

## AbstractID: 1317 Title: Determination of 3D Ultrasound Catheter Localization Accuracy for High Dose Rate Prostate Brachytherapy Treatment Planning

We determined the accuracy of catheter localization based on 3D ultrasound (US) relative to Computed Tomography scan (CT) for High Dose Rate (HDR) prostate brachytherapy. This provides grounds for using 3D US instead of CT for HDR prostate treatment planning. We constructed an ultrasound phantom with a gel mixture (glycerol, agar and water). A template was also constructed with three rows (at US depths of 1.5, 3.5 and 6.5cm) of five catheters each. The catheters were inserted to three different distances, blinded to the person performing the study. Both 3D US and CT scans of the phantom were obtained. We performed fiducial localization on both US and CT, registration of fiducials between US and CT, and finally target localization. The fiducial localization error (FLE), the fiducial registration error (FRE) and the target registration error (TRE) were determined. The variation of US localization of catheter tips based on a single observer has a standard deviation of 0.3mm (FLE). This is comparable to CT (0.4mm). The FRE was just below 1 mm. The difference between the catheter tip localization by US and CT varied from 1.2mm to 1.9mm at the different US depths (TRE). With a maximum of 2mm difference compared to CT in catheter localization, we conclude that we can safely perform treatment planning based on our 3D US.