SHORT PAPER SESSION M2

M2.1 Comparison of image quality between photon counting and energy integrating CT for Prostate Artery Embolisation (PAE) planning with detectability index (d')

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Background

Prostate artery embolisation (PAE) is one of the preferred treatments for benign prostate hyperplasia and can be planned with pre-procedural CT angiography. The small size, location and variability of the prostatic vascular anatomy (PVA) and typical comorbidities of patients undergoing PAE present significant challenges for conventional energy integrating CT (EI-CT) scanners. Our centre began directing patients to a novel photon-counting CT (PC-CT) scanner for PAE planning as its technical specifications indicated it should be particularly well suited for the task1. Our study aimed to assess whether this is the case by comparing image quality (IQ) for each system.

Method

IQ was assessed using detectability index (d'), a task-based, repeatable and clinically relevant metric for IQ. We chose to model d' for depiction of contrast enhanced arteries 0.5-3.0 mm in diameter, with the average diameter of the prostatic artery (PA) being 0.5-1.5 mm. A Mercury 4.0 phantom comprising of 5 sections of varying diameter, with each containing a uniform section and a 10 mg ml-1 iodine insert, was measured for noise-power spectrum and task-specific resolution, respectively.

Results

The PC-CT consistently outperformed the EI-CT under the most difficult imaging conditions, i.e., for the smallest blood vessel diameters in the largest WEDs, while delivering a lower patient dose.

Conclusion

Our findings indicate that the PC-CT outperforms EI-CT in depicting contrast enhanced blood vessels overall under clinically representative conditions. The EI-CT appeared to have been technically limited while the PC-CT demonstrated significant potential for further optimisation without additional dose.

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M2.2 Anthropomorphic bone phantoms for simulating osteoporosis

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Background

Osteoporosis-related fractures (ORF) are rising globally due to ageing populations [1, 2]. Revolutionary scanners such as digital-tomosynthesis (DT), aim to enable early diagnosis and intervention, but validation remains challenging due to the need for diverse disease states. High-fidelity phantoms replicate trabecular architecture and disease progression are essential. This study presents an anthropomorphic bone phantom framework with controllable trabecular structure and bone mineral density (BMD), reducing reliance on cadaveric tissues and animal models while simulating varying fracture risks.

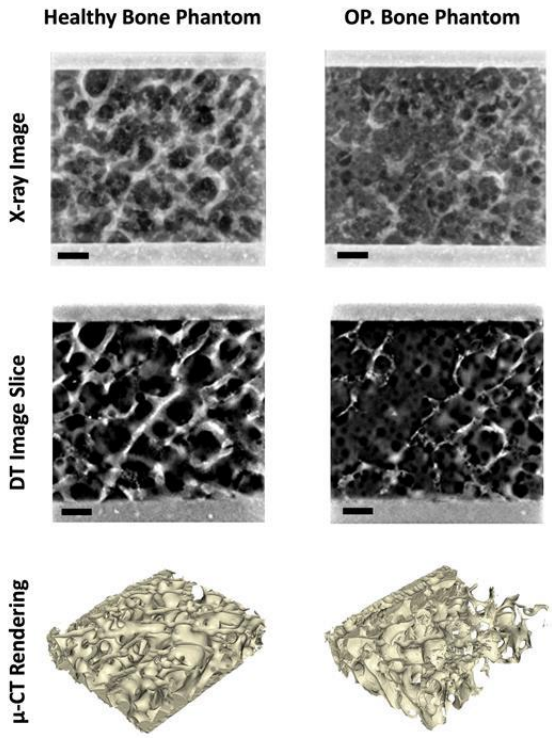
Method

Barium sulphate (BaSO4) powder pre-coated with Polyvinylpyrrolidone (PVP) was mixed with Epofix resin to create a radiopaque material. The of BaSO4 concentration was calibrated to match patient BMD data. PVP coating prevented powder precipitation during resin curing. A µ-CT scan of a lamb hip was segmented to generate a trabecular bone model, which was digitally modified to simulate various health conditions, including osteoporosis (OP). The bone marrow cavity was 3D printed by high-resolution SLA to create a mould for the phantom, which was then filled with BaSO4-infused resin.

