

AbstractID: 3924 Title: Monitoring of Intra-Fractional Patient Motion During High-Dose Extra-cranial Paraspinal Radiosurgery

Purpose: Patients undergoing high dose single fraction radiotherapy to para-spinal sites are setup in a non-invasive immobilization cradle. We study the use of a portable infra-red tracking system for monitoring intra-fractional patient motion.

Method and Materials: Infrared reflectors are affixed on the immobilization cradle, and taped to specific points of the patient to monitor positions or track breathing. A commercial stereoscopic infrared camera continuously tracks all the reflectors. Custom software determines the positions of the patient reflectors relative to the coordinate system of the cradle to assess motion during the treatment. Prior to treatment, the system runs in a learning mode for several breathing cycles to acquire baseline data for comparison with reflector positions detected during the treatment. The displacement of each reflector from its baseline is displayed on a computer screen for continuous monitoring. For the purpose of this study, a 3D patient shift between the beginning and end of treatment was determined by averaging the individual 3D displacements of reflectors attached to skin overlying bone (sternum, hips).

Results: A QA procedure of system accuracy determined that 0.5mm shifts of individual reflectors can be detected. Patient tracking data are consistent with observed patient shifts seen with portal imaging. For the patients studied, each component of the shift seen by the system was within 1mm of the corresponding shift of the bony anatomy in the vicinity of the target seen between pre and post treatment portal imaging.

Conclusion: The system allows the detection of shifts of 2 mm or more as they occur and is therefore clinically useful. This may occur if a patient adjusts his position, for example. The ability to detect smaller shifts that occur slowly is under study. The system provides a real-time measure of patient safety during high dose treatment and is in clinical use.