



Clinical: Musculoskeletal

P001 Audit on open access MRI for General Practitioners

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Open access to MRI Knees was started at Ipswich Hospital in 2009. It was implemented to aid the management of patients with knee problems in primary care and reduce secondary care referrals. Since 2009 we have noted a significant increase in GP requests for MR Knee, with 586 referrals in 2013. Current hospital guidelines advise that MRI Knees should be instigated in patients under 50 years with chronic knee pain and patients greater than 50 with normal plain X-rays. This audit is designed to see how many requests adhere to clinical guidance and allows the department to become a more efficient and cost-effective. We collected data over January to April 2013, looking at 36 patients in total. Our results highlighted that 14/36 (39%) of referrals did not follow the referral criteria. The majority of MRI requests were for patients over 50 (55%). Although 60 % of them had a previous X-ray that showed degenerative changes, they still went on to have an MRI, which merely confirmed the diagnosis of osteoarthritis. 5/20 (25%) of patients over the age of 50 did not have a previous plain film.

Conclusion: MRI is invaluable in the diagnosis of meniscal and ligamentous tears. However it is more beneficial in those under the age of 50 and patients aged above 50 with a Normal X-ray.

P002 Radiation dose comparison of CBCT and CT extremity scans

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Objectives: The purpose of this study was to compare the radiation dose delivered to the patient for two modalities in Computed Tomography during scanning of extremities: conventional CT [CT] and Cone Beam CT [CBCT].

Methods: The Dose Length Product [DLP] readings from the NewTom 5G CBCT scanner and the GE VCT conventional CT scanner were recorded for the following extremity examinations: elbow; wrist, knee, ankle and foot. The average DLP/Scan Length was calculated for each area of interest and recorded as the score for comparison.

Results: The initial analysis of the scores for each area of interest revealed that the CBCT scores were 76-92% lower than of the scores from the conventional CT scans.

Conclusion: When comparing doses between CBCT and conventional CT scanners using the DLP/Scan Length as the score, the findings of this study suggest that the radiation dose to the patient undergoing an extremity CT scan is significantly higher than that delivered to the patient undergoing CBCT. The CBCT extremity scan score range was 1-2 mGy in comparison to the CT extremity scan score range of 8-20 mGy.

There are many variables to be taken into account when directly comparing CBCT with CT. The CBCT scan should be indicated when the requirement is largely for bone anatomy; for example mal-union and will not show as much soft tissue detail as the conventional CT. Further studies to assess image quality are recommended.

P003 Common arthropathies: A pictorial review of their typical radiographic characteristics and how to differentiate between them

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Introduction: X-rays are first line investigations in evaluation for arthritis and are usually acquired as a baseline test while first presentation in the clinic. It is absolutely vital to correctly assess the inflammatory arthritis from a degenerative process because the treatment is completely different. However it may not be easy as there are overlapping characteristics, subtle findings, and unclear terminology. Therefore, this presentation aims to educate the general radiologist in hopes of improving patient management.



Aims and objectives: The objective of this review is to present a simplified approach to radiographic evaluation of arthritis. This exhibit will provide a practical review and radiographic pictorial of rheumatoid arthritis, gout, pseudogout, psoriatic arthritis, reactive arthritis and some other common seronegative conditions, which are often confused radiographically.

Presentations and imaging findings: We will include pictorial review of typical radiographic characteristics. Findings will be demonstrated and identified by the use of radiographs. We will use an algorithm and flow chart to help in stream lining the diagnosis. Inflammatory arthritis is characterized by bone erosions, osteopenia, soft-tissue swelling, and uniform joint space narrowing. Failure to stratify the underlying mechanisms into degenerative or inflammatory categories can lead to wrong, expensive and improper medical treatment.

Conclusion: Differentiating these arthropathies may not be straightforward task however even for musculoskeletal radiologists it sometimes needs multi-disciplinary meetings with rheumatologists to reach to a consensus. We endeavour to teach the basic steps to formulate a optimum diagnosis by providing the key learning points in interpretation of these common arthropathies.

