

AbstractID: 7567 Title: Image guided radiotherapy in prostate localization: a comparison of ultrasound modalities to implanted seed markers and assessment of intrafractional prostate motion

Purpose:

To compare 2D (BAT) and 3D (IBeam) ultrasounds with seed markers (SM) for prostate localization, and to assess intrafractional prostate motion during external beam radiotherapy (EBRT)

Method and Materials:

Prior to daily prostate localization with SM, patients underwent localization with two ultrasound systems for one week and with one ultrasound system for remaining treatments. Ultrasound shifts were prospectively recorded and patients were shifted as per SM alignment. The differences in lateral (LR), craniocaudal (CC) and anterior-posterior (AP) directions were compared assuming SM revealed the true position of the prostate. Intrafraction motion of the prostate was assessed by repeating the SM after EBRT treatment on four fractions.

Results:

From 20 patients, 455 I-Beam and 343 BAT ultrasound scans were compared to SM localizations. I-Beam had a mean error \pm sd of 0.6 ± 3.3 mm in the LR direction, 2.2 ± 4.8 mm (CC) and 0.2 ± 3.8 mm (AP). BAT had a mean error \pm sd of 0.0 ± 3.8 mm (LR), 0.8 ± 4.5 mm (CC), and -1.5 ± 4.3 mm (AP). Deviations >5 mm occurred in 11%, 32% and 18% in the LR, CC and AP directions respectively for I-Beam, and 11%, 24% and 23% respectively for BAT. Deviations >1 cm occurred in 7% in the CC direction for I-Beam. Intrafraction prostate motion is minimal with a mean displacement ≤ 1.5 mm. The greatest movement is in the AP direction with 4% of patients having >5 mm displacement.

Conclusion:

Target localization with two US systems provide different results than SM localization. Our data suggest that PTV margin guidelines for BAT and I-Beam should be greater than those for SM. The US margin requirements may also need to be greater than if no daily localization is performed. In addition, intrafractional prostate motion is minimal with large displacements occurring in $<5\%$ of patients. We have adopted seed markers for daily prostate localization at our institution.