AbstractID: 7563 Title: Parotid Dose Deviation Related to Parotid Volume Reduction During Radiation Therapy: an Analysis Based on TomoTherapy Adaptive Tool

Purpose: To determine the parotid dose deviation from the planned dosimetry of oropharyngeal patients treated by Helical Tomotherapy as a consequence of patient deformation.

Methods and materials: MVCTs of 14 oropharyngeal patients who underwent tomotherapy treatment to 50-56 Gy/25-28 fractions were used to calculate the actual delivered summation dose and dose volume histogram (DVH). The mean parotid dose (MPD) was analyzed as a function of the body and local weight loss, which was calculated using MVCT electron density in a range 2.5 cm superior/inferior of the parotids and interfield distance (IFD) change at the midlevel of the parotid (D_p). The deformable registration and automatically generated contours were reviewed by the radiation oncologist.

Results: The automatically generated contours were considered to be adequate by the physician for dosimetric analysis. MPD changes between 0 to 2.5 Gy were observed, with accelerating changes after fraction 15. The MPD change was found to correlate to with local anatomic change as opposed to total body weight. The dependency on the local body weight calculated by MVCT electron density is positive but not significant. However, a strong correlation between MPD and D_p was observed (R^2>0.9). D_p also linearly decreased with the number of fractions with patient specific slopes due mainly to parotid volume reduction.

Conclusions: We evaluated the Tomotherapy adaptive radiotherapy (ART) tool's deformable registration capability based on daily MVCT of 14 oropharyngeal patients underwent 5-5.5 weeks of Tomotherapy treatment. The mean parotid dose (MPD) change correlated with local anatomy changes with reduced parotid volume resulting in a reduction in a mid-parotid level IFD change in D_p. The patient specific slope determined by D_p and MPD may be used to monitor and predict the parotid dose error due to patient deformation.