDG PET/CT in staging of endometrial carcinoma, especially in the evaluation of lymph nodes and distant metastases. Post surgical and/or post radiotherapy pelvic anatomy may be difficult on contrast enhanced CT or MRI alone. Studies have shown that FDG PET/CT in conjunction with CT and/or MRI has a greater sensitivity and specificity compared with CT and /or MRI alone. This is particularly the case in patients with suspected local recurrence

who are candidates for further radical treatment. There is also evidence that PET/CT studies may be of value in predicting prognosis in these patients. At present, the role of FDG PET/CT in endometrial carcinoma is limited to post therapy patients with suspected recurrence. In our centre at the Wales Diagnostic and Research PET imaging centre, we perform FDG PET/CT in endometrial carcinoma where there is difficulty in staging, restaging or assessment of possible recurrence. We review various cases where FDG PET/CT has been a useful problem-solving tool in terms of patient management.

CONCLUSION: This pictorial review emphasises the particular strengths of FDG PET/CT in the staging and restaging of patients with endometrial carcinoma.

P904

The value of 18F-FDG PET/CT in the evaluation of patients with cervical carcinoma: a pictorial review

Trainer, V. J. • Jayaprakasam, V. S. • Rees, J. I. • Fielding, P. A.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: To illustrate the applications of 18F-FDG PET/CT in the imaging of cervical carcinoma and to demonstrate its ability to delineate nodal and metastatic disease and to aid problem-solving in cases where other imaging modalities or clinical findings have been uncertain.

DESCRIPTION: Within the UK, there are approximately 2,800 new cases and 1,000 deaths from cervical cancer each year. The many treatment options, ranging from fertility-preserving surgery to radical exenteration, lymph node dissections, radiotherapy and chemotherapies, depend on the FIGO staging and imaging findings. MR has an established role in staging newly-diagnosed cervical carcinoma. However the addition of 18F-FDG PET/CT may in some cases lead to more rational selection for surgery. In addition, several studies propose that 18F-FDG PET/CT is highly sensitive and specific for detecting recurrence.

We aim to: Critically appraise the literature regarding 18F-FDG PET/CT imaging in cervical carcinoma.

Illustrate the benefits of 18F-FDG PET/CT over conventional imaging with reference to selected cases performed at our centre. Highlight the importance of 18F-FDG PET/CT in the MDT setting.

CONCLUSION: 18F-FDG PET/CT imaging is fast becoming an important tool in oncological radiology and is beneficial in the staging/restaging of local and distant disease in cervical carcinoma. A clear understanding of the appropriate use of 18F-FDG PET/CT imaging and its interpretation will be key for both radiologists and those attending oncology multidisciplinary meetings. This pictorial review will provide an overview of various aspects of 18F-FDG PET/CT that can be used for cervical carcinoma imaging.

P905

The role of 18F-FDG PET/CT in ovarian malignancy: a pictorial review

Clayton, A. E. • Trainer, V. J. • Litton, K. J. • Rees, J. I. • Fielding, P. A.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: To illustrate the role of 18F-FDG PET/CT in the imaging of ovarian cancer and its usefulness in the identification of distal metastases, in the evaluation of equivocal cases on conventional imaging, in the assessment of treatment response and in the diagnosis of recurrence.

DESCRIPTION: Ovarian malignancy accounted for 3% of new cases of female malignancies and 5% of cancer related deaths in the US in 2009. It is the leading cause of death amongst gynaecological cancers. Surgical/clinical staging forms the basis of the FIGO classification. Whereas, ultrasound and CT remain the mainstay of imaging for the staging of these tumours. It has been postulated that performing 18F-FDG PET/CT will aid in staging, for example in characterising equivocal lesions and in identifying distant metastases, peritoneal deposits and lymph nodes; potentially altering treatment planning and surgical options. The role of 18F-FDG PET/CT in post treatment follow-up is to evaluate disease recurrence and response to treatment. However, there are limitations, which can be due to post surgical change and the obscuration of pelvic anatomy from bladder activity. As time passes and experience increases, the interpretation of ovarian pathology on 18F-FDG PET/CT is improving and it offers a further modality for the multidisciplinary team to utilise.

CONCLUSION: We aim to appraise the literature regarding 18F-FDG PET/CT in ovarian malignancy. We will highlight both the benefits and limitations of 18F-FDG PET/CT in the imaging of ovarian malignancy, with reference to cases performed at our institution.

Musculoskeletal E-Poster

E1001

Current concepts in the imaging of femoroacetabular impingement syndromes

Abdullah, A. • Zeiss, J. • Ebrahim, F. • Semaan, H.
University of Toledo Medical Center, Toledo, OH, USA

KEY LEARNING OBJECTIVES: Femoroacetabular impingement (FAI) syndrome is an important cause of early osteoarthritis of the hip in young patients. The two basic types of impingement, cam and pincer-type impingements are based on the type of anatomic variation contributing to the impingement process. FAI can potentially cause chronic symptoms of pain, joint locking, reduced range of motion in flexion and internal rotation. We will discuss the current concepts in imaging of femoroacetabular impingement.

DESCRIPTION: Imaging including conventional radiography, computed tomography, and magnetic resonance plays a central role in the diagnosis of FAI. However, the diagnosis of FAI is strictly made in the presence of appropriate clinical history in

conjunction with imaging findings. Emphasis will be placed on recognizing this entity on conventional radiography as well magnetic resonance imaging in appropriate clinical setting. The role of radial MR imaging around the femoral acetabulum or neck will be included. A brief discussion of the current imaging criteria will be provided. A gamut of potential pitfalls in the diagnosis of FAI will be discussed such as hip dysplasia in adults, pseudoacetabular overcoverage, and calcium hydroxyapatite deposition associated with acute hip pain.

CONCLUSION: Conventional radiography can be used to analyze the morphologies of a large number of hips and relate the individual morphologies to eventual osteoarthritis. CT-based methods are extremely beneficial in preoperative assessment and surgical planning. MR arthrography is considered the gold standard and clearly depicts the main diagnostic imaging features of FAI, acetabular cartilage, and labral pathology.

E1002

MR imaging features of patellar tendon-lateral femoral condyle friction syndrome

Jibri, Z. • Martin, D. • Mansour, R. • Kamath, S.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: In this presentation, we will illustrate the imaging features of patellar tendon-lateral femoral condyle friction syndrome. We will also highlight the clinical features and the recognised treatment options.

DESCRIPTION: This condition is clinically known as Hoffa's fat pad impingement. It is a recognised cause of anterior knee pain. It is proposed that patellar maltracking is a possible underlying aetiology. MRI is the imaging modality of choice for this condition and it is also helpful in providing clues of any associated functional abnormalities. We will illustrate the MR imaging features of this condition and highlight the indicators of patellar mal-tracking.

CONCLUSION: MRI is the imaging investigation of choice for patellar tendon-lateral femoral condyle friction syndrome. It is important to identify the imaging features of this condition, both for the provision of the appropriate treatment and in order to distinguish this entity from other causes of anterior knee pain.

E1003

Imaging of ankle impingement syndromes

Jibri, Z. • Kamath, S. • Mansour, R.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: This presentation aims to familiarise the reader with the imaging features of the different types of ankle impingement syndrome.

DESCRIPTION: Ankle impingement is the mechanical restriction of movement caused by soft tissue or bony abnormality. It is classified into; anterior, anterolateral, anteromedial, posteromedial and posterior ankle impingement. The plain radiograph may occasionally give clues to suggest the diagnosis. Ultrasound can show features suggestive of soft

tissue impingement. MRI is the imaging modality of choice as it can demonstrate both the bony and the soft tissue abnormalities. In this presentation we will describe the imaging features of ankle impingement syndromes with imaging correlation.

CONCLUSION: MRI is the imaging investigation of choice for ankle impingement syndrome. It is important to identify the imaging features of this condition, both for the provision of the appropriate treatment and in order to distinguish this entity from other causes of ankle pain.

E1004

Femoral acetabular impingement (FAI) syndrome - A controversial diagnosis

Patel, A. T. • Suresh, P.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: To introduce the concept FAI with emphasis on the salient imaging findings. To review the literature regarding the natural history of FAI and FAI's link with osteoarthritis (OA)

DESCRIPTION: The concept of FAI has been gaining momentum over the last 10 years. It is described as a subtle bony abnormality of the hip which if not treated may progress to labral and chondral degeneration and eventually OA. The mainstay of treatment is surgical however our critical review of the literature revealed there is little in the way of compelling evidence to suggest that treatment halts the progression to OA in the majority of cases. In addition there is not enough follow up data to suggest that untreated FAI will progress in the way proposed.

CONCLUSION: Despite the rational argument to suggest that FAI hips may progress to OA, the current literature suggests that the results of surgery are "mildly encouraging" at best. A cautious approach is required until the natural history of untreated FAI is established and the results of long term surgical follow up are published. The reporting radiologist should exercise caution before labelling a patient based on imaging finding alone and the management should involve an individualised multidisciplinary approach and appropriate counselling prior to intervention.

Following reading this exhibit the reader will be aware of:- (1) The imaging findings of FAI. (2) The proposed natural history of FAI. (3) The limitations of FAI as a concept.

E1005

Requests for shoulder ultrasound from primary care

Farmer, K. D.
Royal Cornwall Hospital, Truro, UK

PURPOSE: Over the last 3 years the number of requests for shoulder ultrasounds from primary care to our institution has risen from 10 per month to 80 per month with no significant change in the number requested by secondary care. The purpose of this study was to assess the diagnostic yield of shoulder ultrasounds requested from primary care with the ultimate aim of producing guidelines for the management of patients with shoulder pain.

MATERIALS/METHODS: A retrospective study was made of 200 consecutive shoulder ultrasound requests from primary care over a 20 week period. The scan results were assessed and correlated with the patient demographics and clinical information.

RESULTS: 124 scans were normal. 64 showed rotator cuff tears. 11 showed calcific tendonitis. 1 scan demonstrated bicipital tendonitis.

Of the 64 patients with rotator cuff tears 52 patients were older than 60 years. No tears were found in patients < 42 years. Between 42 and 60 years of age a history of significant acute trauma was given in 10 of the 12 cases.

CONCLUSION: It is possible to offer guidelines to improve the 'pick up rate' of pathology on shoulder ultrasounds based on the patient demographics and clinical details. A diagnostic shoulder ultrasound is only one part of the management pathway of a patient with shoulder pain and these guidelines form part of the wider pathway of treatment of patients with shoulder pain.

E1006

Prevalence of patellar-maltracking indicators in patients with patellar tendon-lateral femoral condyle friction syndrome; preliminary data

Jibri, Z. • Martin, D. • Mansour, R. • Kamath, S.
University Hospital of Wales, Cardiff, UK

PURPOSE: Our aim was to look for any association between the MRI indicators of patellar maltracking and the presence of patellar tendon-lateral femoral condyle friction syndrome (PTLFS), also known as superolateral Hoffa's fat pad impingement syndrome. **MATERIALS/METHODS:** We retrospectively identified patients over an 8 month period who presented with anterior knee pain and had undergone MRI of the knee showing features of PTLFS. We excluded those who had patellar or quadriceps tendinosis, ligamentous abnormalities, patello-femoral joint abnormalities, knee effusion, history of trauma and those with previous knee surgery. On the remaining 30 knees (our sample size), we assessed for the presence of 5 indicators of patellar mal-tracking. These were trochlear dysplasia (trochlear depth < 3 mm), abnormal TTTG (tibial tuberosity-trochlear groove distance of > 15 mm), lateral patellar displacement (> 2mm), lateral patellar tilt (patellofemoral angle < 8°) and patella alta (Insall- Salvati ratio > 1.3).

RESULTS: The trochlear depth was abnormal in 20% of the assessed knees. The TTTG was abnormal in 10%, lateral patellar displacement was present in 40%, abnormal patellar tilt was present in 73% and patella alta in 40% of the assessed knees. Eighty seven percent of the knees had at least one indicator and 50% had at least two indicators of patellar maltracking.

CONCLUSION: In patients with anterior knee pain and MRI signs of PTLFS, there is high prevalence of at least one or two indicators of patellar maltracking, supporting the view that patellar maltracking can predispose to PTLFS.

E1007

Assessment of rotator cuff tears using ultrasound and its correlation with MRI - our audit experience

Jain, A. • Mullett, R. • Dunn, A.
Royal Liverpool University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: Understanding the importance of adopting a reproducible, standardised technique for assessing rotator cuff (RTC) tears with Ultrasound (US).

DESCRIPTION: Background: The severity of atrophy and fat infiltration following RTC tears is inversely proportional to post operative rehabilitation times and outcome measures.

Purpose: Our audit was designed to:

- Evaluate current practice for US grading of RTC muscle atrophy
- Compare image acquisition and scoring systems with current literature
- Correlate US atrophy grading with MRI grading

METHODOLOGY: A single blinded, retrospective review of US grading of supraspinatus muscle (SSP) volume and fatty infiltration. A single blinded, retrospective review of MRI was then carried out. Imaging criteria were based on the methods described by Cardinal and Thomazeau.

RESULTS: 19% of RTC volume and 54% of fatty infiltration grading on US correlated with MRI findings. There was under-estimation of muscle volume atrophy grade in 81% patients and fatty infiltration grading in 27%. Only 39% of original US report criteria correlated with the retrospective US review.

Recommendations:

- Evaluate atrophy with standardized oblique imaging planes
- Agree an optimum frequency - 11 MHz
- Use modified Thomazeau method
- Document atrophy as grade 1-3 or mild / mod / severe

CONCLUSION: Standardised, reproducible imaging planes, atrophy scoring systems and consistent reporting nomenclature are essential for the evaluation of RTC muscle atrophy. These are essential if ultrasound is to be used as a reliable, single, imaging modality in the work-up of potentially repairable RTC tendon tears.

E1008

3D CT-based preoperative planning in primary total hip arthroplasty

Radmer, S.¹ • Huppertz, A.² • Erxleben, U.¹ • Sparmann, M.¹ • Andresen, R.³

¹Center of Orthopedics, Berlin, GERMANY, ²Imaging Science Institute Charité Berlin, Berlin, GERMANY, ³Institute for Diagnostic and Interventional Radiology/Neuroradiology, Westküstenklinikum Heide, Academic Teaching Hospital of the Universities Kiel, Luebeck and Hamburg, Heide, GERMANY

PURPOSE: Total hip replacement represents a considerable intervention in the biomechanics of the human body. For this reason, such interventions require detailed preoperative planning. At present, preoperative planning is done using

x-rays, whereby exact planning is limited by factors such as enlargements, projection angle, as well as imaging of the entire volume. The objective of our study was to test the feasibility and practicability of a 3D planning system.

MATERIALS/METHODS: 215 patients (average age 71.2 (32-85) years) underwent 64-slice CT for preoperative 3D planning of minimal-invasive hip arthroplasty. The data were further processed in DICOM format with the aid of special software (SYMBIOS® 3D-Hip Plan). After establishing the pelvic axis and determining the original center of rotation, the acetabular cup was initially positioned, followed by the stem. Through the possibility of continuous spatial allocation, both the size and the position of the prosthesis could be determined individually.

RESULTS: In 183/215 patients (85,1%) the acetabular cup was implanted as planned, in 32/215 patients (14,9%) a larger cup had to be selected to achieve sufficient primary stability. Due to femoral deformities, 9/215 patients (4,2%) received a custom made femoral stem. In the other 206 patients, the planning could be implemented exactly in 171/206 patients (83%). A femur fracture occurred in none of the patients.

CONCLUSION: 3D hip planning can be used to achieve a preoperative simulation of implant positioning, whereby the center of rotation of the hip can be optimally determined and reconstructed. Possible intraoperatively occurring imponderabilities can already be identified preoperatively.

E1009

Trapezioscapoid joint arthropathy caused by calcium pyrophosphate dihydrate crystal deposition disease of the wrist: what to look for

Theodorou, S. J.¹•Theodorou, D. J.²•Donich, A.³•Lektrakul, N.³•Liu, C.³•Kakitsubata, Y.³•Resnick, D.³
¹UHI, Ioannina, GREECE, ²GHI, Ioannina, GREECE, ³University of California, San Diego, CA, USA

PURPOSE: In the wrist, calcium pyrophosphate dihydrate (CPPD) crystal deposition disease most commonly results in structural joint damage in the form of scapholunate advanced collapse. Our objective was to investigate whether CPPD crystal deposition disease is associated with arthropathy of the trapezioscapoid joint, and other wrist abnormalities.

MATERIALS/METHODS: Retrospective review of frontal wrist radiographs was performed in 2 groups of patients. The first group comprised 112 patients (77 men, 35 women, mean age 74 years, n= 171 radiographs) with a documented diagnosis of chondrocalcinosis, and the control group comprised age- and sex-matched individuals.

Trapezioscapoid joint abnormalities were assessed and graded for all radiographs in both groups. Involvement of 5 other joints was evaluated, including the capitulate, scaphoid-trapezoid, scaphoid-capitate, lunate-hamate, and triquetrum-hamate. Statistical analysis and correlation of trapezioscapoid joint changes with other alterations in the wrist was also accomplished. **RESULTS:** Trapezioscapoid joint arthropathy was found in 45% of CPPD wrists and in 15% of control wrists. Notably, the

degree of arthropathy was more extensive in the CPPD group than in the control group (p<0.001). Features significantly correlated with trapezioscapoid joint arthropathy were first carpometacarpal joint arthropathy (p<0.001), and subchondral cysts in the scaphoid or trapezium.

CONCLUSION: CPPD crystal deposition disease causes significant and frequent radiographic changes of the trapezioscapoid joint in the wrist that may allow precise diagnosis of this disease, even in the absence of chondrocalcinosis. First carpometacarpal joint arthropathy and subchondral cysts of the scaphoid and trapezium are features strongly associated with trapezioscapoid joint arthropathy, in CPPD patients.

E1010

Osteoporosis: from diagnosis to treatment

Ralhan, S.¹•Bhatnagar, G.²•Brown, S.²•Suresh, P.³
¹Torbay Hospital, Torquay, UK, ²Peninsula Radiology Academy, Plymouth, UK, ³Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: Osteoporosis is an ever increasing common clinical condition that is very much under-recognised and under-treated. We illustrate the role of radiology in:

- Diagnosis of osteoporosis; what modalities are available for assessment of bone mineral density.
- Differential appearances of osteoporosis: disuse and aggressive osteoporosis.
- Insufficiency fractures; a multimodality approach demonstrating typical appearances on CT, MRI and nuclear medicine aiding accurate diagnosis.
- Treatment; the role of vertebroplasty.

DESCRIPTION: One in two women and one in five men over the age of fifty in the UK will fracture a bone; mainly as a result of osteoporosis. Familiarity with this pathology is important for radiologists worldwide. The diagnosis can be challenging and the role of dual X-ray absorptometry and other diagnostic techniques is discussed with illustrations. Osteoporosis can present with a variety of plain film features. We present examples of typical, disuse and aggressive forms of osteoporosis. Insufficiency fractures are illustrated on plain film, CT, MRI and nuclear medicine. The ever increasing role of radiology in the management of osteoporosis is discussed with examples of vertebroplasty.

CONCLUSION: Osteoporosis is a mounting clinical problem in an aging national population. Radiology plays an important role in all stages of the disease. Radiologic features in association with clinical presentations are illustrated and radiological treatment modalities are discussed.

E1011

Ankle and hind-foot pathology: MRI appearances

Thorning, C.¹•Tyler, P. A.²
¹East Surrey Hospital, Surrey and Sussex NHS Trust, Redhill, UK, ²Royal National Orthopaedic Hospital NHS Trust, Stanmore, UK

KEY LEARNING OBJECTIVES: (1) Depict the normal radiological anatomy of the ankle and hindfoot. (2) Illustrate the range of manifestations of the ankle and hindfoot. (3) Enable accurate diagnosis of ankle and hind-foot pathology. (4) Understand the role of MRI imaging including MR arthrography in ankle and hind-foot pathology

DESCRIPTION:

- Illustrations and normal MRI appearances of the tibiotalar and ankle mortise joints
 - a. Medial collateral ligamentous complex
 - b. Lateral collateral ligamentous complex
- Pathology of the ankle joint including impingement syndromes
- MRI arthrography techniques and indications
- Anatomy and pathology of the flexor tendons
 - a. Achilles tendon pathology: Insertional Achilles tendinosis and tears
 - b. Peroneal tendon anatomy and pathology
- The extensor tendons of the ankle
- MRI anatomy and pathology of the hind-foot
 - a. Talar osteochondral lesions
 - b. Fractures
 - c. Osteomyelitis
 - d. Charcot neuroarthropathy
- Pathology of the sinus tarsi

CONCLUSION: We will illustrate the relevant anatomy and review a range of abnormalities of the ankle and hind-foot using magnetic resonance imaging.

E1012

Femoroacetabular impingement - pearls and pitfalls on MR arthrography

Teoh, E. J. •McKean, D. •Teh, J.
Nuffield Orthopaedic Centre NHS Trust, Oxford, UK

INTRODUCTION: This presentation outlines the essential features of femoroacetabular impingement on MR arthrography.

LEARNING OBJECTIVES: The 4 main features that should be reported on are outlined:

1. The presence of a labral tear
2. The state of the articular cartilage
3. The presence of cam or pincer impingement
4. The anaesthetic response to the arthrogram

MATERIALS AND METHODS: Classic imaging features of femoroacetabular impingement on MR arthrography are described. The value of radial imaging is demonstrated. The measurement technique for obtaining the alpha angle is described.

CONCLUSION: This poster should improve your interpretation and reporting skills when evaluating femoroacetabular impingement

E1013

Post-operative MRI knee findings

Tyler, P. A.¹•Thorning, C.²•Khoo, M.¹•Shetty, S.¹•Rajeswaran, G.¹

¹Royal National Orthopaedic Hospital NHS Trust, Stanmore, UK, ²Surrey and Sussex NHS Trust, East Surrey Hospital, Redhill, UK

KEY LEARNING OBJECTIVES:

1. Description of the operative procedures available for meniscal injury
2. Depict normal and abnormal MRI appearances post meniscal surgery
3. Illustrate normal and abnormal MRI appearances post ligamentous repair
4. The role of MRI in cartilage repair procedures
5. Post-operative knee protocols to assist in enabling an accurate diagnosis to be made

DESCRIPTION:

- Normal post-operative meniscal appearance
 - a. Partial meniscectomy
 - b. Meniscal tear
 - c. Meniscal transplantation
- Abnormal post-operative meniscal appearance: differentiating between a new meniscal tear and scar tissue
- Normal MRI appearances post anterior cruciate, posterior cruciate, medial collateral and lateral collateral ligamentous reconstruction
- Abnormal MRI appearances post ligamentous reconstruction
- Discussion of cartilage repair procedures such as 'Autologous chondrocyte implantation' (ACI)

CONCLUSION: An appropriate MRI protocol and informed interpretation is necessary to differentiate between normal and abnormal post-operative knee appearances.

Reference: 1. Saifuddin A. Musculoskeletal MRI. New York. 2008

E1014

Elbow ultrasound - the beginner's guide

McKean, D. •Sutcliffe, J. •Teoh, E. J. •Teh, J.
NOC NHS trust, Oxford, UK

INTRODUCTION: This presentation will outline a simple systematic approach to performing ultrasound of the elbow.

LEARNING OBJECTIVES: (1) Essential compartmental anatomy. (2) Ultrasound technique. (3) Imaging appearances of common pathology - synovitis, loose bodies, biceps tendon injury, tendinosis, entrapment neuropathy, masses. (4) Pearls and pitfalls of ultrasound of the elbow

MATERIALS AND METHODS: Anatomical diagrams and corresponding ultrasound depictions are presented.

MRI correlation is provided where appropriate.

CONCLUSION: A systematic approach to evaluating the common pathological conditions of the elbow is presented.

E1015

Entrapment neuropathy - what the radiologist needs to know

Sutcliffe, J. •Teoh, E. J. •McKean, D. •Teh, J.
NOC NHS Trust, Oxford, UK

INTRODUCTION: Painful tingling, numbness and weakness may be the result of the entrapment of a peripheral nerve.

Although common, they sometimes lead to diagnostic and management difficulties. A thorough knowledge of the anatomy of the typical entrapment sites will enable the radiologist to perform a focussed examination of the patient

LEARNING OBJECTIVES: (1) Entrapment neuropathies occur at specific sites, usually where nerves pass through fibro-osseous tunnels. (2) Entrapment neuropathy may be diagnosed using ultrasound or MRI.

MATERIALS AND MATERIALS: In the upper limb examples of entrapment at the spinoglenoid notch, ulnar groove, carpal tunnel and Guyon's canal are provided.

In the lower limb examples of common peroneal entrapment and tarsal tunnel syndrome are provided

CONCLUSION: Nerve entrapment occurs at predictable sites, and knowledge of the key anatomy facilitates diagnosis

E1016

Deciphering the acronyms in rotator cuff imaging

Menon, S. • Ganijee, M. • Bhatti, W.
UHSM, Manchester, UK

BACKGROUND: Advances in MSK ultrasound, MR and arthrography, has enabled detection of subtle pathology, and the ability to characterise tendon and cartilage lesions to a greater extent. This has resulted in an explosion of catchy acronyms, (PASTA, PSGI, ALPSA, HAGL, BHAGL, GLOM, to name but a few). While it is advantageous to detect and characterise subtle lesions, it serves little purpose if the arthroscopist and orthopaedic surgeon don't comprehend the terminology or its clinical implication. In the current climate, with greater number of scans being outsourced and reported remotely, it is vital that both the radiologist and the orthopedic surgeon speak the same language.

AIM: This multimodality pictorial review aims to illustrate the anatomy and pathology and define the terminology used in rotator cuff imaging, by providing diagrammatic illustration with ultrasound and magnetic resonance correlation.

DESCRIPTION: This educational exhibit illustrates, primary and secondary impingement, the different types of tears of the rotator cuff tendons including but not limited to concealed rim rent tears, L shaped, U shaped, partial and full, width and thickness tears, the morphology of acromion and how it contributes to impingement, and alerts us to the common pitfalls encountered in both ultrasound and MR imaging. Last but not the least it provides a template for reporting the Shoulder MR and arthrogram.

CONCLUSION: It is hoped that this exhibit will enable the reader to understand the terminology employed in rotator cuff imaging, and provide a succinct clinically relevant report.

E1017

The milestones and current frontiers of musculoskeletal radiology

Menon, S.
UHSM, Manchester, UK

BACKGROUND: Musculoskeletal radiology has come a long

way since William Roentgen radiographed his wives hand in 1895. One is better poised to challenge new frontiers and invent, when one has a comprehensive understanding of the road he has travelled and the milestones achieved.

AIM: This exhibit aims to highlight the milestones in the growth of musculoskeletal radiology, in conventional radiography, from the days of wet reading of films to digital radiography, in use of ultrasound in studying peripheral tendon pathology, and percutaneous intervention. In CT from days of Godfrey Hounsfield to dual source scanners in MR from 0.2 Tesla scanners to 3T scanners with echo planar imaging, MR spectroscopy, Quantitative T2 imaging, T1 rho, and Ultra short TE scanning. in Intervention from blind tendon injections to radio frequency ablations, cryoablations, vertebroplasty and balloon kyphoplasties. This pictorial review, discusses and illustrates, the physics and clinical applications of frontier technologies with special emphasis on MR and Intervention musculoskeletal radiology.

CONCLUSION: It is imperative that we realise, especially in the current climate; that radiology is engaged in a stiff turf war with non-imagers, and is in danger of becoming extinct. It is hoped that this exhibit reminds us of our achievements, especially with respect to musculoskeletal radiology and reiterates the necessity to remain at the cutting edge of technology to thrive.

E1018

Ultrasound guided tendon therapy - rationale, indications and technique

Dionello, R.¹ • Franklin, J.² • Stedman, J.¹ • Teh, J.¹
¹NOC NHS Trust, Oxford, UK, ²NOC NHS Trust, Abingdon, UK

INTRODUCTION: Ultrasound guided intervention plays an important role in the treatment of tendon pathology.

LEARNING OBJECTIVES: (1) Pathogenesis and pathophysiology of tendon disease. (2) Rationale and evidence for intervention. (3) Various interventional procedures including steroid, dry needling, autologous blood, sclerosing agents and high volume injections. (4) Tips and tricks. (5) Complications

MATERIALS: Animations and sonographic videos demonstrating the technique of injection.

CONCLUSION: With careful planning and attention to detail, ultrasound guided tendon therapy can be safely performed with few side effects and good functional outcomes.

E1019

Posterior dislocation of glenohumeral joint with Salter-Harris type III fracture of proximal humerus

Mahmood, A. • Mullan, C.
Altnagelvin Area Hospital, Londonderry, UK

KEY LEARNING OBJECTIVES: To demonstrate the plain radiographic and CT appearances of Salter-Harris type 3 proximal humeral fracture with posterior glenohumeral dislocation.

