

AbstractID: 10987 Title: Dosimetric impact of anatomic changes due to patient weight loss on TomoTherapy plan

Purpose:

To investigate the dosimetric impact of anatomic changes due to patient weight loss on TomoTherapy plan used in IMRT of head-neck cancers.

Method:

The Cheese phantom wrapped with 1.5cm-bolus was scanned for planning. MVCT scans were done to minimize the dosimetric uncertainties by using different images (kVCT-vs-MVCT). Four plans of 2Gy/fraction were created with targets located around the anterior/lateral areas of the phantom with different sizes. Critical organs were contoured to simulate the spinal cord/brainstem. Phantom plans were delivered with the Hi-Art 2.0 machine. The phantom was irradiated four times with varying bolus thickness (1.5cm and 1.0cm) and finally without any bolus. Dose distributions were measured with A1SL ion chambers and EDR2 films. Using TomoTherapy's Planned Adaptive software, dose distributions were recomputed for each of the irradiation scenarios. Each of the phantom treatment scenarios were also delivered with three clinical QA plans to measure dose distributions around the spinal cord region using EDR2 film.

Results

Relative difference in ion chamber measurements with respect to the 1.5cm bolus plan of $6\% \pm 1\%$ (target) and $4\% \pm 2\%$ (critical organ) were found for the 1cm-bolus case. The differences of no-bolus chamber measurements were $9\% \pm 2\%$ (target) and $4\% \pm 1\%$ (critical organ). Variation in the adaptive planning results indicated mean dose ratios between 1.5cm-bolus and 1.0cm-bolus treatments of 1.05 ± 0.02 (target) and 1.02 ± 0.01 (critical organ). Mean dose ratios between 1.5cm-bolus and no-bolus treatment were 1.07 ± 0.02 (target) and 1.05 ± 0.02 (critical organ), demonstrating that dose to critical organ was increased but in slightly lower than target regions. Review of three clinical plans also showed similar trends in dose to critical organs with decreasing bolus thickness.

Conclusions

Ratios of planned dose to delivered dose to critical organs were increased $\sim 7\%$ by decreasing phantom radius by 1.5cm, however lower than target regions.