P004 Ultrasound-guided dry needling and high volume stripping for achilles tendinopathy: Results in our patients group and review of literature

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Introduction: Chronic Achilles tendinopathy is a common overuse injury. There are several modalities of treatment including autologous blood injection, corticosteroids, high volume stripping and dry needling. There is significant morbidity associated with surgical treatment hence less invasive treatments are favoured these days. Dry needling is a procedure of repeatedly passing a fine needle through the abnormal tendon substance under local anaesthesia. It is done to stimulate an inflammatory response followed by formation of reparative tissue, which strengthens the tendon.

Aims and objectives: We looked into our practice of dry needling and percutaneous high volume stripping of the Achilles tendon as a novel treatment for this condition. Thirty-two patients with sonographically-confirmed Achilles tendinopathy were analysed after their treatment. All were symptomatic for >4 months and have failed alternative conservative treatments. Ultrasound-guided dry needling of neovascular areas and percutaneous high volume stripping was performed by two dedicated musculoskeletal radiologists. Sonographic assessment of the tendon's thickness and neovascularity was undertaken. Pain scores were obtained before and after the procedure for 4 weeks.

Results: 27 out of 32 tendons have been successfully treated and rest are still having their long term follow up. Our combined therapeutic intervention led to a significant improvement in pain scores and most of the patients >85% are satisfied with their outcome.

Conclusion: Dry needling and percutaneous high volume stripping under ultrasound guidance shows promise as an alternative treatment. Patients prefer this treatment as surgery has a longer recovery process and is more invasive with higher risks attached.

P005 Development and validation of a psychometric scale for the visual assessment of AP pelvis image quality

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Purpose: Create and validate a psychometric scale for assessing AP pelvis digital image quality.

Methods: The scale was created following a standard format (Bandura's theory for self-efficacy). An initial pool of items was generated (n=29) and presented to a focus group (radiologists, radiographers and physicists, n=7) for review and modification. Initially the scale was validated using a series of seven AP pelvis phantom images each of known SNR, representing different image qualities. Then the scale was further validated using cadaver images (n=7)



of known and different image qualities. Validation involved 335 participants scoring the cadaver and phantom images using the scale.

Results: Using the scale, participant aggregated mean scores increased with increasing SNR (Phantom - 62.8 to 111.9, $r^2=0.93$; cadaver - 63 to 97, $r^2=95$). Cronbach's alpha revealed scale items were consistent in measuring image quality for phantom and cadaver ($\alpha= 0.8$ to 0.9 ; acceptable $\alpha \geq 0.6$). Factor analysis was conducted to examine how many factors could be extracted. Redundant items were removed because they had low correlation (i.e. acceptable $r=0.2-0.4$) or introduced excessive amounts of error (i.e. $SD \geq 1.5$). A final scale of 24 items was produced. These items had a good inter-item correlation, ≥ 0.2 , and high factor loadings, ≥ 0.3 .

Conclusion: This study represents the first development and validation of a visual image quality scale based on Bandura's theory. The excellent correlation between scale scores and SNR values together with excellent item factor loadings suggests the scale will have value in clinical and research applications.

P006 Does a lower kVp improve visualisation of the trabecular pattern in an anterior-posterior hip projection?

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Rationale: A reduction in bone density is one of the reasons for the increase in incidence of hip fractures within the elderly. Recent studies have shown that for paediatric appendicular projections lowering the tube potential can improve visualisation of fine detail and trabecular pattern. The aim of this study was to assess if such an intervention can improve the visualisation of the trabecular pattern of the proximal femur.

Method: Anterior-posterior hip images were taken using an anthropomorphic pelvic phantom across a range of kVs (40-100). Three regions of trabecular interest were identified and these were scored by five observers against a reference image to evaluate any perceptual changes in trabecular pattern appearance. Regions of interest were also generated for each of the three areas in order to calculate signal-to-noise ratios.

Results: Perceptual changes were noted across a range of kVps. The image at 40kVp was classed as having the highest perceptual image quality for trabecular pattern across all three regions of interest.

Conclusion: Lower kVp may be an option for increasing the visualisation of trabecular patterns during hip radiography.

P007 Can the Genant semi-quantitative scale for vertebral fracture assessment be applied to cervical spine radiographs using CSPINE-CAD?

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Aims/objectives: To determine the accuracy and applicability of the Genant semi-quantitative scale in vertebral fracture classification in the cervical spine.