DESCRIPTION: Dislocation of glenohumeral joint in children

is rare. To our knowledge, this is the second case report of a Salter-Harris type 3 physal fracture with posterior dislocation of the proximal humerus, and the first case with successful closed reduction.

A 14-year old boy presented with pain and swelling of his left shoulder following high speed motorbike accident. Plain radiographs and CT confirmed posterior dislocation of the humeral head and a fracture through the proximal humeral physis extending into the humeral head epiphysis in keeping with Salter-Harris type 3 injury. The humeral head epiphysis was displaced anteriorly in relation to the metaphysis. A closed reduction was successful under general anaesthesia and the patient made an uneventful recovery. At 4 weeks follow-up, radiographs showed normal humeral head contour with evidence of healing and no complications.

CONCLUSION: Salter-Harris type 3 injuries with posterior dislocation of the glenohumeral joint in children are rare. CT is mandatory to assess the anatomy and true fracture pattern for successful management. Closed reduction can be successful. However, due to the risk of avascular necrosis, long term follow up is advised.

Musculoskeletal Poster

P1001

The effectiveness of fluoroscopic Synvisc (Hyaluronic Acid) intra-articular injections in the management of osteoarthritis

Hoosain, M. M. • Davey, R. A. • Ghumra, F. • Armstrong, A. L. • Bhatt, R.
University Hospitals of Leicester, UK

PURPOSE: Osteoarthritis (OA) remains a common disorder. Surgical management is not always suitable, especially in younger patients. There is growing evidence that intra-articular administration of Synvisc (hyaluronic acid) provides symptomatic relief, delaying the need for aggressive intervention. This study evaluates the use of this viscosupplementation in symptomatic patients and assesses response.

MATERIALS/METHODS: All patients who underwent fluoroscopic guided intra-articular administration of Synvisc over a 3 year period (August 2007-August 2010) were identified, and had their notes/imaging retrospectively reviewed. Seventeen patients were identified (n=17). Of these, 12 were referred for injection of their shoulder joint, and 5 for their hip joint.

RESULTS: The mean age of these patients at first injection was 57 years (range 39-73). Eight were female, 9 were male. The duration of symptoms of pain ranged from 10 months to 20 years. Radiological imaging revealed mild OA in 14 (82%) patients, and moderate to severe OA in the remaining 3 (18%) patients. 14 patients (82%) had a previous trial of steroid injections with varying degrees of response. 23 Synvisc injections were administered in the 17 patients (3 had at least one repeat administration). 13 (76.5%) patients had some or total relief of symptoms (95% CI 56.3-96.6%). Mean duration of relief was 4.9 months (range 1-12). There were no immediate

complications/side effects.

CONCLUSION: This study adds to the growing evidence that intra-articular Synvisc injections are safe and effective at symptomatic control of OA and may delay the need for surgery. We advocate its increased use in appropriately selected patients.

P1002

A randomised controlled trial of corticosteroids and local anaesthetic versus anaesthetic alone for therapeutic intraarticular injection of the thumb carpometacarpal joint for osteoarthritis

Mallinson, P. I.¹ • Farnell, R.² • Campbell, D.² • Robinson, P.²
¹Hull Royal Infirmary, Hull, UK, ²Leeds Teaching Hospitals Trust, Leeds, UK.

PURPOSE: To evaluate the efficacy of ultrasound guided intraarticular injection of the thumb for carpometacarpal joint osteoarthritis. Secondly, assess the impact of radiological arthritic severity on treatment efficacy.

MATERIALS/METHODS: All patients had failed conservative treatment, were referred by consultant hand surgeons and randomised to receive both corticosteroid and local anaesthetic or local anaesthetic alone. All participants were blinded to injection contents. 21 ultrasound guided injections were performed over 2 years. (11 combined, 8 anaesthetic alone). Arthritic severity was assessed by ultrasound Doppler assessment of the joint capsule and x-ray appearances (Eaton and Glickel 4-point scale) before treatment. Disability (Disabilities of the Arm, Shoulder and Hand questionnaire) and active pain (Grip/Pinch gauges) were assessed before, 6 weeks and 6 months after treatment. Linear mixed modelling compared treatment changes over time and the effect of osteoarthritis severity on these measures.

RESULTS: Significant improvement in disability occurred in both groups (p=0.0016) at 6 weeks and 6 months. No significant difference in disability improvement was seen between the two groups. For x-ray score >2 no significant improvement was seen (p=0.045). Pain during Tip pinching and Maximum Key pinching showed significantly better improvement in the combined group than the anaesthetic group at 6 months (p=0.027). No significant US Doppler score correlations were seen.

CONCLUSION: This study suggests that steroids and anaesthetic may be beneficial in the treatment of thumb carpometacarpal joint osteoarthritis, with an advantage of combined therapy over anaesthetic alone in pain control. Higher x-ray grade was associated with poorer treatment outcome.

P1003

"Once it Pops you must Stop!" Combining intra-articular steroid and local anaesthetic with large volume capsular hydrodistension for adhesive capsulitis: A single centre review of 60 consecutive patients

Murtagh, B. • Hickson, M. • Andrews, J. • Pathak, S.
Whipps Cross University Foundation Hospital Trust, London, UK

PURPOSE: Adhesive capsulitis is a difficult condition to

treat, physiotherapy and steroid injection alone have had limited success. We describe the radiological technique and 18 month outcome of combining intra-articular steroid and local anaesthetic with large volume (40-140mls) hydrodistension of the glenohumeral joint for adhesive capsulitis.

MATERIALS/METHODS: 60 patients with clinically proven adhesive capsulitis resistant to physiotherapy and steroid injection underwent fluoroscopically guided intra-articular steroid, local anaesthetic and large volume capsular hydrodistension (40-140mls normal saline) as an outpatient procedure. Endpoints leading to termination of the procedure were capsular release, capsular rupture (both identified on fluoroscopy) or patient discomfort. Outcome was assessed via a telephone interview using a Shoulder Pain and Disability Index questionnaire.

RESULTS: We demonstrate a high initial technical success rate employing a posterior, fluoroscopically guided approach with a significant and instant increase in range of movement experienced by the majority of patients. Maintaining benefit at 18 months is dependent on concomitant physiotherapy.

CONCLUSION: Conventional methods of therapy have exercised caution in injecting greater than 20 mls volume into the shoulder joint for fear of capsular disruption. We routinely inject up to 140 mls using fluoroscopy with strict observation of defined endpoints. A minority of patients had capsular rupture not associated with any deleterious effects. Patient discomfort may be overcome with the use of intravenous sedation and analgesia but would require more intensive monitoring and observation; we deem this unnecessary given the favourable outcome without.

P1004

Painless ganglion cyst aspiration for patient and clinician

Clague, G. • Bradley, M.

North Bristol NHS Trust, Bristol, UK

PURPOSE: The management options for ganglion cysts include observation, aspiration +/- steroid injection and surgical excision. One of the problems encountered during fine needle aspiration is the highly viscous cyst fluid being difficult to withdraw. We propose a modified technique, which improves the ease and speed of achieving complete aspiration of ganglion cysts by using local anaesthetic.

METHODS: Twenty-five patients who were referred from primary care and orthopaedic outpatients were diagnosed with ganglion cysts on ultrasound. The modified aspiration technique involves injecting a small volume of local anaesthetic into the cyst fluid prior to aspiration and was performed on all patients.

RESULTS: All cysts were completely drained using this modified technique with no immediate complications and with minimal discomfort to the patient.

CONCLUSION: Our adaptation to the technique of simple aspiration provides a method of achieving complete ganglion resolution with ease and in a time frame appropriate for a standard outpatient appointment. Low immediate complication

rates are seen due to the adjunct of ultrasound and the local anaesthetic reduces patient discomfort during the procedure. This method has been particularly effective for large ganglions but can be equally effective for treating smaller lesions.

P1005

Ultrasound guided soft tissue foreign body removal: Appearances, techniques and pitfalls

Klimczak, K. J. • Bradley, M. • Hunt, R.

Southmead Hospital Bristol, UK

KEY LEARNING OBJECTIVES: (1) The sonographic appearances of common soft tissue foreign bodies. (2) Techniques for Ultrasound guided removal. (3) Common pitfalls encountered whilst attempting removal

DESCRIPTION: Soft tissue wounds caused by penetrating trauma are a common presentation to the Emergency Department (ED). The possibility of foreign body (FB) matter within the wound is often investigated by radiographs which will only reveal radio-opaque material. This leaves the potential for a retained FB and future morbidity from delayed wound healing and soft tissue infection.

Wound exploration within the ED can cause further soft tissue damage and extension of the wound without revealing the retained FB. In addition, the missed diagnosis of a retained FB is reported to be a common cause of litigation against ED doctors. Sonography has been widely reported to be highly sensitive in the detection of FBs within soft tissue, it can also be easily used at the bedside and presents no radiation risk. It can be utilised to accurately locate such FBs and assist in their removal thereby avoiding further complications from unguided wound exploration.

We illustrate the sonographic features of common FBs, present techniques used to remove them from wounds and some of the pitfalls encountered whilst doing so.

CONCLUSION: The possibility of a soft tissue foreign body should always be considered in cases of penetrating trauma to prevent future wound complications and potential litigation.

The use of ultrasound localization and guided foreign body removal will greatly improve the management of such patients.

P1006

Assessment of ultrasound guided soft tissue biopsies in a regional sarcoma centre

Porter, N. A., Wilson, J. P.

Manchester Royal Infirmary, Manchester, UK

PURPOSE: Ultrasound guided soft tissue tumour biopsies are performed in our hospital as part of the hub of the regional sarcoma service as recommended by 2006 NICE guidelines. The purpose of this audit was to compare diagnostic accuracy of biopsies with final histology and to compare findings with a previous audit performed at the time of the introduction of the NICE guidelines.

MATERIALS/METHODS: We reviewed all ultrasound guided

soft tissue biopsies performed in our hospital over a 2 year period from January 2008 to December 2009. The number of inconclusive biopsies was recorded, as well as final histological outcome. Findings were compared with the previous audit.

RESULTS: 142 biopsies were performed over the two years (compared with 50 in the previous audit). Of these, 11 were inconclusive. In total, 73 cases were benign, 51 were sarcomas and 18 were other malignancies. Of the benign biopsies, 28 had surgery and in all except one patient, the histology confirmed benign findings. Of biopsies reported as sarcomas, all except 5 had surgery and in all of these the final histology confirmed sarcoma. 74% of all patients and 87% of those with sarcomas originated from other hospitals.

CONCLUSION: Following development of our regional sarcoma service there has been substantial increase in biopsy numbers within our centre, the majority originating from other hospitals. Of patients with excision histology, all malignancies were correctly identified except in one case in which the initial biopsy was reported as benign.

P1007

Demonstration of the anatomy of the extrinsic carpal ligaments of the wrist using MR Arthrography

Spencer, C. R.¹•Venumbaka, M. R.¹•Toms, A. P.²
¹Colchester University Hospital NHS Foundation Trust, Colchester, UK, ²Norfolk and Norwich University Hospital, Norwich, UK

KEY LEARNING OBJECTIVES: We will describe the normal bony anatomy of the wrist and use the Taleisnik classification to group the carpal ligaments into intrinsic and extrinsic ligaments. Finally, with the aid of selected MR arthrography images, present a pictorial review of normal anatomy of the extrinsic ligaments.

DESCRIPTION: Ligamentous injury is a common cause of carpal instability, leading to chronic wrist pain. Carpal instability is defined either as the misalignment of carpal bones on plain film radiographs or carpal ligamentous tears. Great advances in MR imaging including development of thin section, volume-acquisition sequences, have enabled investigators to identify ligaments of the wrist previously unseen on other imaging modalities. These ligaments have been grouped by Taleisnik (1976) into: intrinsic- entirely within the carpus, and extrinsic- having an attachment to the carpus and passing out of the carpus (radiocarpal or ulnocarpal ligaments).

By injecting gadolinium-containing contrast agents into the wrist, followed by MR imaging; investigators have been able to produce images of better quality, allowing the evaluation of ligament integrity. A greater knowledge of the carpal ligament anatomy is needed to understand the nature of the carpal instability. We present selected MR arthrography images of the wrist to demonstrate the normal anatomy of the carpus and its extrinsic ligaments and emphasize the role of cross-sectional imaging in assessing the ligaments.

CONCLUSION: MR-arthrography is an excellent imaging modality that can be used to assess the nature of carpal instability and evaluate extrinsic ligamentous tears.

P1008

SAPHO syndrome: a rare cause of vertebral disease

Baker, S. A. •Ridley, N. •Williamson, L. •Price, E.
Great Western Hospital, Swindon, UK

KEY LEARNING OBJECTIVES: SAPHO syndrome (synovitis, acne, pustulosis, hyperostosis and osteitis) is a rare condition with both musculoskeletal and skin manifestations. Spinal involvement may occur in up to half of patients but is often unrecognised. Imaging findings can mimic malignancy or infection.

DESCRIPTION: We present three cases of SAPHO syndrome with thoracic spine involvement. Two patients initially presented with back pain. The first case was a 51 year old woman whose MRI showed focal changes in the thoracic vertebrae T8-T11 with patchy high signal on STIR and corresponding increased uptake on a bone scan. The second case was a 48 year old woman whose MRI showed signal changes at T6-T8. In both cases vertebral biopsy showed fibrosis and inflammatory cells but no evidence of infection or malignancy. The first patient had a history of acne and dry skin on the palms and soles; the second had no skin manifestations. The third case was a 34 year old woman with known SAPHO comprising palmoplantar pustulosis and osteitis of the sternoclavicular joints that later developed thoracic back pain. An MRI showed wedging of the T9 vertebral body.

CONCLUSION: SAPHO syndrome is a rare cause of vertebral disease but should be considered in the differential diagnosis of spinal lesions on imaging. Clinical correlation, particularly the presence of skin lesions, is helpful although these may be absent at diagnosis. MRI specific features may support the diagnosis and avoid the need for invasive procedures in selected patients.

P1009

A review of the spectrum of radiological appearances of spinal tuberculosis and its complications

Topple, J. •Shawyer, A. D. S. •Patel, S. •Prabhudesai, S. •Vaidya, S.
Barts and The Royal London, UK

KEY LEARNING OBJECTIVES: Understand the spectrum of appearances of Spinal TB both acutely and in longstanding disease.

DESCRIPTION: We illustrate the variety of different radiological presentations of TB in the spine seen in our East London tertiary referral centre. We demonstrate the range of different associated complications of primary spinal TB.

We also review the role of radiologically-guided procedures in the management of spinal TB and it's complications.

CONCLUSION: Spinal TB has a high morbidity if treatment is delayed and a sound knowledge of it's radiological manifestations facilitates an early diagnosis.

P1010

Multimodal imaging findings in femoro-acetabular impingement

Sullivan, C. M. • Chakraverty, J. K. • Narayanaswamy, S. M. • Kamath, S.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVE: To illustrate the multimodal imaging findings in Femoro-acetabular impingement (FAI).

DESCRIPTION: (1) Different signs to aid in the diagnosis of Cam and Pincer type of FAI on plain film and CT will be illustrated. (2) Value of reformatted CT in the demonstration of these signs will be presented. (3) MRI appearances secondary to FAI such as labral tears, cartilage delamination and juxta-articular fibrocystic changes will be discussed. (4) General Pitfalls of imaging in FAI will be discussed.

CONCLUSION: FAI is recognized as an important cause of premature osteoarthritis of hips in the younger population, but there is lack of awareness amongst radiologists in identifying FAI. This article provides various examples of primary signs and secondary changes of cam and pincer type FAI on plain film, CT and MRI. Recognition of these changes is important as early diagnosis and appropriate treatment of FAI will reduce symptoms and improve function.

P1011

Prevalence of femoro-acetabular impingement in young patients presenting to primary care with hip pain

Sullivan, C. M. • Narayanaswamy, S. • Chakraverty, J. K. • Kamath, S.
University Hospital Of Wales, Cardiff, UK

PURPOSE: To determine the prevalence of Femoro-Acetabular Impingement (FAI) in young patients (20-40years) presenting to primary care with hip pain.

METHODS: Retrospective review of consecutive patients presenting with hip pain aged 20-40years who underwent pelvic X-ray in a 6 month period (Sep 09-Feb 10). Patients with pre-existing hip disease and/or technically inadequate films were excluded. The following radiographic signs of FAI were analysed for; Focal Acetabular Retroversion, Posterior Wall Sign, Coxa Profunda, Protrusio Acetabuli, Acetabular Index, Lateral Edge Angle, Pistol Grip Deformity, and Herniation Pits. Note was also made of the presence of degenerative changes.

RESULTS: Initially, 223 patients were identified. Following strict application of exclusion criteria, 33 patients remained in the study (17 female; 16 male. Age 21-40; Mean 33 years). The majority of films were excluded because of technical factors.

Sixty-six joints were assessed and each radiograph had initially been reported as normal. Of these, 32 patients (97%) had at least one abnormal parameter thought to predispose to FAI.

CONCLUSION: FAI is recognised as a major cause of early osteoarthritis in young population. There are a number of findings on pelvic x-ray established in the literature that can help in the diagnosis of FAI. These positive radiological findings

should be put in context of clinical assessment. Our study demonstrates a high prevalence of parameters predisposing to FAI in young symptomatic population. This study reflects general unawareness of plain film parameters predisposing to FAI amongst radiologists.

P1012

Radiographer reporting of paediatric hips

Waring, L. • Lancaster, A. • Flintham, K. • Buckley, K.
Mid Yorkshire Hospitals, Wakefield, UK

PURPOSE: Traditionally the scope of radiographer reporting was restricted to ED referrals, however this is continually being extended by Advanced Practitioner Radiographers (APRs), particularly within Mid Yorkshire NHS Trust. Among recent role extensions, APRs are now reporting all paediatric hip images to provide standardisation of orthopaedic measurements by fully utilising PACS technology. This provides an accurate diagnostic baseline for further follow up plain film imaging.

KEY LEARNING OBJECTIVES:

- To describe how the service was implemented
- To explain the principles of paediatric hip measurements
- To reflect on the effectiveness of the final report to the multidisciplinary team

DESCRIPTION: The PACS system does not allow the referrer to annotate and save orthopaedic measurements for future comparison, as they previously did on plain film. The radiographer's scope has been extended to take on this role.

A duplicate image is created on the PACS system. When reporting, the APR uses the duplicate image to measure and save formal annotations which include acetabular angles and femoral head migration percentages.

The measurements are useful for GP referrers wishing to seek an orthopaedic opinion, for physiotherapists managing dysplasia in cerebral palsy patients and for surgical planning.

CONCLUSION: This successful role extension has been well received by all referrers. It allows accurate diagnosis of hip pathologies and a reference tool for the ongoing monitoring of hip dysplasia patients. The role extension has provided increased profile of the APR's within the multidisciplinary team and given the APR's a greater role in patient management.

P1013

Knee radiography: kicking the habit - a cost analysis of implementing the Ottawa Knee Rules in the emergency department

Khan, K. • Jarvis, P.
Calderdale Royal Hospital, Halifax, UK

PURPOSE: To evaluate the cost implication of implementing the Ottawa knee rules (OKR) when assessing patients with acute knee injuries presenting to the Emergency Department (ED).

MATERIALS/METHODS: The Emergency Department computer system EDIS was used to identify retrospectively all patients that presented to the ED with an acute knee injury

over the 3 month period from 1st February 2010 to 31st May 2010. EDIS was also used to identify all patients that had a knee radiograph requested.

The clinical notes of all patients identified were evaluated for presence of documentation of the OKR. The final radiology report was obtained from our departmental electronic Picture Archiving Communication System (PACS).

RESULTS: 315 patients attended the ED with a history of knee trauma over the study period. 207 patients (65.7%) had knee x-rays performed. Out of these, 120 patients (58.0%) had knee x-rays that were appropriate and indicated by the OKR. 87 patients (42.0%) had knee radiographs which were not indicated by the OKR. None of the 207 knee radiographs performed demonstrated any bony injury. Strict implementation of the OKR could see 252 fewer knee x-rays being requested per annum. For our hospital this would mean an estimated saving of £26460 per annum. In addition a 21 hour reduction in radiology reporting time per annum.

CONCLUSION: Strict implementation of the OKR in the ED for patients attending with acute traumatic knee injuries would see a marked reduction in the expenditure of the ED.

P1014

The lateral sulcus sign - the good, bad and ugly

Musson, R. E. •Kotnis, N. •Gowlett, S.
Sheffield Teaching Hospitals NHS Trust, Sheffield, UK

KEY LEARNING OBJECTIVES: Anterior cruciate ligament (ACL) tears can be easily missed clinically in the acute setting and if left untreated may lead to instability and secondary meniscal damage. A radiograph of the knee may reveal subtle findings which point to the diagnosis, one of these being the 'lateral sulcus sign'.

DESCRIPTION: The 'lateral femoral sulcus or notch sign', seen on a plain lateral radiograph of the knee is characterised by an abnormal deep depression of the lateral condylopatellar sulcus. This appearance is caused by an osteochondral impaction fracture and is an indirect sign for ACL rupture. The mechanism for ACL tear is rotation force and valgus stress. A pivot shift action occurs during injury to the ACL and the lateral tibia subluxes anterior to the femur resulting in the posterior femur impacting on the lateral femoral condyle. This impaction results in the sulcus seen on plain film and also gives rise to the classical 'kissing contusions' seen at MRI. We present a spectrum of findings of lateral femoral condyle injury due to ACL tear, ranging in severity from bone marrow bruising on MR without correlating plain film findings through to a cortical fracture detected on plain radiograph.

CONCLUSION: The lateral sulcus sign, which can be identified on plain radiographs, is due to an impaction fracture. It is important to look carefully for this sign, recognise its significance and organise early MR imaging to look for associated ACL tear.

P1015

MRI assessment of patellar instability

Jibri, Z. •Mansour, R.
University Hospital of Wales, Cardiff, UK

KEY LEARNING OBJECTIVES: In this presentation, we will illustrate the MRI features of patellar dislocation. We will review the risk factors of recurrent dislocation and chronic patellar instability with imaging correlation.

DESCRIPTION: Most patients with patellar dislocation are young active individuals. Nearly 50 % of these patients will undergo recurrent dislocation. Chronic patello-femoral instability will lead to cartilage damage and subsequent osteoarthritis if not accurately treated. Trauma alone rarely causes patellar dislocation in the absence of underlying predisposing factors. The most common predisposing factors for patellar instability include trochlear dysplasia, patella alta, and lateralization of the tibial tuberosity. In this presentation we illustrate the MR imaging features of patellar dislocation and those of the anatomical risk factors.

CONCLUSION: MRI is the imaging investigation of choice for patellar dislocation. It provides clues about the underlying risk factors for recurrent dislocation. The treatment is aimed to correct the abnormalities that have predisposed to patellar dislocation in order to prevent future instability and permanent damage. It is important to recognise these risk factors on MRI in order to help the surgeon in choosing the accurate treatment strategy.

P1016

Pictorial review of posterolateral corner injuries of the knee on MRI scans

Oh, T. C. •Beardmore, S. •Ali, S. •Canty, S.
Royal Preston Hospital, Preston, UK

KEY LEARNING OBJECTIVES: Understand the posterolateral corner and its components, various ways of pathological presentations and the imaging findings along with management aspects.

DESCRIPTION: Posterolateral corner injuries are defined to be an injury of the structures on the lateral and posterolateral aspect of the knee which contribute to an increased amount of varus, external rotation, and/or coupled posterior drawer and external rotation of the knee. Posterolateral corner injuries of the knee are uncommon but it is important to diagnose them accurately as there is a range of presentations possible. Understanding the underlying anatomical structures that make up the various layers and components of the posterolateral corner is important to understanding the various pathologies that may present. We discuss the types of mechanisms involved in most atraumatic and traumatic types of presentations. Radiograph and MRI findings are illustrated with various variants and pitfalls in evaluating them. The range of pathologies from grade I popliteus tendon strains to full grade III ruptures of LCL complex along with stripping of ilio-tibial tracts are demonstrated. Failure to identify or repair these structures may lead of an unstable knee

or associated ACL reconstruction failure. Discussion of key management points according to injury pattern and severity as well as timing of these interventions are included.

CONCLUSION: Posterolateral corner injuries remain a potential pitfall in diagnoses for the 'routine radiologist' reporting on knee MRI and understanding this injury will aid in future diagnosis.

P1017

Ultrasound guided injection of Morton's neuroma lesions: are we getting it right?

Akhtar, S. • Parkin, C. K. • Walshaw, C. F.
Blackpool Victoria Hospital. Blackpool, Fylde and Wyre Hospitals NHS Foundation Trust, Blackpool, UK

PURPOSE: Injecting Morton's neuroma lesions with a corticosteroid-anaesthetic agent has been shown to produce symptomatic relief. Published data demonstrates symptomatic improvement in 47-76% following a single injection. This audit assesses patient satisfaction and development of complications following one injection.

MATERIALS/METHODS: Forty consecutive patients referred to Blackpool Victoria District General Hospital for ultrasound-guided injection of Morton's neuroma lesions were invited to complete a postal questionnaire. Respondents rated satisfaction following injection using a Johnson Scale, post-procedure complications and further intervention required.

RESULTS: Twenty-nine questionnaires were returned (73% response rate). Most patients (n=20; 69%) reported satisfactory outcomes. Post-procedure complications were reported by 48% of patients (n=14). These included injection site pain (37%), skin staining (14%) and fat necrosis (6%). Fifty-nine per cent required further interventions (nineteen interventions in total) including repeat injections (39%), surgery (26%) and other alternative therapy (3%).

CONCLUSION: Ultrasound-guided injection of Morton's neuroma lesions is a simple treatment resulting in high levels of satisfaction amongst patients. It is an effective alternative to surgery. Our results meet those of other published series. Where further intervention was required, repeat injection was most commonly used. This gives impetus for developing a formalised treatment pathway to invite patients for repeat assessment and injection. Justification for this, along with the potential for direct referral is discussed.

P1018

Unusual sites for extra-osseous accumulation of Tc-99m MDP on bone scan: pictorial review

Paravasthu, D. M. • Diwvedi, R. • Mellor, S. • Curtis, J.¹
¹University Hospital Aintree, Liverpool, UK, ²Royal Blackburn Hospital, Blackburn, UK

BACKGROUND: Technetium (Tc-99m) MDP is an ideal radionuclide tracer for bone imaging due to its chemical stability, and high bone to soft tissue ratio and the short half-life of technetium.

Isotope bone scanning is the most commonly performed nuclear

medicine procedure, primarily for detection and functional evaluation of skeletal abnormalities. It can reveal soft tissue lesions due to abnormal uptake and accumulation of Tc-99m MDP.

Abnormal extra-osseous uptake of Tc-99m MDP can occur with benign and malignant pathology, and can essentially be categorised into seven areas: neoplastic, traumatic, inflammatory, ischaemic, hormonal, excretory and artefactual.

AIMS/OBJECTIVES: We present a pictorial review series illustrating the unusual extra-osseous sites for uptake of radionuclide tracer on skeletal scintigraphy, with a brief review of the pathophysiology, imaging findings and differential diagnosis. The cases range from entities such as cerebral metastasis, liver metastasis, cardiac uptake in a prostate cancer patient and axillary lymph node uptake secondary to tracer extravasation at the injection site.

SUMMARY: Diagnosis using skeletal scintigraphy remains a deductive radiological process in which observations need to be integrated with the clinical picture to formulate a meaningful differential diagnosis. This review illustrates and reiterates the importance of assessing extra-osseous sites, particularly in patients with an uncertain diagnosis.

Neuroradiology E-Poster

E1101

CTA and MRA in the analysis of intracranial aneurysms

Saba, L.¹ • Sanfilippo, R.¹ • Montisci, R.¹ • Argiolas, G. M.² • Suri, J.³ • Mallarini, G.¹
¹AOU Cagliari, Cagliari, ITALY, ²AOB Cagliari, Cagliari, ITALY, ³Idaho State University, Pocatello, ID, USA

BACKGROUND: Risks and complications associated with the treatment of intracranial aneurysms have decreased with the growing use of less invasive endovascular techniques. Nevertheless, some risk remains and must be balanced with the risk of aneurysm rupture. Both the risk of rupture and selection of treatment are largely based on factors related to specific characteristics of the particular aneurysm obtained from imaging examinations. Computed Tomography Angiography (CTA) is nowadays frequently used in this type of investigation. Because magnetic resonance angiography (MRA) is noninvasive, lacks use of ionizing radiation, and is less costly, it is replacing conventional CTA for the diagnosis and follow-up of intracranial aneurysms.

Teaching points: 1) Physiology and pathophysiology of intracranial aneurysms. 2) CTA and MRA technique 3) Value of the contrast material in CTA and MRA 4) What neurosurgeons and neuroradiologist need: sac shape, neck measurement, presence of arterial branching. 5) Post-processing techniques 6) Pitfalls and common errors 7) Presentation of relevant cases.

