

AbstractID: 11580 Title: Evaluation of the Positioning Accuracy in Helical Tomotherapy for Stereotactic Intracranial Radiosurgery

Purpose: To assess the accuracy of patient alignment for intracranial stereotactic radiosurgery (SRS) on Tomotherapy using the standard for linac alignment assessment - hidden target port films.

Method and Materials: For each trial, a small 6.5-mm diameter ball bearing (target) was placed in one of four positions inside a Rando head phantom. A kilovolt computed tomography (kVCT) scan was used for both planning and as the dosimetry quality assurance (DQA) phantom. The DQA capabilities of the treatment planning software were used to position the target to coincide with the isocenteric lasers of the Tomotherapy unit in the axial, sagittal, and coronal planes. Accurate registration of the MVCT to the kVCT should place the target at the isocenter. Lateral and Anterior-Posterior (AP) port films were taken with only the center two binary multi-leaf collimators (bMLC) open. The films were analyzed and shifts were measured in the AP, right-left, and superior-inferior directions relative to the radiation field. The process was repeated 15 times for each target location.

Results: Analysis of 60 pairs of port film yielded the following millimeter errors in the AP, lateral, and average SI directions respectively for each of four trial locations: (1) 0.79 ± 0.27 , 0.77 ± 0.11 , 0.84 ± 0.29 ; (2) 0.88 ± 0.28 , 0.39 ± 0.14 , 0.18 ± 0.25 ; (3) 1.19 ± 0.23 , 0.57 ± 0.19 , 0.43 ± 0.39 ; (4) 1.16 ± 0.18 , 0.34 ± 0.35 , 0.56 ± 0.35 . Across the trials the mean errors were seen to be 1.00 ± 0.30 anterior, 0.50 ± 0.40 superior and 0.52 ± 0.27 to the patient's left.

Conclusion: The results show a root-mean-square error of 1.33 ± 0.28 . The tight standard deviation in each direction suggests there may be systematic error in alignment, which may include measurement error (isocentric placement of phantom) or inaccuracy of MLC alignment.

Conflict of Interest (only if applicable):