AbstractID: 11467 Title: Dosimetric Accuracy of Low Dose Region (V5-V10) in TomoTherapy Planning of Lung IMRT

Purpose: To quantify the dosimetric accuracy of a TomoTherapy treatment planning system in areas of low dose (V_5 to V_{10} regions) and in the presence of tissue heterogeneities in lung IMRT.

Materials and Methods: CIRS anthropomorphic heterogeneous thorax phantom was used to generate clinical treatment plans using TomoTherapy's treatment planning system (TPS). Three plans were developed for treatment delivery using three different field widths (1.0, 2.5 and 5.0 cm) with standard planning parameters used in our clinic. A designated tumor volume was contoured in the phantom lung volume and was planned to receive 200 cGy fractions to a total prescription dose of 7000 cGy. Point measurements with a PTW Farmer chamber were conducted at two locations in the contralateral lung which fell with in the V_5 to V_{10} region of low dose. Comparison of the experimental findings to the TPS results was performed to assess the dosimetric accuracy of TomoTherapy's convolution/superposition algorithm in low dose regions.

Results: Comparison of the ion chamber measurements to the TPS dose calculation demonstrated an average difference of +4.5% and -3.0% at the medial and posterior points of measurement in the contralateral lung of the same axial slice. Variation as a function of field width was found to be 1-2% for chamber measurements. Over the total course of treatment of 35 fractions, differences between the TPS and measurement were 35 cGy regardless of field width or point of measurement.

Conclusions: At low dose levels (V_5 to V_{10} regions), dosimetric accuracy of conventional TPS systems is often underestimated, but our experimental results suggest the TomoTherapy TPS is reasonably accurate under the given conditions. Tomotherapy's TPS provides acceptable dosimetric accuracy in lung region areas of low dose.