Content: 47 cervical spine radiographs were collected from patients aged 18 to 50 years. The radiographs were analysed from C3 to C7 using three different methods: CSPINE-CAD software Version 1.0 (two readers); ImageJ DICOM viewer measurements (one reader) and qualitative visual assessment (one reader) by a reporting radiographer. All readers were blinded to the results of the others during the study. Vertebral compression fractures were classified as mild, moderate and severe with classifications of biconcavity, wedge or crush using the Genant semi-quantitative scale. Data were analysed for percentage agreement in STATA V13.1.

Relevance/impact: The Genant semi-quantitative scale may be a useful measure for computer aided detection (CAD), but whilst the methodology is well-researched in thoracic and lumbar spine fractures, its use and accuracy has not been fully investigated in the c-spine.



Outcomes: Agreement between the two operators using CSPINE-CAD (version 1.0) ranged from 33 to 78%. Excluding the mild fracture category improved the agreement to 65 to 89%. All quantitative methods over-classified vertebrae as fractured when compared to visual assessment by the reporting radiographer.

Discussion: The Genant semi-quantitative scale results in an over-classification of c-spine vertebrae as having compression fractures. Agreement between readers using CSPINE-CAD and DICOM measurements were moderate to good. Adapted thresholds are required for quantitative assessment of the c-spine for CAD software development to improve the accuracy of compression fracture detection.

P008 Student radiographer perceptions of using CSPINE CAD software to assist cervical spine image interpretation and diagnosis

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Aim/objective: The aim of this study was to determine the perceptions of student radiographers of cervical spine (CSPINE) computer aided detection (CAD) software for the interpretation of cervical spine lateral radiographs.

Content: Second year medical imaging students were recruited (n=20) and shown 20 images both with and without CSPINE-CAD applied and asked them to rate their confidence on a scale of 1 - 10. Data were gathered using a survey following the image viewing.

Relevance/impact: The cervical spine is a highly flexible part of the spine which is particularly vulnerable to trauma with the potential for long term and life changing disabilities and degenerative change. Up to 20% of cervical spine injuries have a delayed or incorrect diagnosis. Misinterpretation of images is thought to account for 44% of missed cervical injuries.

Outcomes: Students felt more assured when using CPSINE-CAD software to interpret cervical spine X-rays with a 17.5% increase in their confidence level. All participants considered the software to be potentially useful and also felt similar software could be used for other anatomical areas, particularly thoracic and lumbar spines.

Discussion: The qualitative feedback demonstrated an overall positive response to the development of CSPINE-CAD and participants considered the software to be potentially useful; however, potential disadvantages were outlined such as distracting from the satisfaction of search. Further work is required to explore the impact on diagnostic accuracy from using the software.

P009 Are we united in where we stand - the administration of contrast in postoperative spine

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Imaging the post-operative Lumbar spine is challenging on most occasions, not only on the basis of different surgical approaches and techniques but also due to the varied appearances post surgery. Apart from interpreting the imaging, acquiring the appropriate images with the ideal MRI sequences remains a challenge. One of the commonly used sequences in imaging the post-operative spine involves acquiring images with Gadolinium. However, there seems to be quite a varied opinion about the use of Gadolinium particularly regarding the timing of these scans, i.e. duration post surgery.

We conducted a survey to obtain the opinion from various radiologists (neuroradiologists, musculoskeletal and other radiologists who report MRI spine) to highlight the differences that exist between and within them regarding the appropriate protocol for imaging the post-operative spine. Emphasis in particular has been given to the period post surgery when radiologists think Gadolinium enhanced images would be useful. A comprehensive review of literature of imaging the post-operative spine is also presented.



P010 A pictorial review of the appearances on magnetic resonance imaging of cervical spine injuries sustained in trauma

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Aim/objectives: Magnetic Resonance Imaging (MRI) is an increasingly common modality used in the assessment of cervical spine trauma. It adds important information about soft tissue injuries associated with bony injuries demonstrated on computed tomography (CT). The aim of this pictorial review is to provide an educational tool for the interpretation of MRI of the cervical spine by highlighting common pathologies, and to suggest a systematic approach to the interpretation of the imaging.

Content: We provide a pictorial review of common injuries seen on MRI cervical spine following trauma. For example, this will include anterior and posterior longitudinal ligamentous injury, disc disruption, epidural haematoma, cord contusion, interspinous ligament and ligamentum flavum injury.

