

AbstractID: 7676 Title: Comparison of prostate localization with online ultrasound and  
mega-voltage cone-beam computed tomography

**Purpose:** To analyze the online image-guided localization data from 846 ultrasound (US) and 350 MV-CBCT couch alignments for patients undergoing IMRT of the prostate.

**Method and Materials:** Daily volumetric MV-CBCT and US images were acquired for 11 and 23 patients, respectively, after each patient was immobilized in a vacuum cradle and setup to skin markers as the center-of-mass. The couch shifts applied in the lateral (left-right/LR), vertical (anterior-posterior/AP), and longitudinal (superior-inferior/SI) directions, along with the magnitude of the three-dimensional (3D) shift vector, were analyzed and compared for both methods. The percentage of shifts larger than 5 mm in all directions was also compared. CTV-to-PTV expansion margins were estimated based on the localization data with US and CB image-guidance.

**Results:** Systematic and random shifts from CB versus US were: laterally,  $1.6 \pm 3.8$  mm vs.  $-0.7 \pm 6.9$  mm; vertically,  $-0.9 \pm 5.4$  mm vs.  $-0.2 \pm 6.4$  mm; longitudinally,  $-1.4 \pm 2.9$  mm vs.  $-2.9 \pm 5.2$  mm. The mean 3D shift distance was smaller using CB ( $6.6 \pm 3.6$  mm vs.  $9.1 \pm 6.5$  mm) with a p-value  $< 0.05$ . The US data show greater variability. The percentage of US shifts larger than 5 mm were 33%, 40%, and 31% in the LR, AP, and SI directions, respectively, compared to 17%, 31%, and 7% for CB.

**Conclusion:** MV-CBCT localization data suggest a *different* distribution of prostate center-of-mass shifts with smaller variability, compared to US. The online MV-CBCT image-guidance data show that for treatments that do not include daily prostate localization, one can use a CTV-to-PTV margin that is 2.5 mm smaller than the one suggested by US data, hence allowing more rectum and bladder sparing and potentially improving the therapeutic ratio.

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