AbstractID: 9308 Title: Comparison of CBCT and Electromagnetic Transponders for Prostate Localization

Purpose: In prostate cancer radiotherapy, it is unknown how large the PTV margins must be to account for the isocenter correction tolerance and intrafraction motion. The risk of geographic miss can be minimized by the placement of fiducial markers in the prostate gland for daily pretreatment localization and adjustment of patient position if necessary. In this study, we assess the magnitude of interfraction and intrafraction isocenter displacement using implanted electromangnetic transponders, and validate the accuracy of interfraction localization using cone beam CT. **Methods and Materials**: Fifteen supine prostate IMRT patients with three implanted transponders each were studied. Initial daily localization was based on three laser and skin marks. Daily localization error distribution was determined from offsets between the initial setup position and that determined by Calypso. Post setup with the Calypso system, isocenter localization was immediately independently verified by imaging the radio-opaque transponders using an integrated cone beam CT imaging system. Both localization techniques produced lateral, longitudinal, and vertical target offsets from machine isocenter. Organ motion or patient movement during treatment was continuously monitored by the Calypso system at a 4-mm threshold. **Results**: The mean interfraction displacement (± SD) in cm in the lateral, vertical, and longitudinal directions were -0.2 ± 0.6, 1.8 ± 1.3, and 0.3 ± 0.9, respectively. After any necessary isocenter corrections, the mean isocenter placement error relative to the cone beam CT (± SD) in cm in the lateral, vertical, and longitudinal directions were 0.0 ± 0.1, 0.1 ± 0.2, and 0.0 ± 0.1, respectively. **Conclusion**: Compared with use of skin marks, electromagnetic isocenter repositioning provides an increased degree of isocenter localization. Good agreement was observed between cone beam CT isocenter localization and electromagnetic repositioning. However, the electromagnetic technique, with real time continuous tracking, has the added advantage of threshold-based intervention with no additional radiation dose.