

AbstractID: 3054 Title: Patient Setup Accuracy and Precision of Prostate Radiation Treatment with BrainLab ExacTrac X-ray System with Implanted Fiducials

Purpose: To confirm the intra-radiation treatment motion of the prostate is small enough so that daily positioning of the prostate is a valid effort. To test the automatic target alignment of the ExacTrac X-ray® system.

Method and Materials: The target positioning data of 51 radiation treatment sessions were collected retrospectively from 5 prostate cancer patients treated with IMRT between June and August in 2004. All patients were in supine treatment position and immobilized with HipFix (Med-Tec, Inc.) without any padding or mold on the couch. Four gold fiducial markers (ϕ 1.2 mm, 3.0 mm long, Med-Tec, Inc.) were implanted in the patient's prostate under ultrasonic guidance prior to the planning CT scan. Prior to the treatment, fiducials were localized using stereoscopic kV x-ray imaging system (ExacTrac X-ray®, BrainLab) and the couch was automatically shifted to a correct the target position. There are two sets of data collected. 1) pre-treatment target deviation after the automatic positioning with kV x-ray images. 2) post-treatment target deviation.

Results: 1) The average pre-treatment deviations of the target after the automatic positioning were -0.2 ± 1.3 mm (vertical), -0.1 ± 1.0 mm (longitudinal), and 0.0 ± 0.4 mm (lateral). 2) The average isocenter shifts (difference of the target positions between pre- and post-treatment) were -0.2 ± 1.0 mm (1SD for all errors, vertical), -0.3 ± 1.2 mm (longitudinal), and 0.1 ± 0.5 mm (lateral).

Conclusion: Both averages of post-treatment shift and pre-treatment deviation of the target were negligible considering the uncertainty. Both results showed lower positioning uncertainty by half in the lateral direction compared with the vertical and longitudinal directions, which suggest the lateral target motion was restricted better than the vertical and longitudinal. Same magnitude of position uncertainty of the pre-deviation and post-shift indicates the limit of the precision of daily ExacTrac's automatic positioning.