p056 **Imaging stress fractures**

Safi Rahman [1]; Hasan Nizami [2]; Jenn Shiunn Wong [1]; Priya Suresh [1]; Alun Davies [1]; Abdul Gafoor [1]

[1]Penra Plymouth Hospitals NHS Trust; [2]Plymouth Hospitals NHS Trust

Background: Stress fractures result from abnormal stress on normal bone or normal stress on abnormal bone. The incidence of stress injuries is increasing in recreational/competitive athletes*1. Through a pictorial review we aim to present common sites and imaging modalities used to evaluate stress fractures. Primary investigation includes a plain radiograph, this may be normal*2 initially and radiologists should not be comforted by a negative primary study. If clinical suspicion persists follow-up imaging is advised.

Purpose: The poster will aid radiology trainees / general radiologists in identifying radiological features of and sites of stress fractures such as the os calcis, femoral neck, tibia, metatarsals & sacrum amongst others; including bisphosphonate induced fractures. Imaging modalities used include plain film, CT, MRI and nuclear imaging. We aim to demonstrate salient features from each. The poster will provide an aid memoir for stress fracture imaging.

Summary: The poster will help better manage stress fractures through early recognition and diagnosis by identifying their common sites and importance of follow-up imaging where there is strong clinical suspicion. A negative plain radiograph does not necessarily exclude a stress fracture & early subsequent imaging should be considered to save significant time off training / work & have a positive impact on health/social care*3.

1. Michele Gaeta, MD, Fabio Minutoli, MD, Emanuele Scribano, MD, Giorgio Ascenti, MD, Sergio Vinci, MD, Daniele Bruschetta, MD, Ludovico Magaudda, MD, and Alfredo Blandino, MD Radiology 2005 235:2, 553-561 :CT and MR Imaging Findings in Athletes with Early Tibial Stress Injuries: Comparison with Bone Scintigraphy Findings and Emphasis on Cortical Abnormalities 2.John M Martinez, MD Staff Physician, Kaiser Permanente:http://emedicine.medscape.com/article/1270244-overview. 3.O. Nachtrab, V.N. Cassar-PullicinocorrespondencePress enter key for correspondence informationemailPress enter key to Email the author, R. Lalam, B. Tins, P.N.M. Tyrrell, J. Singh Department of Radiology, The Robert Jones and Agnes Hunt Orthopaedic Hospital, Gobowen, Oswestry Shropshire SY10 7AG, UK. European Journal of Radiology.Role of MRI in hip fractures, including stress fractures, occult fractures, avulsion fractures

p057 **FRAX that fracture**

Sandra Wood

Bradford Teaching Hospitals NHS Foundation Trust

Background Osteoporotic fractures represent a potentially avoidable burden to both the patient and healthcare service. The estimated lifetime risk of fracture at the hip, lumbar spine or distal forearm is 30-40% in developed countries. With over 200,000 fractures occurring every year, the current financial cost to the NHS amounts to over £1.75 billion annually with the figure only set to rise in the future as the population ages As vertebral fractures increase the risk of subsequent fragility fractures by four to five fold, their recognition by the radiology team is crucial for the implementation of secondary prevention strategies. Detecting and treating vertebral fractures early can prevent further vertebral fractures, decrease patient morbidity and prevent future hip fractures. Prompt radiological intervention presents an opportunity to reduce the financial burden of osteoporosis to the NHS.
Purpose: The aim of this review is provide clinicians, radiologists and radiographers an overview of osteoporotic fractures, highlight the importance of detecting such fractures and describe the methods of how we at our institution have improved our detection rates of such fractures -- not just a local problem but a national one.

Summary Brief background of osteoporotic fractures and key statistics, pictorial review of different osteoporotic fractures, classification of vertebral fractures, the use of DEXA scanning and FRAX scoring to identify such patients and describe the methods we have introduced to improve our detection rates.

Giannotti et al (2013) Early Diagnosis of Vertebral Fractures IOP (2016) Facts and Statistics IOP (2016) Invest in your bones: Move it or loose it NHS choice: (2016) Osteoperosis NICE (2012) Osteoperosis: Assessing the risk of fragility fracture CG146 University of Sheffield (2011) FRAX - Fracture Risk Assessmenttool

p058 **Common fracture mimics in plain film radiography: A pictorial review**

Gillian Wilkinson

NHS Forth Valley

Background There are numerous normal anatomical features which may imitate acute skeletal trauma, many of which have characteristic radiological qualities. It is essential that theses features are recognised at image acquisition and interpretation to ensure that the patient receives the correct imaging, treatment and management. Careful correlation of radiological findings with clinical features such as soft tissue signs is often useful to aid in clinical decision making and eliminate or confirm significant injury.

Purpose Describe the key features and radiological presentation of a series of musculoskeletal normal variants that simulate commonly seen fractures. Raise awareness of these common appearances and the differentiation between fracture imitation and acute bony injury.

Content Radiographic images of common fracture mimics. Definitions and explanations of each presentation. Normal variants discussed include; Mach effect, unfused apophysis and epiphysis, secondary ossification centres, previous fractures, accessory ossicles, nutrient channels, soft tissues, sesamoid bones and bony excrescence.

