AbstractID: 11369 Title: Immobilization Accuracy of a Novel Re-locatable Head Frame Investigated with a Real-time Optical Tracking System

Purpose: To evaluate the immobilization accuracy of a novel vacuum bite block re-locatable head frame (RHF) system in patients receiving intracranial stereotactic radiation therapy (SRT) by means of an infrared optical tracking system (OTS).

Methods and Materials:
The RHF was designed for multi-session treatments on the Leksell GammaKnife Perfexion™. In the present REB approved study, the RHF was used for patients undergoing linac-based SRT. A passive optical marker was placed on the bite block as a surrogate for patient motion. The OTS monitored patients continuously throughout each fraction. For each fraction, cone-beam computed tomography (CBCT) was used to verify the patient position at three time points: after the initial setup, pre-delivery following the automatic couch adjustments and post-delivery. To investigate the reliability of the optical measurements, the OTS measurements were compared against the implemented couch shifts for patient setup. Intra-fractional anatomical motion, as measured from the second and third CBCT scans, was compared with the difference in OTS marker positions. Real-time OTS data throughout each fraction was assessed to determine if patients moved by more than 1 mm during treatments.

Results:
Currently, data from three patients have been analyzed. The couch motion measured from the OTS strongly correlated with the actual reported couch shift (Pearson correlation coefficient of 0.99). Mean differences between OTS and true couch motion were 0.01, 0.0, and 0.04 mm in the lateral, anterior-posterior, and superior-inferior directions, respectively. Mean differences between OTS and CBCT reported motion were 0.37, 0.07, and 0.01 mm respectively with a mean vector magnitude of 0.41 mm. The real-time positional data indicated that there were few instances (3) of patient motion greater than 1mm.

Conclusion:
The OTS is a reliable tool for evaluation of intra-fraction patient motion. The results of this study indicate that the RHF provides sufficient immobilization accuracy for SRT.