

AbstractID: 10773 Title: Quality Assurance for Imaging Guided Stereotactic RadioSurgery with Novalis Tx™ System

Purpose: To present QA measurements over extended periods at our institute and recommend a QA program for image-guided radiosurgery on Novalis Tx system.

Method and Materials: Novalis Tx system is developed based on a Trilogy linear accelerator featuring BrainLAB 6D-ExacTrac, HD120-MLC, MV-EPID and KV-OBI&CBCT. Utilization of any new technology and equipment necessitates a comprehensive QA program to maintain and monitor system performance characteristics. In this study, we carried out a systematic QA program, including linear accelerator QA, treatment planning QA, planning MRI and CT QA, treatment imaging QA, patient-specific QA, and system setup procedures for image-guided radiosurgery. Methodology, frequencies and criteria of QA tests were based on AAPM TG40, TG42, TG51, TG66, and ACR MRI QC.

Results: Comprehensive QA was performed from March to December 2008. 1) Daily Winston-Lutz tests of 199 measurements showed that isocenter of gantry rotation was 0.44 ± 0.21 mm; isocenter of couch rotation was 0.34 ± 0.20 mm, within 1mm tolerance. Other linear accelerator QA results were within TG40 criteria. 2) Treatment planning QA was conducted with spot-checks and a RPC SRS head phantom test. In spot-checks, dosimetric discrepancies were within 3% (3.5% for the 4mm cone). RPC radiosurgery test was passed with less than 1% dosimetric deviation, and 100% geometric match. 3) Daily MRI QA showed that average geometric distortion was -0.2 ± 0.4 mm, -0.3 ± 0.4 mm, and -0.9 ± 0.1 mm along vertical, lateral, and longitudinal directions, within 1mm on phantom, 50% of ACR specifications. 4) OBI QA showed that imaging isocenter displacement was 0.46 ± 0.30 mm at AP and 0.76 ± 0.19 mm at RLAT. 5) Over ten months, 128 patients with intracranial lesions were treated with radiosurgery. All second MU checks were within 3%, and there were none treatment errors associated with the SRS treatments.

Conclusion: Comprehensive QA program for image-guided radiosurgery has been developed with proper methodology, frequency and criteria on Novalis Tx system, demonstrated with extensive measurements.