

AbstractID: 11812 Title: On the Importance of Correcting Anatomical Deformations in

Prostate Cancer Patients

Purpose: To assess the effects of target, rectum and bladder anatomical deformations on targeting accuracy of prostate and post-prostatectomy cancer patients undergoing IG-IMRT.

Methods: Localization with online kV-CBCT was performed. The target and OARs positional/volumetric changes were evaluated and couch shifts were applied. For patients with large target/OARs volumetric changes compared to planning CT, arising from medications, diet, and/or ongoing RT, repeated localization CB scans were performed following an interventional procedure, shifts were then evaluated, and the IMRT treatment was subsequently delivered. The interventional procedure involves the insertion of a rectal catheter or rectal deflation, and/or bladder filling. A total of 160 pre-/post-intervention shifts from 14 patients in the lateral/LR, vertical/AP, and longitudinal/SI directions were compared. The percentage of shifts larger than 5 mm in all directions was also compared. CTV-to-PTV expansion margins were estimated based on the pre- and post-intervention localization data.

Results: Systematic/ Σ and random/ σ shifts from pre- versus post-intervention data (in mm) were: LR, 0.2 ± 2.8 vs. 0.4 ± 2.9 ; AP, -0.7 ± 5.3 vs. -1.1 ± 3.6 ; SI, 0.6 ± 3.7 vs. -0.5 ± 2.5 . The mean 3D shift distance was 6.4 ± 3.1 vs. 4.8 ± 2.4 with a p-value < 0.05 . The percentage of pre-intervention shifts larger than 5 mm were 7.5%, 31.3%, and 16.3% in the LR, AP, and SI directions, respectively, compared to 8.8%, 15.0%, and 6.3% for post-intervention. Large anatomical variations were observed for rectum and/or bladder, suggesting that localization without intervention may not be sufficient to ensure accurate targeting and sparing of rectum/bladder.

Conclusion: Localization data from pre- and post-intervention procedures show that for treatments that do not include intervention to correct for rectum/bladder anatomical variations, the CTV-to-PTV margin required is larger by 5 mm, and more rectum/bladder volumes are potentially at risk of radiation-induced acute or late toxicity.