Keats, T.E. and Anderson, M.W. (2007) Atlas of Normal Roentgen Variants That May Simulate Disease, 8th Edition, . Philadelphia: Mosby Elsevier. Learningradiology.com. (2015) 21 Imaging Findings Simulating Fractures.[online]. Available from http://learningradiology.com/archives2013/COW%20586-Fx%20or%20Not/fxornotcorrect.html [Accessed 10/11/2016]. Williams, H. (2008) 'Normal Anatomical Variants and Other Mimics of Skeletal Trauma' in Johnson, K.J. and Bache, E. (ed.) Imaging in Paediatric Skeletal Trauma,91-118, Berlin: Springer.

p059 **Evolving technique in orthopaedic radiography - understanding variation and drivers for change**

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The Mid Yorkshire NHS Trust

Background: Scant research exists to support positioning techniques in orthopaedic radiography, with textbooks reflecting the practices of the pioneers of the profession. Anecdotal evidence suggests variation in current practice. To establish consistent evidence based approaches to radiographic practice any variations should be understood in terms of benefit to the patient or impact on radiation dose.

Objectives: To establish any variation in orthopaedic radiography across the UK and to explore the drivers behind these changes, using 4 common examinations (foot, knee, pelvis and L-spine). Design: This mixed methods CoRIPS funded study involved a national electronic survey of adult X-ray departments, followed by in-depth telephone interviews with a purposive sample of radiographer key informants identified from the survey. Qualitative data was analysed using the framework method. Results: A survey response rate of 39.7% (n=69/174) was achieved.

Findings identified differences in the routine projections undertaken and the approach to positioning. Variations included the use of weight bearing techniques, use of angles, direction of primary beam, and degree of flexion of relevant joint. Analysis of qualitative interviews is ongoing, emerging themes suggest that changes are driven by conscious and subconscious factors. Demands from local referrers and adaptations made due to technological advances being examples of the former, with the latter occurring as practice creep over time.

Conclusions: This study has demonstrated a lack of standardisation of projections undertaken and techniques adopted across the UK. The results suggest that the evidence base is neither established nor embedded and appears not to be the prime consideration

1. Carver E, Carver B. (2006) Medical imaging, techniques, reflection & evaluation. China: Churchill Livingstone. 2. Clarke KC. (1939) Positioning in radiography. London: Heinemann. 3. McQuillan-Martensen K. (1996) Radiographic Technique. Philadelphia: Elsevier. 4. Whitley AS, Sloane C, Hoadley G, Moore AD, & Alsop CW. (2005) Clarke's positioning in radiography. 12th edition. London: Hodder Arnold.

p060 **The experience of radiology at a major trauma centre: An audit to evaluate limb fracture detection on scanograms of whole body trauma CTs**

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Mersey Deanery, Liverpool

Introduction: At our regional Major Trauma centre, radiologists are present at the time of trauma scan to provide a preliminary report. Latest NICE guidelines state that scanograms as well as clinical findings should be used to direct CT-imaging for limb trauma in adults.

Aim: Calculate the true peripheral fracture (TPF) detection rate of initial whole body (PAN-CT) trauma scanogram in our institute. We will audit this against current NICE guidelines and our local set target of 75%. Methods: All patients with PAN-CT scans over a 4 month period were included (100 patients). A senior radiology registrar assessed scout images for peripheral fractures, excluding axial skeleton fractures. Comparison was made against plain radiograph report.

Results: Main indication for PAN-CT was road traffic collisions. 45 patients had subsequent plain films within 20minutes to 2days after CT. 20 patients had a TPF. 2 of those fractures were demonstrated on the scout. 18 out of the 20 TPF had plain radiographs. Only 5.5% of scanograms were matched to a positive fracture radiograph. 50% of scanograms didn't match the positive upper limb fracture demonstrated on radiograph and 44.4% weren't possible to assess.

Conclusion: The use of scanograms for upper limb fractures is non-diagnostic. Limitations were lack of scout extension to include lower limbs and suboptimal scanograms. Clinical history and examination of patients should remain the primary assessment.

p061 **Qualitative assessment of the one stop MSK ultrasound clinic**

Mohamed Bushara; Hasan Nizami; Alun Davies; Abdul Gafoor; Priya Suresh

Plymouth Hospitals NHS Trust

Background: The 'one stop' MSK ultrasound clinic has been established in a large tertiary hospital and has been running for over 3 years, the clinic runs concurrently with trauma and orthopaedics, rheumatology and physiotherapy in tandem. The aim of the

service is to improve patient's experience by reducing their waiting time, number of visits and accelerate the clinical decision making process by providing diagnostic/therapeutic ultrasound most of the time at the same visit. After receiving positive feedback from our initial survey, we had taken on board suggestions made and re-surveyed to complete the cycle.

Method: Patient satisfaction survey was completed by 100 consecutive patients using the service, their views on the service, feedback and suggestions for service improvement were recorded. Electronic survey was sent to all clinicians' making referrals to the clinic and their views on the current running service, how the clinic can be best tailored to their clinical needs and recommendations for better patient experience were recorded.

Results and discussion: The overall response has once again been positive. We aim to present the changes made in response to our previous survey and valuable points highlighted for service improvement. We will share our, now almost 3 and a half year, experiennce of setting up and running this unique 1 stop service, normally offered to cancer patients' which can act as model for other trusts nationwide to consider.

p062 **Auto-reporting audit**

Mohammed Nabi; Rajat Chowdhury

Oxford University Hospitals NHS Trust

Background: Auto-Reporting is a process designed for radiological examinations that are not formally reported by radiologists. The referring clinical team must review these examinations and their interpretation recorded in the patients' records.

Aim: To determine the clinical teams' compliance in the use of the local Auto-Reporting Policy with regards to reviewing the imaging studies that are recorded as Auto-Reported and recording their findings in the patients' records.

