Proffered papers: Clinical

A5.1   The T1 Ratio Of Marrow (TROM) as a novel tool to identify metastatic from non- malignant marrow lesions of the spine : A pilot study

Neha Nischal[1]; Mahtabossadat Afzali Hosseini[2]; Parham Shojaie[2]; Christine Azzopardi[1]; Karthikeyan P Iyengar[3]; Shahnawaz Haleem[4]; Jonathan Stevenson[5]; Rajesh Botchu[1]

[1]Department of Musculoskeletal Radiology, Royal Orthopedic Hospital, Birmingham, UK; [2]Aston Medical School, Aston University, Birmingham, UK; [3]Department of Orthopedics, Southport and Ormskirk Hospital, Southport, UK; [4]Department of Spine Surgery, Royal Orthopedic Hospital, Birmingham, UK; [5]Department of Orthopedic Oncology, Royal Orthopedic Hospital, Birmingham, UK

Objective: The purpose of this study was to analyse quantitative values of normal and abnormal marrow on T1-W images of spine, to propose a ratio for T1 values of abnormal to normal vertebrae and to assess whether this ratio could be helpful in predicting presence of neoplastic lesions in the spine.

Material: 100 randomly selected MRI of lumbar spine without infection, fracture and tumour were selected to form normal cohort. A second cohort of 100 metastasis of lumbar spine was identified. Ratio of T1 value of vertebral body to the T1 value of the inferior vertebral body was performed for normal cohort from T11 to L5. Ratio of T1 value of metastasis to adjacent normal vertebral body was done for metastatic cohort. Data was analysed using standard t-test and kappa was performed for intra and inter observer reliability.

Results: A decline in T1 value of abnormal to normal marrow was seen in patients with metastasis which was statistically significant. We call this the T1 Ratio Of Marrow (TROM). The sensitivity and accuracy with the cut-off value of TROM at 0.7 (92% sensitivity, 97.1% accuracy) is better than at 0.6 (75% sensitivity, 96.2% accuracy) or 0.5 (47% sensitivity, 93.2% accuracy). However lower TROM values are more specific to differentiate benign lesions such as atypical hemangiomas from metastasis.

Conclusion: Using TROM on T1-weighted images can help increase sensitivity and confidence in differentiating neoplastic from non-neoplastic lesions of the spine without the need for additional advanced sequences.

A5.2   Composite dicom image for measurement of angle of femoral version and tibial torsion

Bahman Kasmai; Samantha Low; Geeta Kapoor; Martin Doddington

Norfolk & Norwich University Hospitals NHS Trust

Background: Measurement of tibial torsion and femoral version angles can aid in determining the extent of torsional deformity and help in decision-making including the need for de-rotational osteotomy. The use of colour composite overlayed images, produced by merging of multiple CT slices, provides a convenient and efficient method for measuring the angles of torsional deformities.

Method: A software application was developed using Python programming language1 and PyDicom2 and OpenCV3 libraries to produce composite colour images for angle measurements. The slice and series number are noted for right and left femoral versions, and right and left tibial torsions using PACS reporting software. The Dicom study is exported to a local disk drive or send direct to PACS for reporting or use by referring consultant. The Dicom header of composite images are created using the information from the input CT image data, allowing for automated merging with the original CT study upon export to PACS.

Results: The composite images are exported direct to PACS using Dicom services or shared via file sharing services with the requesting orthopaedic consultants. As the Dicom header for the composite images are derived from the original input CT slices they are merged with the main study without any intervention by PACs administrators. An angle measurements tools is provided in addition to those provided by the PACS reporting software.

Conclusion: A dedicated software application provides a convenient and efficient way to measure torsional deformities by overlaying axial CT images to create composite images for export to PACS.

1. Van Rossum, G., & Drake, F. L. (2009). Python 3 Reference Manual. Scotts Valley, CA: CreateSpace. 2. Mason, D. (2011). SU-E-T-33: pydicom: an open source DICOM library. Medical Physics, 38(6Part10), 3493-3493 3. Bradski, G. (2000). The OpenCV Library. Dr. Dobb's Journal of Software Tools.

