

AbstractID: 5640 Title: Dosimetric evaluation of prostate IMRT treatments positioned based on cone-beam CT

Purpose: To evaluate the dosimetric consequence of 3D positioning verification for prostate IMRT treatment using CBCT.

Method and Materials: Patients in this study were repositioned using 2D orthogonal radiographic images, taken prior to treatment to match 2D bone structures between the radiographic and reference images. Following this, CBCT images were acquired, then the treatment was delivered without an additional shift. A verification plan, CB_{Treat} , was generated based on the CBCT to simulate the actual treatment achieved with positioning verification based on 2D bone structure match. A verification plan, CB_{Bone} , was created based on CBCT with the isocenter shifted to match 3D bone structures between CBCT and planning CT. A verification plan, CB_{Soft} , was created based on CBCT with the isocenter shifted to match 3D soft tissues between CBCT and planning CT. These three verification plans were created for 17 patients for the first treatment fraction and compared to the original plans.

Results: The average dose coverage of prostate/seminal vesicle (SV) and dose to 30% of bladder/rectum showed very similar results for all three verification plans. Individual dose-volume histograms (DVH) displayed similar distribution for CB_{Treat} and CB_{Bone} of all 17 patients. However, DVHs of CB_{Soft} indicated that the coverage of prostate and SV was improved significantly for a few patients at the cost of increased dose to bladder/rectum. Current patient repositioning is limited to translational couch shift although we observed several patients with variations (e.g. prostate deformation due to rectal gas, bladder filling, volume variation) that could not be resolved by the couch shift.

Conclusion: CBCT provides substantial bony and soft tissue information. It also reveals that the prostate is often deformed and simple translation correction will not improve the treatment accuracy. Therefore, customizing margin or adaptive therapy is essential for those patients.

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