Imaging Findings: We present several relevant cases of intracranial aneurysms by using CTA and MRA by explaining the advantages and limits of these techniques. For each case,

the analysis of sac shape, neck and arterial branching will be explained as well as the different therapeutical approach according to the characteristics of the aneurysms. Post-processing techniques will be explained in detail.

CONCLUSION: CTA and MRA can adequately identify and characterize the intracranial aneurysms by giving all the relevant information necessary to select the correct treatment.

E1102

How to perform a correct differential diagnosis among Sellar, Suprasellar, and Parasellar Cystic Lesions

Saba, L.¹•Farina, D.¹•Suri, J.²•Mallarini, G.¹
¹AOU Cagliari, Cagliari, ITALY, ²Idaho State University, Pocatello, ID, USA

KEY LEARNING TECHNIQUES: The sellar and parasellar region is an anatomically complex area where a number of neoplastic, inflammatory, infectious, developmental and vascular diseases can develop. Non-neoplastic cystic lesions (Rathke pouch, arachnoid, epidermoid, abscess) can mimic cystic neoplasms (pituitary adenoma, craniopharyngioma, metastasis, meningioma) leading to wrong diagnosis and improper treatment. The exhibit proposes how to manage imaging tools for the differential diagnosis of the pituitary area cystic lesions. Neuroimaging plays a fundamental role in diagnosis, by narrowing the list of DD. The radiological features must be matched with clinical/laboratory data to obtain a final reliable diagnosis.

DESCRIPTION: In this work our purpose was 1) to identify the lesion and to display its anatomical location and precise relationships; 2) to define the modality of growth (expansile vs infiltrating), considering the effect on bone, sellar cavity, brain parenchyma, neural/vascular structures. 3) to characterise the cystic mass (cystic walls and content) using MR signal and CT density changes and contrast injection; DWI, PWI, MRS and dynamic or delayed post-contrast images contribute to the differential diagnosis.

CONCLUSION: In some cases the differential diagnosis between non-neoplastic and cystic lesions may be extremely complex and an accurate MR technique is mandatory. Moreover in order to obtain a correct diagnosis anatomic location as well as the effect on bone, sellar cavity, brain parenchyma e neural/vascular structure should be considered.

E1103

Neurofibromatosis type 2 (NF2): what every radiologists should know

Uri, I. F. •Chandra, J. •Pretorius, P.
 Oxford Radcliffe Hospitals, Oxford, UK

KEY LEARNING OBJECTIVES:

- Provide clinical background information about neurofibromatosis type 2 including genetics, mode of inheritance, clinical features and natural history
- Become familiar with the criteria used to make the diagnosis and the role of imaging in the diagnosis

- Understand the imaging protocols used in the diagnosis and follow up of NF2 and the role of imaging in managing these patients
- Become familiar with the imaging appearances of a wide range of lesions encountered in cranial and spinal imaging in patients with NF2

DESCRIPTION: Neurofibromatosis type 2 is a rare autosomal dominant multiple neoplasia syndrome characterised by a predisposition to specific neoplasms of the meninges, peripheral nerves and CNS as well as non-neoplastic lesions of the skin, eyes and nervous system.

Bilateral vestibular schwannomas are a well recognised pathognomonic imaging feature of NF2 but there are several other imaging features that suggest the diagnosis. We present a comprehensive pictorial review of the cranial and spinal imaging features of NF2.

CONCLUSION: Imaging - particularly MRI - has a central role in the diagnosis, follow-up and therapeutic decision making process in NF2. All radiologists who report cranial or spinal MRI scans should be familiar with the imaging findings in NF2.

E1104

Neuroradiological diagnoses in acute/sub acute visual loss

Khirwadkar, H. E. •Hourihan, M. D.
 University Hospital of Wales, Cardiff, UK

LEARNING OBJECTIVES:

- Review of the normal neuro-ophthalmic anatomy.
- Neuroradiological appearances of causes of acute and sub acute visual loss will be discussed with classification of pathology by location.

DESCRIPTION: Acute and sub acute visual loss occurs with abnormalities of the ocular media, retina, optic nerve, optic tracts, visual radiations and occipital cortex. Those pathologies visible on neuro-imaging are discussed.

Optic neuropathy is the term used to broadly describe any condition affecting the optic nerve which results in visual loss, typically presenting with unilateral reduced acuity. Optic neuropathy can be inflammatory, compressive or infiltrative in origin. Chiasmal damage presents with a bitemporal hemianopic field loss and is commonly due to a pituitary tumour; however other neoplasms, inflammation and vascular pathology can produce a similar visual loss. A retrochiasmal optic tract lesion typically causes an incongruous homonymous hemianopic field defect. The optic radiations are formed as fibres leave the lateral geniculate body of the thalamus. The effect of damage or disruption varies according to its location: temporal lobe lesions give a superior quadrantanopia, parietal lobe lesions cause a homonymous defect, denser inferiorly and occipital lobe lesions result in congruous defects. Images demonstrating the neuroanatomy of the normal optic pathway and of identifiable lesions producing visual loss are demonstrated.

CONCLUSION: Acute and sub acute visual loss is an indication for urgent imaging. An understanding of neuro-ophthalmic anatomy along with the nature of the field defect may help with the localisation and direct the radiologic search.

E1105

CNS manifestations of neurofibromatosis - 1 - changes on long term follow up

Gnanasambandam, S.¹•Kumaraguru, J.²•Kandasamy, N.²
•Siddiqui, A.²

¹Basildon and Thurrock University Hospitals, Basildon, UK,
²Kings College Hospitals, Denmark Hill, London, UK

Neurofibromatosis is a phakomatosis which is autosomal dominant. Of the two types, Neurofibromatosis type 1 (NF1) is more common (approximately 85%) and involvement may be multisystemic in view of this being a possible disorder of neural crest origin. Intracranial manifestations of this disorder are wide with the most common being hamartomas, vascular dysplasias and optic nerve gliomas. We present a systematic review of the various intracranial manifestations with an emphasis on the imaging differentials and long term follow up in this patient subgroup.

E1106

Multimodality imaging in the evaluation of intracranial features of sickle cell disease

Gnanasambandam, S.¹•Kumaraguru, J.²•Kandasamy, N.²
•Siddiqui, A.²

¹Basildon and Thurrock University Hospitals, Basildon, UK,
²Kings College Hospitals, Denmark Hill, London, UK

Sickle cell disease, a haemoglobinopathy is an autosomal recessive disorder. The amino acid substitution in the haemoglobin chain results in an unstable haemoglobin resulting in vaso-occlusive crisis and haemolysis. This is a multisystemic disorder with significant morbidity and mortality. We present the CNS manifestations of this disease with emphasis on monitoring ischaemic changes and evaluation of the intracranial vascular status with arterial spin labelling MR perfusion imaging. We also show the imaging appearances following vascular by-pass procedures.

E1107

Diffusion weighted imaging in characterising posterior fossa tumours in children - how good are we?

Kumaraguru, J.¹•Gnanasambandam, S.²•Siddiqui, A.¹
•Kandasamy, N.¹

¹Kings College Hospitals, Denmark Hill, London, UK,
²Basildon and Thurrock University Hospitals, Basildon, UK

Diffusion weighted imaging (DWI) has always been a very helpful tool in characterising posterior fossa tumours in children. This has been particularly helpful in differentiating Medulloblastomas from Pilocytic astrocytomas. Apart from typical cases where the DWI sequence was helpful in identifying the lesion, we also present cases where other factors like intratumoural calcification and/or haemorrhage may limit the usefulness of using DWI in the diagnosis. Correlation with the appearances on DWI have been made with the final histological results.

E1108

Cavernous sinus pathology: CT and MRI findings

Imbriano, M. •Salum, E. •Juan Pablo, O. •Castelblanco, N. •Buzzi, A. •Ballester, S.

Diagnostico medico, Buenos Aires, ARGENTINA

LEARNING OBJECTIVES: To recognize the complex anatomy of the cavernous sinus. To illustrate the CT and MRI finding of cavernous sinus lesions.

DESCRIPTION: The cavernous sinus are multi channeled, extradural venous structures lateral to the sella turca. A wide spectrum of neoplastic, inflammatory, infectious and vascular disease processes affects them. CT, CT angiography, MRI and MR angiography play an important role in the diagnosis of these lesions. We describe and illustrate the most common radiological patterns of lesions that affect and invade the cavernous sinus.

CT and MRI can identify primary tumors and can assess the spread of the non-neoplastic process affecting cavernous sinus. The entities include neoplasms (e.g., meningiomas, trigeminal schwannomas, invasive pituitary adenomas, lymphomas, metastasis), inflammatory and infectious diseases (e.g., pituitary abscess, thrombophlebitis, Tolosa-Hunt syndrome), and vascular lesions (e.g., aneurysm, carotid-cavernous fistula).

CONCLUSION: Imaging studies are essential for the evaluation of the tumors and non-neoplastic processes affecting the cavernous sinus. MR has become the dominant modality, as it allows a multiplanar approach and direct visualization of the lesions and adjacent structures involvement.

E1109

The clinical significance of dilated Virchow-Robin spaces in MR imaging

Hansen, T. P. •Cain, J. •Purandare, N. •Jackson, A.
University of Manchester, UK

KEY LEARNING OBJECTIVES:

- Virchow Robin spaces (VRS) are dilated perivascular spaces that are often incidental findings MR brain imaging.
- They occur in clinically normal individuals, but their presence increases with a number of clinical conditions.
- RS increase with age and vascular risk factors.
- They are a surrogate biomarker of microvascular angiopathy (MVA).
- VRS are linked to numerous conditions independent of other factors.

DESCRIPTION: VRS surround the walls of vessels as they travel from the subarachnoid space to the brain parenchyma. VRS can occur in any age group but their numbers increase with advancing age and the presence of atherosclerotic disease in small arterioles. VRS are associated with moderate to severe MVA. VRS have been shown to be more common in lacunar infarcts, treatment resistant depression, and vascular dementia. VRS scoring systems have been shown to be able to predict stroke risk. The diameter of VRS is also significantly increased in those suffering from multiple sclerosis, leading

to hypotheses that they are an inflammatory marker. A variety of different scoring systems have been used to quantify VRS. There are several important differentials for VRS, signal intensity and locations of lesions helps distinguish them from various pathologic conditions, including cystic periventricular leukomalacia, cryptococcosis, and mucopolysaccharidoses.

CONCLUSION: VRS are a common and often overlooked finding on MR brain imaging. In this exhibit we will show the important diagnoses associated with their presence and the differential diagnoses. We will also demonstrate the established scoring methods for quantification of VRS.

E1110

Not to be missed on-call orbital emergencies

Bhuva, S. • Minks, D.

Leeds Teaching Hospital Trust, Leeds, UK

KEY LEARNING OBJECTIVES: Understand the bony and soft tissue anatomy of the orbit; Adopt a systematic approach to evaluating the orbit; Top 5 radiological diagnoses not to be missed by the on call radiology registrar

DESCRIPTION: The CT head is the most commonly performed on-call radiological investigation performed and the orbit is a vital review area. An understanding of the complex bony architecture, soft tissue content and various anatomical compartments is essential to assessment of traumatic and non traumatic emergencies involving the orbit. We shall illustrate this anatomy and describe the importance of identifying the pre and post septal landmarks, ocular, extraconal and intraconal compartments. We shall emphasise a methodical, systematic approach to evaluating this region with corresponding abnormalities of each structure from a range of traumatic and non traumatic aetiologies. A 'Top 5 - Not To Be Missed' radiological diagnosis is offered including traumatic and non traumatic emergencies. The radiological features, potential pitfalls and clinical urgency of prompt and accurate identification will be discussed with imaging examples of: 1) Orbital blow out fracture, with entrapment of the inferior rectus +/- orbital apex fracture potentially compromising the optic nerve; 2) Penetrating injury with intraocular foreign body and Globe rupture; 3) Periorbital cellulitis; 4) Intraorbital haemorrhage; 5) Pseudotumours

CONCLUSION: The orbit consists of complex bony, soft tissue and compartmental anatomy. A systematic approach will allow accurate evaluation of orbital abnormalities which is essential in the setting of traumatic and non traumatic emergencies.

Neuroradiology Poster

P1101

CT head: Collection of cases with important learning points

Haq, R. • Hattab, A. • Sukumar, S.

University Hospital of South Manchester, UK

KEY LEARNING OBJECTIVES: Identify subtle radiological features in CT heads.

DESCRIPTION: CT heads are the most frequently performed on-call scan and can appear to be straight forward for

interpretation. However, they can be challenging even for the experienced radiologist and importantly for trainee radiologists. A systematic approach is crucial for thorough analysis.

We present a collection of cases with subtle and misleading findings which if misinterpreted would have a significant impact on patient management especially in the acute setting.

P1102

Air in brain-beware!

Sankaye, P. • Chhatani, S. • Sahu, A. • Iyengar, S. • Abdellaoui, A. • Adams, W.

Plymouth NHS Trust, Plymouth, UK

KEY LEARNING OBJECTIVES: Pneumocephalus occurs as a result of an abnormal communication between the intracranial contents and disruption of the bony cranium: such as skull base, vault or sinus fracture; or after a surgical procedure. Rarely, if a ball-valve mechanism develops, a tension pneumocephalus can occur. We present some unexpected causes and manifestations of pneumocephalus.

DESCRIPTION: Before the advent of CT and MRI, pneumoencephalography was the only possible technique for imaging the brain. It was an uncomfortable and hazardous procedure in already sick patients. Nowadays CT and MR provide exquisite images of the brain and are more sensitive to the presence of air. On CT air has a Hounsfield attenuation value of -1000 which allows the differentiation from fat. Pneumocephalus is a common sequel encountered secondary to neurosurgical interventions. It can also occur as a result of craniofacial trauma, skull base fractures, interventional procedures and rarely secondary to procedures like epidural anaesthesia and discectomy.

Contributing factors to the pneumocephalus can include duration of surgery, position of the head, intraoperative hyperventilation, anaesthesia technique, infections and tumours.

This presentation will cover the common and rare causes of pneumocephalus, the symptoms patient can present with, its differentials and how to identify it. This will be illustrated by using various imaging modalities and use of their multiplanar capabilities in diagnosing the causes and severity of pneumocephalus.

CONCLUSION: Pneumocephalus, although a common and usually non life-threatening condition, can have serious consequences. Awareness of the various causes and their management will help the radiologist and clinician minimise its possible morbidity and mortality.

P1103

All is not what it seems - artefactual oddities in brain imaging

Giles, K. • Miles, G. • Jones, J.

Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: Recognition of artefacts seen in imaging the brain with various modalities. How idiosyncrasies in brain images can impact upon interpretation

DESCRIPTION: Artefacts are encountered on a daily basis in all

brain imaging modalities and as Radiologists, we have to learn to accept the impact they have on the image quality and hence accuracy of interpretation. In the light of the National Institute for Clinical Excellence (NICE) guidelines on acute head injury management, the unenhanced CT head now represents an increasing workload for Radiologists. Unusual and unexpected appearances on brain imaging can lead to diagnostic uncertainty, the need for repeat investigation and diagnostic delay. Prior knowledge and awareness of various curiosities seen in brain imaging can help to differentiate actual from perceived pathology. The aim of this poster is to visually explore brain imaging artefacts and the possible pitfalls to avoid.

CONCLUSION: Artefacts in imaging the brain are common. There can be a massive impact on the patient outcome if a diagnosis is incorrect, given the potential gravity of intracerebral pathology. Radiologists can avoid the dangers of misreporting brain imaging by having a clear understanding of artefacts and their consequences.

P1104

Neuroimaging in adult first seizures

Gan, C. L. • Emelifeonwu, J. A. • Hourihan, M. • Smith, P.
University Hospital of Wales, Cardiff, UK

PURPOSE: In absence of guidelines for neuroimaging of patients presenting with first seizures, MRI has been adopted as the standard investigation. Neuroimaging is reasonable if the initial diagnosis is unclear. Neuroimaging is not indicated in patients with a confident diagnosis of non-epileptic seizures e.g. psychological, alcohol related, etc. We aim to assess the appropriateness of neuroimaging in adult patients with first seizure in a UK tertiary centre.

MATERIALS/METHODS: All adult patients who attended the seizure clinic in University Hospital of Wales, Cardiff, from 1/1/2008 to 31/12/2008, were studied retrospectively. Patients with seizure secondary to trauma or intracranial haemorrhage were excluded. Clinical letters and investigation results from the Clinical Portal were reviewed to ascertain the characteristics of the seizures, initial diagnosis and neuroimaging, if any.

RESULTS: 102 patients (M:F=1:1) were included in the study. 50 patients had generalised episodes, 8 described focal symptoms and 44 patients did not have seizures, after careful history and examination. 76% of all patients had neuroimaging. Of the 20 patients who were thought to have epileptic seizures, 80% had MRI. Whereas, of the 28 patients where the initial diagnosis was uncertain, 93% had CT and/or MRI. In the remaining 54 patients, where a diagnosis of non-epileptic origin had been made, 43% were imaged.

CONCLUSION: Most patients attending the seizure clinic have a diagnosis other than epilepsy. Although CT head is a relatively low dose examination, patients should not be irradiated unnecessarily. History, examination, and good clinical judgement, are vital in determining whether a scan is indicated.

P1105

Interpretation of cross-sectional imaging in acute ischaemic and haemorrhagic stroke

Haslinger, T. G. • Walton, K. • Hussain, F. • Manoj, A.
Royal Liverpool University Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: To illustrate the typical appearance of ischaemic and haemorrhagic stroke using a variety of cross-sectional imaging modalities

DESCRIPTION: Following the advent of widespread intravenous thrombolytic therapy for the treatment of acute ischaemic stroke, it has become increasingly important for radiology departments to provide rapid access to CT imaging. Evidence from the International Stroke Trial-2 shows that thrombolysis must be administered within 3 hours of the onset of symptoms to be effective. These time constraints mean that it is equally important for clinicians and radiologists to be able to rapidly, but accurately, interpret images to determine whether to administer thrombolysis. It is important for clinicians to discern the early changes of an acute ischaemic infarct, as well as to identify those infarcts likely to develop haemorrhagic transformation if thrombolysis is administered. In addition, it is crucial to be able to identify primary intracerebral haemorrhage along with other mimics of stroke that would be contraindications for thrombolysis. This pictorial review aims to illustrate the typical imaging characteristics of ischaemic and haemorrhagic stroke using a variety of cross-sectional imaging modalities including CT, contrast-enhanced CT and MRI with diffusion weighted imaging. The poster incorporates images of common or important differential diagnoses of stroke that are potential pitfalls. In addition, it will explore further imaging techniques for the subsequent investigation and management of stroke, such as MR angiography.

CONCLUSION: To illustrate and highlight the characteristics of both ischaemic and haemorrhagic stroke, as well as exploring the features of mimics and common pitfalls.

P1106

Practicalities and pitfalls in ASPECT score implementation

Gray, R. A. • Maviki, M. • Jones, J.
Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: ASPECT scoring was introduced as a risk stratification tool for thrombolysis in Derriford Hospital, Plymouth. We present our experience with implementation of this system over 6 months and highlight some of the pitfalls encountered.

DESCRIPTION:

- Introduction.
- ASPECT scoring for dummies. What is the ASPECT score ?
- History of the ASPECT score with literature review.
- Relevance of the ASPECT score.
- How we have implemented the ASPECT score locally.
- Presentation of pitfalls of the ASPECT score in clinical practice. Examples presented with representative images and

discussion of each problem.

- Limitations of ASPECT scoring. Points include:
 - Assesses middle cerebral artery territory only.
 - Correlation of ASPECT score with long term prognosis is unknown.
 - Younger patients are consistently underscored using ASPECTS.
- CONCLUSION: The ASPECT score is a robust, proven, reproducible method of cranial CT interpretation. It encourages the reader to look at the scan in a systematic way. Allows for skills mix.

This exhibit will:

1. Alert radiologists to the need to be familiar with ASPECT scoring.
2. Clearly display criteria for ASPECT scoring.
3. Provides guidance on implementing the ASPECT score within your radiology department.
4. Provide pictorial examples of pitfalls of ASPECT score use.

P1107

Quantitative Virchow-Robin space scoring is superior to white matter lesion scoring as a predictor of stroke risk

Cain, J. R.¹•Clarke, T. C.²•Hansen, T. P.¹•Choo, H.¹•Paranthaman, R.¹•Baldwin, R.¹•Purandare, N.¹•Jackson, A.¹
¹University of Manchester, Manchester, UK, ²Pennine Acute Hospitals NHS Trust, Manchester, UK

PURPOSE: White matter lesion (WML) scoring has been correlated with Framingham stroke risk. Dilated Virchow-Robin spaces (VRS) are biomarkers of microvascular disease. There are two published methods of VRS scoring. We aim to show that VRS scores are a more sensitive and specific indicators of stroke risk than WML scores and determine the superior VRS scoring method.

MATERIALS/METHODS: 231 subjects (aged 44-91) underwent MRI imaging with a 1.5T Achieva scanner (Phillips), investigating the imaging biomarkers of vascular depression and dementia, containing subjects and controls. Modified Scheltens' scale was used for WML scoring. Quantitative VRS were scored on the number of VRS in the basal ganglia in a single slice. Anatomical VRS score was based on VRS in anatomical areas of the basal ganglia. The subjects were stratified for stroke risk using the Framingham stroke risk score. The subjects were divided into high stroke risk >10% and lower risk <10% per year. RESULTS: Scheltens' score, anatomical VRS and quantitative VRS scores all correlated with Framingham risk scores (P>0.001 ANOVA). There was a significant difference between mean VRS scores (P>0.05) with 10% stroke risk but not between Scheltens' scores. The presence of high VRS scores was a more sensitive and specific indicator of stroke risk than Scheltens' (ROC analysis). Quantitative VRS had the highest sensitivity (80%), and specificity (60%).

CONCLUSION: VRS are a more sensitive indicator of stroke risk than Scheltens'. Quantitative VRS scoring is superior to anatomical VRS. Quantitative VRS scoring could be implemented in imaging reports to highlight patients at high stroke risk.

P1108

Pitfalls in diagnosing cerebral venous sinus thrombosis

Chittal, R. R.¹•Chhatani, S.¹•Hamilton, S.¹•Maviki, M.¹•Adams, W.²•Mukonoweshuro, W.²
¹Peninsula Radiology Academy, Plymouth, UK, ²Derriford Hospital, Plymouth, UK.

LEARNING OBJECTIVES: (1) To provide an overview of imaging features, techniques and protocols for diagnosing cerebral Venous Sinus Thrombosis (VST). (2) To illustrate common pitfalls and challenges in diagnosing VST.

DESCRIPTION: Venous Sinus Thrombosis patients usually present with non-specific symptoms and often the diagnosis is difficult. It is a more common problem than previously thought, and is potentially fatal. There are several different causes for VST ranging from systemic inflammatory diseases, inherited conditions as well as acquired coagulation disorders. In up to 20-30% of cases no underlying cause can be identified. Imaging plays a key role in diagnosing this important clinical problem. In this presentation we will discuss different imaging modalities, key diagnostic features and illustrate pros and cons of each imaging modality. We will also cover important imaging pitfalls encountered such as congenital anatomical variations, prominent arachnoid granulations, and discuss flow related phenomena; all of these can complicate the radiologic diagnosis of VST on CT and MRI.

CONCLUSION: We hope to have demonstrated a concise pictorial review enabling easy recall of imaging selection, characteristics, and potential diagnostic pitfalls of VST. This presentation will refresh the memory of the observer and, combined with a systematic approach and awareness of common pitfalls, will help in attaining an accurate diagnosis in order to facilitate early life saving treatment.

P1109

Improving the diagnostic quality of CT Venography - A question of timing gone wrong?

Al-Chalabi, H.¹•Mankad, K.²•Chandrashekar, H.²•Davagnanam, I.²
¹UCL Medical School, London, UK, ²National Hospital for Neurology and Neurosurgery, London, UK

PURPOSE: To evaluate diagnostic quality of intracranial Computed Tomography Venography (CTV) studies and to analyse technical and clinical factors that may influence it.

MATERIALS/METHODS: CTV studies performed over a 12-month period at a specialist centre were included. All scans were acquired at 0.6mm slice thickness on a 128-slice scanner (Siemens SOMATOM DefinitionAS©, 120kV/300mA/Pitch 0.55:1) at 30-second delay post-intravenous administration of 90ml Omnipaque-300© at 4ml/sec.

The diagnostic quality was assessed by 2 neuroradiologists using a qualitative scale. Further, the CT-Hounsfield values were recorded as a measure of contrast opacification at 9 constant points of the venous system and 1-point in the internal carotid artery using a 15MP-Barco PACS monitor. All 3 researchers were blinded to the indications.

Hounsfield values were subsequently mapped to test for normalcy. Means, standard deviations were calculated for each sinus. Mean readings were compared with a 'physiological flow model'.

Regression analysis was performed to evaluate age, sex, ethnicity as factors predicting opacification.

RESULTS: 75 studies (M=16,F=59, Age range=16-79, Caucasian=52, Non-caucasian=23) were reviewed. The proportion of studies considered to be of non-diagnostic quality was 28% (Kappa=0.78).

The gradient of mean opacification recorded in different sinuses was found to be discordant with the 'flow model', Internal Jugular Vein means being higher than those in the Superior Sagittal Sinus ($p < 0.001$, difference in means = +65.3, Student's t-test), confirming timing error in acquisition.

Other factors did not achieve significance as predictors of opacification.

CONCLUSION: The current protocol for CTV does not produce graded opacification of the venous sinuses. Scanning during the first venous pass of contrast is crucial in optimising the diagnostic quality.

P1110

Initial experiences of diffusion tensor tractography in the spinal cord

Koller, C. • Higgins, S. • Wilcock, D. • Singh, J. • Papadimas, T.
University Hospital of North Staffordshire, Stoke-on-Trent, UK

PURPOSE: Diffusion Tensor Tractography is a non-invasive method of visualising white matter tracts. This technique can provide valuable information on patients scheduled for spinal surgery. Our initial experiences of using this technique in the spinal cord in normals and patients are presented.

MATERIALS/METHODS: Spinal tractography of the cervical spinal cord was performed on two volunteers to develop the technique. This was then undertaken on a patient with an intramedullary tumour scheduled for surgery. Diffusion tensor tractography was repeated 6 weeks after surgery.

RESULTS: MRI and CT findings show no white matter detail within the tumour. Spinal tractography indicated that the main corticospinal bundles were located to the right of the tumour. The observations at surgery were in agreement with these findings.

CONCLUSION: Diffusion tensor tractography is a promising technique which can provide additional information for patients with spinal lesions scheduled for surgery. This technique has the potential to improve the surgical outcome for these patients.

P1111

Function for predicting shape diameter of embolized coils in intracranial aneurysm treatment

Owasirikul, W. • Auethavekiat, S.
Chulalongkorn University, Bangkok, THAILAND

PURPOSE: Coil embolization is one of the popular treatments for intracranial aneurysm. Proper coil selection is important to

avoid aneurysm recurrence. This paper proposes the function for coil selection based on arteriographic projection images.

MATERIALS/METHODS: Coils are indexed according to the order of insertion. The response surface modeling (RSM) is used to model the function for selecting the shape diameter (SD) of the first to the third coil. The length is not considered, since physicians often choose the longest available coils. 61 patient cases gathered during March, 2005 to July, 2010 in Chulalongkorn Memorial Hospital, Thailand is used for modelling and evaluating.

RESULTS: It is found that SD of the first coil is the function of major axis length and the intracranial aneurysm volume. SD of the second and the third coil is the function of remaining diameter and remaining volume after the previous coil filling. The incorrect SD prediction had the root mean squared error less than 1 mm.

CONCLUSION: In this paper, we presented mathematical function to predict potential characteristic of coil embolization. The methodology includes a validation process based on RSME and cross-validation method. Our function can predict the suitable coil embolization with the error less than 1 mm. We plan to evaluate our function based on experiment with in-vitro study and clinical metric.

Head and Neck E-Poster

E1201

The general radiologist's guide to the OPG

Bhuva, S. • Minks, D.
Leeds Teaching Hospital Trust, Leeds, UK

KEY LEARNING OBJECTIVES: A systematic approach to orthopantomogram (OPG) interpretation: relevant bony and soft tissue anatomy; highlight potential pitfalls due to artefacts; and provide a guide to recognising important common conditions.