Methods: We conducted a retrospective review of the patients seen in fracture clinic in October 2016, using the Blue Spiers System to identify fracture clinic lists and analysing letters generated by the Trauma consultants. CRIS was used to identify reports, which were generated as Auto-Reported. We also reviewed the images on PACS to compare the radiologists' opinion with the clinical team record. Our findings were correlated with the local Auto-Reporting Policy.

Results: A total of 62 cases were analysed, 22 of which had their radiographs recorded as Auto-Reported. 21 of these cases had their clinical team image interpretation findings recorded in the fracture clinic letters. The radiologist's interpretations of these 21 imaging studies were not significantly different from what was recorded by the clinical teams.

Conclusion: 100% satisfaction with the interpretation of the clinical teams. Although 96% of the radiographs marked as Auto-Reported were reviewed and recorded in the patients' records, our target should be 100%. Recommendations: To distribute the results of this audit to the Trauma and Orthopedics clinicians and re-audit after 6 months.

1. Auto-Reporting Policy – Imaging Service Version 2.0 – May 2015, Oxford University Hospitals NHS Trust. 2. Standards and recommendations for the reporting and interpretation of imaging investigations by non-radiologist medically qualified practitioners and tele radiologists, The Royal College of Radiologists.

p063 **Quantification of IBEX technology for BMD measurement and improved scatter correction on standard DR systems**

Paul Scott [1]; Ben Lopez [2]; Adam Ratcliffe [1]; Joshua Cowling [1]

[1]IBEX Innovations; [2]Durham University

Background: IBEX has demonstrated a technology which adds information to X-ray imaging [1]. It functions by interpreting the pattern of a structured filter attached to the detector. IBEX technology can return both a familiar diagnostic image and information relating to beam energy. This allows measures such as BMD to be acquired from any X-ray scan on DR systems. We demonstrate the quantification of the IBEX technology for BMD measurement on phantoms and show a comparison to a DEXA system. Furthermore, we use this information to accurately predict and remove the effect of scatter to demonstrate our potential for improved gridless imaging.

Method: The quality of IBEX diagnostic images has been assessed using quantitative (MTF) and subjective assessments. A comparison between the IBEX technology and DEXA systems has been performed to demonstrate the extra information returned by an IBEX imaging system. Finally quantitative phantoms are assessed for scatter correction accuracy. Results: MTF and other image quality metrics will be presented. Correlation is observed between IBEX and DEXA system measurements for a set of quantitative phantoms with a residual standard error on IBEX measurements of 0.043 g/cm^2. Scatter correction has been performed on quantitative phantoms and demonstrated to agree with a simulated case with less than 5% total error.

Conclusion: IBEX technology presents a viable, useful and novel addition to standard X-ray imaging, providing both standard and scatter corrected imaging procedures alongside new material information which can be used to enhance diagnostic outputs.

*Cowling, J et al. (2016), Novel X-ray detector technology for quantitative material information in digital radiography, ECR 2016 Book of Abstracts, Insights into Imaging, **7**(1), 466, DOI:10.1007/s13244-016-0473-x*

p064 **When is an effusion not an effusion?**

Lucy Taggart

NHS Greater Glasgow and Clyde

Background Our reporting radiography team notice a trend in the misdiagnosis of effusions, fat pad elevations, lipohaemarthrosis and "normal" soft tissues on our sticky note reporting scheme we run within accident and emergency (A&E) and minor injuries sites. These sites are staffed by nurse practitioners and doctors with varying experience. However effusions appear to be a common miss no matter what expertise.

Purpose We developed a poster showing the common pitfalls of soft tissues signs and the common pathologies they are linked to. This has enabled A&E staff to more effectively assess soft tissue signs on plain film radiographs and direct patients into a more accurate treatment plan in a more timely fashion. The poster has limited information available as not all soft tissue signs could be highlighted, however as a basic indicator of what to look out for has been a vital educational tool in our Accident and Emergency departments. By missing a soft tissue sign indicative of patient pathology we are essential mistreating and misdiagnosing patient. Despite our fast turn around of hot reporting there can sometimes be a significant delay of patient treatment, the poster has allowed soft tissue "red flags" that will require medical intervention to be identified quicker and more effectively.

Summary: The poster has been created as a quick reference guide to allow the quick radiographic appearances of

- Upper limb effusions
- Lower limb effusions
- Lipohaemarthrosis
- Pseudosubluxation
- Fat pad signs

p065 **Computer-aided detection in musculoskeletal projection radiography: A systematic review**

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University of Exeter Medical School

Background: Computer-aided detection (CAD) is utilised successfully in imaging modalities such as computed tomography (CT) colonography and CT lung screening, these CAD systems have increased sensitivity scores[1,2], reducing human error in reporting. Yet there is little information regarding CAD deployed within musculoskeletal (MSK) projection radiography;- As such a systematic review was undertaken to investigate clinical MSK application of CAD software utilising a diagnostic test design.

Method: A systematic review was conducted based on the Cochrane DTA review methodology searching specific inclusion/exclusion criteria. Electronic databases including Medline, EMBASE, HMIC, AMED, PubMed were searched using a pre specified search strategy. Additionally backwards and forwards citation searches were used to include any papers mentioned within the papers scoped and these were themselves reviewed. Two reviewers independently screened results for title and abstract data, and then full papers (with a third reviewer as arbitrator). The final papers had their data extracted and a bias check performed utilising a blinded double assessment with the QUADAS-2 quality check tool.

Results: In total, 6256 papers were originally discovered from the searches, which after duplicate removal and the first round of screening, was truncated to 149 papers. These were then screened for full text analysis resulting in 16 papers for data extraction.

