AbstractID: 1977 Title: Comparison of Intra-Modality and Cross-Modality Ultrasound-Based Image-Guided Systems for Prostate Localization

A 39 patient phase I/II study (CTC#02-017) was performed to compare two different ultrasound-based, image-guided patient positioning systems for daily prostate alignment. Prostate alignment with the BAT (Nomos Corp., Pennsylvania) system [BAT] was compared to that obtained with the Restitu system (Resonant Medical Inc., Montreal) [RES]. The RES system resides in both the CT-Sim and treatment rooms and calculates prostate misalignment by inter-comparing 3D ultrasound images of the prostate acquired at both planning and treatment times (intra-modality comparison). This is unlike the BAT system that calculates prostate misalignment by comparing cross-modality images (i.e.: two-orthogonal 2D ultrasound versus CT images). Data from 110 BAT and 110 RES alignments shows the following (BAT–RES) difference for the displacement of the prostate in the AP, SUP/INF, and LAT directions: -0.2 (0.5), 5.8 (0.6), and 0.8 (0.3) mm, respectively (values in parenthesis indicate the standard error of the mean). The statistical analysis shows a p-value (Wilcoxon signed-rank test) of 0.392, < 0.0001, and 0.010, respectively, which indicates that the nul hypothesis (zero difference) is rejected for SUP/INF and LAT directions. CT and RES measurements of the distance between the prostate centre of mass and planning isocentre position were used to validate the spatial accuracy of the RES system and show that there is no significant difference between their mean values: differences –0.5 (0.8), -0.4 (0.6), and –0.3 (0.7) with p-values 0.254, 0.285, and 0.419, respectively. These results indicate significant systematic differences between intra-modality and cross-modality ultrasound-based patient alignment methods.