DESCRIPTION: The orthopantomogram (OPG) is a unique radiograph that provides a panoramic image centred on the maxilla and mandible. Susceptibility to certain artefacts specific to this form of plain film radiograph makes interpretation particularly challenging. Artefacts include ghost images which result from anatomical image transposition, patient positioning errors and foreign bodies. Recognising these on the radiograph will enable confident identification of anatomical structures and avoid confusion with pathology. An approach for identifying important common conditions on OPG will follow. These conditions include: trauma, cysts, neoplasia and infection. Trauma includes mandibular fractures, isolated and ring types. Cysts are classified as odontogenic (eg dentigerous keratocysts) and non-odontogenic. Neoplasia can be odontogenic, for example ameloblastoma and cementoblastoma (also seen in Pagets disease) or non-odontogenic which can be further categorised into benign and malignant primary and secondary conditions - radiological features that aid differentiation will be highlighted. Infection - osteomyelitis of the mandible will

be illustrated and the importance of recognising emphasized. Generalised conditions (eg Paget's, hyperparathyroidism and fibrous dysplasia) with mandibular manifestations will be illustrated.

CONCLUSION: Interpretation of the OPG is an important and challenging prospect. Knowledge of anatomical features, potential pitfalls and important common conditions enables the general radiologist to confidently identify and differentiate between aggressive and indolent lesions.

E1202

Cytopathological/imaging correlations of ultrasound-guided fine needle aspiration of thyroid lesions. A six-year experience

Elsayed, A.

Northern Lincolnshire and Goole Hospitals NHS Foundation Trust, Diana Princess of Wales Hospital, Grimsby, UK

PURPOSE: To correlate Ultrasound, cyto- and histopathological findings of thyroid lesions. The aims were to establish Ultrasound criteria suggestive of malignancy helping which nodule(s) to target on Ultrasound-guided biopsies and to evaluate a 5 year adequacy rate of fine needle aspiration biopsies of thyroid lesions in our institution.

MATERIALS/METHODS: 500 patients with thyroid lumps referred for Ultrasound examinations of their necks and for Ultrasound-guided fine needle aspiration biopsies of the thyroid lesions. The studies were performed in the period from January 2005 to December 2010. Cytopathological and histopathological results were correlated with sonographic findings of thyroid lesions. Ultrasound criteria of thyroid nodules were classified according to size, shape, margins, echogenicity, presence of micro- or macro-calcifications and vascularity on colour Doppler.

RESULTS: The adequacy rate of fine needle aspiration biopsies was estimated. Ultrasound criteria were correlated with pathological findings.

CONCLUSION: There is a correlation between thyroid nodule criteria as seen by Ultrasonography and pathologically proven malignancy.

E1203

B-mode, colour doppler and microbubble contrast-enhanced ultrasound appearances of parathyroid adenomas

Gill, S. S. •Harvey, C. J. •Cosgrove, D. O.

Imperial college Healthcare NHS Trust, London, UK

KEY LEARNING OBJECTIVES: (1) To review parathyroid gland embryology. (2) To review parathyroid gland anatomy. (3) To review hyperparathyroidism, parathyroid adenomas and relevant imaging findings.

DESCRIPTION: The majority of population have four parathyroid glands; with the superior two glands having different embryology, anatomy, arterial supply and venous drainage from the inferior glands. Primary hyperparathyroidism is most commonly caused by parathyroid adenomas, which are

usually asymptomatic, however, may present with the features of hypercalcaemia. An up-to-date knowledge of the imaging appearances of parathyroid adenoma is important as surgery is recommended in a select group of patients.

CONCLUSION: The normal parathyroid glands are not usually detected on ultrasound imaging and this article will empower its reader for their optimal detection, as well as reviewing the B-mode, colour doppler and microbubble contrast-enhanced ultrasound appearances. The majority of the literature on microbubble contrast-enhanced ultrasound is based on hepatic, renal and prostatic tumours. To our knowledge, this is the first pictorial review covering the broad array of appearances of parathyroid adenomas during microbubble contrast-enhanced ultrasound.

E1204

Emergency ENT radiology part 1 infective: what the on-call radiologist needs to know

Hughes, E. K.¹ •Hughes, J.² •Madani, G.¹

¹Department of Radiology, Imperial College Healthcare NHS Trust, London, UK, ²Department of Head and Neck Surgery, University College Hospitals NHS Trust, London, UK

KEY LEARNING OBJECTIVES: To familiarise the on-call radiologist with the key imaging features of ENT infection-related emergencies.

DESCRIPTION: Common infective emergency ENT cases were reviewed and the key radiological features highlighted. The cases are classified as:

1. Petromastoid - Mastoiditis and its complications
2. Sinonasal & Orbit - Peri-orbital cellulitis, orbital abscess, acute bacterial sinusitis, pyocele, Potts puffy tumour, cavernous sinus thrombosis.
3. Oral cavity and oropharynx - Peri-tonsillar and dental abscess.
4. Salivary glands - Infective sialadenitis and Ludwig's angina.
5. Neck - Deep neck space infections

CONCLUSION: ENT emergencies can be life threatening; with the risk of airway compromise, haemorrhage, intracranial and mediastinal complications. Interpretation of the imaging features is often challenging, particularly to a general radiologist, who may encounter such scans only in the emergency setting. We provide a comprehensive review of the key radiological findings of common infection-related ENT emergencies.

E1205

Emergency ENT radiology part 2 traumatic and foreign body insults: what the on-call radiologist needs to know

Hughes, E. K.¹ •Hughes, J.² •Madani, G.¹

¹Department of Radiology, Imperial College Healthcare NHS Trust, London, UK, ²Department of Head and Neck Surgery, University College Hospitals NHS Trust, London, UK

KEY LEARNING OBJECTIVES: To familiarise the on-call radiologist with the key imaging features of ENT emergency traumatic and foreign body insults.

DESCRIPTION: Common emergency traumatic and foreign-

body insult ENT cases were reviewed and key the radiological features highlighted. The cases are classified as:

1. Temporal bone fractures and their complications
2. Laryngeal trauma
3. Penetrating neck trauma
4. Foreign Bodies- aerodigestive foreign bodies and oesophageal food bolus

CONCLUSION: ENT traumatic and foreign body insults can be life threatening; with the risk of airway compromise, haemorrhage, intra-cranial and mediastinal complications. Interpretation of the imaging features is often challenging, particularly to a general radiologist, who may encounter such scans only in the emergency setting. We provide a comprehensive review of the key radiological findings of common traumatic and foreign body ENT emergencies.

E1206

Lesions of the angle of the mandible

Minks, D. P.¹•Matthews, W.²•Bhuva, S.¹
¹Leeds Radiology Academy, Leeds, UK, ²Leeds General Infirmary, Leeds, UK

KEY LEARNING OBJECTIVES: Trainees may not feel confident differentiating between subtle radiological features of lesions which commonly present at the angle of the mandible, especially if discovered as an incidental finding. This poster will make use of good imaging examples to provide a concise description of common clinical and radiological presentations.

DESCRIPTION: Classify lesions described according to their odontogenic apparatus.

Clinical presentations and radiological features using examples of imaging of lesions presenting at this site such as: odontogenic keratocysts, ameloblastoma, central giant cell granuloma, aneurysmal bone cyst, solitary bone cyst, staphne's cavity, radicular cyst, osteosarcoma.

CONCLUSION: There are many lesions that can affect the angle of the mandible, and some are unique to it. With the help of this educational poster, you will feel more confident in narrowing down the differential diagnosis.

E1207

Craniofacial fibrous dysplasia: key radiological features and differential diagnosis

Minks, D. P. •Bhuva, S.
Leeds Radiology Academy, Leeds, UK

KEY LEARNING OBJECTIVES: An educational poster which explains the pathophysiology of craniofacial fibrous dysplasia, it's presentation, the radiological features to be aware of, and how to differentiate it from other similar conditions.

DESCRIPTION: Craniofacial fibrous dysplasia usually presents as a feature of polyostotic fibrous dysplasia, but can be isolated to the face and skull in the monostotic form of the disease. It is also seen in the McCune Albright Syndrome. Keys sections of the poster explain:

Presenting Symptoms and Signs

Pathology

Radiological Features with labelled imaging examples:

Plain film

CT

MRI

Prognosis and management

How to differentiate between other similar conditions (using imaging examples), and the pitfalls to avoid:

Paget's Disease

Giant cell granuloma

Cemento-ossifying fibroma

Intraosseous meningioma

Metastases

CONCLUSION: Craniofacial fibrous dysplasia is a condition whose benign fibro-osseous lesions of the skull and face have interesting radiological features. There are key features which will allow one to differentiate it from other similar conditions.

E1208

How to measure vestibular schwannomas (a critical comparison of measurement methods)

Cain, J. R.¹•Singh, F.²•Qureshi, S.³•Jackson, A.¹
¹University of Manchester, Manchester, UK, ²Central Manchester University Hospitals NHS Foundation Trust, Manchester, UK, ³Salford Royal NHS Foundation Trust, Salford, UK

KEY LEARNING OBJECTIVES:

- Vestibular schwannomas (VS) are increasingly small at presentation.
- Measurement and repeated MRI imaging has become in important part of management.
- Several competing measurement techniques exist including linear and volume methods.
- Both manual and semi automated methods exist.
- Each technique has associated errors and advantages and disadvantages.

DESCRIPTION: VS, also known as acoustic neuromas, are benign tumours of the vestibulocochlear nerve which arise in the internal auditory canal and cerebellopontine angle. MR screening of individuals with unilateral hearing loss, tinnitus and vertigo has lead to VS becoming increasingly small at presentation. Accurate measuring of the tumour size and repeat measurement is extremely important for management. VS display variable and unpredictable growth patterns with mean growth rate estimated at 1-2mm per year. Accurate measurements are vital to assess tumour size during pharmacological clinical trials. Measurement methods include a single linear measurement using the maximum diameter of the extracanalicular portion on axial images measured perpendicular to the petrous ridge. This is also called the Response Evaluation Criteria in Solid Tumours (RECIST). This method has a retest error rate of up to 25%. Bidimensional and volume estimations methods including rectangular box and ellipsoid models also have high associated error. Several studies have used semi-automated and fully automated methods determine tumour volume.

CONCLUSION: Assessment of VS progression requires accurate measurement. In this exhibit we will present the currently used measurement methods with illustrated examples and the associated reproducibility error, advantages and disadvantages of each method.

Head and Neck Poster

P1201

Knowledge of the anatomical neck spaces, the key to diagnosis of the pathology in the supra hyoid region

Viswanathan Nair, U.¹•Muthu., S.¹•Suresh Kumar, D.²
¹Wrexham Maelor Hospital, Wrexham, UK, ²Morrison Hospital, Swansea, UK

Imaging of the supra hyoid neck is a complex subject which is a challenge to the radiologist. A basic knowledge of normal neck anatomy is essential for understanding the pathology. The supra hyoid neck is anatomically delineated into various named spaces by the layers of deep cervical fascia. Each space contains specific anatomic structures, which can be responsible for specific pathologic processes. By knowing the spaces and the normal contents, an anatomically based differential diagnosis can be generated.

This educational poster presents a simplified approach to the various spaces of the neck in the supra hyoid region and their anatomic components with the use of modern cross-sectional imaging methods (CT & MRI). Each space is discussed separately and a differential diagnosis is listed out based primarily on the normal anatomic contents of the space.

P1202

FESS: what the surgeon needs to know from radiologists

Purayil, T.¹•Chapman, P.¹•Gray, R.¹•Mukonoweshuro, W.¹•Carswell, A.²•Malghan, L.³
¹Peninsula Radiology Academy, Plymouth, UK, ²Southmead Hospital, North Bristol, UK, ³Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: (1) An overview of relevant imaging features which will help surgeons to plan FESS. (2) Acknowledge imaging limitations and pitfalls.

DESCRIPTION: Functional Endoscopic Sinus Surgery (FESS) comprises a group of surgical interventions. The operating Otorhinological Surgeon will depend on information from the Radiologists for planning the operation. Computerized Tomography (CT) images give vital information on anatomical variation and pathological changes.

Some of the issues of interest to the surgeon are: status of the Osteo-meatal complex, presence or absence of normal bony boundaries, the variable attachment of the middle turbinate, the depth of the lateral lamina cribiforma (Keros classification) and other anatomic pathological details, such as calcification within soft tissue masses.

CT is a snapshot of image and one should be aware of some of the limitations as things change from the time of imaging to the time of operation.

CONCLUSION: This poster will highlight key imaging details and summarize the important issues around imaging prior to FESS. We believe this poster will be of educational value for junior trainees to understand the complexities of this subject in a concise format.

Of interest one should note that the use of image guidance systems is becoming increasingly common and may lead to more widespread use of preoperative imaging.

P1203

Regional thyroid MDT at a tertiary centre- radiologist workload and contribution

Pandey, A. •Lewis-Jones, H.
 University Hospital of Aintree, Liverpool, UK

PURPOSE: To assess Radiologist workload in a Regional Thyroid MDT at a tertiary centre and to analyse radiologist's contribution in the MDT.

MATERIAL/METHODS: The MDT lists from January 2010 to July 2010 were analysed retrospectively. PACS, radiologist's MDT notes and MDT outcome lists were analysed to ascertain the images reviewed for each patient, any additional comments made and if radiological input had any impact on the patient's management. Radiological contribution was categorised as level 0 when no additional comments were made; level 1 when additional information was added but there was no change in management and level 2 when additional information was added which led to change in management of the patient.

RESULTS: A radiologist was present in 10/13 fortnightly held regional thyroid MDTs. These 10 MDTs had 66 patients in total, range of 2-11 patients. Five patients did not require imaging review. 80% of the patients were referred from external hospitals. In total 52 ultrasounds, 56 CT scans, 29 MRI scans, 18 nuclear medicine scans and 1 PET scans were reviewed. The Radiological contribution was level 0 in 83% of patients, Level 1 in 9% and Level 2 in 8% of patients.

CONCLUSION: There is an ever increasing demand on the Radiologist's time. With only 8% significant contribution made by Radiologist in a Tertiary level Regional Thyroid MDT, then consideration should be given to radiological input by request, rather than for every patient.

Paediatrics E-Poster

E1301

Significance of solitary abnormalities on bone scintigrams of children with malignancy

Sonoda, L. I.¹•Set, P. A.²•Balan, K. K.²
¹Paul Strickland Scanner Centre, Mount Vernon Hospital, Northwood, UK, ²Addenbrooke's Hospital, Cambridge, UK

INTRODUCTION: 99mTc-MDP bone scintigraphy is employed to investigate children with known or suspected malignancy. While the presence of multiple lesions on bone scans of children in the context of known malignancy is generally considered to

be due to metastases, the exact significance of solitary hot spots remains unknown. An accurate diagnosis is critical in order to determine the optimal management and eventual outcome. This study was undertaken to evaluate the significance of solitary abnormalities on bone scintigrams of children with known or suspected malignancy.

MATERIALS AND METHODS: A retrospective review of 215 sequential paediatric bone scintigrams over a 10-year period was performed. Further evaluation of the solitary lesions demonstrated on bone scintigrams was carried out by either imaging or biopsy studies. Spontaneous resolution of a lesion on subsequent bone scintigram without a change in therapy was considered benign while progression of the solitary abnormality was considered malignant.

RESULTS: 49 scans (22.8%) were found to have single lesions, of which 18 were due to uptake at the primary site and were excluded from further consideration. Of the remaining 31 lesions 13 (41.9%) were confirmed as metastases, 18 lesions were proven to be benign (by imaging in 14, biopsy in 2 and clinical follow-up in 2).

No statistically significant difference was observed between patients with benign and malignant conditions and the sites of occurrence of solitary lesions.

CONCLUSION: Solitary hot spots in children with known or suspected malignancy are common and therefore have to be taken seriously due to their higher malignant potential.

E1302

National audit of the use of ultrasound imaging to guide paediatric chest drain insertion

Wallis, A. G. • Thyagarajan, M.
University Hospitals Bristol NHS Foundation Trust, Bristol, UK

PURPOSE: Following the BTS guidelines for the management of pleural infection in children, we performed an audit of current practice in UK Paediatric Radiology Departments regarding the use of ultrasound to guide chest drain insertion for pleural infection in children.

We set out to determine the national compliance to these guidelines, identifying whether they are recognised and being adhered to.

MATERIALS/METHODS: A web-based questionnaire e-mailed to members of The British Society of Paediatric Radiologists who were either general radiologists with an interest in paediatric imaging or paediatric radiologists.

RESULTS: 52 consultant radiologists participated. 22 (42.3%) were general radiologists and 30 (57.7%) were paediatric radiologists. 40 (76.9%) were previously aware of the guidelines, 12 (23.1%) were not. The guidelines state that ultrasound must be used to confirm the presence of a pleural fluid collection and should be used to guide drain placement. 31 (60.8%) used ultrasound to mark a site for chest drain insertion by paediatricians, 10 (19.6%) used ultrasound guided insertion of drain as standard. 2 (4.2%) stated that the paediatricians use ultrasound themselves to guide placement.

CONCLUSION: There is excellent national adherence to the guidelines. The exact role of ultrasound varied depending on the size of the hospital, as many District General Hospitals will transfer patients to tertiary centres if a pleural effusion is confirmed on ultrasound. Just under 25% of those who replied were unaware of the guidance. We hope to further educate clinicians and radiologists regarding the best practice of management of paediatric pleural infections.

E1303

Chickenpox - a pictorial review of complications

Sandhu, R. S. • Danin, J. • Alavi, A. • Seah, M.
St. Mary's Hospital, London, UK

PURPOSE: Varicella infection is a common childhood illness from which most children make a rapid recovery but a significant minority will experience a range of complications. The aim of this study is to highlight the presentation of these complications in the acute setting and how the radiologist can assist with early diagnosis.

MATERIALS/METHODS: A review of the clinical presentation, imaging, management and outcome of the cases presenting to our institution (a referral centre for paediatric infectious disease) are demonstrated to highlight the life-threatening complications. Representative high quality plain film, US, CT and MRI images are used to assist in the early recognition by radiologists.

RESULTS: A greater awareness of the radiological complications of childhood chickenpox is achieved so that prompt recognition and early supportive or curative treatment can be initiated in the acute setting.

CONCLUSION: It is rare for childhood chickenpox to present with complications in an immunologically competent child. It is therefore important for radiologists to be familiar with the imaging signs of acute complications when they do occur to prevent a delay in diagnosis and treatment initiation. This will have a positive impact on the subsequent lifetime morbidity and illness prognosis.

E1304

MR Spectroscopy in paediatric neuroradiology: when, how and why?

Gnanasambandam, S.¹ • Neramballi, M. M.² • Prabhu, S.³
¹*Royal Devon & Exeter Hospital NHS Trust, Exeter, UK,*
²*Beth Israel Deaconess Medical Center, Boston, MA, USA,*
³*Children's Hospital Boston, Boston, MA, USA*

PURPOSE: To describe role of MR spectroscopy in modern paediatric neuroradiologic practice.

METHODS: Using examples from a retrospective review of the imaging archives over the last ten years at a tertiary care paediatric centre, we will illustrate how MR spectroscopy can have an impact in the care of the paediatric patient presenting with a neurological disorder. We describe how to choose imaging parameters and process the data obtained to ensure reliable and reproducible results.

RESULTS: We illustrate the diagnostic value of spectroscopy in children presenting with perinatal depression, non-accidental injury, infection, brain neoplasms, metabolic disorders like various leukodystrophies, mitochondriopathies and storage disorders, ischemia and intractable seizures. We demonstrate from our experience that there is added value from MRS in cases where MRI is positive and more interestingly, when the structural MRI is negative. We also illustrate false negative and false positive cases where the MRS can be misleading and describe the reasons for these findings and ways to ameliorate these problems.

CONCLUSION: MR spectroscopy, when obtained using correct techniques and processed optimally can help in neurotherapeutic decision-making and planning appropriate management in the paediatric patient.

Paediatrics Poster

P1301

Neonatal imaging for the DGH radiologist

Simpkins, C. J. • Durran, A. C. • James, J. • Thorogood, S. V.
Royal Cornwall Hospital, Truro, UK

KEY LEARNING OBJECTIVES: All general Radiologists will encounter neonatal (0-4 weeks) radiographs during everyday practice; this poster aims to cover the basic required for plain film interpretation. The main learning points that will be covered are:

- Lines and tubes
- The neonatal chest radiograph
- The neonatal abdominal radiograph

DESCRIPTION: Description and radiological examples of the appropriate position of neonatal lines and tubes including umbilical arterial and venous catheters, endotracheal tube, and Replogle tube.

Examples of normal neonatal chest and abdominal radiographs. Examples of common neonatal chest radiograph findings including Hyaline Membrane disease, Transient Tachypnoea of the Newborn, Bronchopulmonary Dysplasia, meconium aspiration, pneumonia and pneumomediastinum.

Neonatal abdominal conditions identified on plain radiographs including diaphragmatic hernia, midgut volvulus, necrotizing enterocolitis, small and large bowel obstruction and perforation.

CONCLUSION: This poster describes some of the common and 'not to be missed' plain radiograph findings the DGH radiologist or radiology registrar should be aware of. Recommendations for further imaging/investigation will also be included.

P1302

Line, tube, catheter and drain complications in the paediatric patient

Lloyd, S. • Ilyas, S. • Vardhanabhuti, V. • Nensey, R. • Apsey, J. • Foster, J.
Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: To review the radiographic appearances of common complications arising from the insertion of chest drains, lines, endotracheal and nasogastric tubes in routine radiological practice in the paediatric patient.

DESCRIPTION: Chest drains, central venous catheters, umbilical catheters, arterial lines, endotracheal and nasogastric tubes may all be used in paediatric patients under a wide range of common elective and emergency circumstances. The devices can vary from those inserted in adult patients due to patient size, tolerance and anatomical differences. Different sites of access may also be used for central venous catheters and arterial lines. As such, the potential complications following insertion of these devices, and the radiographic appearances of the devices and their complications can differ substantially from their adult equivalents. We will review the radiographic appearances of these complications in different imaging modalities, but with particular emphasis on plain radiography, which is the most common modality used to review the position of these devices post-insertion.

CONCLUSION: The radiographic appearances of complications following the insertion of lines, tubes, catheters and drains in the paediatric patient can differ substantially from those seen in adult patient populations. This review of these appearances may facilitate early recognition of such complications and thus aims to be of educational benefit to all those involved in the care of paediatric patients.

P1303

Unexpected course of left leg percutaneous central venous line silastic catheters in the ascending lumbar vein in premature infants: pictorial review

Alfahad, A.¹ • AbdulKarim, D.² • Toms, A.¹
¹Norfolk and Norwich University Hospital Radiology Academy, Norwich, UK, ²Norfolk and Norwich University Hospital, Norwich, UK

KEY LEARNING OBJECTIVES: Peripherally inserted central catheters (PICC) are widely used in the care of preterm and critically ill neonates. The aim of this pictorial review is to demonstrate the spectrum of radiological appearances of malpositioned long lines on conventional radiographs.

DESCRIPTION: The optimal length of catheter insertion is from the great saphenous vein at the level of the medial malleolus to the inferior vena cava at the level between T9 and L3. Lines that end below the L5 level are not likely to be in the inferior vena cava.

Lines that ascend to the left of the spine may be in an anomalous inferior vena cava but may be in a vertebral vein, in an anterior abdominal wall vessel, in the aorta, or extravascular.

Long lines inserted in the left ascending lumbar vein and contrast passing into the prevertebral plexus will produce a characteristic pattern of opacification of the vertebral plexus. Although accidental cannulation of the left ascending lumbar vein is well recognised; in our review we demonstrate that right sided ascending lumbar vein cannulation can occur as well.

CONCLUSION: Localisation of the tip of a long line is important

in order to reduce the chance of line related complication. Contrast medium can add valuable information but it may under- or overestimate catheter length.

P1304

Paediatric stroke - a pictorial review

Akhtar, S. • Al-Islam, S. • Porter, N. • Shabani, A. G. S. • Stivaros, S. M. *Royal Manchester Children's Hospital, Central Manchester University Hospitals NHS Foundation Trust, Manchester, UK*

KEY LEARNING OBJECTIVES: The clinical manifestation of stroke represents significant morbidity and mortality in the paediatric cohort. There is a much wider aetiology than in the adult age group and in general it is a less well-described clinico-radiological entity. The widespread availability of advanced neuroimaging has improved early diagnosis of stroke and identification of commonly encountered underlying pathologies. This review discusses common causes of paediatric stroke and their characteristic imaging appearances.

DESCRIPTION: There is a wide spectrum of aetiologies in childhood stroke. Some overlap with the adult population, whilst others are unique to children. Image interpretation can be challenging as children may be affected at any time from the antenatal period to adolescence. Risk factors can be classified according to the nature of the underlying cause including: cardiac disease, haematological disorders, infectious agents, iatrogenic, metabolic disease, neurocutaneous diseases, trauma and vasculopathies.

Computed tomography and magnetic resonance are the primary neuroimaging techniques allowing identification, localisation, and characterisation of underlying abnormalities in affected patients. These can be combined with techniques targeting other body systems or more detailed neuroimaging.

CONCLUSION: Paediatric stroke may result from a wide range of aetiological factors.

Although features of paediatric stroke may be non-specific, a careful clinical history and examination must be combined with appropriate imaging to maximise diagnostic efficacy. Recognition of imaging features of stroke specific to these age groups will assist rapid identification of causation and facilitate diagnosis. This will ensure appropriate treatment and best available outcome in this debilitating and often catastrophic disease entity.

P1305

Where is the air on the neonatal CXR?

Massey, H. L. • Haworth, J. • Darby, M. *Southmead Hospital, Bristol, UK*

KEY LEARNING OBJECTIVES: To be able to identify air in an abnormal position on the neonatal CXR.

DESCRIPTION: The chest xray (CXR) is the most common radiological investigation performed in the neonatal intensive care unit. We present a series of images demonstrating the more unusual appearances of air in various abnormal positions, which were taken over a 3 month period in our hospital, in the form a pictorial review.

Pathologies demonstrated include pneumothorax, pneumomediastinum (with CT correlation), pneumopericardium and pneumoperitoneum. We discuss the key radiological features in each case. It is important for the radiologist to be able to identify the presence and location of the air to guide the clinicians in further management.

CONCLUSION: The CXR is one of the key investigations performed neonates and it is vital for radiologists reporting these images to have a good understanding of the appearances of any air in an abnormal position.

P1306

An approach to occult spinal dysraphism to a non paediatric radiologist

Purayil, T. • Chittal, R. • Maviki, M. • Sahu, A. • Foster, J. *Peninsula Radiology Academy, Plymouth, UK*

LEARNING OBJECTIVES: (1) To provide an overview of imaging choices, imaging features, techniques and protocols for diagnosing spinal dysraphism. (2) Describe advantages and disadvantages of different imaging choices. (3) To illustrate common pitfalls and challenges in diagnosing occult spinal dysraphism

DESCRIPTION: Occult spinal dysraphism comprises of skin-covered spinal column and neuraxis anomalies. Occult spinal dysraphic lesions include dorsal dermal sinus, tethered cord with spinal lipoma, lipomyelomeningocele, and diastematomyelia and are commonly associated with urinary tract anomalies.

Spinal ultra sound is primary tool in any setting to investigate occult spinal dysraphism. This paper is to discuss the indications for spinal ultrasound, including its advantages and disadvantages when compared with spinal MRI. The features and ultrasound findings both in normal infants and in those with spinal dysraphism are reviewed. New generation high frequency ultrasound machines with extended field of view capability now permit imaging of high diagnostic quality in young babies

CONCLUSION: We hope to have availed the observer with concise pictorial review enabling easy recall of imaging characteristics, choices and pitfalls. We believe that this presentation will be valuable for non Paediatric Radiologist and trainees.

P1307

Ultrasound measurement of paediatric renal transverse pelvic diameter: common errors and a proposed standard for measurement

Akhtar, S. • Porter, N. • Plumb, A. A. O. • Wright, N. B. *Royal Manchester Children's Hospital, Central Manchester University Hospitals NHS Foundation Trust, Manchester, UK*

KEY OBJECTIVES: Renal tract ultrasound is a commonly undertaken investigation in children. A complete assessment should include measurement of the renal transverse pelvic diameter (TPD). However our experience suggests that this measurement is not always performed correctly. This has implications for patient management particularly in paediatrics

where clinical pathways rely on TPD measurements. Here we define the nature of the problem and suggest a standardised technique for measurement.

DESCRIPTION: An audit of 125 renal ultrasound images, reviewed at our tertiary centre nephro-urology meeting, revealed that 42% were performed unsatisfactorily. In 11 cases no transverse image was available making retrospective review impossible. In 42 kidneys measurements were erroneous, including measurement of the extra-renal pelvis, oblique measurements and mistaking the renal vein for the pelvis.

It is generally accepted that a fixed anatomical point, the renal hilar lip, should be used for TPD measurements. A cross-sectional image of this can be achieved by obtaining a maximum bipolar length of the kidney and then rotating the probe through 90 degrees. Attention is also drawn to maintaining optimal image focus, depth and gain. Doppler flow can be applied to differentiate the renal vessels from the renal pelvis.

