

AbstractID: 1200 Title: Cone Beam CT based Intraoperative Dose Assessment in TRUS Guided Prostate Seed Implant - Geometric Verification

Transrectal ultrasound (TRUS) guided prostate seed implant has become a standard treatment option for localized prostate cancer. To build a real-time dosimetric feedback system during implantation, we propose to use a C-arm based cone-beam CT (CBCT) for seed localization and 3-D TRUS for imaging the prostate. Hence, image fusion can be used for the calculation of prostate dosimetry in the OR. This is a feasibility study to investigate the geometric uncertainty between the two imaging modalities in the fused image.

We used a geometric phantom made of 7 pairs of crossed nylon wires and 3 dummy iodine seeds were attached on the phantom as fiducial markers. The phantom was mounted on a stepper/template assembly immersed in water for TRUS imaging. Axial TRUS images were obtained with a B&K unit over 5.5 cm at 1mm intervals. Under the same experimental setup, a CBCT image was obtained with a Siemens C-arm based CBCT unit at 125 KVp and 500 projections. A 512x512x384 volumetric image with isotropic resolution of 0.4 mm was reconstructed. These two image sets were imported into the Varian Variseed system for image fusion using the fiducial markers.

The geometric discrepancy between the two image sets was found to be more critical at points farther away from the probe. The disagreement was $< 0.2\text{mm}$ and $< 0.5\text{ mm}$ for points 2 and 6 cm from the probe respectively. The results suggest the feasibility of using CBCT and TRUS for intraoperative dosimetric feedback.

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