AbstractID: 11514 Title: Comparison of Cone-Beam CT and Frame-Based Localizations for Stereotactic Radiosurgery with Fixed Head Rings and Removable Frames

Objectives: To compare localization accuracy using both conventional frame-based localizers and cone-beam CT (CBCT) images for stereotactic radiosurgery (SRS).

Methods: A SRS geometric phantom was used to verify the localization accuracy based on a SRS localizer (BrainLAB) and CBCT images (NovalisTx, Varian Medical Systems). 70 patients with 86 SRS treatments were retrospectively analyzed (11 with fixed head rings and 75 with removable U-Frames with additional skin masks). Patients were localized with the Brainlab localizer first. CBCT images with 1 mm slice thickness were then acquired to match planning CT.

Results: The SRS geometric phantom showed that the Brainlab localizer and CBCT images based localizations agreed within 1 mm. The magnitudes of shifts between the Brainlab localizer and CBCT images based localizations for SRS with fixed head rings were 0.04 ± 0.05 cm along x (lateral), 0.09 ± 0.06 cm along y (vertical), and 0.08 ± 0.08 cm along z (longitudinal) direction with 0.06 ± 0.14 degrees of couch rotation. For the SRS patients using removable U-frames with masks, the magnitudes of shifts between the Brainlab localizer and CBCT images based localizations were 0.11 ± 0.10 cm along x, 0.12 ± 0.09 cm along y, and 0.18 ± 0.13 cm along z direction with 0.34 ± 0.53 degrees of couch rotation. The 95% probability shifts for the removable frame were 0.3 cm along x, 0.3 cm along y, and 0.4 cm along z direction with 1.6 degrees of couch rotation.

Conclusions: The results from both the phantom test and the patients with a fixed head ring show that the CBCT based localization is reliable and accurate. For patients with removable frames, if the localization is based only on the frame-based localizer without any imaging guidance, a margin of 3 ~ 4 mm is necessary to ensure adequate coverage.