CONCLUSION: Our experience indicates that renal TPD is often suboptimally assessed despite renal ultrasound being commonplace. The TPD should be assessed in all scans with a true mid-portion transverse image of the renal pelvis across the hilum. This ensures that measurements are both accurate and reproducible consequently guiding appropriate patient management.

P1308

MCUG - why, when, how, what?

Simpkins, C. J. • Durran, A. C. • Thorogood, S. V.
Royal Cornwall Hospital, Truro, UK

KEY LEARNING OBJECTIVES: • Indications for MCUG. • How and when to perform MCUG. • Common pathologies with examples. • When and which adjunctive investigations should be performed.

DESCRIPTION: • This poster will describe the indications for MCUG as defined by NICE. • A step by step approach to performing MCUG including dose reduction techniques. • An example of the normal findings and the standard images to acquire when screening. • Pathological examples including neurogenic bladder, vesico-ureteric reflux grades I-V, and posterior urethral valves.

CONCLUSION: This poster describes the core knowledge required by the general radiologist or radiology registrar in order to properly vet requests, perform and interpret micturating cystourethrograms.

P1309

The paediatric hip

Simpkins, C. J. • Durran, A. C. • Thorogood, S. V.
Royal Cornwall Hospital, Truro, UK

KEY LEARNING OBJECTIVES: • Which radiological investigations to perform and when. • Developmental Dysplasia of the hip • Perthes disease • Slipped Upper Femoral Epiphysis • Septic Arthritis • Paediatric bone tumours

DESCRIPTION: This poster will illustrate the common paediatric hip conditions. When and what investigations should be performed for a given age of patient and instructions on image interpretation.

CONCLUSION: Paediatric hip conditions are common and frequently encountered by general radiologist in District General Hospitals, this poster illustrates the common paediatric hip conditions and some of the rare but 'not to be missed' pathology.

Multisystem Disorders E-Poster

E1401

An introduction to on-call radiology for trainees

Ali, K. A.¹ • Khan, I.¹ • Rasul, S.²
¹Victoria Infirmary, Glasgow, UK, ²Crosshouse Hospital, Kilmarnock, UK

KEY LEARNING OBJECTIVE: Provide a pictorial review of a selection of common and important acute clinical presentations for junior radiology trainees new to on-call shifts.

DESCRIPTION: With the increasing demand for emergency radiological imaging out of hours, junior radiology trainees are expected to interpret images and provide accurate interim reports, sometimes as early in their training as the beginning of their second year. Beforehand many trainees are understandably daunted and feel much trepidation, often having had limited emergency radiology experience. Interim reports provided by trainees are often crucial for immediate treatment and early management of acute clinical presentations. In many cases consultant review of images and final report verification does not occur until the next day.

RESULTS: This pictorial review outlines common and important acute presentations, including diagnostic imaging of the head, chest, abdomen, pelvis and extremities. Examples provided include intracranial haemorrhage, acute cerebral infarction, pulmonary embolism, small bowel obstruction, ischaemic bowel, acute appendicitis, acute cord compression and trauma. A step-by-step approach for image interpretation is outlined. Key radiological features for accurate diagnoses and avoidance of errors are emphasised.

CONCLUSION: Junior trainees often are expected to interpret images and provide accurate interim reports relatively early in their training. This pictorial review outlines a selection of common and important acute radiological presentation for junior trainees new to on-call shifts.

Multisystem Disorders Poster

P1401

Incidental and unsuspected cardiac masses on computed tomography

Tagg, C. E. • Shaw, M. • Pollentine, A. • McGann, G.
Cheltenham General Hospital, Cheltenham, UK

KEY LEARNING OBJECTIVE: Cardiac review is now routinely included in reporting body CT scanning, and is no longer just the remit of Cardiac Radiologists. We demonstrate a number of cardiac masses found unexpectedly on CT, illustrating some of the pathologies found in this region.

DESCRIPTION: Pictorial images of:

Thrombus:

Left and Right Ventricular thrombus in dilated cardiomyopathy

Tumour masses:

left atrial myxoma

intra-atrial septum lipoma

infiltration of the right ventricle by lymphoma

intraventricular deposit from non-small cell lung cancer primary

metastatic tumour from renal cell carcinoma

fatty hypertrophy presenting as atrial pseudomass

Vascular masses:

Sinus of valsalva and left main coronary artery aneurysms

Arterio-venous fistula between coronary artery and vein

CONCLUSION: Our unsuspected cardiac masses presented as filling defects, myocardial masses or abnormal vascular structures. Detection of these will usually impact on patient management.

REFERENCE: Bogaert J et al *Radiologica Medica* 115(2); 175-90, 2010 Mar. Cardiac and pericardial abnormalities on chest computed tomography: what can we see (Review).

P1402

Pictorial review of the radiological features of cystic fibrosis including the common and rare complications

Martin, D. J. • Trainer, V. • Eynon, A.

University Hospital Llandough, Cardiff, UK

KEY LEARNING OBJECTIVES: To give a concise but comprehensive pictorial review of the radiological features of Cystic Fibrosis.

DESCRIPTION: Our hospital has a dedicated, specialist unit for the treatment of cystic fibrosis and consequently we image a significant number of patients with this disease. We present examples of a variety of the typical imaging features of CF but also provide examples of some of the complications and atypical features of cystic fibrosis which we have encountered. We will also add clinical information to illustrate the importance of certain radiological features.

CONCLUSION: We present a multimodality review of this subject and feel it will be of interest and aid learning for both trainees and consultant radiologists

P1403

Imaging of extra-osseous myeloma

Thiagarajah, R. • Riordan, R.

Plymouth Hospitals NHS Trust, Plymouth, UK

KEY LEARNING OBJECTIVES: Extraosseous myeloma is capable of affecting almost every organ system in the body. The imaging features are nonspecific and can mimic other conditions. The objective of this article is to describe the clinical significance

of extraosseous myeloma and to present the varied imaging findings of extraosseous myeloma.

DESCRIPTION: Recent studies suggest that clinically or radiologically detectable extraosseous manifestations occur in approximately 10-16% of patients with multiple myeloma and that the incidence of extraosseous disease has increased in recent decades.

The presence of radiologically detectable extraosseous myeloma is associated with a poor prognosis and thus is an important factor in the initial workup and follow-up evaluation.

CONCLUSION: Imaging plays an important role in the recognition and early detection of extraosseous disease in myeloma patients.

We present a pictorial review of the different imaging features in extra-osseous myeloma and the degree to which various anatomical sites are affected.

We aim to increase awareness of extraosseous myeloma, with a view to expediting diagnosis and correct patient treatment.

Nuclear Medicine E-Poster

E1501

PET Imaging of multi-organ sarcoidosis

Parsons, C. • Adesanya, O.

University Hospital Coventry and Warwickshire, Coventry, UK

KEY LEARNING OBJECTIVES: A definitive diagnosis of sarcoidosis requires identification of non-caseating granulomas in the setting of compatible clinical and radiological features. It can be difficult to establish the diagnosis, particularly given the differential diagnosis of tuberculosis and lymphoma.

DESCRIPTION: Sarcoidosis is a systemic disorder of unknown aetiology, with a wide range of clinical and radiological manifestations. We present a pictorial review of the nuclear medicine and radiological appearances, and discuss two patients with multiple organ-involved sarcoidosis. Each patient benefitted from nuclear medicine investigations that gave a radiological overview of the pathological process.

CONCLUSION: Gallium SPECT-CT and 18F-FDG PET/CT have a role to play in both the diagnosis and management of sarcoidosis, given their ability to demonstrate a morphological and functional map of the inflammatory lesions, particularly useful in atypical complex and multi-systemic presentations.

Oncological Imaging Poster

P1501

Significant second findings on a PET-CT in patient with suspected malignancies

Martin, J. • Chaudhry, F. N.

Bradford Royal Infirmary, Bradford, UK

PURPOSE: To see the important 2nd findings on PET-CT for

people with suspected malignancies, and follow them to see whether the teams looking after patient carried on the suggested investigation/ imaging and if there was any significant pathology on suggested investigation/imaging.

METHOD: This was a retrospective study in which 263 PET-CT scans done in 6 months were looked at to find the significant 2nd findings. This included scans on patients with suspected cancer or a scan as a part of the diseased surveillance. Important second findings were identified and investigations and imaging suggested to the primary teams. We reviewed the notes and follow up scans to see whether primary teams found any significant pathology or whether the second finding was merely based on physiological uptake.

It also helped us to find the compliance of the teams with suggested investigation/imaging.

There were 100 scans with significant second finding. The compliance rate with suggested investigation/imaging by the primary physicians was as low as 40%. The suggested investigations were colonoscopy/gastroscopy, ultrasound of the thyroid, MR of the liver, checking PSA, checking Glucose Tolerance etc.

RESULTS: 1. The compliance rate by the physicians was disappointing i.e; 40%. 2. There were 10% patients with a 2nd malignant focus on the follow up imaging and biopsies. In particular thyroid malignancy co-existent with lung malignancy was a significant finding. 3. There was physiological intake in GIT with no significant findings on gastroscopy and colonoscopies.

P1502

Repeat stenting of oesophageal strictures. Can the procedure be justified in patients with advanced malignant disease?

Burgess, V.¹•Macanovic, M.²•Durran, A.²•Dodds, N.³•Maskell, G.⁴

¹Peninsula College of Medicine & Dentistry, Plymouth, UK, ²Peninsula Radiology Academy, Plymouth, UK, ³Royal Cornwall Hospitals Trust, Truro, UK, ⁴Royal Cornwall Hospitals Trust, Truro, UK

PURPOSE: To determine the most common indications for repeat stenting of malignant oesophageal strictures, to identify peri-procedural complications and determine if the procedure is justified in terms of post-procedural survival.

METHODS: The hospital PACS and endoscopy databases were searched retrospectively. A review of patient notes was performed for those patients who had undergone repeat radiologically inserted oesophageal stent during a 4-year period.

RESULTS: A total of 24 patients underwent repeat oesophageal stenting. In all but one case the underlying pathology was oesophageal malignancy. The most common indication for a repeat procedure was tumour infiltration (n=11), followed by stent migration with dysphagia (n=9). One patient required a covered oesophageal stent to treat a tracheo-oesophageal fistula caused by locally invasive bronchial carcinoma. The procedure was technically successful in 83% of cases. Procedural complications included; stent displacement or migration, failure

to cross the lesion and persisting fistula. The mean survival following the first and second restenting procedure was 3.2 months and 4.8 months respectively, advocating the efficacy and justification for such a procedure in the palliation of oesophageal malignancy.

CONCLUSION: Results of our study demonstrate that radiological restenting of malignant oesophageal strictures is a worthwhile procedure that can be achieved with a high technical success rate and a low risk of procedural complications. The relatively long post-procedural survival implies a benefit from restenting considering the advanced stage of malignancy encountered in this group of patients.

P1503

Pictorial presentation of TNM staging of lung cancer using CT, MR, PET/CT and nuclear studies

Chin, T. •Kumar, A. •Gulati, A. •Katti, A.
University Hospitals Aintree, Liverpool, UK

KEY LEARNING OBJECTIVES: 1. Review of TNM staging principles of lung cancer. 2. Pictorial presentation of TNM staging of lung cancer using CT, MR, PET/CT and nuclear studies.

DESCRIPTION: Lung cancer is the most common cause of death from cancer in men, and recently also in women, having surpassed breast cancer in absolute numbers per year, in the UK. As with all cancer management principles, early staging of lung cancer is vital to ensure appropriate management that is tailored to the patient's needs. Radiological TNM staging provides key information, by characterising the lesion and assessing local and distal nodal and organ involvement, to various members of the MDT for patient outcome planning. This is achieved by the various modalities of CT, MR, PET/CT and nuclear studies, all of which are now routinely used in assessing the disease extent. It is therefore important that the radiologist is intimately familiar with both the principles of TNM staging in lung cancer, and the appearances in multi modality imaging to ensure that accurate staging is performed each time.

CONCLUSION: Lung cancer has and will remain a significant cause of morbidity and mortality in the UK for both men and women. Radiologists play a key role in ensuring that appropriate care is directed to the patient with lung cancer by TNM staging the disease extent. We demonstrate different examples of lung cancers at various TMN stages imaged by CT, MR, PET/CT and nuclear medicine, as a learning tool for radiologists to ensure accurate staging of lung cancer.

P1504

TNM classification usage in new or unexpected primary neoplastic findings in a MDT setting

Chin, T.¹•Bahgat, M.²•Kumar, A.¹•Nedumaran, A.¹•Katti, A.¹
¹University Hospitals Aintree, Liverpool, UK, ²Alexandria Medical School, Cairo, EGYPT

PURPOSE: This study was done looking at the usage of TNM classification in radiology reports for unexpected neoplastic

findings on imaging or cancer staging scans, and the impact on clinical decision making in MDT's if TNM classification was not implemented in the reports.

MATERIALS/METHODS: Retrospective study was conducted through the local electronic systems looking at MR and CT staging reports in August 2010 and PET/CT reports from Aug-Sept 2010. The sole inclusion criterion was that the patient must have had a new finding highly suspicious of an identifiable primary neoplasm, either radiologically or non-radiologically. Each corresponding radiology report was then examined to see if the TNM classification was used for tumour staging purposes. MDT outcomes were recorded and analysed.

RESULTS: 30 routine full chest to pelvis CT examinations identified a new and highly suspicious primary neoplasm of which 22/30 (76%) were TNM staged. Only 17/26 (65%) urgent and targeted CT scans and 26/41 (63%) staging PET/CTs had any mention of TNM nomenclature in the report. All (29/29) MR reports were TNM staged. Having TNM staging recorded on the radiology reports helped in making clearer and quicker MDT decisions.

CONCLUSION: This study shows the incidence of TNM nomenclature usage in CT, MR and PET/CT reports for cancer staging at our department. TNM classification was found to be useful in deciding patient management in a MDT setting by conveying clear and concise clinical information to clinicians efficiently.

P1505

Unsuspected pulmonary embolism - an important secondary finding in oncology CT

Sak, S. C. • Abdi, S.
Weston Park Hospital, Sheffield, UK

AIM: To investigate the prevalence and outcome of unsuspected pulmonary embolism (PE) at staging or follow-up chest computed tomography (CT) in oncology patients.

MATERIALS AND METHODS: A retrospective analysis of 1844 consecutive chest CT examinations performed during a 12-month period in 1248 oncology patients was undertaken. All the examinations were acquired using 2.5mm collimation and 25 seconds delay after the intravenous contrast medium administration. The disease status, concomitant surgery and chemoradiation therapy were recorded.

RESULTS: Unsuspected PE was present in 3.3% (41/1248) of the patients and 2.2% (41/1844) of the CT examinations. The presence of PE was not associated with a specific type of malignancy or the therapeutic intervention. 6 (15%) of the patients had central emboli, between the main pulmonary arteries (saddle embolism). 25 (61%) of the patients had emboli within the lobar arteries and 10 (24%) patients had segmental artery embolism. All of the patients with embolism were treated with full anticoagulation. 28 of the patients died within the period of the study. The cause of death was attributed to the progression of the underlying disease in 100% of them. There was no record of death as a direct result of the PE.

CONCLUSION: Unsuspected pulmonary embolism can be found in a significant number of oncology patients undergoing a routine staging or follow-up CT chest examination. Formal review of the pulmonary arteries for PE is advised.

P1506

Radiological versus pathological staging in localised renal cell carcinoma in DGH- do we need a change?

Klcova, J.¹ • Khan, A.² • Taylor, J.¹
¹Royal Blackburn Hospital, Blackburn, UK, ²Appleton Healthcare, Warrington, UK

PURPOSE-MATERIALS: The purpose of our audit was to evaluate the accuracy of our preoperative CT reporting in assessing renal tumour size and nodular grading when compared to pathological specimen obtained during surgery.

METHODS: Retrospective review of histopathology and radiology records of patients who received radical or partial nephrectomy for renal lesions suspicious of malignancy during 3 year period. Pre-operative CT reports were reviewed and axial measurements of renal mass size measured were collected. Pathological tumour size was defined as the largest diameter of tumour measured in surgical specimen.

RESULTS: Eighty cases were included in the study. 93% were malignant lesions and 7% benign lesions. The TNM stage was given in only 37% of cases of renal cell carcinoma (RCC) and of these only 42% matched histopathological staging. Inferred TNM staging was correct in 56% of cases. In 73% of cases, inferred nodal stage was correct. In 23% of cases of RCC, the radiological TNM grade was understaged and in 13% of cases overstaged compared to the pathology report. Of the benign lesions, 90% were wrongly diagnosed from the CT and thought to be malignant.

CONCLUSION: More accurate preoperative measurement of renal masses can be achieved simply by measuring the largest dimension of the mass in four planes compared to our "standard" practice of axial planar measurement. This can be achieved easily in the same scan series without increasing radiation dose.

P1507

MR imaging features of concurrent chemoradiation therapy (CCRT) effects on cervical cancer in the female pelvis

Singh, F. • Mak, S. • James, A. • Suzanne, B. • Carrington, B.
Christie NHS FT, Manchester, UK

PURPOSE: To demonstrate MR imaging features of CCRT in the pelvis of cervical cancer patients within the first 2 years of treatment.

METHODS: 52 cervical cancer patients (stage T1b- 6, T2- 40, T3- 2, T4- 4; 25 node positive) treated with concurrent cisplatin, external beam radiotherapy and low dose rate brachytherapy were imaged, 41 scans between 1 and 6 months after treatment commenced, 23 between 6-12 months and 13 between 1 and 2 years. 35 patients had 1, 12 patients had 2, 3 patients had 3 and 2 patients had more than 3 scans. T2W MR images were systematically assessed for treatment effect and bowel and

bladder involvement graded according to severity
RESULTS: Grade 1 Treatment Effect- mucosal high signal intensity (HIS), considered to represent oedema, was seen in the bladder (49%), rectum (49%) and sigmoid colon (49%). Grade 2 Treatment Effect- muscle layer HIS was seen in bladder (18%), rectum (6%) and pelvic muscle (64%). The incidence of fascial plane thickening was 43% and presacral fluid 45%. New features included persistent small volume ascites (91%), persistent ill defined intermediate/high signal intensity areas in the cervix (39%) and vaginal vault, T2WI HIS of the anal mucosa (55%) and fluctuating treatment effect severity over time.
CONCLUSION: CCRT is associated with particular features such as small volume ascites, presacral fluid and anal canal mucosal change, which demonstrate temporal variation in severity. Recognising the post treatment effects of CCRT is important to avoid pitfalls in interpretation.

Oncological Imaging E-Poster

E1601

Limited 18F-FDG-PET/CT for assessing response to chemotherapy in lymphoma patients

Sonoda, L. I. • Sanghera, B. • Mills, T. • Wong, W.
Paul Strickland Scanner Centre, Mount Vernon Hospital, Northwood, UK

INTRODUCTION: 18F-FDG-PETCT plays an important role in the management of post-chemotherapy follow-up in lymphoma patients. Some centres perform pre-chemotherapy baseline CT and first post-chemotherapy PETCT from skull base to pubic symphysis. With a concern of radiation burden, especially in young patients, this study aimed to assess if PETCT acquisition area could be minimised, and how much radiation dose could be reduced.

MATERIALS AND METHODS: Retrospective data analysis of 100 consecutive lymphoma patients (55 male, mean 41.7 years-old, Hodgkin's lymphoma 50, non-Hodgkin's lymphoma 50) was performed to record sites of disease on pre-chemotherapy CT and post-chemotherapy PETCT. The potential reduction in radiation dose and timesaving achieved with PETCT scans limited to sites of known disease identified on pre-chemotherapy CT was calculated.

RESULTS: No FDG-uptake was seen in 72 of the 100 subjects. FDG-uptake at known disease sites was seen in 24 cases. Of the remaining 4 cases one had clinically significant pathology, a rectal adenocarcinoma. PETCT scans did not reveal any unexpected sites of lymphoma.

Limiting PETCT to sites of known disease would have resulted in a mean radiation dose saving of 4 mSv (27.3 %), with a mean timesaving of 16 minutes per PETCT.

CONCLUSION: Our study suggests young lymphoma patients may benefit from reduced radiation dose / scan time by limiting PETCT to sites of known disease with low risk of missing significant pathology. However in older patients, with increased

incidence of asymptomatic synchronous malignancies, we recommend whole-body PETCT is advisable unless pre-chemotherapy PETCT has been performed.

Education/Training Poster

P1601

A UK survey of consultant radiographers perceptions on the education and training required to achieve consultant status

Forder, K.¹ • Pratt, S. D.²
¹*Nevill Hall Hospital, Abergavenny, UK, ²Cardiff University, Cardiff, UK*

PURPOSE: To investigate the perceptions of consultant radiographers in the UK on the education and training required to achieve consultant status.

The first consult post established in radiography was in 2003. Consultant roles are very diverse and although there has been discussion about regarding the value of Masters and PhD level qualifications there has been little agreement on the details of education and training consultants should undertake in order to achieve consultant status

MATERIALS/METHODS: An online questionnaire was sent to 47 consultants radiographers in the UK. Information sought included consultant radiographers' education and training backgrounds and perceptions, barriers to education and training for their role and opinions on education and training a radiographer should undertake to achieve consultant status.

RESULTS: Twenty four consultants responded, giving a response rate of 51.6%. All consultants (n=24) had undertaken education and training as a prerequisite to their role. 70.8% (n=17) undertook an MSc degree and 66.6% (n=16) completed in house training. The consultants agreed the education and training they received had prepared them for their role.

CONCLUSION: A formal qualification such as an MSc (related to the consultant's specialist area) should be undertaken in conjunction with in house training in order to adequately prepare consultant radiographers for their role.

P1602

Investigation into the opportunities and barriers to a radiographer comment scheme

Lancaster, A.¹ • Hardy, M.²
¹*Mid Yorkshire NHS Trust, Wakefield, UK, ²University of Bradford, Bradford, UK*

BACKGROUND: The articulation of an initial interpretation of trauma radiographic images either verbally or in writing (commenting) by radiographers is a relatively new extension of the widely implemented "red dot" system. Radiographer commenting reduces the uncertainty inherent within the 'red dot' system and instead makes the radiographers opinion on the image appearance explicit and transparent. However, despite commenting being promoted by the professional body, the implementation of commenting systems has been relatively slow.

One possible barrier to implementation is the lack of evidence in relation to the ability of radiographers to accurately comment on radiographic images and subsequently their willingness and confidence to undertake commenting.

METHOD: A questionnaire was distributed to radiographers of differing grades employed at a single multi-site hospital Trust (3 hospitals). The questionnaire contained paired and unpaired attitudinal statements confirm to accurately reflect radiographer attitudes towards commenting.

RESULTS: 53 questionnaires were returned (n = 53/79; 67.1%) for analysis and included radiographers of all grades (practitioner - consultant). This presentation will identify the barriers and opportunities for the implementation of radiographer commenting and potential solutions to barriers to enhance the successful implementation of service change. With the recent UK government Spending Review emphasising the increasing role of radiographer interpretation, this presentation provides a timely insight into radiographer perceptions of service change.

P1603

Chest reporting by radiographers: findings of an accredited postgraduate programme

Piper, K. J. • Cox, S.

Canterbury Christ Church University, Canterbury, UK

AIM: To analyse the objective structured examination (OSE) results of the first six cohorts of radiographers (n>30) who successfully completed a postgraduate certificate (PgC) programme (accredited by the College of Radiographers) in reporting of adult chest examinations.

METHOD: One hundred radiographic chest examinations were used in the OSE, which included the following abnormal appearances: collapse/consolidation and atypical infections; chest trauma; subtle lung lesions; interstitial lung, cardiovascular, inhalation and environmental diseases; and connective tissue disorders. Incidental findings/normal variants included breast implants, accessory lobes and fissures, rib variants, pectus excavatum deformity and benign calcification. The prevalence of abnormal examinations in the OSE was approximately 50%. For each of the 100 chest examinations the radiographers were required to (a) decide if an examination was normal or abnormal (b) describe the abnormal appearance/s and (c) indicate the most likely pathology/pathologies present. Sensitivity, specificity and total percentage agreement rates (and 95% confidence intervals) were calculated using all reports (n=3200) for the first five cohorts, recruited nationally between 2002 and 2009.

RESULTS: The mean sensitivity, specificity and agreement rate rates, including the 95% confidence intervals, for the first five cohorts of radiographers (n=32) were 94.8% (93.8% - 95.9%); 96.3% (95.3% - 97.3%); and 89.3% (88.2% - 90.3%), respectively. These results suggest that this group of radiographers can report adult chest examinations to a satisfactory level of competence but further work is required to confirm clinical application of these findings.

P1604

Journey from radiology student selected component (SSC) to finished book

Clarke, C. G. D. • Dux, A.

University Hospitals of Leicester, Leicester, UK

OBJECTIVE: My poster explains how a 3 week medical student placement in a Radiology department lead to the creation of a new chest X-ray teaching resource for medical students. It reflects on some of the benefits a radiology student selected component can have on the development of a medical student.

DESCRIPTION: I show how my personal aims for the radiology student selected component lead to a perceived need for a teaching resource and how this idea progressed to a finished book. I explain how student feedback from lectures and focus groups was used to develop and improve the project - using colour to illustrate the radiographs. A timeline from 2008-2011 is given to help visualise the events in the development of this teaching resource.

CONCLUSION: Student Selected Components in radiology can be very rewarding, not only by developing and improving students' knowledge of radiology but also by improving teaching and communication skills. The experience can enhance learning and help students pursue a career in imaging.

P1605

Assessing the effects on learning and experience between full time and day release professional placements in diagnostic radiography

Tessier, J. W.

University of Newcastle, Newcastle, AUSTRALIA

PURPOSE: Increased student intake in recent years due to workforce demand has necessitated use of placement sites at great distances from the University site. This has resulted in reduced opportunity for students to obtain individually preferred placements and may possibly have affected student clinical performance.

The aim of this research is to evaluate an alternative method of clinical placement targeting increased flexibility in delivery.

MATERIALS/METHODS: Following a pilot program in 2008, two options of clinical placement have been made available to students in their final semester of Program. All year 3 students in 2009 and 2010 were given questionnaires before and after their final placement. A separate questionnaire was given to all supervising radiographers in 2010, to assess the outcomes of the two placement methods. The questionnaires asked issues related to the determining factors for placement selection, as well as the expectations and experience of placement.

RESULTS: Quantitative and qualitative feedback indicated that there were multiple benefits to having options for placement including, increased opportunities for students due to better placement scheduling, and better workflow efficiencies in the department, which are both often limitations in the current placement system. Students indicated a range of life style and

emotional issues that effected placement selection.

CONCLUSION: In addition to allowing clinical centres to structure placement times according to workflow, students can benefit from increased performance from the increased flexibility in matching placement requirements with lifestyle choices and commitments.

P1606

Radiology-integrated training initiative (R-ITI) - what trainees really think

Kiu, A.¹, Wilkinson, G.²

¹University Hospital South Manchester, Wythenshawe, South Manchester, UK, ²Royal Hospital for Sick Children, Edinburgh, UK

OBJECTIVES: To determine how Clinical Radiology trainees across the UK utilize R-ITI and what they think of it.

METHODS: An electronic questionnaire was sent to Training Programme Directors in Clinical Radiology across the UK asking them to forward it to their specialist trainees (ST1-ST5) for completion online. Deaneries included were London, Mersey, Northwest, Oxford, Scotland and West Midlands. 100 responses were collected. The questions included time spent on R-ITI, number of modules completed per month, how they rated the modules and how useful R-ITI was compared to time spent in radiology.

RESULTS: More than 50% spend 1-5 hours per week on R-ITI. 64% completed at least one module per month. 54% rate the modules as good or very good whilst 30% rated as satisfactory. 65% of trainees believe clinical teaching to be more important than its e-learning counterpart and 25% believe they hold a similar value. Free text comments show strong support for R-ITI in grades ST1-ST3.

DISCUSSION: To our knowledge, there is no literature on the views of Clinical radiology trainees on R-ITI. This formal feedback provides evidence of trainees experience on which to base further development of trainee-centred education.

CONCLUSION: This study proves that trainees highly value R-ITI, especially amongst ST1-ST3. Where some believe it as of equal value to time spent at radiology department, most still believe in clinical experience being the mainstay of learning with R-ITI by its side.

P1607

Access to and use of EBP resources in the clinical workplace: An Australian perspective

Shanahan, M.

RMIT University, Melbourne, AUSTRALIA

PURPOSE: EBP requires health practitioners to search for, appraise and use information (evidence) to develop best-practice healthcare. Medical databases and journals are key EBP resources. This paper investigates Australian Medical Radiation Science (MRS) practitioners' access to and use of EBP resources. MRS practitioners comprise the professional groups of Nuclear Medicine Technologists, Radiographers, Radiation Therapists and Sonographers.

