

AbstractID: 8691 Title: Phantom evaluation of implanted coil localization accuracy of the BrainLab ExacTrac gating system and 4DCT

Purpose: The purpose of this study was to evaluate the accuracy of measured target motion using 4DCT scanning and BrainLab ExacTrac (ET) Gating system for gated therapy. Motions of an implantable coil as a function of respiratory phase were compared from the two systems to the known motion for a commercial gating phantom. **Methods & Materials:** A Quasar respiratory motion phantom containing an implantable coil as a surrogate target was used. Phantom motion was sinusoidal with a 4-second period and amplitudes of 5-25 mm. 4DCT datasets were sorted in 10 distinct respiratory phases, reconstructed, and imported into the Pinnacle TPS. Coil endpoints were identified on each phase-sorted CT datasets to measure coil distortion. To compare coil localization accuracy, both systems imaged the implanted coil at the same respiratory phases and measured overall relative coil displacement as a function of respiratory phase. **Results:** Coil length errors measured on the 4DCT were <0.8 mm at end inhale/exhale phases, but 8.1 mm at mid-inhalation. Maximum localization error from the expected position for all motion profiles was 5.5 mm for both coil tips in 4DCT, but only 0.8 mm for the ET Gating system. Even at the greatest coil velocity, ExacTrac coil localization agrees with calculated coil motion within 1 mm. 4DCT showed problems resolving a coil during large respiratory-induced velocities, but accurately resolved the coil length within 1 mm of actual coil length at end expiration/inhalation. **Conclusions:** 4DCT can provide accurate representation of the phantom at end-respiration for treatment planning. ExacTrac can accurately localize the coil to determine target motion over all phases. Good agreement of the techniques will allow minimization of internal motion margins in gated radiotherapy. **Conflict of Interest:** This work was supported in part by a research agreement with BrainLab, Inc.