

## AbstractID: 8457 Title: Dosimetric and Image Quality Analysis of a New Ultrafine Imaging Mode in TomoTherapy

**Purpose:** TomoTherapy MVCT can be carried out using three distinct imaging modes: Fine, Normal and Coarse. These correspond to a CT slice thickness of 2 mm, 4 mm and 6 mm. In this study we evaluate a new Ultrafine mode allowing slice thickness of 1 mm. Measurements in a phantom are carried out to estimate typical patient dose for all 4 modes. Image quality for the various modes is compared.

**Method and Materials:** A standard TomoTherapy solid water “cheese” phantom was used for all dosimetric analyses. Measurements were made at superficial (0.5 cm) and deep (15.0 cm) regions using ionization chambers. Image quality was evaluated using a megavoltage CT phantom containing 0.067-1.0 Lp/mm. In addition, clinical images of a cranium containing 2 mm gold markers were also evaluated for quality. The collimator width was maintained at standard settings for Fine, Normal and Coarse modes, and reduced to finer settings for the new Ultrafine mode.

**Results:** The collimator opening on our unit was measured at isocenter and was found to be 0.69 cm in the three standard modes, and 0.39 cm in the new Ultrafine mode. The measured imaging dose was: Ultrafine 2.07 cGy, Fine 2.44 cGy, Normal 1.30 cGy and Coarse 0.90 cGy. Dose at superficial and deep regions was similar. The axial views for all four modes show similar resolution as expected since a 512x512 matrix is used regardless of mode. However, the sagittal images show considerable improvement, in both phantom and clinical studies, when imaged in Ultrafine mode.

**Conclusion:** A new Ultrafine collimator setting for TomoTherapy, allowing a resolution of 1 mm in the sagittal plane, is characterized. This improvement is gained without increased patient exposure compared to the standard 2 mm Fine mode. This new imaging mode is expected to be particularly useful in radiosurgery.