AbstractID: 8914 Title: Integrated Subvolume Boosting Technique to Reduce Normal Tissue Irradiation during SBRT Treatment Planning using Helical Tomotherapy

Purpose: To characterize the reduction in normal tissue volume irradiated in a SBRT treatment plan by delivering an inhomogeneous dose to the PTV—via integrated subvolumes prescribed to increasing doses above prescription dose—instead of a homogeneous dose using helical tomotherapy.

Method and Materials: Three patients were retrospectively planned using helical tomotherapy with two treatment plans: (1) homogenous plan delivering a uniform prescription dose to the PTV and (2) inhomogeneous plan delivering a non-uniform dose to the PTV. Subvolumes were created by volumetrically contracting the PTV by 4mm resulting in three subvolumes within the PTV (PTV_i, PTV_{ii}, and PTV_{iii}). Dose prescriptions to the various targets were as follows: *Homogenous:* PTV: 95% of volume to receive 60.0Gy; *Inhomogeneous*: PTV_{iii}: 20% of volume to receive 80.0Gy, PTV_{ii}: 50% of volume to receive 75.0Gy, PTV_i: 50% of volume to receive 70.0Gy, PTV: 95% of volume to receive 60.0Gy. The homogenous and inhomogeneous plans were compared on the basis of normal tissue volume reductions to various dose levels assuming identical target coverage of the PTV.

Results: A significant reduction in the volume of normal tissue irradiated to high doses was achieved for all patients. Average reduction of $V_{90\%}$, $V_{80\%}$, $V_{50\%}$, and $V_{20\%}$ were 18, 15, 9, and 7%, respectively. It was noted that as the dose level decreases, the percent volume reduction between the homogeneous and inhomogeneous plans decreases.

Conclusion: The study served to quantify the volumetric reduction of normal tissue irradiated during lung SBRT treatments with helical tomotherapy when delivering non-uniform doses to the PTV as compared to uniform doses. Our results indicate that an inhomogeneous dose distribution generated by the creation of integrated subvolumes prescribed to higher doses within the PTV significantly reduces the volume of normal tissue irradiated, especially at higher doses (>50% of prescription dose).