

AbstractID: 4355 Title: Positioning in cranial stereotactic radiotherapy: anatomical points vs. full 3D transformation

Purpose: Some commercial IGRT systems do not have yet proper software tools for stereotactic localization. We evaluated two different isocenter realignment techniques for fractionated cranial treatments (previously presented). The goal of this report is to compare these two techniques and quantify the importance of using isocenter shifts derived from full 3D alignments.

Method and Materials: A comparison study was carried out based on a total of 26 treatments (7 patients localized with the GTC relocatable frame; total of 41 isocenters.). Prior to each treatment a scan was acquired with Primatom CT-on-rails system (Siemens, Concord, CA), and the scan was registered by the treatment planning system (Radionics, Boston, MA). Three anatomical control points (ACP) were used for realignment. First, the control points were identified by a physician, their coordinates were recorded and a daily shift was calculated as an average value of the control point shifts (ACP method). Then using 3D transformation, we separately calculated the shifts of the control points and the shifts of the isocenters (3D alignment method). Statistical analysis was performed separately for (1) control points shifts and (2) isocenter shifts.

Results: As expected, the differences between the two methods in control point shifts (0.6 to 0.9 mm, one SD) correlated with the root-mean-square of the individual uncertainties of each method. When comparing isocenter shifts, we found greater random (0.9 to 1.1 mm) and systematic differences between the methods. The increased errors observed in isocenter shift comparison were due to several peripheral isocenters, for which the ACP method failed. The maximum discrepancies observed were from 3 to 5 mm.

Conclusion: The results from this study show that when using the GTC relocatable frame a physician can use the ACP method for patient alignment, provided that the treated isocenter is close to at least one point or between points.