Conclusion: Results demonstrate that CAD has the potential to help diagnostic accuracy within MSK imaging, but is still in its infancy. This is reflected in the majority of the research papers outlining proposed software, but with limited or no clinical testing or participant follow up

1. Beigelman-Aubry C, Raffy P, et al. Computer-Aided Detection of Solid Lung Nodules on Follow-Up MDCT Screening: Evaluation of Detection, Tracking, and Reading Time. American Journal of Roentgenology. 2007;189(4):948-55. 2. Petrick N, Haider M, et al. CT colonography with computer-aided detection as a second reader: observer performance study. Radiology. 2008;246(1):148-56

p066 **Forgotten signs in rheumatology**

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Great Western Hospital, Swindon

Background: Soft tissue swelling, juxta-articular osteoporosis, joint space narrowing, and marginal erosions are all well-known radiographic signs of Rheumatoid Arthritis that are commonly identified. Classical signs of seronegative arthropathy are also well described. However, there are a number of other recognised, but often overlooked plain film signs of rheumatological disease. Recognition of these can aid diagnosis and monitor disease progression.

Purpose: A pictorial review of often forgotten signs of rheumatological disease on plain film, including Rheumatoid Arthritis, Psoriatic Arthritis, Calcium pyrophosphate dihydrate deposition (CPPD), and Diffuse idiopathic skeletal hyperostosis (DISH). This pictorial review will aid recognition by radiologists and rheumatologists who are not familiar with these rare signs.

Summary: The poster will be organised into disease categorised groups with displays of unusual and rarer plain film signs for each rheumatological condition. The cases include: Rheumatoid arthritis: Terminal phalangeal sclerosis, inferior distal clavicular erosions, posterosuperior calcaneal erosion, rib erosions, non-cervical spinal disease. Psoriasis: Acro-osteolysis affecting terminal phalanges of hands and toes. CPPD: Unusual sites. DISH: Periosteal new bone formation and enthesopathy in the pelvis.

p067 **Ankle-foot orthosis lifespan estimation: Does radiographic evidence support the computer simulation prediction of orthotic deformation and breakdown propagation patterns?**

Amanda Rutherford [1]; Jonathan McConnell [1]; Graham Johnstone [1]; Gillian Wilkinson [1]; Andrew Sheilds [2]; Ester Smith [2]; Craig Girvan [2]; Steven Combes [2]; Shahbaz Hameed [2]; Dominic Conlin[2]

[1]*NHS Greater Glasgow and Clyde;* [2]*Glasgow Caledonian University*

Background/Objectives: The time period for use of Ankle Foot Orthosis (AFO) and the number of patients now using them has increased - this has been a driving force in developing new orthotics with greater longevity. An AFO is a leg splint for patients who have below knee paralysis - its purpose is to readjust patients gait back to a more comfortable walking style, allowing for increased mobility. The purpose of this study is to compare radiographs and computed simulations of deformations/stress points of several AFOs from patients presenting with differing initial gait problems to establish the durability and estimated lifespan of the orthosis.

Method Baseline imaging will be obtained before fitting the orthosis to the patient. Follow up interval imaging of each orthosis over a period of time will generate radiographic evidence of wear and timeframe influences and compared with computer simulated predictions to establish the validity of computer modelling and consequent personalised construction of the AFO for each patient.

Outcomes: Work in progress.

Discussion: This study has potential for further multidisciplinary research in prosthetic/orthotics between healthcare professionals and engineering with the aid of diagnostic imaging.

p068 **The occurrence of bone marrow oedema in asymptomatic adolescent footballers - an observational study**

Lucy Ashton [1]; Jon Fulford [1]; Susan McAnulla [1]; Karen Knapp [1]; Christine Heales [2]; David Silver [3]; Craig Williams[4]

[1]*University of Exeter Medical School;* [2]*Plymouth Hospitals NHS Trust;* [3]*Royal Devon and Exeter NHS Foundation Trust;* [4]*University of Exeter*

Background Studies have demonstrated the presence of bone marrow oedema in asymptomatic athletes who engage in a variety of sporting activities[1,2,3,4]. Many studies have focused on sportsmen and women who are skeletally mature. The aim of this observational study was to examine whether a similar pattern of oedema was evident in adolescent elite football players.

Method 14 footballers (16 to 18 years) attached to a sports academy underwent T1 and STIR MRI scans of both knees and ankles. Scans were examined for evidence of bone marrow oedema. Participants were asked to report either acute or chronic pain affecting the lower legs. Training and injury records for participants were provided by the academy coaching staff for that current academic year.

Results Results of the scans demonstrated the presence of bone oedema in 47% of ankle MRI sequences (15/32) and 22% of knee sequences (7/32). The most common sites for oedema were either the medial or lateral malleoli (11/15) or the medial femoral condyle (5/7). No participants reported any significant injuries during their career and all were actively training at the time of scanning.

Conclusion MRI findings in this cohort reflect those shown in previous studies of skeletally mature athletic asymptomatic populations. The clinical significance of oedema is uncertain in the absence of acute trauma and may reflect biomechanical stresses associated with high intensity training (minimum 10 hr per week). Presence of oedema in the adolescent asymptomatic athlete provides a diagnostic challenge when translated to the acute injury setting.

