AbstractID: 7242 Title: Treatment planning comparison of dynamic multileaf collimation and helical tomotherapy for spinal cord sparing in head and neck re-irradiation

Purpose: To compare dynamic multileaf collimator (DMLC) and helical tomotherapy (TOMO) IMRT delivery techniques for head and neck re-irradiation.

Method and Materials: Five cases were selected. For each case, a planning target volume (PTV) and the spinal cord were contoured. A 5 mm margin was added to the spinal cord to create a planning organ-at-risk volume (PRV). Plans were developed to deliver 60 Gy to 95% of the PTV while minimizing PRV dose. For DMLC delivery, 7 fields in the transverse plane were used. Plans were developed for two secondary collimator configurations, one in which the collimators were set by the optimization engine (DMLC STD) and one in which the PRV was always blocked by a collimator jaw (DMLC BLOCK). For both DMLC STD and TOMO, the optimization parameters were adjusted to minimize the PRV dose without exceeding 69 Gy to a volume of tissue >1 cc. DMLC BLOCK plans were optimized using the same parameters as the DMLC STD plans. The PTV D_{1cc}, spinal cord $D_{0.5cc}$, and non-specified normal tissue D_{1cc} were calculated.

Results: The TOMO plans were able to both minimize the spinal cord dose and limit the hotspot. The DMLC plans were not able to limit the hotspot to the extent of the TOMO plans. The DMLC BLOCK plans achieved equivalent cord sparing, but with increased dose heterogeneity. The mean spinal cord $D_{0.5cc}$, was 8.8, 16, and 8.4 Gy for the TOMO, DMLC STD, and DMLC BLOCK plans respectively. The mean PTV D_{1cc} was 67.7, 68.6, and 71.4 Gy and the normal tissue D_{1cc} was 65.2, 68.2, and 71.5 Gy.

Conclusion: Dynamic MLC IMRT is capable of producing spinal cord sparing equivalent to helical tomotherapy. However, with current technology, the sparing is at the expense of PTV heterogeneity and larger doses to small volumes of normal tissue.