Relevance/impact: This will be of use to radiologists, clinicians and any other member of the multi-disciplinary team involved in the assessment of the trauma patient. Recognition of soft tissue as well as bony cervical spine injuries is necessary in order to make decisions about the subsequent treatment.

Outcomes/discussion: Knowledge of the soft tissue injuries that can be sustained in cervical spine trauma and assessed by MRI is important for anyone involved in the patient's care. A systematic approach to MRI of the cervical spine will facilitate ease of recognition of injuries, and help ensure accuracy of reporting.

P011 MRI importance in early detection of musculoskeletal trauma: Occult injuries may be missed on standard trauma CT

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Aims/objectives: Pan CT is the first line investigation for assessing polytrauma patients including osseous and spinal injuries in United Kingdom. However, CT has its limitations to demonstrate some injury patterns, particularly soft-tissue injuries and bone oedema. In simpler trauma such as fall in elderly MRI, radiographically occult and undisplaced fractures may not be evident even on a CT scan. In this exhibit, we demonstrate greater sensitivity of MRI in context of trauma.

Content: We will explain the use and indications of MRI in acute trauma settings, recognize bone marrow edema and soft-tissue injuries and correlate these findings with other imaging modalities. The key issue is the ability of MRI to successfully detect not only the normal anatomy but also anatomic disruption caused by injury. Successful MR imaging of radiographically occult bone and soft-tissue injuries involving the spine, hip, knee, ankle, wrist (scaphoid), and elbow will be described.

Relevance/impact: Early diagnosis of these injuries can have significant impact on management especially occult fracture neck of femur, scaphoid or distal radial fractures, talar neck or knee injuries. Traumatic knee derangements may include fractures, osteochondral lesions, bone bruise, cruciate and collateral ligament lesions, and meniscal tears. Traumatic spinal injuries may include intramedullary or epidural hematomas, contusions, vertebral fractures, ligamentous disruption and herniated discs.

Outcomes: Early diagnosis by MRI has proved to be a cost-effective and reliable alternative.

Conclusion: MRI involves no radiation and provides increased diagnostic information in musculoskeletal trauma cases, when compared to standard CT.

P012 Traumatic destabilising elbow injuries: What not to miss - what a radiologist should comment upon!

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Introduction: Early identification of injuries that can lead to elbow instability is critical to guide appropriate management of destabilizing elbow trauma. Functional stabilization of the elbow is provided by three primary and



four secondary structural components eg ulnohumeral articulation, the anterior bundle of the MCL, and the LUCL (lateral ulnar collateral ligament). Disruption of the LUCL has been associated with posterolateral rotational injury (PLRI). The injury mechanism most commonly involves valgus and pronation stresses.

Aims and objectives: Our aim is to improve an understanding of the stabilizing osseous and ligamentous anatomy as well as pattern recognition that predispose to instability. Our goal is to recognize possible ligament injury or secondary signs of instability on X-rays and arranging prompt cross sectional imaging. We will emphasize the fracture or dislocation patterns of elbow injury that may result in instability and their associated mechanisms.

Presentation and imaging findings: We will demonstrate simple dislocation, PLRI, posteromedial rotatory instability, the “terrible triad,” Essex-Lopresti fracture-dislocation and the posterior Monteggia lesion etc discussing the features that impact treatment. We will illustrate the injuries through X-ray correlation with CT and MR imaging including MR arthrography.

Conclusion: We expect that radiologist will be better able to recognize and communicate the salient features of destabilizing elbow injuries to allow appropriate treatment planning. The evaluation of traumatic elbow injuries requires not only the radiographic detection of bone abnormalities but also the inference of potential associated secondary occult bone and soft-tissue injuries that could predispose for chronic joint instability.

P013 Funny fingers

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Aims/objectives: There are a number of unusual findings in the digits that are seen from time to time in the radiology and rheumatology departments.

Content: The cases include the following: terminal phalangeal sclerosis in rheumatoid arthritis, osteopoikylosis, bone island, osteoid osteoma, infection, sarcoid, dactylitis, BPOP, thyroid acropachy, thalassemia and congenital/normal variants.

Relevance/impact: Some of these anomalies may cause diagnostic confusion. We have created a teaching folder for reference to these and more common findings.

Outcomes: We will present a pictorial review.

Discussion: It is important for rheumatologists and radiologists to be aware of unusual pathological conditions and normal variants. An e-learning resource is helpful for this.

