AbstractID: 4520 Title: Comparison of MLC and Solid Modulation in Pediatric Patients Receiving IMRT

Purpose: Intensity modulated radiation therapy (IMRT) offers the potential of reducing the volume of normal tissue irradiated, and thus may provide significant benefit in pediatric patients. However, the total number of monitor units (MUs) associated with MLC-based IMRT (MLC-IMRT) may be 2-5 times higher than conventional planning, resulting in higher total body doses. Solid modulator-based IMRT (SM-IMRT) may provide significantly fewer MUs, and thus lower total body doses. The goal of this study is to compare MLC-IMRT with SM-IMRT treatment planning and delivery in the pediatric setting.

Methods and Materials: Representative pediatric sites (brain, orbit, neck and abdomen) were used in this analysis. For each case, a 5-9 beam MLC-IMRT plan was generated with the XiO treatment planning system (CMS Inc., St Louis, MO) using 6 MV photons. Dose volume histograms (DVHs) were calculated and the total number of MUs was recorded. Using the same input parameters, a second plan was then generated for each patient with SM-IMRT. In both cases, 10 intensity levels were utilized. The total MUs and DVHs for the PTV and surrounding normal tissues were compared for each pair of plans.

Results: In general, both the MLC-IMRT and SM-IMRT plans were comparable. Only minor differences in the DVHs were noted in the low dose region (20-40% of the prescription dose). However, the total number of MUs was significantly different. The average number of MUs for the MLC-IMRT plans and the SM-IMRT plans were 797 and 428, respectively ($p=0.05$). Measurements of the total body doses in a pediatric phantom will also be presented.

Conclusions: SM-IMRT plans result in significantly fewer MUs compared to MLC-IMRT plans. Pediatric patients may benefit from the reduced total body doses, and hence reduced risk of secondary malignancies associated with this approach.

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