METHODS: Survey design was used to collect data. A survey was sent to a random sample of 1067 Registered MRS practitioners. The survey data were entered into SPSS 17.0® and descriptive and inferential statistics were used for analysis. **RESULTS:** Three hundred and twenty useable questionnaires were returned. Demographic analysis showed the respondent sample was representative of Australian MRS Practitioners. This study, providing baseline data from Australia, reports that computer configuration within workplaces influences MRS practitioners access to and frequency of use of medical databases ($p < .01$, $p < .01$) and online journals ($p < .01$, $p < .02$). A large number of practitioners (29%) reported that they had access to none (10%) or only one (19%) journal with respondents reporting that journal access was often limited to 'abstracts only'. This study identified that the vast majority (75%) of MRS Practitioners were not given time during work hours to search for or read professionally relevant information.

CONCLUSION: With a growing demand for EBP to be implemented into clinical practice, issues reducing the accessibility of EBP resources within workplaces must be addressed so that all practitioners can avail themselves of EBP resources and implement the findings into practice.

P1608

Scouting about - always be prepared!

Lloyd, S. • Pandher, B. • Ilyas, S. • Maviki, M.

Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: To illustrate the importance of always examining the scout view and looking outside the initial area of interest in order to achieve full and accurate diagnoses when reporting CT and MRI studies.

DESCRIPTION: Scout views are always obtained when performing CT and MRI studies. It is acknowledged that examining these views and looking outside the initial area of interest may provide further information to aid in diagnosis. However, it is not uncommon practice for only the axial and reformatted images to be reviewed by a reporting radiologist, thereby missing important information and clues contained within the scout view. To emphasise the importance of the scout view, we present a variety of demonstrative cases where clinically relevant information was retrospectively identified on the scout views. We show CT and MR studies whose scout views were subsequently found to contain evidence of new, significant diagnoses, including examples of 'edge of the film' abnormalities. Further cases illustrate how the scout view may present a panorama of multiple findings that unite to reveal a convincing overall final diagnosis.

CONCLUSION: Careful review of the scout views of CT and MR studies is essential, as not doing so risks missing clinically significant information that may not be seen on the axial and reformatted images of the initial areas of interest.

P1609

Lines, wires and tubes – acceptable positioning in the adult patient

Chhatani, S. • Ilyas, S. • Gray, R. • Sankaye, P. • Gay, D.
Plymouth NHS Trust, Plymouth, UK

KEY LEARNING OBJECTIVES: To review optimal and suboptimal positioning of lines and wires such as central venous catheters, peripheral access lines, ventriculo-peritoneal or pleural shunts, nasogastric tubes, drains and pacemaker wires in adult patients on radiographs.

DESCRIPTION: Lines and wires are an integral part of patient management. It is important for radiologists and physicians to be able to review various lines, tubes and wires on routine radiographs as faulty insertion, inaccurate drainage and iatrogenic injuries are not uncommon. The situation is further complicated by less than optimal exposure in this subset of often acutely unwell patients requiring lines, tubes and wires. The aim of this exhibit is to be a comprehensive review of criteria for correct placement of these devices and to highlight commonly encountered pitfalls. A selection of lines, wires and tubes will be presented with:

1. A radiograph showing acceptable positioning
2. A schematic diagram presenting the range of positioning that is acceptable
3. At least one example of incorrect positioning.

CONCLUSION: This comprehensive review will serve as a basic requisite for trainees. Equipped with this knowledge, they should be competent at identifying lines, wires and tubes and confirming their correct positioning. This knowledge will surely be a great help to avoid some fatal mistakes that can cause a grievous injury to the patients.

P1610

CT features of hypoperfusion complex and pre-cardiac arrest - a pictorial review

Lloyd, S. C. • Ilyas, S. • Pandher, B. • Nensey, R. • Vardhanabhuti, V. • Venkataranasimha, N.
The Peninsula Radiology Academy, Plymouth, UK

KEY LEARNING OBJECTIVES: To review and illustrate the varied enhancement patterns on CT of solid visceral organs, bowel and vessels in the context of global hypoperfusion and discuss the pathophysiology and prognostic significance of these appearances.

DESCRIPTION: Understanding and recognition of the enhancement patterns of different organs on CT in the context of hypoperfusion can aid in differentiation from solid organ injury, thereby facilitating prompt and timely diagnosis. Several signs of hypoperfusion complex on CT are also of prognostic significance and their recognition may be useful in directing patient management. In this review we aim to demonstrate the main features on CT of hypoperfusion of each major organ, including pre-arrest appearances on CT, the bowel with 'shock bowel', plus vascular structures such as the IVC and aorta with

'shock vessel' and 'the halo sign'.

CONCLUSION: Armed with the knowledge from this review, radiologists should be well-equipped to recognise the CT features of hypoperfusion complex and pre-arrest, as well as being able to use these features to differentiate from solid organ injury. As several of these CT features are prognostic indicators, radiologists may also be able to use them to advise on patient triaging and any potential need for early critical care referral.

P1611

Pictorial cross-sectional reference of the visual pathway-anatomy and pathology

Shah, A. H. • Djoukhadar, I. K. • Macmullen-Price, J.
The Leeds Teaching Hospitals NHS Trust- Leeds General Infirmary, Leeds, UK

KEY LEARNING OBJECTIVES: (1) Using clear cross-sectional images and accompanying illustrations we outline the anatomy of the visual pathway on CT and MRI. (2). Identification of the common pathological processes that affect the visual pathway, demonstrating the importance of an understanding of the anatomy.

DESCRIPTION: MR images were shown to 20 radiology trainees (1st-5th year), of whom only 20% managed to correctly identify the anatomical landmarks for the visual pathway and all agreed that having a pictorial cross-sectional reference would be a useful educational resource.

The human visual system is the part of the central nervous system which enables us to process visual information, as well as enabling some non-image forming photoresponse mechanisms. It interprets information from visible light to build a representation of the surrounding world.

We outline the anatomy of the visual pathway along its course starting at the visual information assimilated at the retina and passed to the primary visual cortex via a series of discrete white and grey matter areas consisting of the optic nerve, optic chiasm, optic tract, pulvinar nucleus, lateral geniculate body, superior colliculus and optic radiations. We clearly outline the anatomical course of the visual pathway using cross-sectional images with accompanying illustrations, including examples of commonly encountered pathological findings.

CONCLUSION: A great variety of pathologies may affect the visual pathway. These may not be fully appreciated unless one has a clear understanding of its precise anatomy. This brief review will provide the basis for such knowledge in a simple and concise format.

P1612

What is sialography?

Corn, S. • Wood, S. • Lancaster, B. • Loney, E.
Bradford Teaching Hospitals Foundation Trust, Bradford, UK

Sialography is commonly used within our imaging department to examine the salivary glands. This technique is used when patients experiencing problems with their salivary glands have had a negative ultrasound scan. Many staff members are

unfamiliar with the procedure and appear reluctant to participate. As a result of this only a select few radiographers are confident in carrying out sialograms. A decision was made by our expert sialography radiographers that production of a poster and patient information leaflet would help educate both patients and staff in this area.

The poster and leaflet aim to provide a better understanding of salivary gland anatomy and pathology and to instil confidence in those carrying out the procedure. With the use of photos and radiographic images positioning will be clarified and common pathologies will be examined. The poster can be used as a reference point for those wanting to learn how to undertake sialograms and will be helpful for the training of undergraduates. By receiving the leaflet patients will be better informed prior to their investigation and should be more at ease. Displaying the poster in the waiting area as well as the examination room will increase awareness and aim to answer any questions the patients may have.

This exercise aims to continue to promote the imaging department as a teaching and learning environment. This exercise can also be used to promote CPD and encourage staff from other areas to participate in similar exercises within their own specialist areas.

P1613

"A pain in the groin" - pictorial review of a common presenting complaint with multiple etiologies

Nelson, A. S. • Mullett, R. • Earnshaw, D.
Arrowe Park Hospital, Liverpool, UK

KEY LEARNING OBJECTIVES: We aim to illustrate examples of different pathologies, which have presented with groin pain to our Department. We include various modalities and describe the important imaging findings, which help to differentiate between the diagnoses.

DESCRIPTION: The groin can be anatomically divided into the inguinal canal and the femoral triangle. Due to the large number of anatomical structures found in the groin, many different pathologies from various body systems can present with groin pain. This includes, for example musculoskeletal, vascular and gastrointestinal pathologies.

The groin can be imaged with multiple modalities including ultrasound, CT and MRI. The clinically suspected pathology will determine the modality of choice.

We present different pathologies in the groin from common diagnoses such as herniae to less common differentials such as deep vein thrombosis and Abdominal Aortic Aneurysms

CONCLUSION: This poster illustrates that the differential diagnosis for groin pain is large and multi-system. We believe that this poster will help Radiologists to consider less common pathologies in their differential diagnosis, and some imaging findings to look for in this anatomically complex area.

Education/Training E-Poster

E1701

Change blindness in radiology: development of a radiographic flicker test

Mucci, B.¹ • Mexa, D.² • Biello, S. M.² • Simmons, D. R.²
¹*South Glasgow University Hospitals, Glasgow, UK,*
²*University of Glasgow, Glasgow, UK*

KEY LEARNING OBJECTIVES: Outline the relevance of Change Blindness to radiology. Discuss the Flicker Test as a measure of Change Blindness. Demonstrate radiographic flicker test.

DESCRIPTION: Radiologists are aware of Inattentional Blindness where an object in clear view is missed. Increasingly radiographs are viewed by scrolling through images and Change Blindness comes into play. This phenomenon is where an observer fails to detect large changes within a scene. Psychologists test subjects for this using a Flicker Test where changes between image pairs are viewed and detection of changes recorded. Any changing image could be used, but the subspecialist knowledge of radiologists means that a tailored test would be advantageous in this subpopulation. Using photographic manipulation software radiographic images were altered and paired with unaltered images. These were presented as flickering image on a laptop using "SuperLab" software which allows time to detection of change to be recorded. A pilot was tested on volunteer lay people to confirm operational utility of the system and give a baseline data set with which radiologist can be compared under differing circumstances. A mix of plain radiograph and cross sectional images has been used. In this electronic poster we will illustrate the image pairs and demonstrate the flicker test in use.

CONCLUSION: Measures to minimize Change Blindness are increasingly important for radiologists. Our poster describes the phenomenon and demonstrates how a specialty specific Flicker Test can be used to educate radiologists about the phenomenon and additionally how it can be a teaching and research tool.

E1702

The RITE project: towards a research-led curriculum in a diagnostic radiography degree

Higgins, R.¹ • Hogg, P.² • Robinson, L.² • Newton-Hughes, A.² • Burton, N.² • Cheetham, M.² • Falzon, M.² • Fradley, S.²
¹*Clatterbridge Centre for Oncology / College of Health & Social Care, School of Health, Sport & Rehabilitation Sciences, Wirral / Salford, UK,*
²*College of Health & Social Care, School of Health, Sport & Rehabilitation Sciences, Salford, UK*

KEY LEARNING OBJECTIVES: The Research Informed Teaching Experience (RITE) is an important step in the move towards a more prominent research ethos within a BSc (Hons) radiography programme.

DESCRIPTION: Over an 18-month period a teaching and learning strategy was refined, based upon guided discovery and provided 1st year students with a week-long set of structured events suitable to their programme of study. The

students followed an experimental science approach and investigated the relationship between image quality and image acquisition parameters. The students undertook methodological development and testing, exploration of theory, analysis of data and drew inferences from this data. Tutor support was provided at specific points within the week. RITE was evaluated during two pilot weeks; participants for each week comprised of 2 groups of 1st year student radiographers. At the end of each pilot week, qualitative data was collected to determine the student's perceptions of RITE. The qualitative data included feedback forms and a DVD recording of student presentations and discussions between students and staff.

CONCLUSION: Following thematic analysis of the DVD and student feedback forms; students from both weeks agreed the experience was helpful to their learning and felt this was because they were able to undertake this type of learning within an environment that allowed them to challenge established concepts - something that could not be achieved within a clinical setting. RITE has now become embedded within the 1st year radiography programme. We have now commenced work on 2nd and 3rd year RITE strategies.

E1703

The London Underground of anatomy

Conway, O. J.
Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES: To demonstrate a fun yet memorable system for simplifying radiological anatomy learning in preparation for the Part 1 Radiology anatomy exam. To directly compare simplified "maps" of key chapters of normal anatomy with their equivalent CT, MRI and Ultrasound images.

DESCRIPTION: Since the reintroduction of the anatomy component to the radiology exams, junior radiologists find it useful to have a simple and concise way to revise and improve their anatomy knowledge whilst applying this to radiological practice. I have developed a new and exciting system of demonstrating complex aspects of anatomy including vascular and neurological pathways (such as the coeliac axis, the circle of willis and the brachial plexus) in the style of the iconic London Underground tube map. By comparing these maps directly to true-to-life CT, MRI and Ultrasound equivalent images, a radiology trainee is quickly able to memorise, apply and refer back to these images in order to improve their radiological anatomy knowledge.

CONCLUSION: The "London Underground Tube Map" of radiological anatomy is a fun yet effective way of demonstrating key elements of normal anatomy and cross referencing this to true-to-life radiological findings in a variety of modalities.

E1704

Does teaching foundation trainees regarding central venous catheterisation incorporate the use of ultrasound as suggested by NICE guidelines?

Nayagam, K.¹•Upadhyay, B.²•Bartlett, D.³•Kaul,

A.⁴•Upadhyay, N.⁵

¹Luton & Dunstable NHS Trust, Luton, UK, ²Basildon and Thurrock University Hospitals NHS Foundation Trust, Basildon, UK, ³Addenbrookes Hospital: Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK, ⁴The Princess Alexandra Hospital NHS Trust, Harlow, UK, ⁵Hammersmith Hospital: Imperial College Healthcare NHS Trust, London, UK

PURPOSE: Current National Institute of Clinical Excellence (NICE) guidelines advice the use of ultrasound for central venous catheter (CVC) insertion. CVC insertion is one of the proficiencies highlighted in the foundation programme. Training methods for practical procedures may take the form of skills lab sessions, formal teaching, and observation of a competent practitioner or conducting the procedure under supervision of a competent practitioner (Direct Observation of Procedural Skills - DOPS). The purpose of this study was to evaluate whether different teaching methods used to train junior doctors in CVC insertion was compatible NICE guidance.

METHODS: Fifty junior doctors in their first and second year of Foundation Training were emailed a questionnaire to establish their experiences of the teaching methods used to deliver CVC insertion training. Trainees were also required to answer questions related to NICE guidance on the subject.

RESULTS: Twenty-nine responses were received from fifty questionnaires sent (58%). Only three doctors received dedicated formal teaching (10%) all of which were aware of the NICE guidelines. Of fifteen that had observed the procedure or had completed a related DOPS only four (27%) were aware of the NICE guidelines.

CONCLUSION: This study suggests that the majority of CVC line insertion training is through the observation of competent practitioners and DOPS, however NICE guidance may not be followed in this setting. Training competent practitioners involved in teaching and supplementing ward based sessions with formal teaching may help to raise awareness of important guidelines amongst junior doctors.

E1705

WHO checklist completion in radiology. are we as good as we think?

Madani, H.¹•Kodur, R.¹•Nelson, A. S.²•Banks-L'Amie, S.³•O'Grady, E. A.¹•Camenzuli, A. M.¹

¹Aintree University Hospitals NHS Foundation Trust, Liverpool, UK, ²Wirral University Teaching Hospital NHS Foundation Trust, Wirral, UK, ³The Royal Liverpool and Broadgreen University Hospitals NHS Trust, Liverpool, UK

PURPOSE: To improve awareness within the radiology community to the recently introduced WHO checklist. To look at the utility and compliance rates of the newly introduced WHO checklist for invasive procedures.

METHODS: Retrospective analysis of the data from the radiology information system was used to identify CT and Fluoroscopy guided interventional procedures performed within a one month period (August 2010). Completed WHO checklists,

scanned into the radiology information system, were analysed to calculate the compliance rates. 100% was set as a standard. Absence of a scanned form was presumed to indicate that a checklist was not performed. All forms were reviewed to assess any findings or discrepancy documented prior to the procedure, as a result of using the WHO checklist.

RESULTS: A total of 51 Interventional procedures were performed. 45 procedures were performed under fluoroscopic guidance and 6 under CT guidance. Overall compliance was 74%. Fluoroscopic guided procedures were 84% compliant and none of the CT guided procedures had a recorded WHO checklist. The WHO checklist process highlighted nine clinically relevant events which included allergies and missing haematology results.

CONCLUSION: A lower than expected compliance rate for the radiology WHO checklist was highlighted. This poster will raise the awareness of radiologists to the recently introduced WHO checklist and emphasise the importance of performing a pre-procedural checklist prior to an invasive procedure, in line with the Royal College of Radiologists guidelines.

E1706

The rhetoric of typography in medical CV's (or does using a comic font make people laugh at you)

Hathorn, J. • Anderson, H.

Norfolk and Norwich University Hospital, Norwich, UK

PURPOSE: We present evidence from our study and the literature to identify if the layout and font of a CV could consistently improve or worsen the first impression it makes to your potential employers. We also provide suggestions to improve the aesthetics of your CV.

Materials and Methods: Participants, who were all radiologists and radiographers, were asked to grade the first impression of 36 single page CV's, each with an individual combination of variables. Each document was ranked on a visual analogue scale, once for its professionalism and once for its aesthetics as a document outside of the context of a job application.

RESULTS: The data underwent multiple regression analysis showing certain fonts and layouts improved the first impression the CV produced to a statistically significant level. Some also significantly decreased the mark. The more familiar, conservative layouts proved the most popular.

CONCLUSION: Making a good first impression with your CV is vital. We show a few simple methods of improving the look and layout of your CV specific to short listing radiologists and radiographers. Our main **CONCLUSION:** is don't mess about with your CV, a conservative layout may seem dull but using alternatives has been proven to worsen first impressions and take away from the content you've worked hard to produce.

E1707

Blended learning initiatives - How do the perceptions of diagnostic radiography academic staff and students compare?

Kirwan, L.

PURPOSE: Blended learning is the integration of innovative teaching methods into traditional teaching which aims to revolutionise the learning process by increasing student interaction and engagement within the classroom environment. Blended learning methods add an element of flexibility to the learning process, empowering students to become autonomous learners. Understanding students' needs and pedagogical preferences is essential and should be considered when designing and integrating blended learning initiatives. This study set out to capture the opinions of students regarding blended learning initiatives and to assess the perceptions that diagnostic radiography lecturer's have of student opinions of these initiatives.

METHODS: Data was collected by a mixed method approach using questionnaires. Participants included 106 3rd year diagnostic radiography students and 16 diagnostic radiography lecturers. A student response rate of 92% and a lecturer response rate of 50% were achieved.

RESULTS: Gaps of opinion existed between students and lecturers regarding the length of time students spent on podcasts, the use of podcast for exam preparation and the ability of conditional branching to increase student interaction.

CONCLUSION: To conclude there is a gap between students' and lecturers' opinions regarding blended learning initiatives. These new initiatives need continual evaluation, and to gain the full potential from these initiatives the channels of communication between lecturers and students need to remain open.

Audit Poster

P1701

Audit of requests for DVT ultrasound

Barry, B. P. • Crilley, T. • MacLeod, F. K.

Horton Hospital, Banbury, UK

PURPOSE: Deep vein thrombosis (DVT) is a common condition, but it is suspected clinically even more commonly and most ultrasound examinations performed to look for DVT are negative. Current guidelines call for urgent ultrasound for suspected DVT, which causes a strain on the resources of a busy ultrasound department. Ultrasound should be performed only in cases justified by an assessment of pre test probability. Specifically we use a guideline that Well's score should be assessed and if the score is 1-2 an ultrasound should not be requested unless D-dimer is elevated.

METHODS: We audited all DVT ultrasound requests for a three month period (135 cases) collecting demographic details, clinical information provided, Well's score, and D-dimer result.

RESULT: Well's score was not indicated on any of the 135 requests. It was calculated where possible from the request cards. In three cases a score could not be calculated as no clinical information was provided other than "?DVT". 8 cases

had a Well's score of 0 or less and should not have been scanned. 99 cases had Well's scores of 1-2; of these only 26% provided information on D-dimer results. Only 9% of cases had a DVT on ultrasound.

CONCLUSION: The majority of requests did not follow local guidelines, and as a result a large number of potentially unnecessary ultrasounds were performed. This has a significant impact on an already stretched service. We are changing practice so in future requests must indicate an appropriate clinical history, Well's score and D-dimer result if appropriate.

P1702

Re-audit: Do we complete requests for CT scan of abdomen properly?

Shaw, O. • Jehangir, E. • Fidler, J.

West Cumberland Hospital, Whitehaven, UK

PURPOSE: To improve the quality of information on the referrals for CT scan of abdomen. This includes identification of patients at increased risk for contrast adverse reactions; consideration of pregnancy in women of childbearing age; and legibility of clinical information, Patient's and Referrer's ID.

MATERIALS/METHODS: Retrospective review of 50 random request forms for CT scan of abdomen from the Surgical team.

RESULTS: Audit revealed poor quality of information supplied by the Referrers to the Radiology Department. Creatinine level and history of allergy were provided in only 20% and 18% respectively. Illegible clinical information and Referrer's ID, and incomplete Pt's ID were given in lesser percentages. Possibility of pregnancy was not considered in all 7 women of childbearing age.

The implemented action plan included introduction of a new better designed request form for CT scans at our hospital. The importance of providing the required information in a legible style was emphasized to doctors at two audit presentations. Reminder posters have been displayed at doctors' offices. Re-audit revealed a much better compliance with correct referral procedures, but the request forms are still not fully completed. Pregnancy status is still not mentioned by the Referrers.

CONCLUSION: The implemented actions have helped to improve quality of information on the referrals for CT scan of abdomen. However, manual request forms allow incompleteness and illegibility. Electronically submitted request forms would eliminate this and bring a number of other advantages. Transformational Programme Forward is introducing the electronic requesting system in hospitals of our Trust from April 2011.

P1703

Closing the loop: contrast induced nephropathy in itu patients in a university hospital

Lam, K. • Lowsby, R. • Chan, T. Y. • Walker, J.

Royal Liverpool University Hospital, Liverpool, UK

PURPOSE: Contrast-induced nephropathy (CIN) is a significant and preventable cause of renal failure associated with increased

mortality, hospital stay and long-term haemodialysis. Critically ill patients have increased risks of developing CIN due to pre-existing disease and sepsis. A university hospital audit in 2007 found that 22.2% of ITU patients had significant rises in creatinine following intravenous contrast medium (IVCM). In 2008, IVCM guidelines were implemented trust-wide to detect patients with pre-existing renal impairment and provide guidance for pre-optimisation and prophylactic measures depending on CKD stage, including early renal team involvement. A re-audit assessed the impact of IVCM guidelines in decreasing the incidence of CIN in ITU.

METHODS: ITU patients who received IVCM for CT studies from Mar-Dec 2010 were identified. Patients on haemodialysis pre-contrast or who died within 48 hours post-contrast administration were excluded. Pre-contrast (within 48 hours) and post-contrast (48-72 hours) creatinine levels were analysed. CIN was defined as an increase in serum creatinine exceeding 25% or 44umol/l from baseline within 3 days of administration of contrast media in the absence of alternative causes.

RESULTS: 90 patients were identified. 10 patients who required haemodialysis pre-contrast or died within 48 hours post-contrast were excluded. Mean age was 59 years (range 25-89 years) with a male:female ratio of 46:34. 14 (17.5%) patients had significant rises in creatinine post-contrast. Patients who died within 48 hours had ruptured AAA, severe sepsis, ischaemic bowel etc. **CONCLUSION:** The incidence of CIN has decreased to 17.5% in medical and surgical ITU patients since the introduction of the IVCM guidelines.

P1704

The investigation of PE in a district general hospital

Murtagh, B. • Berriman, T.

Colchester Hospital University Foundation Trust, Colchester, UK

PURPOSE: The BTS Guidelines 2003 give diagnostic criteria and investigation algorithms for the establishment of PE. We audited for compliance.

MATERIALS/METHODS: An audit was made of all patients attending radiology for CTPA or VQ during February 2010 according to the PACS database (radiology imaging). Requesting information was obtained from CRIS (radiology department ordering and requests) and the request cards analyzed for evidence of adherence to scoring criteria. D-Dimer results were checked and PACS searched for pre-scan chest x-rays, if this had been reported, its result, time from request to CTPA or VQ imaging and from imaging to reporting. Bedweb was used to assess date of admission, additional clinical details and cause of mortality. Original notes were scored for PE probability according to the Guidelines and compared to what was documented on the requests

RESULTS: The trust is not compliant with the BTS guidelines. D-dimer assays and chest x-rays are sub-optimally utilised. Ordering clinicians do not document sufficient clinical information on request cards to adequately score their patients

as to probably of PE.

A modified chest x-rays ordering form requiring clinical probability scoring with D-dimer and CXR results was piloted. The preliminary results are encouraging and subsequent to approval from the medical consultants will be officially rolled out in the New Year.

CONCLUSION: Poor documentation prevents radiologists from appropriately screening CTPA/VQ suitability. A modified CTPA ordering form has encouraged clinicians to utilize the guidelines more appropriately, which have already showed a decrease in unnecessary radiation exposure and utilization of resources.

P1705

Top 5 MRI errors at a DGH: our 7 year experience

Prowse, S. J. • Etherington, R.
Countess of Chester Hospital, Chester, UK

KEY LEARNING OBJECTIVES: To review all MRI errors confirmed at a DGH radiology discrepancy meeting. To identify specific common problems and present examples of the five most common errors.

DESCRIPTION: All errors specific to MRI discussed at a radiology discrepancy meeting between October 2004 and November 2010 were reviewed. Errors are brought to the meetings attention either through a systemic review process or by incidental case reviews. Those where a discrepancy was confirmed by the reviewing radiologists were classified by error type: observation and interpretation (false positive, false negative and misclassification); technical error; and, communication error. 99 errors were identified in 93 patients. 93 (94%) were due to image observation and interpretation error (4 false positive, 68 false negative, and 21 misclassification). 3 (3%) errors were due to technical errors and 3 (3%) were due to communication errors. The most common errors by investigation were MRI of the spine (27), brain (23) and pelvis (14). The five most common specific recurring errors included failure to recognise, or misclassification of, disc protrusion/extrusion (10), failure to pick up distant disease in the pelvis such as bone lesions (7), missed axial skeleton spondylitic changes (6), missed orbital disease (3), and missed rotator cuff tears (3).

CONCLUSION: Radiological errors are important to identify to aid patient management and to improve radiologist performance. By examining 7 years worth of MRI errors we have identified and presented several recurring errors. We believe awareness of these common errors will help minimize them in the future.

P1706

Ensuring accuracy in diagnostic image interpretation: a continuing programme of peer review

Snaith, B. • Field, L. J. • McGuinness, A.
The Mid Yorkshire NHS Trust, UK

KEY LEARNING OBJECTIVES: This poster will describe the development of an annual audit programme for Advanced Practitioner's that proposes a method of maintaining quality and

accuracy in the production of radiological reports. This proposed method of audit will develop the reflective processes and peer review method which is currently under utilized.

DESCRIPTION: The continuing process of audit by reporting Practitioner's is fully endorsed by the RCR (2009) and the CoR (2007) which state that self audit should be used in conjunction with a continued professional development portfolio. Although various governing bodies such as the Department of Health, CoR, RCR, and the Audit Commission have all emphasised the importance of the audit, recommendations regarding the methods are limited. (Jones and Manning 2008)

Continuing education, audit and periodic re-assessment of competence are important in providing a quality assured reporting service. However, other factors, particularly the views of service users, the period between examination request and receipt of the report are important quality indicators and will need to be built into the routine quality assurance plan for the department.

CONCLUSION: At present all new employees within the Trust undertake an audit of competency which consists of 100 double reported cases with a discrepancy rate of no more than 2 significant cases +/- 8 minor disagreements. This process is mandatory before issuing unsupervised reports. A combination of retrospective peer review, prospective peer review and MDT discussions will ensure that all avenues of accuracy and education are addressed on an individual, departmental and organizational level.

P1707

Audit of radiation awareness in medical staff

Zaghi, H. R.
Leeds General Infirmary Hospital, Leeds, UK

PURPOSE: To assess doctor's knowledge of radiation dose for commonly requested examinations and to raise awareness of radiation doses and potential hazards of radiation.

MATERIALS/METHODS: 60 questionnaires were distributed randomly amongst MCHFT medical staff from three clinical divisions, i.e. surgery & cancer, emergency care, women's, children and sexual health. The questionnaires included the equivalent dose in chest x-ray for the commonly requested imaging investigations: abdomen x-ray, lumber spine x-ray, CT, head, CTPA, CT abdomen & pelvis, MRCP and the risk of fatal malignancy by doing chest x-ray and CT scan. Compliance with the target of 50% awareness was only achieved for two questions and 4 of the 9 questions were below 39%. the overall aggregated compliance for the questionnaire was less than 50% target. The designation of medical staff has collected and showed a wide variance in knowledge of radiation dose.