1. Kornaat, P. R., et al. (2008). "Bone marrow edema-like signal in the athlete." European Journal of Radiology 67(1): 49-53. 2. BRUNNER, M. C., et al. (1989). "MRI of the Athletic Knee: Findings in Asymptomatic Professional Basketball and Collegiate Football Players." Investigative Radiology 24(1): 72-75. 3. Kornaat, P. R. and S. K. Van de Velde (2014). "Bone Marrow Edema Lesions in the Professional Runner." Am J Sports Med 42(5): 1242-1246. 4. Soder, R. B., et al. (2012). "MRI of the knee in asymptomatic adolescent swimmers: a controlled study." British Journal of Sports Medicine 46(4): 268-272.

p069 **Knee X-rays - are we adhering to iRefer?**

Sharenja Jeyabaladevan; Vishnu Naidu
Princess Alexandra Healthcare Trust, Essex

Background Knee pain is a common complaint in primary care. The majority of knee complaints can be attributed to osteoarthritis (OA)1. Knee X-rays often can be limited in what they add to a clinical diagnosis. Evidence based guidelines have thus been created by The Royal College of Radiologists called iRefer. The existence of these guidelines are not well known amongst clinicians. Method Patients across two primary care centres were identified between 1st-31st August 2016. Those who had a knee X-ray were selected and a manual screening of their notes was undertaken to retrieve (1) presenting complaint, (2) referral reason, (3) X-ray outcome and (4) any further imaging/follow up. Data was compared against knee X-ray iRefer guidelines.

Results 50 patients fit the selection criteria across both primary care centres. Of those, 40 patients presented with pain as their primary symptom, 2 with locking, 4 with knee trauma, and 4 with non-specific complaints. Only 12/50 patients met the iRefer criteria. 3 of these had features of OA, 1 with a metallic foreign body and 8 being normal. 38/50 patients didn't meet the criteria; 15 had normal X-rays, 20 had evidence of OA, 1 had a small effusion, 1 with shrapnel and 1 with chondrocalcinosis.

Conclusion iRefer guidelines are not well known in primary care despite a large volume of requests. The majority of requests did not meet iRefer guidelines. In order to increase awareness of iRefer, the audit was presented and a simplified format of the guidelines was sent to all GPs.

1. Porcheret, M., Jordan, K. and Croft, P. (2006). Treatment of knee pain in older adults in primary care: development of an evidence-based model of care. Rheumatology, 46(4), pp.638-648. 2. Irefer.org.uk. 2016 [cited 6 December 2016]. Available from: http://www.irefer.org.uk/

p070 **Spicks and specks: clues to pathology around the knee. All you kneed to know**

Nicholas Ridley; Rachel Hilton; Marek Machowski
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Background: Tiny fragments of bone, calcification or enthesopathy around the knee can be important clues to more significant pathology. Most of these are well described but are easily overlooked. The classic example is the Segond fracture that is a strong marker for internal derangement.

Purpose: We aim to present a large number of examples of these 'spick and specks' around the knee so that radiographers who red dot films, reporting radiographers and radiologists and ED doctors have an educational resource to review. The principle learning outcomes are that health professionals reviewing knee radiographs are able to spot, describe and understand the significance and importance of these abnormalities.

Summary: The following abnormalities amongst others will be covered; Normal variants, post trauma (e.g. cruciate avulsion, Pellegrini Stieda, Segond, Osgood Schlatter's disease, quads rupture) and other pathology e.g. seronegative arthopathy, CPPD, Guinea worm and synovial chondromatosis.

p071 **Re-audit of MRI in the diagnosis of meniscal tears**

Dhaara Bhatt; Fatima Alves-Pereira; Andoni Toms

Norfolk and Norwich University Hospital

Background MRI has reported sensitivities of between 88% - 95% for meniscal tears and is routinely used to assess meniscal integrity [1]. Previous audits in our department had recorded similar diagnostic accuracy for isolated meniscal tears. A re-audit was performed to measure the accuracy of MRI for meniscal tears but expanded to include patients with anterior cruciate ligament (ACL) tears.

Methods Patients were identified from our electronic surgical database. 50 consecutive cases recording the presence of a meniscal tear on arthroscopy between October 2015 and March 2016 were identified. The time interval between the arthroscopy and MRI was recorded. MRI reports were assessed by two radiology trainees and discrepancies between the MRI report and surgical findings were independently reviewed by 3 senior musculoskeletal radiologists.

Results 40 of 50 patients (sensitivity 80%) were correctly diagnosed with a meniscal tear on MRI. Of the remaining 10 patients, there was a persistent discrepancy between MRI and arthroscopy in 3 patients, 8 patients had an acute ACL injury, and 4 of the discrepancies were meniscocapsular separations of the posterior horn of the medial meniscus.

Conclusion The discrepancy rate between MRI and arthroscopy appears to be higher in the setting of an acute ACL injury. In half of these cases a meniscocapsular tear seen at arthroscopy was not identified at MRI.

