Conclusion: The increase in ball-bearing diameter suggests that paddle movement can be identified on mammography images. Increase in diameter can be used as an indicator of movement severity.

P-163 **Development of personalised paediatric femora model using CT**

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Objectives: Children younger than three years old are most likely to experience inflicted injuries. Current diagnosis is heavily dependent on clinicians' experience and lacks objective measurements. Individualised biomechanical models could be used to identify when the carers' narrative of the accident is physically incompatible with observed fracture. The first step towards this ambitious goal is to verify the feasibility to generate accurate biomechanical models from medical imaging data of very young children.

Methods: Ten QCT scans were performed as part of post-mortem examination of children (0-3 years) using a GE Lightspeed 64-slice CT scanner. The scans were segmented to create finite element models of the right femora. The stiffness (Young's modulus) of femur was estimated based on measured Hounsfield units using a well-established densitometric calibration protocol. Each model was subjected to a series of four-point bending simulations, representing various directions of impact perpendicular to the shaft.

Results: The cross-section of the femur at mid-shaft became elongated in the anteroposterior direction for older children. The mature cortical bone was present at a very early age. The load to fracture as predicted by the biomechanical model varied with age.

Conclusions: This preliminary study showed that the current approach was appropriate and capable of distinguishing effects of loading, mechanical properties and geometry. Both the length and diameter of the femur increase with age, while the stiffness becomes more differentiated. The model will be further developed to simulate loading scenarios during inflicted injury to help identify injury characteristics in suspected abuse.

Current and emerging techniques

P-164 **Diffusion weighting in abdominal imaging - a problem solving tool**

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Diffusion imaging is a valuable tool in diagnostic magnetic resonance imaging. It is an established and well recognised technique, however is often under utilized in the investigation and diagnosis of abdominal pelvic disease.

The strength of diffusion imaging lies in its sensitivity and ability to detect inconspicuous lesions, but challenges occur in its interpretation due to susceptibility to artefact when acquiring different diffusion sequences

Diffusion imaging is often invaluable in the detection and characterisation of lesions, especially when evaluated in conjunction with standard abdominal MRI sequences. Occasionally it can prove the sole component of the study that determines clinical outcome.

We present a pictorial review to demonstrate the technical aspects of diffusion in abdominal imaging. Emphasis will be made on clinical cases such as cancer staging, which demonstrate its value in lesion detection and characterisation as well as the common pitfalls.

P-165 **Peninsula Trauma Centre: Our experience of imaging of pelvic fractures with emphasis on review of anatomy, classification systems and associated injuries**

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Introduction: We come across a large amount of pelvic trauma as we are now the major trauma centres in the West Country and are called 'Peninsula Trauma Centre'. We see a significant volume of trauma in Southwest of England associated with Motorcross, horse-riding and surfing.

Objectives: We perform a Pan-trauma CT, for all the patients, who qualify the trauma criteria. The radiologist plays a significantly important role in making an accurate and quick diagnosis. The anatomy of the pelvic ring is quite complex and it is important to understand the mechanisms of injury that lead to disruption of the ring.

Methods and materials: CT is the mainstay of imaging for the initial assessment of pelvic trauma. The commonly associated injuries such as Malgaigne fracture cannot be emphasized enough. Optimizing imaging techniques may help in making a quick and accurate diagnosis, in communicating the findings to the trauma team, and in surgical planning.

Discussion: This presentation will review anatomy of the pelvis with illustrations, radiographs, and CT images and the current major classification systems. We discuss pelvic imaging modalities with emphasis on the use of coronal and sagittal reformats. Associated injuries and complications such as urogenital and vascular injuries will also be addressed.

Conclusion: It is important that the radiologist makes a timely and accurate diagnosis in cases of major pelvic trauma. Using the versatility of the current CT scanners and advanced softwares help in detection of subtle fractures and associated injuries.

P-166 **Increasing SID for AP pelvis imaging - impact on radiation dose and image quality**

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Aim: Determine whether increasing source to image distance (SID), with and without the use of automatic exposure control (AEC) for antero-posterior (AP) pelvis imaging, reduces dose whilst still producing an image of diagnostic quality.

