AbstractID: 12974 Title: Estimation of Computed Tomography Dose Index based on Optically Stimulated Luminescence Technology

Purpose: Optically Stimulated Luminescence (OSL) dosimetry provides a potential solution to the arising dose concerns over MSCT due to its high sensitivity, re-readability, flexible size and ease of use. This study was intended to evaluate the accuracy and reproducibility of OSL dosimeter system in CT energy range.

Materials and Methods: OSL strips with 150-mm long, 5-mm wide and 0.3-mm thick were used to measure the CT dose index in standard PMMA dose phantoms. The OSL strips were placed in a cylindrical PMMA holder specially designed for this study. All scans were performed using a GE Lightspeed VCT scanner at axial mode. Two groups of experiments were performed by varying kVp settings (100, 120 and 140 kVp) and collimated beam widths (5, 10, 20 and 40 mm), respectively. Three OSL strip measurements were done for each scan condition. The exposed strips were read out using a custom built OSL reader system. All readings were corrected using the field-specific energy correction factors to compensate energy dependence and over response effects of OSL materials. For each scan condition, $CTDI_{100}$ was also obtained at the same phantom setup but using a 100 mm long pencil chamber. Absolute percentage difference between $CTDI_{100\text{-}OSL}$ from OSL readings and $CTDI_{100\text{-}IC}$ through pencil chamber readings was calculated.

Results: The system accuracy was verified by comparing the difference of $CTDI_{100}$ values obtained using OSL and pencil chamber, which were < ±5% for all scan conditions. An average coefficient of variation (CV) of 3.1% indicates good reproducibility of the OSL dosimeter system.

Conclusions: The LED-based OSL system showed good reproducibility and accuracy over a wide range of CT x–ray beam energy. With the simple calibration, it can prove to be a promising alternative for routine QA check and hence a potential solution for patient dose estimation.