AbstractID: 8875 Title: Feasibility study of longitudinal field junctioning with helical tomotherapy

Purpose: To examine junctioning of longitudinally adjacent PTVs treated with helical tomotherapy (HT). **Method and Materials: C**ylindrical PTVs were defined in an elliptic cylindrical homogeneous phantom. Dose distributions (95% PTV to receive 2 Gy) created using 2.5 and 5.0 cm long HT fields were calculated and verified dosimetrically. Cranial – Caudal (CC) dose profiles were summed to study the junctioning of PTVs to create a single contiguous PTV. Junctioning adjacent PTVs with different inter-PTV spacing, created by equal or different field sizes was studied for dose homogeneity. The use of dose stepped PTVs near the junction region was also examined. Here the SUP end of the INF PTV or the INF end of the SUP PTV was divided into smaller subPTVs of decreasing prescription dose. The resulting dose distributions were summed as a function of inter-PTV spacing. Simulated dose profiles were verified by film dosimetry. **Results:** The most homogenous dose resulted when adjacent PTVs had the same CC dose profile (field size). Independent of the Inter-PTV spacing, PTVs of different CC dose profiles could not produce homogeneous doses. Minimizing the volume dose excursion from prescription resulted in cold spots (-26%) and hot spots (+29%) with 8% of the PTV receiving < 95% of prescription. Dividing each PTV into four multiple contiguous subPTVs, with constantly decreasing prescribed dose (2, 1.5, 1.0, 0.5Gy) allowed PTV matching with dose homogeneity similar to junctioning PTVs of equal CC slope. 95% of the PTV received at least 101% of the prescribed dose, with dose excursions of -19% to +13% from prescription, (1% of the PTV received less than 95% of prescribed dose). **Conclusion:** Junctioning adjacent PTVs is possible, but PTVs created by different field widths present a challenge. Homogeneity is improved by breaking PTVs into multiple contiguous subPTVs modified to feather (broaden) the effective junctioning region.