Methods: Using a computed radiography (CR) system, an anthropomorphic pelvic phantom was positioned for an AP examination using the table bucky. SID was initially set at 110cm, with tube potential set at a constant 75kVp, with two outer chambers selected and a fine focal spot of 0.6mm. SID was then varied from 90cm to 140cm with two exposures made at each 5cm interval, one using the AEC and another with a constant 16mAs derived from the initial exposure. Effective dose (E) and entrance surface dose (ESD) were calculated for each acquisition. Seven experienced observers blindly graded image quality using a 5-point Likert scale and 2 Alternative Forced Choice software. Signal-to-Noise Ratio (SNR) was calculated for comparison. For each acquisition, femoral head diameter was also measured for magnification indication.

Results: Results demonstrated that when increasing SID from 110cm to 140cm, both E and ESD reduced by 3.7% and 17.3% respectively when using AEC and 50.13% and 41.79% respectively, when the constant mAs was used. No significant statistical difference (p= 0.967) between image quality was detected when increasing SID, with an intra-observer correlation of 0.77 (95% confidence level). SNR reduced slightly with increasing SID.

Conclusion: For CR, increasing SID significantly reduces both E and ESD for AP pelvis imaging without adversely affecting image quality.

P-167 **Cone beam CT for upper and lower limbs: Scanning techniques**

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Introduction: CBCT scanners have long been associated with head and dental applications. The NewTom 5G is the first horizontal CBCT scanner in theUKto produce CBCT scans of limbs. This paper explains the imaging protocols and the associated positioning challenges for limb scans.

Materials/methods: The development of positioning and scanning protocols was done with a full-size skeleton. The various fields of view were investigated by repeated exposures of the skeleton limbs. Scans on feet, ankles, knees, hands, wrists and elbows were performed with the patient comfort and physical ability in mind. Lying down and seated positions were investigated. For the fore limbs, patient's entry in the scanner was investigated from either side of the gantry.

Results: With fields of view as small as 6cm x 6cm and a great versatility for patient positioning, it is a challenging scenario to visualise the limb anatomy in complete cranial, caudal, supine and prone positions (e.g. the hand or elbow being placed out-stretched from either side of gantry), instruct the patient and control the chosen position.

Conclusion: The NewTom 5G has various FOV selections with options for Hi-Res or Standard-Res scan and Regular or Booster dose. These combinations offer a higher range of scan options to show bony structures in the body. The radiographer should be aware to show caution in the initial set-up with the patient orientation and show consideration to patient physical ability and dose when selecting the best option for the requested CBCT scan.

P-168 **Dual energy computed tomography in tophaceous gout - an old disease with a new perspective**

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The aim of this review is to describe the physics related to Dual energy computer tomography (DECT) and its relevance to gout diagnosis, monitoring, and prediction of outcome.

DECT characterizes the chemical composition of material according to its differential x-ray attenuation at two different energy levels(80 and 140 kVp). DECT scans were performed on 8 patients over a 12 month period, with clinical diagnosis of gout using a renal stone colour-coding protocol that specifically assessed the chemical composition of the material (ie, urate coloured in red, calcium coloured in blue). Here we review the analysis and outcomes of these patients.

Clinical diagnosis of gout is difficult and definite diagnosis with positive urate crystal aspiration often is made late in the disease process. DECT is a relative new non-invasive imaging modality that is able to distinguish urate crystals from calcium in soft tissue and synovial fluid. Going forward DECT imaging could also provide outcome measures, such as change in tophus volume, for monitoring the response to urate-lowering therapy and this is an important application in the clinical trial setting.

P-169 **Evaluation of carbon fibre for use in MRI radiotherapy treatment planning**

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It has been established that co-registration of pre-treatment MR and CT images is an effective method of gaining improved tumour target definition alongside geometric accuracy and electron density. Patient position must be replicated throughout planning scans to achieve successful co-registration.

Carbon fibre is the material of choice for couch tops and accessories used in contemporary radiotherapy treatment and planning, due to its high tensile strength, rigidity, low radiation beam attenuation and lightweight properties. As carbon fibre couch tops are readily available and already in general use in radiotherapy departments, incorporating them into the MRI planning process would be a cost effective and convenient method of reproducing patient position. However, there is little evidence available to determine the compatibility of carbon fibre couch tops and accessories for use in MRI.

The aim of this experiment was to establish whether carbon fibre is a suitable material to manufacture flat top couches for MRI radiotherapy planning scans.

Clinical: Nuclear medicine