

AbstractID: 13867 Title: VMAT Optimization on MVCT Dose and the Affects on Prostate IMRT Acceptance Criteria

Purpose: Daily image guidance techniques may contribute significant dose to the patient, particularly in the case of megavoltage conebeam CT. Methods to account for this dose include (1) not altering the prescription, (2) subtracting the MVCT dose from the prescription, and (3) including the daily MVCT dose in the optimization process. This work evaluates the aforementioned methods with respect to the plan acceptance criteria for prostate IMRT at Fox Chase Cancer Center.

Method and Materials: MVCT dose was measured in phantom for a Siemens' Artiste linear accelerator. The 15MU mode utilized was for a 27.4 x 27.4cm² field size, 6MV full rotation beam. The dose measured was scaled using TMR ratios to mimic irradiation in an elliptical phantom with major and minor axis lengths of 40cm and 20cm, respectively and was found to be approximately 9.71cGy. The MVCT beam was simulated on patient geometry within the Nucletron Oncentra MasterPlan system. Dual arc VMAT plans were generated to meet our acceptance criteria with respect to the methods above.

Results: Method 1 above results in dose increases in high and low dose rectal cut-points of 5.7% and 11.7%, respectively. Method 2 results in 1.4% and 7.3% increases while method 3 results in 5.1% and 3.9% increases without changing the input parameters from those used for the dual arc plan.

Conclusions: Dose from MVCT on a daily basis can adversely affect plan acceptance criteria. Lower MU protocols can be used but may result in decreased image quality. All plans in this study met our clinical acceptance criteria although those optimized on the MVCT dose demonstrated the lowest increase in lower dose regions. As the significance of adverse effects may be amplified for serial vs. parallel critical structures it may be prudent to optimize on the MVCT dose when generating IMRT plans.