Results

The anthropomorphic bone phantoms, representing healthy and OP trabecular structures, were evaluated using 2D X-ray, and 3D µ-CT and DT. All imaging modalities effectively differentiated cortical and trabecular bone. X-ray images showed the OP phantom had lower grayscale values, while µ-CT and DT captured morphological changes across different health conditions.

Conclusion
The developed phantoms provide realistic trabecular structures and are compatible with X-ray, µ-CT, and DT systems. This approach may accelerate 3D-based precision diagnostics and reduce reliance on extensive clinical data.



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M2.3 The relevance of incidental sonographic findings undergoing investigations for postmenopausal bleeding

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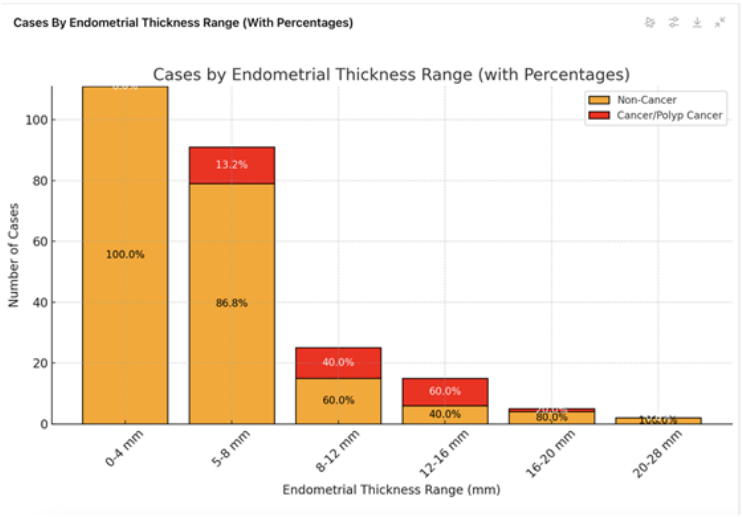
Background
Postmenopausal bleeding (PMB) is a key indicator of endometrial cancer. An endometrial thickness (ET) ≤4 mm has a >99% negative predictive value for malignancy.
Renal ultrasound (US) & other sonographic pelvic pathology assessments are frequently included, adding further pressure to under sourced healthcare services. The clinical significance of these additional assessments remains unclear. This study evaluates the relevance of unexpected renal & pelvic pathology in PMB investigations.
Method
A retrospective review off 300 consecutive patients underwent US for PMB between January & May 2023. Data included age, ET, pelvic & renal pathology, hysteroscopy results, HRT use, & histology-proven malignancies
Results
The mean age was 59 years (43-96). 7 samples were reported as Cancer or metaplasia with atypia. 112 cases had an endometrial thickness>5mm, no cancer cases detected with ET<4. 104 (34.6%) had hysteroscopy. 15 patients had renal pathology (6 AML and the rest were benign pathologies). There were no ovarian malignancies and the majority were benign pathologies.
Logistic regression analysis of the results didn't show an association between the presence of pelvic or renal pathology & cancer/polyp cancer.
Conclusion
The study confirms adherence to NICE and ROG current guidelines for PMB investigations in our unit. However, no correlation found between incidental pelvic or renal pathology findings & cancer, suggesting routine screening assessment of these findings may be irrelevant. Streamlining more targeted imaging protocols could reduce unnecessary investigations & optimise resource allocation.

Table



M2.4 Optimising primary care referrals for groin ultrasound: a quality improvement project

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Background

There is limited evidence for use of ultrasound in diagnosing groin hernias, with minimal impact on surgical decision-making. However, increasing numbers of unnecessary ultrasound for groin hernia diagnosis are being performed at our institution. This study aimed to reduce unnecessary scans and associated costs and streamline referral pathways to enhance patient outcomes.

Method

A retrospective analysis was performed on patients over 16 years of age who underwent groin ultrasounds between January and June 2024 at a tertiary centre, with referrals originating from primary care. Data collected included patient demographics, referral indications, and study outcomes. Bilateral groin examinations were considered as a single study.

