

AbstractID: 10839 Title: Dose Grid Effects in Adaptive Planning of Helical TomoTherapy for Hypofractionated Treatments

**Purpose:** To evaluate potential dosimetry discrepancies generated by varying the dose grid resolution in adaptive planning of TomoTherapy for hypofractionated treatments.

**Method and Materials:** Twelve patients with intracranial lesions treated with image guided helical TomoTherapy under a hypofractionated protocol are reviewed. Due to the short course and high dose per fraction, we use the adaptive planning tool to obtain the delivered dose distribution. The associated pretreatment MVCT and planning KVCT images are fused and the treatment doses are calculated comparing the fine dose grid ( $1.51 \times 1.51 \times 2 \text{mm}^3$ ) and the normal grid ( $3.02 \times 3.02 \times 2 \text{mm}^3$ ) settings. The summative dosimetry of the targets is analyzed to identify the effects of dose grid size on adaptive planning.

**Results:** The mean difference in coverage of the GTVs by the prescription dose, calculated with fine versus normal dose grid, over all patients is  $2.6\% \pm 10.5$ . When segregated by size the mean difference and standard deviation in GTV coverage for small lesions ( $< 2.5 \text{cc}$ ) is  $3.1\% \pm 12.2$ . It improved for medium ( $2.5-7.5 \text{cc}$ ) and large ( $> 7.5 \text{cc}$ ) lesions at  $0.6\% \pm 0.6$  and  $1.4\% \pm 2.5$ , respectively. For all the patients the mean variation between the fine and normal grids in the calculated coverage of the PTVs by the prescription dose is  $16.3\% \pm 17.4$ . For small PTVs alone ( $< 5 \text{cc}$ ) the mean difference in coverage is  $19.5\% \pm 19.4$ . The variation improved again at  $9.1\% \pm 1.1$  for medium PTVs ( $5-15 \text{cc}$ ) and  $7.3\% \pm 1.9$  for large PTVs ( $> 15 \text{cc}$ ).

**Conclusion:** While performing critical adaptive planning evaluation for intracranial patients treated with TomoTherapy, influence of the dose grid on the summation dosimetry must be considered. In our study, there is an appreciable difference in calculated target coverage amongst different dose grid resolutions, especially for small targets treated under hypofractionated protocols. Consequently, the use of fine dose grid is necessary if adaptive planning is performed for assessing positioning errors.