A5.3 Clinical investigation of a novel ceramic hip resurfacing using radiostereometry

Clare Moody[1]; Martin Downing[2]; James Holland[1]

[1]Newcastle Hospitals NHS Trust; [2]Downing Imaging Limited

Introduction: Radiostereometric analysis (RSA) is a proven imaging method assessing implant stability and survival. As part of an MHRA-approved clinical investigation of the ReCerf Hip Resurfacing Arthroplasty (MatOrtho Ltd., UK), implant stability will be assessed in a subgroup of patients. To ensure high-quality RSA imaging, surgeons and radiographers rehearsed using a cadaver and phantoms. For statistical validation, RSA precision under repeatability conditions was assessed to determine measurement sufficiency of axial subsidence.

Materials and Methods: ReCerf implantation and rehearsal of marker insertion was carried out on a cadaver. Ten one-millimetre tantalum markers were placed into the pelvic and femoral bone near to the implant. RSA imaging was performed in a routine radiography room using a mobile unit for the second x-ray source. For the phantom, resurfacing implants were fixed to sawbones secured to a perspex base. The phantom was imaged 25 times under typical radiographic variability conditions with up to 10cm translation and 15-degree rotation in any axis between image exams. Precision at 95% confidence of migration was calculated using model-based RSA software (Downing Imaging Ltd., UK).

Results: Good marker insertion patterns were achieved in the cadaver. RSA cadaver imaging determined guide limits of x-ray exposure for sufficient image quality. Precision of axial migration was 0.09mm and 0.08mm for the cup and stem.

Conclusions/Discussion: Using onsite precision assessment and modified routine radiographic practice, high-quality RSA imaging can be performed in our centre. Our CAD model-based RSA method was validated capable of providing sufficiently precise axial migration measurements to assess implant stability. Patient imaging has now successfully commenced.

1. Pijls, B.G., Nieuwenhuijse, M.J., Fiocco, M., Plevier, J.W., Middeldorp, S., Nelissen, R.G. and Valstar, E.R., 2012. Early proximal migration of cups is associated with late revision in THA: a systematic review and meta-analysis of 26 RSA studies and 49 survival studies. Acta orthopaedica, 83(6), pp.583-591. 2. Valstar, E.R., Gill, R., Ryd, L., Flivik, G., Börlin, N. and Kärrholm, J., 2005. Guidelines for standardization of radiostereometry (RSA) of implants. Acta orthopaedica, 76(4), pp.563-572. 3. ISO 16087:2013 Implants for surgery — Roentgen stereophotogrammetric analysis for the assessment of migration of orthopaedic implants

A5.4 CT urography for visible haematuria in the under 50s - is it worth it?

Carina Brolund-Napier[1]; Lucy Boyle[1]; Sophie Watson[1]; Fraser Merchant[1]; Nirav Kaneri1; Mohammed Bilal[2]; Paul McCoubrie[1]

[1]University Hospital Bristol and Weston NHS Foundation Trust; [2]Birmingham and Solihull Mental Health Trust

Background: CT Urography (CTU) detection of upper tract urothelial cancer (UTUC) is reported to be extremely rare in patients under the age of 50 referred with haematuria, with no additional diagnostic benefit when compared with unenhanced CT alone. This study assessed CTU detection of UTUC in adults under the age of 50 referred for initial investigation of visible haematuria (VH), and whether unenhanced CT alone would suffice.

Methods: Retrospective review of 1405 consecutive CTUs of patients aged 16-49 years performed in our tertiary centre between 02/01/2015 and 30/12/2019. We included 757 patients referred for initial assessment of VH with no significant prior urological disease. Our CTU protocol includes an unenhanced phase and a split intravenous bolus enhanced phase. A consultant uroradiologist reviewed all abnormal CTU findings and assessed whether the unenhanced CTU phase demonstrated the abnormality.

Results: Out of 757 CTUs, two cancers were identified in the 40-49 age group; one UTUC and one bilateral renal cell carcinoma case, both evident on the unenhanced CTU phase. 532 CTUs (70.3%) were normal. Proportion of normal CTUs by age group was inversely proportional up to the age of 39. Renal tract calculi were the most common non-malignant finding in 103 patients (13.6%).