RESULTS:

- Limited doctor's knowledge of radiation dose for commonly requested examinations and the potential hazards of radiation
- The 50% awareness target met in two areas only
- The performance of doctors from surgery and cancer is

better than the performance of emergency care doctors in relatively equal samples.

CONCLUSION: need to improve doctors knowledge of the radiation dose of commonly requested investigations and this achieved through feedback results to the participants, medical teaching sessions include information on radiation doses, visual reminders : posters in the clinical areas, prompts for high examinations for electronic requesting software.

P1708

A plain film audit of paediatric in-patients

Bliss, H. J. • John, S. A. • Negus, S.
St George's Healthcare NHS Trust, London, UK

AIMS AND OBJECTIVES: The aim of this audit is to evaluate the quality of in-patient radiographs (in department and portable) taken between September 2009 - September 2010.

METHODOLOGY: Each in-patient radiograph was reported by a Consultant Paediatric Radiologist who deemed whether the image was of good or poor quality. If the radiograph was deemed of poor quality, it would be grouped under ten different factors ranging from image quality to positioning and radiographic technique etc.

RESULTS: According to departmental guidelines designed by the Consultant Radiologists, the number of poor quality radiographs should not exceed 5% per month. The results for the year Sept-09/Sept-10 showed an average of 2.9% per month, where no month exceeded 5%.

CONCLUSION: Although this average (2.9% per month) may seem as a small percentage, the St. George's Radiology Department prides itself on providing a high standard of service. Therefore this audit has highlighted areas where we can improve by educating staff on the results obtained so that best practice can be adhered to.

P1709

Large scale dose audits using IRS systems in the North West, service delivery

Pike, A. M. • Charnock, P.
Integrated Radiological Services, Liverpool, UK

PURPOSE: The methodology for large scale dose audit using data from RIS has previously been published and demonstrated to be successful on individual hospitals and solely on plain film examinations. This study applies the methodology to multiple hospitals in the North West and includes other modalities such as fluoroscopy, interventional and CT. The aim was to replicate the reports produced by the HPA approximately every 5 years.

METHOD: Records were collected from RIS systems and processed in a statistical package. Impossible data was removed and statistical analysis was performed to remove suspect records. The room mean was then calculated for each examination per hospital and compared to reference data from HPA and IPPEM.

RESULTS: Following refinement of the data there was 271608 plain film records, 31456 fluoroscopy, and 52386 CT records

from six large hospital trusts over an 18 month period. A regional DRL was established for this group of hospitals for all modality areas except interventional and compared to the national reference data.

CONCLUSION: This is the first time this methodology has been applied to a multi-centre study. Interventional was the only area that was unsuccessful. This was due to a non uniform convention of naming examinations. With some refinement of the process this method will be used to establish regional DRLs more frequently and with larger data sets than is currently done.

P1710

Ultrasound operator identification: audit of practice

Alobeidi, F. • Roddie, M.
Imperial College Healthcare NHS Trust, London, UK

PURPOSE: Reliable identification of ultrasound (US) operators is essential for patient safety and departmental efficiency. Our hospital protocol requires operators to record their initials onto the first US image. We audited current practice and tracked changes over a 3 year period.

MATERIALS/METHODS: The images of all ultrasound scans performed during the last full week of June were reviewed on PACS. Operators were informed about the audit when data collection commenced and the identification protocol was explained to new staff at induction. A target of 95% for positive US operator identification was set. The data was analysed by operator grade and by individual performance.

RESULTS: A total of 581 studies (2008), 763 studies (2009) and 787 studies (2010) were reviewed. The operators were 7 radiographers, 22 consultants and 13 radiology trainees. Positive operator identification of studies occurred in 69% (2008), 80% (2009) and 85% (2010). Analysing the results by operator grade, the radiographers met the target in 2009 (95%) and 2010 (96%) but the consultants and radiology trainees failed to achieve the target in any of the study periods, although a gradual improvement over time was observed. Failure of US operator identification was most frequent among radiology trainees although a few staff across the grades persistently failed to initial their studies.

CONCLUSION: Although a significant improvement was achieved in US operator identification over time by all grades, the department has yet to achieve the 95% standard. Educational prompts are now displayed in the department to reiterate the importance of this practice.

P1711

Can we scan any faster? A clinical audit

Karsandas, A. • Ali, T.
Newcastle upon Tyne Hospitals, Newcastle upon Tyne, UK

PURPOSE: Advances in CT technology have reduced scanning times significantly. Standard practice in our trust is to allocate 15 minute slots for diagnostic scans. The aim of this study was to review the 15 minute standard, assessing adherence and

identifying any causes for delay, and the impact of these on service delivery.

METHODS/MATERIALS: We looked at all patients who were scanned at a large central hospital in Newcastle upon Tyne over a period of one week. A digital stop-watch was used to measure the door-to-door study time including transfer time and IV cannulation as appropriate.

RESULTS: 168 patients underwent a CT scan during the week of our study. Just under 20% of scans took longer than 15 minutes. The main cause for delay was found to be obtaining IV access (61% of delays). The average time for a CT scan was 10:56 minutes, and the average time to obtain IV access with the patient on the table was 3:37 minutes. We also found that 37.5% of inpatients who required a contrast enhanced study arrived without a cannula in situ.

CONCLUSION: The rapid scanning times achievable by modern scanners dictate the need to modify other aspects of practice in order to reduce total study times. We identified obtaining IV access for enhanced CT scans as the main cause for delay. In fact for every three inpatients arriving without IV access, a scanning slot was essentially lost. Recommendations and changes were made with re-audit happening one year following the implementation of these.

P1712

An audit of the WHO checklist for interventional radiology procedures

Papadacos, N. •Goh, G. •Belli, A.
St. George's Healthcare NHS Trust, London, UK

PURPOSE: Following the recent WHO surgical safety recommendations, the National Patient Safety Agency (in conjunction with the RCR) introduced a modified WHO surgical safety checklist for interventional radiology (IR) procedures to reduce adverse incidents. We conducted an audit within our IR department to assess whether the WHO checklists had been adequately completed since their introduction. Furthermore we planned to implement methods to maintain or improve completion of the checklist.

MATERIALS/METHODS: A retrospectively study was conducted of all IR procedures from the hospital PACs system from 06/06/2010 to 06/07/2010. All available WHO checklists scanned were assessed. The safe site marking category was sub analysed with reference to the procedure performed.

RESULTS: 46 of the 104 (44.2%) procedures had a WHO checklist completed and scanned onto PACs. 2.2% of these cases had all 3 main sections of the checklist completed, 10.9% had 2 sections completed, 58.7% had 1 section completed and 28.3% had none of the sections adequate completed. 11 of the 46 case (23.9%) did not have the safe site marking appropriately recorded for the associated case.

CONCLUSION: Completion of the checklist and adequate site marking falls below the standards expected. Since this audit, we have undertaken educational sessions with all the IR department staff, via e-learning, written and oral presentations. In addition

we have implemented specific changes to our working practice for further improvement. We are in the process of conducting a larger prospective study to reassess our completion of the WHO checklist and the success of the implemented changes.

P1713

Radiological images taken following shoulder trauma

Joy, J. •Roche, A. •Webb, M.
Countess of Chester Hospital, Chester, UK

PURPOSE: Plain X ray AP and axial images should be performed for the assessment of the shoulder following trauma. The 45-degree modified supero-inferior image is perceived as a reasonable alternative to the classical axial view if it is difficult to obtain. We noticed poor compliance of our Trust protocol.

MATERIALS/METHODS: In the initial audit x-ray images taken for the first 29 patients attending the A&E with a history of shoulder trauma in August 2009 were studied. A New Trust protocol was introduced in October 2009 regarding radiological views required for shoulder trauma. Ideal images remained the same (AP and Axial) but if Axial is unachievable, a 45 degree modified supero-inferior projection is recommended. A re-audit of the first 31 patients who presented in January 2010 following shoulder trauma was conducted.

RESULTS:

August 2009

N= 29

AP views 86%

Axial views 14%

36% of patients who did not have axial views had 45 degree modified supero-inferior projections. 57% of patients had additional x-rays including post reduction/manipulation and lateral films.

January 2010

N=31

AP views 97%

Axial views 35%.

80% of patients who did not have axial views had 45 degree modified supero-inferior projections taken. 23% had additional x-rays including lateral PA views.

CONCLUSION: The Practice of shoulder trauma imaging in our hospital has improved following the introduction of the new Trust protocol. There has been a decrease in the additional X rays taken since its introduction. The percentage of Axial and Modified images taken immediately following shoulder trauma has also improved.

P1714

Core tissue lung biopsy using fine needle aspirate technique: diagnostic accuracy and complications

Abbas, M. I. •Sada, P. •Almallah, F.
Manor Hospital, Walsall, UK

PURPOSE: To assess the safety and effectiveness of the technique of CT guided FNA to obtain lung core tissue biopsy

for histology analysis. The diagnostic yield and complication rate were compared with the standard set up by British Thoracic Society (BTS).

MATERIALS/METHODS: A retrospective review of all lung biopsies in our department using FNA was carried out for a 21 months period. A total 117 biopsies were performed in 96 patients using two types of needles, automated firing system (AFS) and Franseen needle. 18 gauge needle used in both techniques. Core tissue was obtained by Franseen needle under negative pressure using 20 mls syringe. This technique is used to decrease the complication rates of lung biopsy with half the cost of AFS technique.

RESULTS: 117 biopsies were performed in 96 patients. 10 developed pneumothorax. No haemothorax or mortality were recorded.

There were 102 FNA. Of those 81 (79.3%) resulted in diagnostic histological yield and 8 (7.8%) pneumothoraces. Failed studies were repeated using the same technique.

15 biopsies performed using AFS with 100% diagnostic yield and 2 (13.3%) pneumothoraces.

BTS standards recommends that adequacy of sample should be over 90% and sensitivity for malignancy of 85-90% in lesions over 2cm.

CONCLUSION: Obtaining core tissue sample using FNA is a cheap and safe technique with a high diagnostic yield and very low complication rate.

P1715

Re-audit of voice recognition system report content in a tertiary referral centre

Karuppiah, A. S.^{1,2}•Subedi, N.¹•Denison, A.¹
¹Aberdeen Royal Infirmary, Aberdeen, UK, ²Norwich Radiology Academy, Norwich, UK

KEY LEARNING OBJECTIVES: Continuous voice recognition dictation systems for radiology reporting provide a viable alternative to conventional transcription services with the promise of shorter report turnaround times and increased cost savings. The purpose of this study was to analyze the error rate of the system in the final radiological reports. Since the introduction of the system in a tertiary referral centre based at Aberdeen UK, we have documented error rates of 4.3%, 3.3% and 4.1% in the years 2002, 2004 and 2008. **Standard:** An overall error rate of 5% in VRS reports.

DESCRIPTION: Retrospective data collection over two weeks using VRS database. The last 25 reports of the each user were sampled. A user with more than 5 yrs experience in VRS was classified as experienced user. A total of 826 reports analysed. Incoherent reports with no sensible opinion resulting in lack of communication between clinician and reporting radiologist was thought to be a major error.

RESULTS: There were 38 errors in 32 reports, overall error rate of 4.6%. Of these, minor, moderate and major errors were 24, 11 and 3. Experienced users are less likely to have errors in their final radiological report (Error rate of 2.9%) compared to the

users having less than 5 years experience in using the software (Error rate 6.1%).

CONCLUSION: Acceptable error rate is found while using VRS software in generating radiological report. The error rate is found to diminish with increasing familiarity with the system.

Audit E-Poster

E1801

Adapted anatomical image criteria for pa chest radiography: an audit of local performance

Teoh, E. J. • Nazir, S. • MacLeod, F.
Horton General Hospital, Banbury, UK

PURPOSE: To evaluate departmental performance in meeting anatomical image criteria for PA chest radiography using criteria adapted from European and American guidelines.

MATERIALS/METHODS: One-hundred consecutive PA chest radiographs performed by our department were retrospectively evaluated against the following criteria: 1. Performed at full inspiration; 2. Symmetrical reproduction of the thorax; 3. Medial borders of the scapulae to be outside the lung fields; 4. Visualisation of: (a) both apices, (b) whole rib cage above the diaphragm, (c) lateral costo-phrenic angles, (d) retrocardiac lung and mediastinum, (e) spine through the heart shadow, 5. Image annotations should not obscure lung fields; 6. Appropriate collimation of listed structures while limiting exposure of remainder of the patient. In the absence of national standards, a proposed uniform standard of 100% was applied.

RESULTS: Compliance rates exceeding 95% were achieved in 6 out of 10 criteria. Rotation was noted in 33% of radiographs with a statistically significant proportion of patients above 65 years in this group (52%, p=0.0134). Poorest performance was in the requirement for medial borders of the scapulae to be outside the lung fields (31% compliance). The feasibility of meeting this criterion is discussed.

CONCLUSION: While majority of criteria are achievable in most patients, due attention should be paid to minimise rotation, particularly in older subjects. Consensus on a reasonable standard for medial borders of the scapulae to be outside the lung field should be reached at departmental level, although establishing a standard for this lesser known criterion may be considered at a higher level.

Trauma Imaging Poster

P1801

Traumatic soft tissue injuries of the chest and abdominal wall: findings on trauma CT

Idriz, S.¹•Abbas, A.¹•Gibb, I.²•King, L. J.¹
¹Southampton University Hospital, Southampton, UK, ²Fort Blockhouse, Gosport, UK

KEY LEARNING OBJECTIVES: To describe and illustrate the

patterns of superficial soft tissue injuries commonly encountered on whole body trauma CT.

DESCRIPTION: Whole body MDCT is now a well-established technique for the investigation of major trauma. Initial image review focuses on the detection of life threatening internal injuries to the thorax, abdomen, pelvis, head and skeletal system. Superficial soft tissue injuries are also frequently demonstrated on whole body CT which may be overlooked by the reviewing Radiologist particularly where there are significant distracting intra-abdominal or thoracic injuries. These superficial injuries can be associated with significant morbidity and occasionally mortality if undiagnosed.

We present a review of the CT findings of superficial soft tissue injuries resulting from blunt and penetrating torso trauma including contusions, haematomas, active arterial bleeding, muscle ruptures, mid line and translumbar abdominal hernias, wound tracks, foreign bodies and subcutaneous emphysema.

CONCLUSION: Superficial soft tissue injuries are commonly encountered on whole body trauma CT. This presentation highlights the importance of these injuries and presents a radiological review of the commonly encountered findings on whole body CT in the setting of major trauma.

P1802

The brachial plexus-often unrecognised injury in cervical spine trauma

Dubey, N. •Gupta, A. •Clarke, M. J.
Khoo Teck Puat Hospital, Singapore, SINGAPORE

KEY LEARNING OBJECTIVES: To highlight the importance of evaluating the brachial plexus in cervical spine and neck trauma cases

DESCRIPTION: Brachial plexus injury is an often overlooked cause of distressing symptoms that are related to the upper extremity, following cervical spine and neck trauma. Such cases are increasingly being seen nowadays with the high incidents of road traffic accidents. These symptoms are generally dismissed as upper limb weakness or numbness and the clinicians often refer these trauma cases for imaging evaluation of the cervical spine, mostly an MRI and in a routine MR Cervical spine examination the brachial plexus is poorly if at all imaged. We present three cases of trauma with vague upper limb symptoms that were referred to our department initially for MR cervical spine evaluation but were felt to have brachial plexus trauma on initial impression. Subsequent targeted brachial plexus imaging revealed plexus injury either as direct trauma or haematoma compressions and the patients were suitably managed.

CONCLUSION: We aim to highlight, through this presentation, the importance of optimal evaluation with a high index of suspicion for brachial plexus injuries in cervical spine trauma, especially when presented with vague upper limb symptoms. We also highlight the MR sequences and orientations that show these injuries optimally such as the Dixon, gradient and contrast enhanced sequences with the coronal orientation being the most intuitive and informative.

P1803

Gunshot injuries

Shawyer, A. D. S. •Gayed, W. •Odedra, B. •Patel, C. •Renfrew, I.
Barts and The Royal London, London, UK

KEY LEARNING OBJECTIVES: To gain knowledge of the injury patterns and spectrum of radiological appearances of gunshot wounds.

DESCRIPTION: Brief review of the latest epidemiology showing a rise in gunshot injuries.

Pictorial review of the injuries patterns associated with both high and low velocity bullets, demonstrating both direct and secondary effects.

CONCLUSION: Gun crime and gunshot injuries are on the increase in inner cities across the UK. Radiologists involved the care of these patients should understand the patterns and mechanisms of these injuries.

P1804

Pull the other one! What you need to know about paediatric elbow X-ray interpretation

Pandher, B. S. •Chapman, P. •Julia, J. •Lloyd, S. •Foster, J.
Department of Radiology, Derriford Hospital, Plymouth, UK

KEY LEARNING OBJECTIVES:

- Comparative Adult and Paediatric Elbow X-ray Anatomy
- Ossification Centres and Times
- X-ray Interpretation
- Common Fractures in Children
- The elbow in Non Accidental Injury
- Risk Factors for fracture.

DESCRIPTION: The paediatric elbow radiograph can be difficult to evaluate due to the ossification centres of the elbow. In a busy Emergency Department, subtle signs can be missed. Missed fracture diagnosis is a leading cause of malpractice suits brought against hospital trusts. A questionnaire sent to junior radiology trainees at Derriford revealed that paediatric elbow films is one area of X-ray assessment that was problematic, due to the reasons mentioned above. This poster concentrates on the radiological anatomy of the elbow as a basis for image interpretation. A simple mnemonic system for remembering ossification centres and times is used. Important areas for review on the X-ray are described using bony alignment, fat pads and presence of effusion. The most common fracture types are discussed using the assessment method on images in order to consolidate the learning objectives. Other areas of consideration, such as possibility of NAI and risk factors for fractures, are briefly discussed.

CONCLUSION: Radiology Trainees get relatively little exposure to Paediatric film reporting. This poster aims to summarise important points to remember and a simple system of image assessment.

P1805

The role of the radiologist in renal trauma

Williams, F.
Frenchay Hospital, North Bristol, Bristol, UK

KEY LEARNING OBJECTIVES: To study the role of diagnostic imaging and interventional radiology in the diagnosis and treatment of major upper genitourinary trauma.

DESCRIPTION: The treatment of renal trauma has moved away from the operating room and into the radiology department in recent times. This is based on superior methods of diagnosis with a move away from limited techniques such as intravenous urography to multidetector row computed tomography (MDCT). High grade (IV and V) renal injuries and major vascular complications can now be diagnosed with high degrees of accuracy. Furthermore, interventional techniques now enable adequate minimally-invasive management of both renal pedicle injuries and emerging complications in kidney trauma patients managed conservatively. This enables patients to avoid major surgical complications. We present several examples of high grade renal injuries, their subsequent interventional radiological treatment and management of complications.

CONCLUSION: Diagnostic imaging provides an excellent diagnostic and therapeutic pathway for major renal injuries, diverting patients away from traditional surgical techniques.

Trauma Imaging E-Poster

E1901

The radiology of high energy blunt abdominal and pelvic trauma

Wan, M. S. • Navaratne, S. • Lewis, D.
King's College Hospital, London, UK

KEY LEARNING OBJECTIVES:

- Discuss the recent shifting paradigm of the clinical management of significant blunt abdominal and pelvic trauma and its impact on radiology services.
- Illustrate the wide spectrum of abdominal and pelvic visceral injury commonly encountered on CT imaging, using real life cases.
- Highlight the 'not-to-miss' findings and how these may significantly alter the patients' subsequent management.

DESCRIPTION: High energy trauma to the abdomen and pelvis (e.g. from road traffic accident or fall from height) usually involves multiple organs and presents a challenge to hospitals admitting acute emergencies. Its optimal management relies on concerted effort from multidisciplinary teams, including the radiology department. With accumulation of surgical experiences and advances in CT technology, there has been a shift to more conservative clinical management of these patients wherever possible, with increasing and earlier use of CT to help patient selection. This poses significant demand on radiologists to speedily identify and accurately interpret multiple pathologies

from huge CT datasets, which they may only encounter infrequently in other settings. Many of the complex management decisions (such as surgery vs embolisation, transfer to tertiary centres) rely heavily on such CT findings and it is essential that every radiologist is confident when faced with this challenge.

CONCLUSION: The radiology team has a central role to play in the contemporary management of these patients. Our pictorial review presents significant pathologies commonly encountered with a highlight on their clinical significance.

E1902

The imaging of urethral trauma

Colledge, J. • Shawyer, A. D. S. • Adams, A. • Allouni, K. • Power, N.
Bart's and the London, UK

KEY LEARNING OBJECTIVES AND DESCRIPTION: (1) Outline the recognized traumatic urethral injuries patterns and their classification. (2) Pictorial review demonstrating the spectrum of injuries and the modalities currently used for their diagnosis and assessment in our regional Trauma Centre. This includes Plain radiography; Fluoroscopy and CT. (3) illustrate the surgically and prognostically important features of these injuries with their long-term sequelae.

CONCLUSION: Traumatic urethral injuries can have devastating long-term consequences. We highlight the importance for trauma radiologists to be aware of the common injuries patterns and the appropriate techniques for early, accurate diagnosis and characterization of these injuries.

Imaging Informatics Poster

P1901

Image display performance – an ageing process

Mould, P. J.
Betsi Cadwaladr University Health Board, Glan Clwyd Hospital, Bodelwyddan, UK

PURPOSE: The use of flat panel image display units in medical diagnosis has been widespread within healthcare for a number of years. However, there is little reported data on the variation in performance with equipment age. In North Wales a number of different brands of equipment have been in use, some of which have been identified as reaching the end of their useful life and have been replaced. Analysis of past performance can help assess the life expectancy of equipment and aid the selection of future purchases.

MATERIALS/METHODS: A routine quality control programme has been implemented to monitor the performance and set-up of primary diagnostic displays, following the recommendations contained in IPPEM report 91.

RESULTS: Data has been collected from tests made over the past five years on the maximum luminance, luminance variation between monitors, contrast ratio, and DICOM greyscale calibration. The results demonstrate significant differences in performance between different manufacturers throughout the

lifetime of the units. The report also highlights the benefits of a backlight hours clock to assess usage and a backlight saving setting to turn displays off when not in use.

CONCLUSION: It has been shown that routine testing of primary diagnostic displays can indicate (help predict) their useful lifetime, as well as providing insight into the effects on display quality and life expectancy of poorly set-up displays.

P1902

Using computer simulation in workflow design and improvement in multimodal image guided interventions

Fernandez-Gutierrez, F.¹•Toomey, R.¹•Houston, G.²•Melzer, A.¹
¹*Institute for Medical Science and Technology, University of Dundee, Dundee, UK,* ²*Ninewells Hospital and Medical School, University of Dundee, Dundee, UK*

PURPOSE: A key concept in future image guided interventions is to use combined multimodality imaging techniques such MRI, PET/CT, Angiography, Ultrasound and so on. Their integration in an Imaging Operating System (IOS) raises multiple new challenges. Layout design, safety concepts, economic aspects, ergonomics and workflow are some of the topics that have to be considered. The purpose of this project is to use numerical

modelling and computer simulation to optimize the safety, efficiency and the effectiveness of an IOS.

METHODS: A framework is being developed prior to the model's implementation. From the literature, to build computer models for OR management we need a description of parameters, resources and processes/activities. Ninewells Hospital in Dundee (UK), The Interventional Centre in Oslo University Hospital (Norway) and Saarland University Hospital (Germany) are some of the centres that would collaborate as resources for real data to feed the models. The data will be manually collected and stored in a data system (Delmia) and templates. The scope of the project will be limited to those relevant procedures that are available in those centres.

RESULTS: The real data collected as part of this work-in-progress will allow us to build appropriate and complete models for different procedures and different layouts for IOS at different levels.

CONCLUSION: Computer simulation has shown to be a useful tool for OR management in the last decade. Therefore we will produce a powerful tool to compare how different layouts affect various image guided procedures and to improve the design of an optimal workflow.

A

Abbas, A. 82, 135
 Abbas, M. I. 134
 Abdellaoui, A. 110
 Abdi, S. 123
 AbdulKarim, D. 118
 Abdullah, A. 96
 Abhyankar, M. 74, 78
 Aboagye, E. 48
 Acharya, R. 57
 Adam, A. 3
 Adams, A. 72, 137
 Adams, H. 71
 Adams, M. 3
 Adams, W. 110, 112
 Adapala, R. 85, 87
 Adapala, R. K. 85
 Adesanya, O. 121
 Ahmed, A. 37
 Ahmed, K. 93
 Akhtar, S. 107, 119
 Al-Adhami, A. 68
 Alam, K. 62
 Alavi, A. 117
 Albazaz, R. 85
 Al-Chalabi, H. 112
 Alfahad, A. 118
 Ali, K. A. 120
 Ali, S. 106
 Al-Islam, S. 119
 Ali, T. 133
 Allouni, K. 137
 Almallah, F. 134
 Alobeidi, F. 133
 Alqaroot, B. 8
 Al-Sam, R. 67
 Amin, Z. 30
 Anderson, H. 130
 Andre, P. 62
 Andresen, R. 79, 98
 Andrews, J. 102
 Annan, B. 72
 Anslow, L. 66
 Anthanasious, T. 93
 Anwyl, D. 66
 Apsey, J. 118
 Argiolas, G. M. 107
 Armstrong, A. L. 102
 Arora, P. 73
 Arridge, S. R. 62
 Arya, A. 36
 Ashcroft, G. P. 42
 Aspden, R. M. 42
 Asquith, J. 41
 Astley, S. 12
 Atkinson, D. 37, 45
 Auethavekiat, S. 113
 Avula, S. 46
 Aziz, Z. 72

B

Babar, S. 11
 Badar Bin Bilal, S. 86

Bahgat, M. 122
 Bainbridge, J. 12
 Baird, C. 50
 Baird, R. 47
 Baker, S. A. 104
 Bakhshayeshkaram, M. 29, 74
 Balan, K. K. 48, 116
 Baldwin, R. 112
 Ballester, S. 109
 Ball, P. 50
 Bamber, J. 23
 Banks-L'Amie, S. 129
 Barr, N. 11, 12
 Barry, B. P. 130
 Bartlett, D. 129
 Barton, D. P. 32
 Bashaeb, K. O. 43, 67, 83
 Batty, R. 9, 29
 Batty, R. 9, 29
 Beadle, L. 14
 Beale, A. 18, 78
 Beale, A. M. 78
 Beardmore, S. 106
 Beckmann, L. 38
 Behrens, P. 83
 Belfield, A. 59
 Belfield, J. 5, 93
 Bell, D. 49
 Belli, A. 42, 45, 134
 Bergin, D. 21
 Berks, M. 11
 Berriman, T. 131
 Bhagat, A. 46
 Bharwani, N. 1
 Bhatnagar, G. 99
 Bhatti, W. 19, 57, 101
 Bhatt, R. 102
 Bhuva, S. 110, 113, 115
 Biello, S. M. 55, 128
 Binukrishnan, S. 74, 78
 Birch, C. 14
 Biswas, S. 90
 Blakeborough, A. 92
 Blakeborough, T. 44
 Bliss, H. J. 133
 Boggis, C. 11
 Bombor, I. 79
 Booth, L. 33
 Booth, T. C. 4
 Bosmans, H. 31
 Bouwman, R. 31
 Boxer, D. I. 46
 Boyd, E. 9
 Bradley, A. 43
 Bradley, M. 103
 Bragadeesh, T. 78
 Briggs, R. 88
 Britton, P. 39
 Brookes, M. 44
 Brown, E. 61
 Brown, G. 46
 Brown, I. 77, 82
 Brown, I. W. 82
 Brown, S. 71, 99

Bryan, L. 49
 Bucker, A. 43
 Buckley, C. 2, 55
 Buckley, D. 32
 Buckley, K. 105
 Bull, C. 50
 Burgess, V. 122
 Burke, D. 52
 Burton, N. 128
 Butt, N. A. 67, 83
 Butt, S. 64
 Buzzi, A. 30, 109
 Byrd, H. 14

