AbstractID: 1787 Title: The Accuracy of 3-D Inhomogeneity Photon Algorithms in Commercial Treatment Planning Systems using a Heterogeneous Lung Phantom

Simple density-correction algorithms have insufficient accuracy to estimate dose in regions of electronic disequilibrium, or account for changes in lateral scatter, resulting in errors in dose estimates within the lungs. This work evaluated the differences between measurements and heterogeneous dose estimates from 3 treatment planning systems: the ADAC Pinnacle collapsed cone convolution algorithm, the Varian Eclipse photon pencil beam-based algorithm, and the CMS Focus convolution and Clarkson algorithms. Conformal radiotherapy treatments using 6MV and 18MV photon beams were delivered to an anthropomorphic thorax dosimetry phantom. Lung-equivalent regions contained a tumor, located either centrally or medially. Measurements were performed using radiochromic film in axial, coronal, and sagittal calculation planes and TLD centered within the GTV. The criteria used to compare measurements with the treatment were the TG-53 5%/3mm criteria. Initial evaluations showed that the algorithm's estimation of dose to the TLD within the GTV varied from 94-107.8% of the measured dose. Pixel-by-pixel binary agreement maps showed a range of 45% of pixels passing criteria at 18MV to 80% at 6MV on Pinnacle, 57% at 18MV to 69% at 6MV on Eclipse, 45% at 18MV to 72% at 6MV for CMS convolution and 45% at 18MV to 51% at 6MV for CMS Clarkson. Profile analysis demonstrated the areas where the calculated data exceeded the 5%/3mm criteria. The systems tested did not meet published criteria for agreement between 55 and 20 percent of the area evaluated.

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