1. Phelan N, Rowland P, Galvin R, O'Byrne J.M. A systematic review and meta-analysis of the diagnostic accuracy of MRI for suspected ACL and meniscal tears of the knee. Knee Surg Sports Traumatol Arthrosc. 2016 May; 24(5):1525-39.

p072 **Radiologist's guide to patella tendon disease**

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[1]*Stockport NHS Foundation Trust;* [2]*University Hospital South Manchester*

Patellar tendinopathy is a common condition seen in athletes. It is thought to be due to repeated loading of the knee extensor mechanism characterised by anterior knee pain and most frequently seen in sports that involve jumping such as basketball. (1) (2) Traditionally the conservative management of patella tendinopathy has involved combinations of rest with eccentric exercises such as decline squats. (3) Surgical procedures are also used although varied success rates have been reported. (4) More recently minimally invasive techniques such as dry needling, autologous blood injection and platelet rich plasma therapy have been employed. These techniques utilise ultrasound to determine the site for injection. (5) We employ elastography during the routine assessment of tendon disease which assesses tendon rigidity on a colour scale. The colour of the scale is suited to the operator's preference; either a henna red or a royal blue colour is representative for normal tendon rigidity. The diseased patella tendon becomes less rigid and organised compared to normal tendon and the colours depicted represent softening within the affected tendon. Alteration in the tendon ultrastructure seen with tendinopathy may manifest as tendon thickening, increased Doppler activity, interstitial fissures or low echo clefts. These affected regions are targeted during injection therapy. (1)

(1) Warden SJ, Brukner P. Patellar Tendinopathy. Clin Sports Med 22 (2003) 743 – 759 (2) Khan KM, Cook JL, Kannus P, et al. Time to abandon the ''tendinitis'' myth. BMJ 2002;324:626-7 (3) Ferretti A, Puddu G, Mariani P, et al. The natural history of jumper's knee: patellar or quadriceps tendinitis. Int Orthop1985;8:239–42. (4) Khan KM, Cook JL What is the most appropriate treatment for patellar tendinopathy. Br J Sports Med 2001;35:291-294 doi:10.1136/bjsm.35.5.291 (5) Mathijs van Ark, Johannes Zwerver, Inge van den Akker-Scheek. Injection treatments for patellar tendinopathy. Br J Sports Med 2011;45:1068-1076 doi:10.1136/bjsm.2010.078824

p073 **Atypical Femoral Fractures (AFF's): Discussion and radiological review**

Mike Mackenzie

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To review the definition and pathophysiology of atypical femoral fractures Incipient or complete atypical fractures Compare insufficiency fractures (loosers zones) Recent epidemiologic evidence shows that the absolute incidence of atypical femoral fractures is small compared to the incidence of typical hip fractures. Long-term bisphosphonate use may be an important risk factor for atypical fractures For patients with postmenopausal osteoporosis durations (longer than 5 years) there is minimal additional 'antifracture' benefit demonstrated for treatment.

Aasis, U. et al (2013) Atypical Femoral Fractures: What Do We Know About Them? J Bone Joint Surg Am. 16(95): e8 Donnelly, E. et al (2012) Atypical Femoral Fractures: Epidemiology, Etiology, and Patient Management Curr Opin Support Palliat Care. 6(3): 348--354. McKenna, M.J. et al (2014) Clinician approach to diagnosis of stress fractures including bisphosphonate- fractures associated n DOI: http://dx.doi.org/10.1093/qjmed/ hct192 99-105 Neviaser, A.S. et al (2008) Low-energy femoral shaft fractures associated with alendronate use. J Orthop Trauma. 22(34): 6-50. Pankaj T & Thorn JM (2012) Atypical femoral fractures related to bisphosphonate therapy. MSK Imaging. 22(3): 178-181 Shane, E. et al (2010) Atypical subtrochanteric and diaphyseal femoral fractures: report of a task force of the American Society for bone and mineral research. J Bone Miner Res.10;25(22):67-94.

p074 **Femoroacetabular impingement - what the radiologist needs to know**

Samir Khwaja; Saqib Butt; Scott Mcdonald

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Femoroacetabular impingement (FAI) is increasingly recognised as a cause of hip pain and dysfunction especially in young active patients (1). FAI is caused by repetitive abutment of a morphologically abnormal proximal femur and/or acetabulum during hip motion, especially during flexion and internal rotation. The resulting stress on the acetabular labrum and articular cartilage can cause labral damage and cartilage degeneration, resulting in early-onset osteoarthritis.

Pincer impingement generally involves the acetabular side of the joint where there is excessive coverage of the acetabulum, which maybe focal or diffuse. Cam impingement involves various forms of femoral head asphericity. Most patients have a combination of both forms of impingement (2). Imaging has a key role in detecting both the morphological features and pathological changes associated with FAI.

Our case-based multi-modality review will enable the radiologist to:

1. Understand the anatomy of the hip joint and how this affects function.
2. Identify, characterise and describe the radiologic findings associated with FAI.
3. Outline the key radiographic measurements and signs.
4. Highlight the role of MRI and CT in detecting the morphological features and pathological changes associated with FAI.
5. Communicate abnormalities more effectively with clinical colleagues.

p075 **Intra and inter-operator precision measurements of hip migration using projection radiography and dual energy X-ray absorptiometry**

Ella Hancock; Harriet Elder; Saffron Martin; James Spreadbury; Chris Morris; Karen Knapp

University of Exeter

Background: Children with cerebral palsy (CP) are at an increased risk of hip dysplasia. To monitor hip dysplasia, regular bilateral hip radiographs are undertaken at 6 to 24 month intervals and the migration percentage calculated. The aim of this study was to explore whether dual energy X-ray absorptiometry (DXA) measurements can provide reproducible hip migration measurements as a potential low dose alternative to projection radiography (PR).

Method: A Kyoto Kagaku PBU-50 phantom was imaged once in the recommended position for hip migration imaging using both Siemens Multix Fusion DR and GE Lunar Prodigy for PR and DXA respectively. Images were downloaded and the hip migration percentage calculated using GNU image manipulation (GIMP). Intra- and inter-operator precision errors were calculated using the coefficient of variation (CV%), root mean square standard deviation (RMSSD) and RMSCV% from 30 repeated measurements completed by four researchers for both modalities.

