

AbstractID: 13928 Title: Accounting for prostate motion in interstitial prostate LDR brachytherapy for aiding post-implant dosimetry.

**Purpose:** This study examines the utility of 4DCT for post-implant dosimetry in interstitial LDR prostate brachytherapy. **Method and Materials:** Static and “free-breathing” CT images of a customized CIRS torso phantom were acquired on a Philips 16-slice 4DCT scanner. The phantom was positioned at an angle on a 1D motion platform to simulate 2D longitudinal and vertical motion. The breathing signal was acquired using the Varian RPM system. Free-breathing image sets were acquired at 10 and 30 cycles/minute (CPM) with an amplitude of 2 mm to simulate prostate motion (the minimum achievable with our motion stage). The 4DCT images were binned in 4 phases and reconstructed retrospectively. The prostate gland was simulated by adding a 12.5 cc wax cylinder to the central rod of the phantom. Forty five dummy seeds were placed peripherally and within the cylinder volume, such that any two seeds were separated by at least 3 mm relative to each other. Seed type, strength and total dose was chosen to be I-125, 0.389U and 145Gy, respectively. Post-implant dosimetry was performed with the Variseed software using the auto-detection feature to identify seed locations. **Results:** While V100 and V90 were independent of cycle rate, there were variations up to 30% in D90 between the various phases of the 4DCT and the static scan. At 10 CPM, D90 varied from 114-154% across the 4 phases; at 30 CPM the D90 range across the phases was 111-117%. The static scan D90 was 123%. **Conclusion:** This preliminary study suggests that accounting for respiratory induced prostate motion may provide greater accuracy in post-implant dosimetry. Based on the extent to which the target dose coverage is compromised as a result of motion, one may be able to perform corrective action, such as adding an external beam boost to the prostate to achieve the intended dose coverage.