

AbstractID: 8965 Title: Dose Trends in Tube-Current Modulated Multi-Detector CT Imaging

Purpose: The purpose of this work was to compare clinically relevant point dose measurements in both homogenous geometric and anthropomorphic phantoms in order to compare the effects of MDCT tube-current modulation on the dose distributions in each. These dose measurements were compared to corresponding $CTDI_{vol}$ measurements to determine this metric's effectiveness in describing clinical scan doses in MDCT.

Method and Materials: A fiber optic coupled dosimeter system was utilized with both a homogenous elliptical phantom and an anthropomorphic phantom incorporating accurate anatomical features scaled to represent ICRP reference man. Point dose measurements were taken at various points in both phantoms using routine abdominal scan techniques. Both modulated and fixed tube-current scans were performed, and the resulting data was used to create an isodose map for each phantom. CTDI measurements were taken using the same scan techniques, and the resulting $CTDI_{vol}$ was compared to the doses measured using the elliptical and anthropomorphic phantoms.

Results: Tube-current modulated scans produced an average point dose reduction of 7.6% in a homogeneous elliptical phantom. This reduction was accompanied by a more uniform dose distribution across the transverse slice, with the most reduction apparent across the minor elliptical axis. The average point dose reduction was slightly less in the anthropomorphic phantom, where tube modulation resulted in an average dose reduction of 4.5% and a similar improvement in dose uniformity. $CTDI_{vol}$ was found to underestimate the average point dose measured from the anthropomorphic phantom, with measured doses being 90% higher than the predicted $CTDI_{vol}$.

Conclusion: Tube-current modulation was found to reduce both the average dose and the dose variation for an individual slice in both a homogeneous geometric phantom and a heterogeneous anthropomorphic phantom. $CTDI_{vol}$ was found to be a poor predictor of organ doses in MDCT.