P014 A retrospective audit of GP plain film lumbar spine referrals

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A retrospective audit of 100 patients referred for lumbar spine radiography was undertaken. This was to determine whether GP's are referring patients for these radiographs in accordance with I-refer and to establish whether the current departmental protocols are in line with I-refer's recommendations. Clinical information was used to determine whether it was justified in accordance with I-refer. A radiologist aided in the decision making regarding which imaging path any unjustified patients should have undergone. The sample was also split into over and under 50 years. For patients under 50 years of age 68% of referrals were unjustified whereas 32% were justified. For patients over 50 years of age 62% were unjustified in comparison to 38% being justified.

Possible explanations for this set of results included local guidelines indicating radiography for non-specific lower back that has been ongoing for 6 weeks or more, as well as some GP resources advocating lumbar spine radiography for query OA. Patient pressure and the low availability of MRI are other considerations.

Departmental protocols for lumbar spine X-rays were reviewed and updated, to be on par with the I-refer guidance and to reduce the number of lumbar spine radiographs performed on patients under 55 for non-specific lower back pain. All GP lumbar spine referrals are vetted for their appropriateness by an experienced radiographer and



generalised staff training in vetting is to be rolled out soon. Local GP surgeries have also been informed of the changes to the referral criteria and are expected to adhere.

P016 MR lumbar spine and knee: Are our GPs referring appropriately?

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The Dudley Group NHS Trust

Aim: To assess appropriateness of GP-referred MRI lumbar spines and knees against published guidelines (iRefer) with a view towards resource optimization.

Relevance: Recent reports suggest "doctors were ideally placed to identify savings and minimise waste in the NHS" and "£200m could potentially be saved by reducing unnecessary scans".

Methods: Retrospective study (July–October 2013). 100 GP referrals each for MRI LS spine and knees included. Data compared against iRefer.

Outcomes: MR was used as the appropriate modality in 98% for lumbar spines. 61% had good correlation between imaging findings and clinical information provided. Large discrepancy was noted in referral patterns. Physiotherapist led centres had better requesting practice.

Only 64.2% MRI knees were appropriate investigations. In 31.6% the clinical details correlated with MRI findings. Of the 16 patients >65, 50% had prior X-ray confirmation of OA, therefore didn't need MRI to aid management. 13/16 (81%) had evidence of moderate or severe OA on MRI; hence MRI yielded no additional value.

Discussion: Whilst the MRI service was appropriately used for lumbar spine imaging, this expensive resource was overused for imaging knees in elderly population with increased reliance on MRI over X-rays. Although in younger patients (>65), most MRI knee referrals were appropriate, in older patients (>65) most scans were potentially avoidable. With the current financial constraints and the need to minimise resource wastage, clearer referral pathways for the elderly in current iRefer guidelines should be introduced. The role of cheaper X-rays as primary imaging modality for OA knees should be reiterated to the commissioners.

P017 Identification and numbering of lumbar vertebrae using various anatomical landmarks on MRI of lumbosacral spine

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Aims: Usefulness of anatomical landmarks in numbering of lumbosacral vertebrae in MR reporting and comparison of outcome results with the published literature.

Content: Prospective study looking at consecutive 100 unreported MRI of lumbosacral spine. These were reviewed by a radiology consultant and a radiology registrar. Five different anatomical landmarks were looked on each MRI scan; aortic bifurcation, origin of right and left renal arteries, conus medullaris, origin of iliolumbar ligament and confluence of inferior venacava.

Relevance: There is prevalence of lumbosacral transitional vertebrae in general population ranging anywhere from 4% to 30%. So it is more important to have an accurate numbering of the vertebral levels to avoid wrong level surgeries causing continued suffering to the patients and litigations to the hospitals.

Outcomes: Our study showed that aortic bifurcation at L4 level (80%) versus literature (83%). The origin of the iliolumbar ligament at L5 level (90%), versus literature (83%). Origin of right renal artery at L1 (54%) versus literature (L1/2 disc level 52%). No study were found in the literature looking at left renal artery origin, our study showed L1 level in 57%. There was variation in the level of conus medullaris and IVC confluence, in comparison with the published literature.