Conclusion: In our centre, UTUC is extremely rare (0.1%) in adults under 50 years referred with VH. CTU offered no diagnostic benefit when compared with unenhanced CT. We therefore recommend unenhanced CT as the primary imaging investigation for VH in this patient group, thereby significantly reducing radiation dose, costs and reporting.

A5.5   Diagnostic efficacy of bi-parametric versus multiparametric magnetic resonance imaging for detection of prostate cancer in Thai patients

Chalida Aphinives; Lalita Tabkhampa; Kulyada Eurboonyanun

Faculty of Medicine, Khon Kaen University

Background: The bi-parametric MRI (bpMRI) is based on T2-weighted (T2W) imaging and functional sequences diffusion-weighted imaging (DWI). The multiparametric MRI (mpMRI) was composed of bpMRI and dynamic contrast enhancement (DCE). However, the value of DCE MRI in the detection of prostate cancer is still controversial.

Method: Retrospective analysis of 109 men who underwent mpMRI with prostate biopsy from January 2015 to March 2021. The bpMRI examination included T2W, DWI, and apparent diffusion coefficient map (ADC map), then added DCE to the mpMRI examination with masked clinical and laboratory information. Two diagnostic radiologists interpreted both examinations separately. The performance, diagnostic test accuracy, and subgroup analysis were analyzed.

Result: Around one-third (31.2%) of 109 patients were positive malignancies. The diagnostic accuracy of bpMRI was less than mpMRI, especially in the PI-RADS 3 group. The intra-observer agreement between bpMRI and mpMRI was moderate. The inter-observer agreement between the two readers was minimal agreement.

Conclusion: The mpMRI was more accurate in the detection of prostate cancer than bpMRI, especially in the PI-RADS 3 group.

1. Alabousi M, Salameh JP, Gusenbauer K, Samoilov L, Jafri A, Yu H, et al. Bi-parametric vs multiparametric prostate magnetic resonance imaging for the detection of prostate cancer in treatment-naïve patients: a diagnostic test accuracy systematic review and meta-analysis. BJU Int. 2019 Aug;124(2):209-220.
2. Thestrup KC, Logager V, Baslev I, Møller JM, Hansen RH, Thomsen HS. Bi-parametric versus multiparametric MRI in the diagnosis of prostate cancer. Acta Radiol Open. 2016 Aug 17;5(8).

Proffered papers: Standards and service development

B4.1   The acceptability of x as an alternative to physical grids to UK-based diagnostic radiographers

Emma Hyde

University of Derby

Background: Virtual Grid software uses a mathematical algorithm to remove radiation scatter and improve image contrast, without the need for a physical grid. It has been designed to enable radiation dose reduction whilst increasing image quality (Imaging Technology News, 2014; Radiopaedia, 2022). Despite the introduction of Virtual Grid software to the UK in recent years, anecdotal evidence suggests that there has been limited uptake and use. This study set out to investigate the acceptability of Virtual Grid software to UK-based Diagnostic Radiographers, by identifying the enablers and blockers to its use.

Method: Following ethical processes, a small-scale study is being undertaken to collect perceptions and opinions about the acceptability of the use of Virtual Grid software within the UK-based Diagnostic Radiography community. Qualitative data will be collected via online focus groups, which will be audio-recorded and transcribed verbatim. Transcripts will be analysed using thematic analysis to identify enablers and barriers to Virtual Grid software use, with the goal of increasing its' acceptability.

Results: Data collection will be starting in Spring 2023, and early results will be reported at UKIO 2023.

Conclusion: The use of Virtual Grid software has the potential to make a significant impact on radiographic practice, by supporting radiation dose reduction alongside improved image quality. Understanding the barriers and enablers to the use of Virtual Grid may help to support an increase in its acceptability and use.

1. Imaging Technology News (2014) Virtual Grid Adapts Contrast on X-rays to Improve Quality of Exams taken Without a Grid. Available at: https://www.itnonline.com/content/virtual-grid-adapts-contrast-x-rays-improve-quality-exams-taken-without-grid
2. Radiopaedia (2022) Virtual Grid. Available at: https://radiopaedia.org/articles/virtual-grid?lang=gb