C

Caddick, L. 61
 Cahill, D. 68
 Cahir, J. 64
 Cain, J. 10, 109, 112, 115
 Cain, J. R. 112, 115
 Callaway, M. 24
 Calleja, M. 24
 Calnan, F. 19
 Camenzuli, A. 86, 129
 Camenzuli, A. M. 129
 Campbell, D. 102
 Campbell, R. 11
 Canty, S. 106
 Carey, B. 36
 Carradine, D. 6
 Carre, M. 52
 Carrington, B. 123
 Carswell, A. 116
 Castelblanco, N. 109
 Cavanagh, P. 18, 47
 Chaganti, S. 40, 71, 73
 Chakraverty, J. K. 105
 Chandra, J. 108
 Chandramohan, M. 2, 34
 Chandramohan, M. 2
 Chandrashekar, H. 112
 Chandratreya, L. 72
 Chang, D. 85
 Chan, T. Y. 131
 Chapman, P. 65, 116, 136
 Chari, B. 90
 Charnock, P. 58, 133
 Chaudhary, H. 64
 Chaudhry, F. N. 121
 Chaudhry, M. 5, 93
 Chaudhry, M. A. 93
 Chawla, S. 5, 93
 Cheetham, M. 128
 Chetcuti, K. 84, 85
 Chhatani, S. 8, 78, 110, 112, 127
 Chiarelli, P., 65
 Chin, J. 72
 Chin, T. 88, 122
 Chittal, R. 65, 76, 78, 112, 119
 Chittal, R. R. 76, 112
 Choo, H. 112
 Chowdhury, F. 48
 Christie, A. 42
 Chun, J. 42

Clague, G. 103
 Clark, A. J. 91, 94
 Clarke, C. G. D. 125
 Clarke, M. J. 136
 Clarke, T. C. 112
 Clarkson, M. J. 62
 Clarkson, M. J. 62
 Clayton, A. E. 96
 Clayton, B. 49
 Cocker, M. 58
 Coles, D. R. 49
 Colledge, J. 137
 Colledge, J. D. 72
 Colley, S. 24
 Collin, N. 93
 Condron, M. 50
 Connolly, P. 69
 Conway, O. J. 92, 129
 Cooke, J. 31
 Copley, S. 23
 Corcione, S. 12, 13
 Corn, S. 127
 Corrigan, A. 78, 88
 Cosgrove, D. O. 114
 Cowell, G. W. 81
 Cowling, M. 41
 Cox, S. 125
 Crilley, T. 130
 Crossman, J. 60
 Cross, T. 25
 Cullen, N. 81
 Curtis, J. 70, 107
 Cynthia, M. 94

D

Dagum, M. 94
 Dance, D. 31
 Danin, J. 117
 Darby, M. 119
 Dash, R. 36
 Davagnanam, I. 112
 Davey, R. A. 102
 Davis, M. D. J. 51
 Dawood, A. 63
 D'Costa, H. 90
 Delfina, C. 94
 Denison, A. 135
 Denton, E. 17, 47
 Desai, S. 45
 deSouza, N. M. 32
 Devaraj, A. 51
 de Vries, K. 43
 Dick, E. 40
 Diffey, J. 12, 70
 Dionello, R. 101
 Diwvedi, R. 107
 Dixon, A. 34
 Djoukhar, I. K. 127
 Dodds, N. 122
 Doggart, A. 60
 Donich, A. 99
 Donnelly, P. M. 50
 Downey, K. L. 32
 Doyle, G. J. 47

Drinkwater, K. 20
 Dubbins, P. 32
 Dubey, N. 136
 Dugar, N. 20, 51
 Dumonteil, S. 68
 Duncan, T. 85
 Dunn, A. 98
 Durran, A. 49, 75, 76, 77, 82, 94,
 118, 120, 122
 Dux, A. 125

E

Eady, A. 51
 Earnshaw, D. 128
 Earnshaw, J. 18
 Eatough, J. 63
 Ebrahim, F. 96
 Edey, A. 74
 Eisma, R. 43, 82
 Elias, D. 17
 Elliott, S. T. 63
 Ellis-Owen, R. 89
 Ellis, S. 30
 Elsayed, A. 114
 Elyan, S. 89
 Emelifeonwu, J. A. 111
 Emerson, N. 52
 Enekwa, C. N. 14
 England, A. 14, 15, 61
 Erxleben, U. 98
 Etherington, R. 66, 132
 Ettles, D. 45
 Evans, A. 3
 Eynon, A. 90, 121

F

Fairhurst, J. 46
 Faivre-Pierret, M. 12
 Falzon, M. 128
 Famiglietti, L. 80
 Farina, D. 108
 Farmer, K. D. 97
 Farnell, R. 102
 Farrell, S. 26
 Fawcett, R. 72
 Fell, M. 18, 27
 Fenton, A. 63
 Fernandez-Gutierrez, F. 43, 138
 Ferris, C. 30
 Fewins, H. 78
 Fidler, J. 131
 Fielding, P. 95, 96
 Field, L. J. 132
 Findlay, J. L. 69
 Findlay, R. 78
 Finegan, C. 12
 Fletcher, A. 77
 Flintham, K. 105
 Flohr, T. 20
 Flont, B. 83
 Folan, M. 9
 Foley, P. 78
 Forder, K. 124

Foster, J. 118, 119, 136
 Foster, K. 36
 Fradley, S. 128
 Franklin, J. 101
 Freeman, S. 94

G

Gafoor, A. 2, 40
 Galea, A. 32, 40
 Gallaway, S. 86
 Gan, C. L. 111
 Gandhi, S. 89
 Ganguly, A. 70
 Ganijee, M. 101
 Gardner, D. 28
 Garrett, M. 76
 Gartner, L. 19
 Gatley, S. 21
 Gay, D. 32, 40, 127
 Gayed, W. 136
 Geach, R. 93
 George, J. 56
 Ghumra, F. 102
 Gibb, I. 135
 Gibbs, S. 52
 Gilbert, F. J. 12, 42
 Giles, K. 91, 110
 Giles, S. L. 32
 Giles, T. 74
 Gill, D. 88
 Gill, S. S. 81, 114
 Ginder, L. M. 41
 Given-Wilson, R. 31
 Glancy, S. 4
 Gleeson, F. 22
 Gnanasambandam, S. 72, 109, 117
 Goh, G. 134
 Golding, S. J. 55
 Goodwin, R. 2
 Gosling, O. 49, 59, 60, 78
 Gosling, O. E. 59, 60
 Gower-Thomas, K. 12
 Gowlett, S. 106
 Graeme-Baker, S. 72, 87
 Gray, R. 111, 116, 127
 Gray, R. A. 111
 Green, S. 7
 Gregory, C. J. 36
 Griffin, C. 93
 Griffin, K. M. 48
 Griffiths, E. A. 36, 37
 Grigg, M. 14
 Grima, M. 94
 Groves, C. J. 34
 Grubnic, S. 22, 45
 Gueorguieva, M. 1 43
 Guest, S. 59
 Gulati, A. 122
 Gummow, A. D. 86
 Gupta, A. 136
 Gupta, C. 90
 Gurgar, N. 91
 Gurjar, N. 94
 Guthrie, J. 17

H

Hadley, D. 29
 Hagan, I. 61
 Halligan, S. 37
 Hamilton, S. 8, 78, 112
 Hankey, T. 1
 Hansen, T. P. 10, 109, 112
 Hany, T. 48
 Haq, R. 87, 110
 Harden, S. 77, 82
 Hardy, M. 33, 34, 124
 Harper, J. C. 70
 Harries-Jones, H. 22
 Harris, J. 2
 Harris, O. 69
 Harvey, C. J. 114
 Harvey, D. 9, 51
 Haslinger, T. G. 111
 Hathorn, J. 64, 130
 Hattab, A. 87, 110
 Hauge, I. H. 69
 Hawkes, D. 37, 62
 Hawkes, D. J. 62
 Haworth, A. 70, 84
 Haworth, J. 119
 Healey, J. 11
 Hedges, W. P. 47
 Henwood, S. M. 33
 Hersey, N. O. 92
 Herwadkar, A. V. 7, 24
 Hickey, N. 9
 Hickson, M. 102
 Hicks, W. 76
 Hide, G. 30
 Higgins, R. 128
 Higgins, S. 113
 Hill, S. 75
 Hinksman, L. 67
 Hipwell, J. H. 62
 Hogg, P. 31, 58, 69, 70, 128
 Holemans, J. 78
 Holland, M. A. 13
 Hollings, N. 76
 Holt, E. 59
 Hoosein, M. M. 102
 Hopkins, R. 91
 Hornby, S. 65
 Hourihan, M. 108, 111
 Hourihan, M. D. 108
 Houston, G. 43, 138
 Howlett, D. C. 36
 Hufton, A. 12
 Hughes, D. 68
 Hughes, E. K. 114
 Hughes, G. 38, 78
 Hughes, J. 114
 Hughes, M. 58
 Hughes, P. 7
 Hughes, R. 39
 Hume, J. 52
 Hunt, R. 72, 86, 103
 Huppertz, A. 98
 Hussain, F. 111

Hussain, M. 42
 Hussain, S. 22

I

Idriz, S. 82, 135
 Ilyas, S. 79, 118, 126, 127
 Imalingat, H. M. 64
 Imbriano, M. 109
 Immel, E. 43, 62, 82
 Iqbal, A. 67
 Irion, K. 74, 78
 Irwan, R. 50
 Irwin, G. 39
 Iyengar, S. 8, 59, 60, 78, 110
 Iyengar, S. E. 60
 Iyenger, S. 75
 Iyngkaran, T. 30

J

Jackson, A. 10, 109, 112, 115
 Jackson, J. E. 81
 Jackson, M. R. 52
 Jackson, S. 2
 Jacob, K. 4
 Jacob, P. 83
 Jacobs, J. 31
 Jain, A. 69, 86, 98
 James, A. 123
 James, J. 118
 Jarosz, J. 3, 21, 56
 Jarvis, P. 105
 Jayaprakasam, V. 95, 96
 Jayaprakasam, V. S. 96
 Jayaprasagam, K. 56
 Jefferson, E. 74
 Jehangir, E. 131
 Jibri, Z. 71, 97, 98, 106
 John, S. A. 133
 Johnson, C. A. 5
 Johnson, G. 87
 Johnstone, A. 91
 Jones, H. L. 14
 Jones, J. 110, 111
 Jones, L. 93
 Jones, T. 75
 Joy, J. 47, 134
 Juan Pablo, O. 109
 Julia, J. 136

K

Kadi, N. 93
 Kainberger, F. 21, 24
 Kakitsubata, Y. 99
 Kamath, S. 97, 98, 105
 Kamusella, P. 79
 Kandasamy, N. 109
 Karsandas, A. 133
 Karuppiyah, A. S. 42, 135
 Kasthuri, R. 43
 Katti, A. 88, 122
 Kaul, A. 129
 Kaur, M. 38
 Kazmi, F. 72, 87

Keaney, C. 67
 Keat, A. 19
 Kelley, T. 90
 Kelsall, J. 59
 Khan, A. 123
 Khan, I. 10, 120
 Khan, K. 105
 Khan, M. K. 89
 Khan, N. 87
 Khanna, K. 64
 Khan, S. H. 47
 Khirwadkar, H. E. 108
 Khoo, M. 19, 100
 Kibriya, N. 74, 78
 Kilsby, H. 15
 King, A. C. 40
 King, L. J. 135
 King, S. J. 59
 Kinver, C. L. 14
 Kirwan, L. 130
 Kiu, A. 126
 Klcova, J. 123
 Klimczak, K. J. 86, 103
 Knapp, K. M. 15
 Knight, A. 36
 Kodur, R. 81, 86, 129
 Koller, C. 63, 94, 113
 Konala, P. 72
 Konala, P. K. 71, 73
 Kotnis, N. 106
 Kotre, J. 9, 30, 36, 61
 Kumar, A. 88, 122
 Kumaraguru, J. 109

L

Laasch, H. 2, 67
 Lalem, R. 6
 Lambie, H. 95
 Lam, K. 131
 Lancaster, A. 105, 124
 Lancaster, B. 127
 LaPorte, S. 9
 Lawson, R. 70
 Leach, M. 35
 Lee, J. C. 17
 Lektrakul, N. 99
 Lever, A. M. 48
 Lewis, D. 137
 Lewis-Jones, H. 116
 Lewis, M. 92
 Liong, S. Y. 43
 Littler, P. 81
 Litton, K. J. 90, 96
 Liu, C. 99
 Llabres, F. 27
 Lloyd, S. 79, 118, 126, 136
 Lloyd, S. C. 127
 Loader, R. 59, 60
 Lodge, P. 44
 Loney, E. 127
 Loveday, E. 93
 Lowsby, R. 131
 Lyburn, I. 61
 Lynch, J. 58

M

Macanovic, M. 75, 82, 94, 122
 Mackenzie, A. 31
 Mackie, A. 74
 MacLachlan, S. A. 55, 66
 MacLeod, F. 135
 MacLeod, F. K. 130
 Macmullen-Price, J. 127
 Madani, G. 17, 114
 Madani, H. 70, 84, 129
 Magee, D. 32
 Mahatma, A. 41
 Maher, M. 28
 Mahmood, A. 101
 Main, C. 77
 Makaronidis, J. M. 11
 Mak, S. 123
 Malghan, L. 8, 72, 116
 Mallarini, G. 41, 56, 75, 80, 87, 107, 108
 Mallinson, P. I. 102
 Mandegaran, R. 68
 Manghat, N. E. 35
 Manimaran, S. 77
 Mankad, K. 112
 Manning-Stanley, A. S. 14
 Manoj, A. 111
 Mansour, R. 97, 98, 106
 Marshall, T. 30
 Martincich, L. 12
 Martin, D. 89, 97, 98, 121
 Martin, D. J. 89, 121
 Martin, J. 121
 Mashinini, T. 59
 Maskell, G. 122
 Maskova, J. 83
 Massey, H. 93
 Massey, H. L. 74, 119
 Matthews, W. 115
 Maviki, M. 111, 112, 119, 126
 Maxwell, A. 12
 Mayo, L. 59
 McCarthy, C. 24
 McCoubrie, P. 4, 86, 94
 McGann, G. 120
 McGill, G. 69
 McGuinness, A. 132
 McHugh, K. 39
 McKavanagh, P. 50
 McKean, D. 100
 McKiernan, S. 65
 McKnight, L. 4
 McLean, J. 38
 McLeery, M. 67
 McMillen, U. 50
 Meakin, J. R. 42
 Meegada, M. 49
 Meeson, S. 55
 Mehta, J. 15
 Mellor, S. 107
 Melzer, A. 43, 62, 82, 138
 Menon, S. 19, 57, 101
 Menys, A. 37

Mercer, C. 31, 69
 Mercer, C. E. 70
 Mereddy, P. 40
 Mexa, D. 55, 128
 Mitchell, M. 3
 Miles, G. 91, 110
 Miles, K. 35
 Miles, R. 65
 Miller, B. H. 37
 Miller, L. R. 33
 Mills, T. 124
 Milross, C. 28
 Minks, D. 110, 113, 115
 Minks, D. P. 115
 Miskiel, K. 24
 Mitchell, C. 59
 Mitchell, G. 75
 Mittal, T. 35
 Modi, S. 67
 Moghaddam, A. 73
 Mohan, K. 74
 Mohankumar, R. 86
 Moholkar, S. 39
 Mohsin, N. 90
 Molloy, E. 14
 Montisci, R. 41, 80, 107
 Morgan-Hughes, G. 49, 59, 60, 78
 Morgan, R. 45, 51, 90
 Morgan, R. D. 90
 Morgan, V. A. 32
 Morris, H. 52
 Morris, J. 11, 12
 Morris, J. 11, 12
 Mortensen, C. 93
 Mortimer, A. 74, 86, 93
 Moss, J. 43
 Mould, P. J. 137
 Mucci, B. 55, 68, 128
 Mukonoweshuro, W. 112, 116
 Mullan, C. 101
 Mullett, R. 87, 98, 128
 Murchison, J. 70
 Murchison, J. T. 29
 Murday, D. C. 82
 Murtagh, B. 102, 131
 Musson, R. 92, 106
 Musson, R. E. 106
 Mutch, S. 58
 Muthukumarasamy, S. 93
 Muthukumar, T. 2
 Muthu, S. 116

N

Naaseri, S. 72, 87
 Nader, K. 62
 Nair, A. 22
 Nakhuda, Y. 64
 Narayanan, P. 11
 Narayanaswamy, S. 105
 Narayanaswamy, S. M. 105
 Nargol, A. V. 40

Navaratne, S. 56, 137
 Navarro, C. 60
 Nayagam, K. 129
 Nazir, S. 135
 Nedumaran, A. 84, 122
 Negus, I. S. 59
 Negus, S. 133
 Nelson, A. S. 128, 129
 Nensey, R. 19, 118, 127
 Neramballi, M. M. 117
 Newman-Sanders, T. 1
 Newton-Hughes, A. 128
 Newton, T. 64
 Ng, M. 73
 Nicolaidis, A. 57
 Nicol, E. D. 49
 Nightingale, J. M. 33
 Ninan, T. 19, 58, 76, 79
 Ninan, T. M. 58
 Norwing, E. 80
 Norwing, E. C. 80
 Nyekiova, M. 60

O

O'Connor, J. 2
 O'Connor, P. 11
 Odedra, B. 136
 Odille, F. 37
 Oduko, J. M. 31
 Offiah, A. 52
 Ogrady, E. 86
 O'Grady, E. A. 129
 Oh, T. C. 106
 Oliver, H. 64
 Olubaniyi, B. O. 58, 72
 Owasirikul, W. 113

P

Padley, S. 41, 45, 49
 Padley, S. P. 49
 Pai, D. 90
 Paisley, E. 63
 Pakkal, M. 79
 Paley, M. 44
 Paliwalla, M. 19
 Pandey, A. 74, 78, 116
 Pandher, B. 126, 127, 136
 Pandher, B. S. 136
 Papadacos, N. 134
 Papadias, T. 113
 Paranthaman, R. 112
 Paravasthu, D. 84, 85, 87, 107
 Paravasthu, D. M. 85, 87, 107
 Parekh, P. 75
 Parker, G. 44
 Parkin, C. K. 107
 Parr, N. 68
 Parry, C. 12
 Parry, L. 14
 Parsons, C. 121
 Partington, K. J. 91, 95
 Patel, A. 19
 Patel, A. T. 97

- Patel, C. 136
 Patel, S. 72, 77, 104
 Patel, U. 46
 Paterson, A. 9
 Pathak, S. 102
 Patterson, A. 36
 Patterson, C. M. 49
 Paul, M. 84
 Peddu, P. 17
 Pediconi, F. 12
 Peebles, C. 41, 77
 Peebles, C. R. 82
 Phillips, A. 21
 Pike, A. 58
 Pike, A. M. 133
 Pike, L. 35
 Pinglay, P. A. 79
 Piper, K. J. 125
 Pisharody, S. 57
 Planche, K. 21
 Plumb, A. A. O. 119
 Pollentine, A. 76, 86, 91, 120
 Porter, N. 119
 Porter, N. A. 103
 Powell, B. 42
 Powell, S. 27, 81
 Power, N. 137
 Prabhudesai, S. 104
 Prabhu, S. 117
 Prajapati, R. 12
 Pratt, S. D. 124
 Pretorius, P. 9, 21, 29, 108
 Price, E. 104
 Prow, K. 59
 Prowse, S. J. 66, 132
 Psatha, M. 42
 Puni, R. 38
 Punwani, S. 30, 37
 Puppala, S. 84
 Purandare, N. 10, 109
 Purayil, T. 76, 116, 119
 Pursnani, K. G. 36, 37
- Q**
- Quirk, P. 17
 Qureshi, M. 29
 Qureshi, S. 115
- R**
- Radmer, S. 98
 Rajaratnam, V. 56
 Rajashanker, B. 73
 Rajeswaran, G. 19, 64, 100
 Raju, P. 40
 Raju, V. 60
 Raju, V. M. 49
 Ralhan, S. 99
 Ramaswamy, R. 90
 Ranga, N. 65
 Rankin, J. K. 15
 Rasul, S. 120
 Rawlings, D. J. 61
 Ray, S. 39
- Redpath, T. W. 42
 Rees, J. 95
 Rees, J. I. 96
 Rehman, J. M. 5
 Reid, A. W. 81
 Reid, E. J. 15
 Reid, J. 70
 Reid, K. 26
 Reilly, G. 52
 Remedios, D. 9, 19
 Renfrew, I. 136
 Rennie, W. J. 2
 Resnick, D. 99
 Richards, M. 44
 Richardson, D. 25
 Richards, P. J. 6
 Riches, S. F. 32
 Ricketts, J. A. 65
 Ridley, N. 88, 104
 Ridley, N. F. 3
 Riley, S. J. 34
 Riordan, R. 29, 32, 71, 73, 121
 Robinson, L. 128
 Robinson, P. 102
 Robson, A. J. 50
 Robson, K. J. 9
 Roche, A. 134
 Rockall, A. 3
 Roddie, M. 29, 133
 Roddie, M. E. 81
 Roditi, G. 41, 84
 Roditi, G. H. 81
 Rodrigues, J. 4
 Roe, A. L. 51
 Rogers, P. J. N. 5
 Roobottom, C. 8, 28, 44, 49, 51, 58, 59, 60, 72, 75, 76, 77, 78, 79, 82
 Rottenberg, G. 3, 68
 Rowland-Hill, C. 17
 Rowlands, J. 61, 89
 Rowley, T. 43
 Roy, A. A. 30
 Rube, M. 62
 Rubens, M. 72
 Rudralingam, V. 86, 87
 Ryall, C. J. 20
 Ryan, S. 24
- S**
- Saba, L. 41, 56, 57, 75, 80, 87, 107, 108
 Sada, P. 134
 Sadigh, S. 72
 Sage, W. 92
 Sahdev, A. 1, 3
 Sahu, A. 19, 29, 76, 110, 119
 Saidi, B. 29, 74
 Sajid, B. 19
 Sakellariou, S. 84
 Sak, S. C. 123
 Sala, E. 11
 Salum, E. 109
 Sampson, M. 30
- Samraj, P. 62
 Samshuddin, S. 67
 Sandhu, R. S. 117
 Sanfilippo, R. 80, 87, 107
 Sanghera, B. 124
 Sankaye, P. 8, 110, 127
 Sannia, S. 80, 87
 Sanni, S. 75
 Sardanelli, F. 12
 Sayanvala, H. 19
 Schmidt, W. 83
 Schmitz, K. 83
 Scoffings, D. 21
 Scott, E. 15
 Scream, N. 23
 Seah, M. 117
 Searle, J. 61, 89
 SEDENTEXCT Project Consortium 61
 Selby, P. 32
 Self, A. 85
 Sellars, S. 18
 Semaan, H. 96
 Seshadri, N. 48
 Set, P. A. 116
 Seymour, R. 4, 15
 Shabani, A. G. S. 119
 Shah, A. H. 127
 Shambrook, J. 77, 82
 Shanahan, M. 126
 Shaikat, A. 49
 Shaw, A. 36
 Shaw, M. 61, 76, 89, 91, 120
 Shaw, O. 131
 Shawyer, A. D. S. 104, 136, 137
 Sheikh, H. 39
 Shetty, S. 100
 Shrimpton, P. C. 55
 Siddiqui, A. 109
 Silvester, K. 11
 Simmons, D. R. 55, 128
 Simpkin, C. 32
 Simpkins, C. 75, 76, 77, 82, 94, 118, 120
 Simpson, H. 68
 Singh, F. 115, 123
 Singh, J. 113
 Singiseti, K. 40
 Sinkus, R. 24
 Slaven, K. 86
 Smith, H. R. 31
 Smith, J. J. 31
 Smith, P. 111
 Smyth, C. 74
 Snaith, B. 9, 26, 34, 132
 Sonoda, L. I. 48, 116, 124
 Sourbron, S. 32
 Sparmann, M. 98
 Spencer, C. R. 104
 Spencer, J. A. 95
 Sprigg, A. 46, 52
 Stedman, J. 101
 Stephens, M. 89
 Stevenson, J. 4

Steward, M. 37
 Stewart, D. 46
 Stivaros, S. M. 119
 Stockwell, R. C. 37
 Straiton, J. 7, 9
 Strouhal, P. D. 62
 Strudley, C. 31
 Suarez, V. 94
 Subedi, N. 135
 Sue, A. 11
 Sukumar, S. 86, 87, 110
 Sullivan, C. 12
 Sullivan, C. M. 105
 Summerton, N. 2
 Suresh Kumar, D. 116
 Suresh, P. 5, 97, 99
 Suresh, S. 2, 19, 40
 Suri, J. 56, 57, 75, 80, 87, 107, 108
 Suri, J. S. 41
 Surjan, Y. 28
 Sutcliffe, J. 100
 Suzanne, B. 123
 Svensson, W. 2, 25
 Sweetman, L. 59, 61
 Swift, S. 36, 95
 Szczepura, K. 31, 69

T

Tabarsi, P. 29, 74
 Tagg, C. 76, 120
 Tagg, C. E. 120
 Tanner, C. 62
 Taylor, J. 123
 Taylor, L. 50
 Taylor, P. 2
 Taylor, S. 37
 Teasdale, E. 10
 Teh, J. 100, 101
 Teoh, E. J. 100, 135
 Tessier, J. W. 125
 Theodorou, D. J. 99
 Theodorou, S. J. 99
 Thiagarajah, R. 29, 121
 Thind, G. 67
 Thomas, A. 30
 Thompson, D. 63
 Thompson, J. D. 58
 Thompson, S. M. 58
 Thorning, C. 99, 100
 Thornton, M. 93
 Thorogood, S. V. 118, 120
 Thrall, J. 6
 Thyagarajan, M. 117
 Tins, B. 39
 Tolan, D. J. 21, 36
 Toms, A. 5, 22, 104, 118
 Toms, A. P. 22, 104
 Toomey, R. 43, 138
 Toomey, R. J. 43
 Topple, J. 104
 Trainer, V. 90, 95, 121
 Trainer, V. J. 96
 Tuckett, J. D. 63
 Tuck, J. 43

Turner, C. 26
 Tuson, J. 86
 Twist, D. 66
 Tyler, P. A. 19, 64, 99, 100

U

Uberoi, R. 3
 Uff, C. 25
 Upadhyay, B. 129
 Upadhyay, N. 129
 Uri, I. F. 108

V

Vaidya, S. 3, 104
 Valdez, M. N. 94
 Valori, R. 44
 Van Beek, E. 70
 Van Beek, E. J. 17
 van den Bosch, H. C. 12
 Van Engen, R. 31
 Varadpande, M. 87
 Vardhanabhuti, V. 19, 58, 72, 76,
 79, 118, 127
 Venkataranasimha, N. 127
 Venumbaka, M. R. 104
 Vicente, C. 94
 Vinjamuri, S. 61
 Viswanathan Nair, U. 116
 Vlahos, J. 17, 24

W

Wah, T. 32
 Walker, A. 61
 Walker, B. 59
 Walker, J. 131
 Walker, P. S. 85
 Wallis, A. G. 64, 71, 117
 Wallis, D. 64
 Wallis, M. 1, 31
 Wallis, M. G. 1
 Walshaw, C. F. 107
 Walsh, G. 28
 Walsh, S. 22
 Walton, K. 111
 Wan, M. S. 56, 137
 Ward, A. 14
 Ward, J. B. 36, 37
 Waring, L. 105
 Warner, J. 85
 Warren-Forward, H. 28, 65
 Warren, L. 31
 Watson, D. 4
 Watson, H. 42
 Watt-Smith, S. 39
 Webb, M. 134
 Webster, P. 18
 Weir-McCall, J. 36
 Werb, S. 50
 West, H. 15
 White, P. 3, 7
 Whiteside, S. 12
 White, V. 2
 Wilbraham, L. 67

Wilcock, D. 113
 Wilcox, A. 81
 Wilkins, H. B. 7
 Wilkinson, A. 52
 Wilkinson, G. 126
 Wilkinson, S. 52
 Williams, F. 83, 94, 137
 Williams, J. W. 73
 Williams, M. P. 91
 Williams, M. W. 12
 Williams, S. M. 92
 Williamson, J. 46
 Williamson, L. 104
 Wilson, D. 32, 78, 88
 Wilson, D. W. 88
 Wilson, J. P. 103
 Wilson, M. 11, 12
 Wissgott, C. 79, 83
 Wittkop, B. 61
 Wivell, G. 47
 Wong, J. 41
 Wong, W. 124
 Wood, A. 77
 Wood, S. 127
 Workman, A. 1
 Wotton, F. 49
 Wright, N. B. 119
 Wu, Z. Q. 42

Y

Yang, G. 62
 Yap, K. S. 84
 Yeang, H. 69
 Yeung, A. 4, 63, 74
 Yong, A. 89
 Yoong, P. 5
 Young, K. C. 31
 Young, P. 12, 21
 Yu, D. 30

Z

Zacharkiw, A. 67
 Zaghi, H. R. 132
 Zagorski, C. J. 47
 Zahirifard, S. 29, 74
 Zanca, F. 31
 Zanoni, P. 17
 Zealley, I. A. 24
 Zechmann, C. M. 12, 13
 Zeiss, J. 96
 Zou, M. 59