AbstractID: 13921 Title: Non-Coplanar Treatment of Hypofractionated Intracranial SRT with Tomotherapy

Purpose: To report on a newly developed positional device and dosimetric results in Tomotherapy intracranial hypofractionated Stereotactic Radiosurgery Treatment (SRT) with non-coplanar beam characteristics.

Methods: An in-house developed positional device has been adapted to generate the non-coplanar dosimetric effects in selected hypofractionated intracranial SRT patients. Three different head positions and CT data sets of same patients were scanned to provide the basic panning information. Contrast is also provided to delineate CTV. Dose constraints for PTV and OARs were scaled down according to the total composite dose (30Gy is split into 12Gy, 12Gy and 6Gy with 5 treatment fractions). The ability to change the rotational angles of the head for each treatment fraction would reduce the volume of normal brain tissue irradiated to lower clinically significant doses and increase the dose gradient surrounding the treatment area. Due to the TomoTherapy nature of helical co-planar treatment, this methodology will generate a composite non-coplanar delivery in order to reduce the low dose spread inside the PTV slices. Planning was performed with the three CT data sets and the composite dosimetry was evaluated to prove the clinical efficacy.

Results and Discussion: Clinical dosimetry results indicate improved dosimetry coverage while minimizing the scattered dose to the volume slices of PTV. Composite dosimetry indicated the 50% isodose volume minus target volume was reduced by 9.4% for a small tumor ($0.7cm^3$). For a medium tumor ($2.5cm^3$), the volume was reduced by 8.9% and for a large tumor ($4.2cm^3$), the volume was reduced by 13.0%. All those reduction ha shown by manipulating the various head treatment positions, we can achieve lower dose sparing inside the volume of PTV slices.

Conclusions: Our developed device and composite dosimetric results have shown the clinical benefits to improve the dose gradient and minimize the low dose region inside the PTV CT slices.