AbstractID: 9405 Title: Dosimetric Uncertainties in Matched IMRT and Conventional Fields for Head and Neck Cancer Radiotherapy

Purpose: Two techniques using IMRT for treatment of head and neck tumors are commonly employed: (A) extended-field IMRT (EF-IMRT) with a single isocenter; (B) Beam-split method with an AP field for the low neck/supraclavicular fossa. Beam-split technique used in the latter approach introduced dosimetric uncertainties at the matchline due to imprecise calibration of the independent jaw or MLC positions. The objective of this study is to evaluate the potential matchline dose variation if such a systematic error occurs.

Methods: Five patients with nasopharyngeal cancer treated with EF-IMRT technique were replanned with the beam-split approach. A midline cord block was used in the AP fields. To simulate the effect of a systematic error in jaw/MLC positions, analyses were performed with the conventional field(s) matched exactly and shifted $\pm$ 1,2,&3mm (superior-inferior) relative to the IMRT fields. Dose covering 95% of the tumor volume (D95) was measured for a 1.2 cm thick volume of the CTV centered at the matchline (mCTV) to assess tumor volume dose coverage. Dose encompassing 1 cc (D1cc) of the spinal cord volume within the IMRT fields were analyzed.

Results: For the beam-pslit technique, overlap of the AP beam with the IMRT fields led to dose increases in D1cc of the spinal cord by 3.14Gy $\pm$0.57Gy, 5.45Gy $\pm$ 1.97Gy, and 9.9Gy $\pm$ 5.33Gy for 1, 2, and 3 mm overlaps, respectively. A gap between the AP field and the IMRT fields led to dose reductions in D95 of the mCTV by 4.55 $\pm$1.86Gy, 8.38 $\pm$ 2.52 Gy, 13.92 $\pm$ 0.36Gy for 1, 2 and 3 mm gaps, respectively.

Conclusions: Systematic errors due to independent jaw/MLC imprecision can potentially lead to concerning dosimetric variations when matching conventional and IMRT fields in head and neck radiotherapy. Stringent quality assurance on MLC/jaw positions is required when the beam-split method is applied.