Discussion: The two most reliable landmarks in numbering the lumbar vertebrae in everyday practise in cases of lumbarisation or sacralisation or thoracic vertebral variability are aortic bifurcation and the origin of iliolumbar ligaments.

**P018 Recognising acute calcific tendonitis involving the gluteus maximus and adductor magnus insertion**

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Pictorial presentations of four cases of calcific tendonitis with osseous involvement occurring in the hip, in particular the gluteus maximus and adductor magnus.

Calcific tendonitis is a benign, self-limiting pathological process defined by calcium hydroxyapatite crystal deposition in tendons with an unknown aetiology. It occurs in up to 3% of adults, with a peak age of incidence between 30 and 50 years and a female predilection. Calcific tendonitis most commonly affects the shoulder, and in decreasing order of frequency, the hip, elbow, wrist and knee. The disease has three phases: phase 1 (pre-calcification); phase 2 (calcification) and phase 3 (post-calcification). Clinically, patients may be asymptomatic or present with pain, being most symptomatic in phase 2. Other non-specific symptoms include erythema, swelling, painful range of motion, and fever.

Calcific tendonitis is diagnosed when radiographs classically show amorphous calcifications in the soft tissues of the shoulder. However, with adjacent bone involvement on advanced imaging, this disease can be easily misdiagnosed as neoplasm or infection, leading to unnecessary intervention.

We present four cases of calcific tendonitis occurring in the hip, initially investigated for malignancy and infection based on conventional radiography.

Further imaging was necessary to diagnose calcific tendonitis. Where magnetic resonance imaging was equivocal, computed tomography helped to define the soft-tissue calcification and cortical erosion. Our findings reiterate that calcific tendonitis can be safely diagnosed when intratendinous calcification is observed in the region of the linea aspera with cortical erosion or periosteal reaction but no discrete soft tissue mass.

P019 An audit of radiological diagnostic accuracy of rotator cuff tears

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The aim was to determine the diagnostic accuracy of departmental US, MR and MRA for rotator cuff tears, by comparing radiological findings with subsequent arthroscopy. The radiological accuracy was compared with the standard set in the 2013 Cochrane systematic review. All 142 departmental scans of the shoulder for 6 weeks from 1st January 2014 were included in the retrospective audit, of these 30 resulted in subsequent arthroscopy.

In 63% the radiological and surgical findings agreed. MR showed a diagnostic accuracy of 82%, MRA 80%. Sensitivity for both modalities was 100%, and specificity 79% for MR and 100% for MRA. The US diagnostic accuracy was 43%, with a sensitivity and specificity of 57% and 71% respectively.

In comparison with the Cochrane meta-analysis the MRA and MRI showed superior sensitivity and specificity; however the accuracy for US was significantly worse, with a difference of 34% for sensitivity and 14% for specificity. Causes for this could include a small sample size and operator inexperience. There was an inbuilt audit bias due to the orthopaedic department often performing their own US, whose results were not included as this would have prevented an accurate audit of our own performance. However there is likely a difference in clinical presentation between the two patient groups, which could have impacted the results.

In order to improve performance, the findings were presented at the local clinical governance meeting, a shoulder US reporting proforma was created, and retraining was provided to US practitioners. A re-audit will evaluate the affect of these measures.

P020 Peritalar fractures: A pictorial review of these subtle foot fractures we don't want to miss

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Aims/objectives: Peritalar fracture and dislocation is a potentially devastating injury in which the complications range from chronic pain to subtalar arthritis to talar avascular necrosis. Because of the complex anatomy of the foot, rarity of fractures of the foot, and subtle radiographic findings, and low incidence limit familiarity, foot injuries are commonly overlooked and mis/undiagnosed. Peritalar dislocation represents 1.5% of all traumatic dislocations and 15% of talar injuries.

Content: This pictorial review will present an organized, detailed review of the normal anatomy of the peritalar region with conventional radiography and CT imaging. A review of the associated mechanisms of injury along with treatment will be discussed. These peritalar fractures will be presented: peritalar injuries (talus, calcaneal, navicular, and cuboid fractures as well as subtalar, calcaneocuboid, and talonavicular joint dislocations), transverse tarsal (Chopart) joint injury, talar dome injury, lateral and posterior talar process fractures, and occult calcaneal fracture variants.

