

AbstractID: 3688 Title: Importance of pre-fraction helical CT isocenter verification in extracranial stereotactic radiosurgery

Purpose: To quantify the impact of pre-fraction helical CT isocenter verification vs. setup based on planning CT in fractionated extracranial stereotactic radiosurgery.

Method and Materials: Treatment plans (Elekta PrecisePlan) and pre-fraction isocenter verification helical CT scans for 12 patients (40 fractions) were recovered from treatment plan archives. All structures were contoured by a single physician at the time of treatment. Each plan was imported into a customizable treatment plan analysis suite (CERR). Using CERR, pre-fraction isocenter verification CT scans were fused with the original treatment plan using the external body frame as a reference. The original planned dose distribution was then translated from original treatment plan isocenter to pre-fraction verification isocenters in each fraction. Dose and volume parameters for pertinent structures were automatically extracted using both registration methods (planned or pre-fraction scans) for the original treatment plan and for all subsequent fractions. All patients were treated using the pre-fraction verified isocenter rather than pre-calculated body frame fiducials as per our institutional policies.

Results: GTV volumes on pre-fraction CTs varied from original planned GTV volume (64%-203%, mean=101.8+/-26.5%) largely due to helical sampling of a mobile target. Using the external body frame as the only setup reference would have resulted in geographic misses (<80% coverage of 95% of GTV) in 7/40 (17.5%) fractions. Pre-fraction isocenter verification resulted in improved D95 GTV coverage (88-102%, mean=99.3% +/-2.4%) with no geographic misses.

Conclusion: The current RTOG protocol (0236) evaluating extracranial stereotactic radiosurgery does not require pre-fraction CT tumor position verification. Our institutional policy is to verify isocenter/tumor position prior to each fraction via CT. Although helical scanning artifacts are present, pre-fraction CT-based isocenter verification may provide more consistent tumor coverage than setup to planned body frame fiducials.

Conflict of Interest (only if applicable): Support for this research was provided in part by Elekta, Inc.