AbstractID: 8840 Title: Intrafraction Motion of Prostate in Cyberknife Hypofractionated Radiotherapy

Purpose: To report the characteristics of prostate motion as tracked using implanted fiducials during hypofractionated radiotherapy with CyberKnife. **Method and Materials:** Twenty one patients with prostate cancer who were treated with CyberKnife between January 2005 and September 2007 were selected for this retrospective study. The CyberKnife uses a stereoscopic X-ray system to obtain the position of the prostate target through the monitoring of implanted gold fiducial markers. If there is a significant deviation, the treatment is paused while the patient is repositioned by moving the couch. The deviations calculated from X-ray images acquired within the time interval between two consecutive couch motions constitute a data set. **Results:** A total of 427 data sets and 4439 time stamps of X-ray images were analyzed. The average duration for each data set is 697 s. The spread of prostate position increases as the time elapses. At 30 s, a motion larger than 2 mm exists in about 5% of data sets. The percentage is increased to 8%, 11%, and 14% at 60 s, 90 s, and 120 s, respectively. A similar trend exists for other values of prostate motion. **Conclusions:** With proper monitoring during treatment, the prostate shifts observed among the patients can be kept well within the tracking range of the CyberKnife. On average the sampling interval of ~40 s between consecutive X-rays is adequate to ensure sub-millimeter tracking. However, there is significant movement variation among patients and higher sampling rate is necessary in some patients.