Results

A total of 2104 patients were included in the study. The mean age was 55.5 years, of whom 77.2% were male. Among all referrals, 53.8%(1133/2104) were solely for suspected hernia, representing inappropriate requests. Of these, 62% (702/1133) confirmed the presence of a hernia, while 35.5%(402/1133) were negative for hernia. 8.7%(184/2104) of all referrals lacked a clear clinical question. Postoperative referrals constituted 17.3%(365/2104) of all studies, while musculoskeletal causes were suspected in 0.3%(7/2104) of cases. A malignant soft tissue mass was detected in 0.9%(19/2104) of cases.

Conclusion

The majority of groin ultrasound were found to be unnecessary, resulting in inefficiencies and increased costs. Following this review, the institution has collaborated with surgical and primary care teams to revise guidelines and streamline referral processes. The improved pathway has been updated on the institution's intranet. Additionally, targeted educational newsletter and sessions will be delivered to primary care clinicians.

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M2.5 Can we cap gadolinium doses for paediatric MRI examinations without compromising quality?

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Background

Although macrocyclic gadolinium based contrast agents (GBCAs) are generally regarded as safe, concern has grown regarding deposition within the brain, particularly for repeated doses.1,2 Environmental impact of GBCA manufacture and water pollution following use is also alarming.3,4 Following reports that diagnostic enhancement can be achieved with a maximum dose of 10mls gadoterate meglumine in children (regardless of patient size), this study examined if a capped dose of 10mls provided sufficient enhancement for a range of MRI examinations.

Methodology

86 consecutive MRI examinations in patients weighing >50kg were performed with a 10ml dose (instead of the previous 0.5ml/kg regimen). Examinations were independently reviewed by two consultant paediatric radiologists to determine quality of enhancement. Prior uncapped examinations (if available) were also reviewed.

Results

Examinations covered all body regions in a variety of indications (oncology, rheumatology, infection etc). Enhancement was judged diagnostic quality for all 86 examinations by both reviewers. 56 patients had previous uncapped examinations: in 43 enhancement was deemed equal; in 6 the higher (uncapped) dose was considered superior; in 7 the lower (uncapped) dose was considered superior. For these 86 patients a total of 265.4ml GBCA was saved.

Conclusion

Capping paediatric doses of GBCA at 10ml does not appear to compromise scan quality and has been implemented locally since this study was conducted. However, MSK colleagues have queried this dose modification for synovitis studies - subgroup analysis is being undertaken at the time of submission.

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M2.6 DULLNESS and MELUCCI; An evidence-based approach to liver lesions in oncology surveillance imaging

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Aims

Since moving to a 3T scanner in 2021, increasing numbers of indeterminate liver lesions have been detected in oncology surveillance scans, causing dilemmas at our local oncology MDTM. Combining local experience with a literature review, we developed an evidence-based pathway in which unnecessary imaging and biopsies were minimised.

Method and Materials

Literature search for evidence regarding liver lesions in post treatment paediatric cancer patients yielded 6456 titles for review. 31 items were downloaded for further analysis.

Results

Benign liver lesions (typically FNH or “FNH like” lesions) are well described in paediatric patients following oncology treatment, particularly following high dose, multi agent or platinum based chemotherapy, and in neuroblastoma patients. Variability in appearance is described in the literature, so we deemed making a firm diagnosis less important than excluding features suggestive of malignancy. The labels DULLNESS (“Doubtful or Uncertain Liver Lesion Not Enlarging on Serial Scans”) and MELUCCI (“Modestly Enlarging Lesion Unaccompanied by Concerning Characteristics on Imaging”) were coined to describe two common scenarios in which additional imaging or biopsy was considered unnecessary. Reported red flag features requiring consideration of biopsy or short interval repeat scan include indeterminate imaging features, rapidly increasing lesion size, increasing multiplicity and short interval between initial malignancy diagnosis or end of treatment and lesion development.

Conclusion

We present an evidence-based flowchart to guide imaging and management of liver lesions detected during paediatric oncology surveillance. MDT discussion remains central to the decision making process, but awareness of commonly occurring benign lesions may help avoid unnecessary biopsy.

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