AbstractID: 6538 Title: Analysis of setup accuracy for invasive frame-based stereotatic radiosurgery (SRS) patients using cone beam computed tomography (CBCT)

Purpose: To evaluate the setup accuracy of invasive frame-based stereotactic radiosurgery (SRS) patients using cone-beam computed tomography (CBCT).

Method and Materials: Each patient participating in this institutional-approved prospective protocol was immobilized with a Brown-Roberts-Wells (BRW) frame and scanned on a CT simulator for treatment planning (2mm slice thickness). The patient was transferred to the treatment room and setup to the BRW coordinates of the planning isocenter. Before treatment was delivered, the patient was CBCT scanned with the CT localizer attached to the BRW frame. A CBCT scan of a BB at the treatment isocenter was also acquired to evaluate the apparatus accuracy of the BRW frame system. Systematic shifts between CBCT and treatment isocenters were measured independently from an orthogonal pair of projection images of a BB at the treatment isocenter, and were used to identify the treatment isocenter in the patient CBCT scan. BRW coordinates of the treatment isocenter of the patient scan were compared with the planning BRW coordinates to evaluate the localization accuracy. The patient CBCT scan was then co-registered with simulation CT to determine the setup accuracy.

Results: Three patients were successfully recruited to date. The average apparatus accuracy (Euclidean distance between the BRW coordinates of the planning isocenter and the BB) was 0.46±0.39 mm (mean ± one standard deviation). The average localization accuracy was 0.88±0.18 mm. The total setup accuracy of the invasive SRS frame was 1.63±1.39 mm with major sources of error in the superior-inferior (0.43±2.18 mm) and anterior-posterior (0.33±0.79 mm) directions.

Conclusion: The apparatus error generated by the BRW frame system was comparable to earlier reports. Although the localization accuracy for patient treatment was slightly worse, significant setup errors were observed due to patient sag. Volumetric CBCT scan was therefore recommended even for invasive frame-based SRS to correct this problem.