

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/ $\Sigma$  and random/ $\sigma$  shifts from pre- versus post-intervention data (in mm) were: LR,  $0.2 \pm 2.8$  vs.  $0.4 \pm 2.9$ ; AP,  $-0.7 \pm 5.3$  vs.  $-1.1 \pm 3.6$ ; SI,  $0.6 \pm 3.7$  vs.  $-0.5 \pm 2.5$ . The mean 3D shift distance was  $6.4 \pm 3.1$  vs.  $4.8 \pm 2.4$  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.