

Poster Session : P6

Breast thickness based DRLs in screening mammography

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The motivation for use of dose audit and DRLs is to promote continuing optimisation. General radiology practice quotes a DRL for an average patient and has been widely adopted for standard imaging examinations. However, for mammography, the range of breast sizes encountered in clinical practice limits the utility of DRLs. For a number of years, we have been conducting an annual clinical dose survey based on 100 consecutive client examinations collected over a contemporaneous time period. A MATLAB programme was developed to extract demographic and exposure data from the DICOM image headers. This was subsequently compiled in a database for calculation of mean glandular dose (MGD) developed for the UK breast screening programme. In order to improve the utility of DRLs for routine audit without adding significant complexity, we have determined three distinct DRLs based on the 95th percentile of the distribution of MGD values within three bands of compressed breast thickness; Average breast (50 mm–70 mm), Small breast (<40 mm) and Large breast (>80 mm). Completing the dose audit cycle requires dissemination of results in a relatable way and in order to achieve this, we have produced a poster for display in each mammography room which radiographers can use to reference against any examination performed. This provides a more meaningful comparison of their practice with the norm. We anticipate that as radiographers become accustomed to viewing and evaluating MGDs, they will become more familiar with the expected behaviour of a system and differences between systems.

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Poster Session : P7

A phantom based study on the effects of contrast agents and kilovoltage and on standardised uptake value in PET/CT

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Standardised Uptake Value (SUV) is an important parameter used in PET. It is based on a calculated volume of interest from an attenuated corrected PET/CT image. The attenuation coefficient is generated from a CT scan, in an attempt to provide dose performance and diagnostic image quality of the scan. Both oral and intravenous iodinated contrast are used as part of these scans. In an attempt to reduce dose from the diagnostic CT scan, a reduction in kilovoltage (kV) can be done. However, literature on this topic is either unavailable or is not widely published. The aim of this thesis is to evaluate the effect of iodinated contrast agents and varying kV on SUV's with a phantom on a conventional PET/CT scanner. A set of phantoms were constructed based on the NEMA 2012/IEC 2008 PET Phantom to simulate FDG anatomically and physiologically in an abdomen. The phantom consists of three versions of an adapted NEMA 2012/IEC 2008 phantom. SUV and FDG concentrations were calculated for different contrast concentrations and over ranges of

CT kVp energies. Images were evaluated for artifacts and the kBq/ml was measured for each version. The studies showed that there was a dependence on the contrast used and the energy level. When there was a presence of contrast in the phantom, the measured kBq/ml was higher than the theoretical kBq/ml as the attenuated image was over correcting for the activity.

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Poster Session : P8

Objective QA assessment of ultrasound

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Ultrasound is an important imaging modality for the work-up and biopsy of breast lesions. Subjective ultrasound QA using a standard phantom has been performed according to a protocol for some time. However, the inherent nature of these tests combined with operator variability make it difficult to assess system performance over time or to facilitate inter-system comparison. As a result, we evaluated software (QA4US) for objective evaluation of ultrasound performance in order to facilitate these aims. A measurement protocol has been developed and implemented in the QA4US software by the MUSIC group at Radboud University Medical Center, Nijmegen, NL. QA4US is a freeware application developed in MATLAB to enable users to perform tests outlined in the European Guidelines. A standard tissue mimicking phantom is required and the software analyses stored B-mode ultrasound images. Objective assessment is based on relative echo level, therefore the dB scale is used for the estimation of most quality measures; overall dynamic range, contrast resolution, contrast sensitivity, spatial resolution and overall system sensitivity. Initial trial use of QA4US informed many useful tips to enable efficient assessment which are outlined and would benefit new users. Results have enabled observation of trends over time, showing generally consistent results but some have also highlighted transducer element failure and surface damage. QA4US is proving a useful tool for monitoring system and probe image quality and generated reports aid liaison with vendors in relation to quality issues. However, the initial set-up and familiarisation period can be time consuming.

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Poster Session : P9

A deep learning approach for identifying focal prostate cancer from multi-parametric MRI

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There are no technical barriers to delivering radiotherapy to small focal lesions within the prostate, however, reliably identifying