AbstractID: 8134 Title: Analysis of Daily Setup Variation with Tomotherapy Megavoltage Computed Tomography (MVCT)

Purpose: To evaluate setup variation for different sites using tomotherapy pretreatment megavoltage computed tomography (MVCT), and provide the reference margins for different anatomic sites.

Method and material: Ninety-two patients were positioned supinely the same as CT simulation. MVCT was used to verify patient position and target localization before each treatment. With anatomy registration tool, MVCT provided the real-time tumor/organ shift coordinates, relative to the positions when the simulation CT was done. The thermoplastic face mask was used for H/N and brain treatment. Hip and pelvic Vac-Lok™ cushions were used for prostate patients. There was no respiration suppression used for lung and abdomen patients. The setup variations in the inter-fraction treatments were recorded and corrected for treatment. 2900 data points were analyzed for the 92 patients with the five different sites: head and neck, brain, prostate, lung and abdomen.

Results: The mean inter-fractional setup error for H/N and brain was smallest among the five sites analyzed. The mean setup error in the 3D translational for H/N, brain, prostate, abdomen and lung were 2.2mm, 2.3mm, 3.2mm, 4.4mm and 7.7mm respectively. The largest motion in lung was in the longitudinal direction, with mean error 6.0mm and standard deviation of 4.8mm. The mean rotational variation ranged from 0.2° to 0.5°, with the standard deviation from 0.7° to 0.9°. The system error and random error were analyzed and the suggested margin for H/N, brain, prostate, abdomen and lung in the direction of lateral, longitudinal and vertical ranged from 5.0 to 9.3 mm, 5.8 mm to 14.6 mm, and 1.7 mm to 7.8 mm respectively.

Conclusion: The pre-treatment MVCT can be used to improve the accuracy of patient positioning and to reduce the tumor margin. Results from this study could be used as a reference to determine the tumor margin for regular radiation therapy treatment.