Results: The CV% ranged from 8.4% to 21.6% and 10.05% to 22.4% and the RMSCV% (RMSSD) was 17.05% (1.76) and 14.80% (2.23) for PR and DXA respectively. The mean migration percentage was 10.3% for PR and 15.2% for DXA, although these differences need to be treated with caution due to re-positioning between PR and DXA in addition to suboptimal anatomy of the phantom.

Conclusion: These results demonstrate that DXA shows potential as a low dose alternative to PR for hip migration measurements. This study was restricted to an adult phantom and further research is required in-vivo to explore these results in a more clinically relevant population.

p076 **Review of the deltoid ligament**

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Background: The deltoid ligament is a complex structure with variable superficial and deep layer components involved in the stabilisation of the ankle joint. It provides strong resistance to valgus, pronation and rotation forces on the talus. The ligament is prone to injury with eversion and pronation mechanisms of force and fractures of the lateral ankle destabilize the structure.

Methods: To understand the pathological mechanisms this structure is subjected to, we provide a review of the deltoid ligament complex anatomy. Radiological appearance is reviewed using multi-modality imaging: plain film radiography, ultrasonography and magnetic resonance imaging. With appreciation of the structure we visit the pathological processes involved including trauma, impingement and tibialis posterior dysfunction and their radiological features. The aim of this review is to raise awareness of the patterns of injury and pathology for the general radiologist.

Results: Both ultrasonography and magnetic resonance imaging provide detailed anatomical evaluation and are complementary modalities for identifying the substructure anatomy and pathological processes it undergoes.

Conclusion: The deltoid ligament is a primary stabiliser of the ankle joint; understanding this detailed anatomy helps to guide early treatment options and prevent long-term morbidity when abnormalities occur.

p077 **Fluoroscopically guided glenohumeral joint injection - a single centre experience**

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Aim: Referral for fluoroscopy guided glenohumeral injection is increasing. We aim to present our local experience of GHJ steroid injections over a year looking specifically at pain diaries - their return rate, percentage reduction in pain score and breakdown of responders and non-responders looking at age, gender and severity of radiographic signs. A literature search (1,2,3) revealed no official standard of expected pain improvement. Whilst there are publications commenting on mean pain score, to our knowledge there is no publication that provides the breakdown percentage of responders vs non-responders.

Method: Retrospective analysis of patients' visual analogue pain scores and their clinical referrals were searched on CRIS over a year. Patients included were those referred for osteoarthritis or adhesive capsulitis. Acromioclavicular joint injections were excluded. Plain radiographs were reviewed for assessment of severity of degenerative changes.

Results: We analysed 218 events. A total of 101 pain diaries were scanned onto RIS. Out of theses, 60 GHJs (59.4%) were reported to have 'good' response (50% and above improvement from baseline pain score), 8 GHJs (7.9%) had 'some' response

(between 25% and 50% improvement), and 33 GHJs (32.7%) 'poor' response (25% and less improvement). Roughly 55% of patients had their pain diaries scanned onto RIS, and this requires improvement.

Conclusion: Our review will help set a standard, improve patient consent and guide patients' expectations in terms of how likely they will experience an improvement. We have also proposed changes to the local pain diary collection method and will be auditing returns.

1. Cho, C.H. (2016) Proper site of corticosteroid injection for the treatment of idiopathic frozen shoulder: Results from a randomized trial. Joint Bone Spine. 83(3):324-9. 2. Song, A. (2014) Outcomes of Ultrasound-guided Glen Humeral Corticosteroid Injections in Adhesive Capsulitis. Br J Med Med Res. 25; 5(5):570-578. 3. Carette, S. (2003) Intraarticular corticosteroids, supervised physiotherapy, or a combination of the two in the treatment of adhesive capsulitis of the shoulder: a placebo-controlled trial. Arthritis Rheum. 48(3):829-38.

p079 **Crowned Dens Syndrome: A case report illustrating its non-specific presentation**

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Background: Crowned Dens Syndrome is a rare cause of neck pain characterised by CPPD deposits in the periodontoid tissues. It is generally seen in older female patients and can result in cervical cord compression. It is often misdiagnosed and definitive diagnosis on clinical grounds is difficult due to non-specific presentation. The condition can mimic a range of other pathologies on clinical findings and CT is the gold-standard in identifying the calcification in the periodontal ligaments.

Purpose: Our case illustrates the non-specific clinical presentation of crowned dens syndrome in an 88 years old patient. He presented with long standing history of gradually progressing left sided upper limb and bilateral leg weakness, unsteadiness and recurrent falls. CT cervical spine demonstrated a crown of amorphous mineralization extending around the peg, resulting in mass effect and narrowing of the spinal canal at this level. There was a further diffuse halo of mineralisation at the bilateral sternoclavicular joints, consistent with the same process. The findings were consistent with crowned dens syndrome (peri-odontoid CPPD), causing narrowing of the spinal canal, with a similar appearance of CPPD in the sternoclavicular joints. Crowned Dens Syndrome is an under-recognised condition and clinicians should be aware of its clinical feature to avoid unnecessary investigations.