Relevance/impact: Because of the effect on hindfoot kinematics, missed or delayed diagnosis of peritalar injuries often results in impairment. If the diagnosis is delayed, salvage arthrodesis may be necessary to restore function to the extremity.

Outcomes: Prompt and accurate diagnosis of peritalar injuries may improve long-term outcomes.

Discussion: Recognizing peritalar fractures provides the radiologist the opportunity in making accurate diagnosis and management. Knowledge of these fractures and injury patterns prevents future misses. Targeted signs and findings that support the presence of these fractures will be described. The importance and necessity of CT for prompt diagnosis will be emphasized.

P021 Audit of emergency department ankle X-ray requests: Can we improve compliance with Ottawa rules and how useful are they?

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Aims: To assess Emergency Department (ED) requests for ankle radiographs against Ottawa rules which are the basis of Royal College of Radiologists guidelines. Then re-evaluate following intervention to investigate any change in compliance and subsequent number of positive investigations.

Content: Complete audit cycle retrospectively reviewing data from a single NHS Trust hospital that is a regional trauma centre where ankle radiographs are requested in ED by Doctors, Extended Scope Practitioners and Triage Nurses. Target compliance 100%. Educational intervention involved dissemination of an Ottawa rules algorithm amongst ED practitioners and departmental meeting discussion.

Relevance: Ankle trauma is a common presentation to ED. Although radiographs are requested in most cases, less than 15% being positive for fracture prompted development of the 1992 Ottawa rules.

Outcomes: Cycle 1: 68%(68/100) request forms met standards. 10%(7/68) that met standards and 46%(15/32) that did not (totalling 22) were reported as positive. Cycle 2: 82%(82/100) request forms met standards. 15%(12/82) that met standards and 50%(9/18) that did not (totalling 21) were reported as positive.

Discussion: We highlighted a need to increase ED practitioners' compliance with Ottawa rules. Our intervention was somewhat successful in achieving this. However, the proportion of positive investigations remained similar overall and in both cycles was higher in requests that did not meet standards. More research is needed to evaluate the value of Ottawa rules.

P022 Metal artefact reduction sequences in MR imaging of orthopaedic implants

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Objective: To discuss the cause of metal artefacts around orthopaedic implants in magnetic resonance (MR) imaging and review conventional methods of metal artefact reduction as well as the dedicated multispectral metal artefact reduction sequences available.

Content: Metallic orthopaedic implants can result in severe degradation of MRI images because ferromagnetic susceptibility causes signal loss, signal pile up, failed fat suppression and geometric distortion. Several methods can be employed to try and reduce these susceptibility artefacts. Fast spin echo techniques can be adjusted by modifying echo times, matrix, receiver bandwidth, slice thickness and echo train to minimize frequency encoding misregistration. Short tau inversion recovery and Dixon techniques are more resistant to susceptibility artefact than spectral fat suppression. Dedicated metal artefact reduction sequences are also available in which frequency encoding misregistration is controlled using a variety of techniques including specific resonant frequency acquisition, view-angle tilting and phase encoding.

Relevance: Imaging around metal implants has been essential to understanding the severity and prognosis of adverse reaction to metal debris in metal on metal hip replacements. Conventional radiography is often normal or demonstrates minimal change and is unable to demonstrate the often extensive soft tissue pathology such as necrosis, soft tissue masses, fluid collections, muscle atrophy, tendon avulsions and osteonecrosis. Due to poor correlation of MRI findings and clinical and serological measures of disease MR imaging is the principal tool for the diagnosis and surveillance.

Outcome: To provide a learning tool and update on conventional and multispectral techniques for optimum MR imaging around orthopaedic implants.

P023 The 'moustache sign': An extremely rare radiological sign of ankylosing spondylitis

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Ankylosing spondylitis (AS) is a chronic inflammatory seronegative arthritis affecting the axial skeleton, particularly the sacroiliac and spinal-facet joints and the paravertebral tissues. The radiographic features of AS are diverse and may be seen by plain radiograph (XR), computed tomography (CT) and magnetic resonance imaging (MRI). The 'moustache sign' is one such radiographic feature of AS found on thoracic MRI that has been reported by Behari et al.¹ The 'moustache sign' represents intervertebral disc desiccation, fibrosis and panligamentous ossification at a focal intervertebral level. This sign seems to be very rare with only two reported cases ever documented.

