

AbstractID: 10931 Title: Clinical Data Evaluation of Fiducial-free Spine Tracking for CyberKnife Radiosurgery

Purpose: To evaluate the accuracy of the Xsight® Spine Tracking (XST) System in the CyberKnife® Robotic Radiosurgery System (Accuray Incorporated, Sunnyvale, CA) using retrospective analysis of clinical data. **Method and Materials:** The XST System performs patient alignment and frequent intra-fractional tracking for spine radiosurgery. The 3 translations and 3 rotations of the 3D transformation are computed and used for treatment couch correction in patient setup and radiation beam position compensation during treatment delivery. The XST System eliminates the need for fiducials by using 2D-3D spine registration of two orthogonal X-ray images and the planning CT image. Analysis was performed using image data acquired for 26 patients previously treated using fiducial tracking. The data consists of a CT image for each patient plus 4,480 X-ray image pairs acquired during treatment. The cases cover the entire spinal column (3 cervical, 13 thoracic, 7 lumbar and 3 sacrum). Each patient had 4–6 metal fiducials implanted in vertebrae adjacent to the spine lesion being treated. Fiducial and XST tracking were performed for all X-ray image pairs. The XST transformation errors were calculated by using the fiducial tracking results as the reference gold standard. **Results:** The error of each translation component is <0.5 mm in 20/26 patients, <1 mm in 25/26 and <1.5 mm in 26/26. The mean 3D translation error is 0.6 mm. The error of each rotation component is <0.5° in 9/26, <1° in 23/26, <1.5° in 25/26 and <2° in 26/26. The mean total rotation error is 0.8°. For 1 patient with >1 mm translation error and 3 patients with >1° rotation error, the fiducials are far from the center of region of interest, which degrades the fiducial tracking accuracy. **Conclusion:** The XST System robustly tracks all spine regions and accurately computes both translations and rotations.

Research sponsored by Accuray Incorporated.