Summary: It will include the above information and various radiological images, including CT and plain films for the C-Spine.

p080 **The detection of wooden foreign bodies: An experimental study comparing DDR and ultrasonography**

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University of Suffolk

Background This study investigates and compares direct digital radiography (DDR) and ultrasonography in the detection of wooden foreign bodies in soft-tissues. Patients attending the accident and emergency department following suspected wooden foreign body are often referred for radiographic investigation. Evaluation of retained foreign bodies remains paramount for assessment of these wounds as they are frequently missed on initial assessment (DeBoard et al., 2007, pp.23-39). The misdiagnosis of retained wood may cause harm to a patient as this can result in the damage of nerves or adjacent blood vessels (Kaiser et al.,1997, p.107). It is therefore of paramount importance that the most suitable imaging modality is used to detect and localise foreign bodies in order to ensure that removal is quick and accurate, and that the patient will have minimally associated complications.

Method Four pork feet were used to insert wooden foreign objects. Images were judged on the image acceptability and foreign body detection using a radiographer and sonographer. This compares the observed and expected proportions to see if they are any observed differences between the two imaging modalities (Chilisa and Preece, 2005, p.133).

Results Results are currently being undertaken and will be accessible at the end of January 2017.

Conclusion To follow.

Chilisa, B. and Preece, J. (2005) Research Methods for Adult Educators in Africa. Hamburg, Germany: UNESCO Institute for Education. DeBoard, R. H., Rondeau, D. F., Kang, C. S., Sabbaj, A. and McManus, J. G. (2007) 'Principles of basic wound evaluation and management in the emergency department', Emergency Medicine Clinic of North America, 25 (1) pp.23-39. Kaiser, C.W., Slowick, T., Spurling, K.P. and Friedman, S. (1997) 'Retained foreign bodies', The Journal of Trauma, 43 (1), pp.107-111.

p081 **A pictorial review on lesions of the paediatric pelvis: What not to miss!**

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Purpose In this pictorial review, we present six cases, describing clinical history and characteristic radiographic findings. The aim is to highlight important review areas when evaluating paediatric pelvic radiographs. Pelvic lesions are often difficult to appreciate due to overlying anatomical structures.

Methods We selected six cases of iliac bone lesions at Royal Manchester Children's Hospital, reviewing clinical history and imaging findings.

Results An 11 year old female was confirmed to have a tuberculosis cold abscess after pelvic X-rays, CT pelvis contrast and MRI pelvis. These images demonstrated destructive changes within the iliac blade, fluid collection and peripheral contrast enhancement. A skeletal survey in a 6 year old male showed an incidental finding of fibrous dysplasia with diffuse sclerotic changes throughout the pelvic bones. An 11 year old female was diagnosed with osteosarcoma. Pelvic X-ray and MRI contrast demonstrated a sclerotic right iliac bone associated with a surrounding large calcified soft tissue mass. A 15 year old male was confirmed to have an aneurysmal bone cyst in the right acetabulum following pelvic X-ray and MRI, which demonstrated a well defined septated expansile lesion. Lastly we have 2 cases of Ewings Sarcoma in a 16 year old male and a 9 year old female. Both cases had patchy sclerotic changes in the pelvic bones, associated with surrounding soft tissue masses. These were confirmed on plain pelvic radiographs, MRI and CT.

Conclusion With careful scrutiny, plain radiographs are fundamental in the diagnosis of bone lesions. This poster outlines the importance of review areas.

p082 **Horsing around: A summary of the CT findings in horse related major trauma**

Peter Abernethy

Peninsula Radiology Academy, Plymouth

Horseback riding is considered more dangerous than motorcycle riding, skiing, automobile racing, football and rugby<1>. This is a retrospective look at the injury types and patterns of horse related trauma at the regional trauma center with a large rural population. We regularly encounter major trauma related to horse riding. This poster aims to look at previous cases with a pictorial review of injuries and statistical analysis to help the reader with future trauma reporting, particularly in the case of horse related injury.

The following issues will be addressed; what are the most common injuries and effected systems? Is there a correlation between patient demographics and severity of injury? Are there any tips for review areas from difficult cases? This will be displayed answering the 3 questions above with one column for each question with patient images to illustrate.

<1>Jill E Ball, Chad G Ball, Robert H Mulloy, Indraneel Datta and Andrew W Kirkpatrick; Ten years of major equestrian injury: are we addressing functional outcomes? Journal of Trauma Management & Outcomes 20093:2

HEAD, NECK AND NEURORADIOLOGY

p083 **Percutaneous CT-guided biopsy of the spine**

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Background: Our aim was to determine the success rate of percutaneous spinal biopsies for infection and neoplasia in comparison to national data and regional guidelines.

Methods: The 1st audit was between January 2010-February 2012, the 2nd audit November 2014-November 2016. Local radiology information systems were used to obtain data on all patients undergoing a percutaneous biopsy noting the site, indication, histology and microbiology.

Results: 1st Audit: 82 biopsies with 37 for infection and 45 for neoplasia. In 17% of cases bacteria were isolated with tuberculosis being most common. 56% had a definite neoplasia and 44% had no neoplasia/indeterminate biopsy. 2nd Audit: 91 biopsies with 19 for infection, 68 for neoplasia and 4 for infection or neoplasia. In 36% of cases bacteria were grown, with staphylococcus aureus being most common. 60% had a definite neoplasia, 33% had no neoplasia, 7% had indeterminate biopsy. In each audit, 3 cases with initial negative biopsy showed a neoplasia on subsequent sampling.

Conclusion: Following the low yield results for infection from previous auditing, a change was made to the protocol. A higher proportion were performed for atypical imaging features or failure to respond to antibiotics, which may account for the reduced number and yield when comparing to national standards. Increased biopsies of neoplastic lesions may reflect trends for more aggressive management of metastatic disease and need for histology. Although we have a high rate of diagnostic sampling, it is lower than the national findings and may suggest a lower regional threshold for sampling indeterminate lesions.