AbstractID: 8911 Title: Dosimetric Delivery Verification of Whole Brain Radiotherapy with Hippocampal Avoidance (WBRT-HA) and Simultaneously Integrated Multiple Metastases Boost (SIB)

Purpose: To verify the delivery accuracy and precision of a whole brain radiotherapy hippocampal avoidance (WBRT-HA) and simultaneously integrated multiple metastases boost treatment plan in a head phantom.

Method and Materials: A helical tomotherapy treatment plan was created using the Rando anthropomorphic head phantom. The image set was transferred to Pinnacle^3 TPS where structures were segmented. Contours from an actual patient segmentation were applied to retain an accurate representation of the human anatomy. The plan was generated using a field width of 1.0 cm, pitch of 0.215, and modulation factor of 4.0. Dose prescriptions to the various targets were as follows: Met1 & Met2 – 95% of volume to receive 70.8Gy, Met3 – 95% of volume to receive 63Gy, and WB-CTV – 95% of volume to receive 32.25Gy delivered in 15 fractions. TLD-100 chips were placed at the center of each metastasis, hippocampus lobe, and the brain. All fifteen fractions were delivered to the head phantom. After each fraction, the phantom was opened, and TLDs were replaced. The head phantom was then repositioned, and a MVCT was acquired for localization.

Results: Agreement between calculated and measured doses for the metastases, hippocampus, and whole brain were shown to be within 15, 10, and 3%, respectively. Reasons for these discrepancies aren't exactly known; however, being that the whole brain dose was within 3%, overdosing of the metastases and hippocampus may be due to their small volumes. Furthermore, the relatively small variance associated within each of the structures indicates that precise interfractional repositioning was possible with MVCT imaging.

Conclusion: Our results indicate that for small volumes the calculated dose was underestimated by up to 15% using helical tomotherapy. It was noted that the MVCT of tomotherapy is vital for the precise delivery of WBRT-HA with SIB of multiple metastases.