AbstractID: 3180 Title: Margin Calculations for Prostate Radiotherapy Using Electronic Portal Imaging, Implanted Fiducials and Three Localization Methods

Purpose: To quantify the PTV margin for prostate radiotherapy based on daily electronic portal images (EPIs) of intraprostatic fiducial markers and three localization methods: Skin marks, visual matching and computer aided matching. To correlate with high statistical accuracy the prostate and bony anatomy location based on the EPIs.

Method and Materials: A cohort of 20 patients, receiving standard course fractionation, had gold fiducial markers placed in their prostates and marker position relative to isocenter was determined based on CT simulation. Skin marks established initial localization. Daily orthogonal pre-treatment EPIs were used to visually identify the markers and determine any 3D offsets. Finally, off-line computer aided localization was performed. 3D localization offsets and margins were determined for each method. Prostate to bony anatomy position correlation was based on an 80 patient cohort and evaluated with Pearson r^2 correlation value ($r^2 > 0.75$ suggests strongly correlated).

Results: Margins based on localization using skin marks (visual matching) and [computer aided matching] are 5.1 (2.7) [1.5] mm Sup-Inf, 7.3 (2.9) [2.0] mm Ant-Post and 5.0 (2.8) [1.0] mm Right-left. The Pearson r^2 correlation value for the bony anatomy vs. prostate is 0.12 Sup-Inf (not correlated), 0.30 Ant-Post (not correlated), and 0.79 Right-Left (strong correlation).

Conclusion: There is a substantial reduction in the margin from the skin mark setup to the visually matched localization and further to computer aided localization. A nearly 4 fold decrease from skin mark setup to computer matched localization in the Ant-Post direction indicates a potential for dose reduction of critical structures and increased dose to the PTV. Correlation results suggest that bony anatomy cannot be used as a predictor of prostate motion (except in the Right-Left direction), and if so used, may be harmful.

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