Materials/methods: We reviewed all (n=2096) thoracic MRIs performed in our institution from January 2000 until September 2012. We also used HIPE to identify all patients admitted to our institution over 10 years with diagnosis of AS (n=136) and reviewed their radiology.

Results: Out of the 2096 thoracic MRIs that we reviewed, we did not find any that demonstrated the 'moustache sign'. We reviewed the radiology records of 136 patients admitted with AS. Only 40 of 136 had thoracic MRIs done: none of which demonstrated the 'moustache sign'.

Discussion: The 'moustache sign' is extremely rare. From our review of 2096 thoracic MRIs, we did not find any evidence of such a sign. Out of 136 patients with AS presenting to our institution over twelve years, most AS patients did not require a thoracic MRI. There are only two documented cases of it to date.

1. Behari S, Tungeria A, Jaiswal AK, Jain VK. The "moustache" sign: localized intervertebral disc fibrosis panligamentous ossification in ankylosing spondylitis with kyphosis. *NeuroIndia*. 2010 Sep-Oct;58(5):764-7.

P024 Fibrodysplasia Ossificans Progressiva - a rare genetic disorder of extra-skeletal bone formation

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Introduction: Fibrodysplasia Ossificans Progressiva (FOP), known as Myositis Ossificans Progressiva, Münchmeyer's disease or "Stone Man Syndrome", affects 1 in 2 million people worldwide. In the UK there are 45 known cases. FOP



is a disabling genetic disorder that affects muscles, tendons, ligaments and connective tissues to form/calcify into bone progressively, restricting movement (ifopa, 2009; Kriegbaum and Hillerup, 2013; fopaction, 2014).

Aim: The aim of this poster is to use a case profile approach to inform radiographers about this condition.

Discussion: Frequently, radiographers are the first point of contact with the patients visiting an NHS Trust for the first time. Children who have FOP, typically appear normal at birth. However, it is characterized by the congenital malformation of the great toes, thumbs or both (Kaplan, Chakkalakal and Shore, 2012; Kriegbaum and Hillerup, 2013). During the first decade of life, the children present sporadic episodes of painful soft tissue swellings and bone growth which are commonly mistaken for tumours. Biopsies or surgical attempts to remove the bone, result in more robust bone growth leading to severe disability, pulmonary complications and premature death by the age 50-60 years (Pignolo et al., 2011; Kriegbaum and Hillerup, 2013). There is no known cure for FOP and it is usually misdiagnosed, which could lead to a great deal of pain and suffering for the patients and their families. Increased awareness of this condition would enhance patient care and ensure that a more informed form of treatment can be given in the case of trauma or surgery.

Clinical: Head and neck

P025 Imaging of masses behind the eardrum

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Aims: To discuss the imaging of masses behind the eardrum and give illustrative examples of important differentials.

Content: This is a challenging diagnostic area for the Radiologist. Differentials for masses behind the eardrum include Glomus tumours, Cholesteatomas, invasive head and neck cancers of the middle ear cleft and anatomical variants. Using these examples we will discuss a range of imaging protocols that can be used for investigation of such masses including unenhanced CT scans and contrast enhanced MRI scans. From this, we will then go onto present a protocol for the investigation of middle ear masses.

Relevance: This poster condenses the range of differentials as well as the important aspects of anatomical variants that should be considered by the Clinical Radiologist.

Outcomes: From the discussion and exploration of imaging of masses behind the eardrum we will then go onto to present a protocol for the investigation of such masses.

Discussions: The Clinical Radiologist is often referred patients for investigation who have a mass behind the eardrum. Sometimes this is described as either a reddish blue mass or occasionally a pearly white mass. These masses have a number of differentials ranging from normal variants and benign disease to the more serious malignant pathology. Thus the reporting Clinical Radiologist must have a good understanding of the sorts of pathology that can arise in the area so that the most appropriate imaging modalities can be selected to discern the more serious pathology from the benign.

P026 Assessment of the orthopantogram and common positioning errors

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The orthopantogram is currently the most commonly performed extra oral examination. It provides a panoramic overview of the teeth and their supporting structures in a single image, allowing assessment of dental disease, teeth abnormality, trauma and treatment workup.

The development of this technique has resulted in vast improvements in image quality with decreased exposure to radiation and at a low cost. The quality of this examination relies upon the accurate positioning of the patients teeth