AbstractID: 11550 Title: Comparison of helical tomotherapy and mixed beam treatment plans for superficial parotid cancers

Purpose: To compare helical tomotherapy (HT) with mixed beam therapy (electron and IMRT) plans for a superficial parotid treatment. **Method and Materials**: Mixed beam and HT dose plans were developed for a patient with a superficial parotid gland tumor. Seven mixed beam plans included a 7-field photon IMRT plan optimized on top of a single en-face, 16-MeV electron beam dose distribution. The ratio of photon to electron beam weights (at depth R_{100}) were 1:0 (IMRT only), 2:1, 1:1, 1:2, 1:3, 1:4, and 0:1 (electrons only). Planning objectives for HT plans were set as closely as possible to those in the mixed beam plans, and were determined using our clinical planning protocol for head and neck cancers. The resulting dose distribution from each plan was evaluated using multiple dose metrics for the planning target volume (PTV) and normal tissues.

Results: Dose homogeneity, $D_{95\%-5\%}$, was best for HT (0.94 Gy), and worst for electrons (7.19 Gy), but improved with mixed beam (0.99 Gy for 1:3) to nearly equal that of HT. Conformity index was 0.69 for HT and 0.78 for IMRT, but improved with mixed beam (0.80 for 2:1). Mean dose to the contralateral parotid was 16.0 Gy for HT and 20.1 Gy for IMRT, but improved with mixed beam (9.8 Gy for 1:4). Similar normal tissue results were found for the spinal cord, eyes, lens, optic nerves, and contralateral eye.

Conclusions: Utilizing IMRT in mixed beam therapy improves dose homogeneity while taking advantage of the finite electron range to spare nearby critical structures. In this case, mixed beam therapy plans were comparable with or superior to HT and IMRT for the PTV and normal tissues.

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