AbstractID: 5174 Title: Helical TomoTherapy for Radiosurgery: Plan Optimization and Delivery Considerations

Purpose: To quantify the quality and deliverability of Helical Tomotherapy plans for small targets. Plan quality can be improved via auxiliary structures used to increase the dose gradient outside the target volume.

Method and Materials: Plans were created for a 1.0 cm diameter target (PTV), with and without the use of: (i) a 1 cm thick annulus surrounding the PTV as a "region at risk"; (ii) "blocks" placed superiorly and inferiorly to the PTV, truncating the length of the helical delivery. The dosimetric effects of these modifiers were analyzed. The consequences of the blocks in terms of required gantry rotation rate as a function of helical pitch were analyzed.

Results: Dose gradient as measured via the effective radii of the 50% and 100% dose volumes is significantly increased via the use of blocking structures. Dose conformity is also increased. Reducing total couch translation distance to less than the beam width causes a reduction in number of rotations contributing dose to a given point. A higher dose per rotation is thus required, possibly reducing gantry rotation speed below the minimum. Reducing pitch increases number of rotations, thus allowing higher dose per helical pass. For example, in this case a small pitch of 0.1 allows delivery of 20 Gy to the PTV boundary in two helical passes, with a beam delivery time of 5 minutes per pass.

Conclusion: Helical Tomotherapy is able to produce high dose gradients outside the target volume, especially with a restriction on helix length. Doses typically given in single fraction radiosurgery are deliverable via one or more helical passes within a single session. Judicious choice of helical pitch prior to planning can save time in arriving at optimal delivery parameters.

Conflict of Interest: Research sponsored by TomoTherapy Inc.