Abstract ID: 15797 Title: Applicability of a Point Fiducial-based Model for the Prostatic Bed in Post-Prostatectomy Radiation Therapy Patients: An Expedited Dosimetric Analysis using New Functionality in Philips' Pinnacle³ Treatment Planning System's Research Version

Purpose: The shape of the post-prostatectomy volume, fiducial placement and isodose coverage is more complex than prostate radiation therapy; but to date, there have been no commercial tools to estimate the delivered dose in patients aligned with fiducials. A fiducial-based algorithm to determine the dosimetric effects of fiducial localization has been implemented as 'Delivered Dose Investigational Tool' (DiDIT), in Philips' Pinnacle TPS' research version (Philips Medical Systems, Fitchburg, WI).

Methods: 17 post-prostatectomy patients were treated with SMLC IMRT, electromagnetic (Calypso Medical Technologies, Seattle, WA) tracking, 5mm CTV-PTV expansions and 3mm tracking tolerances. The DiDIT tool implemented convolution of the static plan dose distribution with rigid motion (rotations and translations) calculated from the ~150,000 fiducial tracking points, to generate estimates of the delivered dose. This analysis takes into account fiducial placement eccentricity, rotations, translations and the individual patient anatomy and treatment plan. Treatment adequacy was defined as the delivered minimum dose to the prostatic bed (CTV) >= 98% of planned minimum dose. Tracking data from subsets of the treatment course (first 3, 5 and 10 fractions) were utilized to determine the ability to predict treatment adequacy.

Results: Each patient had fiducial motion of less than 2mm. Each DiDIT evaluation took 5 – 15 minutes. Treatment was adequate in 11 of 17 patients, with the CTV having cold spots of 4 to 32%. DiDIT analysis of the initial fractions was not predictive of inadequate dose delivery. Patients with inadequate dosimetry seemed to have more eccentrically placed transponders and/or more rotation though no cut-off values were noted.

Conclusions: The DiDIT tool was used to quickly model delivered dose from fiducial localization. Results show that even with continuous fiducial tracking, there may be residual errors in the localization of the prostatic bed. Further work comparing these results with daily volumetric imaging is warranted.

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