

AbstractID: 2662 Title: Peripheral Doses in CyberKnife Radiosurgery

Purpose: To measure doses delivered outside of the irradiated volume for typical CyberKnife treatments and to compare the results to peripheral doses arising from similar Gamma Knife (GK) and IMRT treatments.

Method and Materials: CyberKnife treatment plans were developed for two hypothetical lesions in an anthropomorphic phantom, one in the thorax and another in the brain. In both cases, 500 cGy was prescribed to the 70% isodose line. Li-F TLD-100 capsules were placed within the phantom at various depths and distances from the irradiated volume. For the brain lesion, GK and 6-MV IMRT treatment plans were also developed, and peripheral doses were measured.

Results: Peripheral doses for the CyberKnife thorax treatment ranged from $3.3 \pm 0.13\%$ to $1.2 \pm 0.06\%$ of the prescribed dose (D_p) at distances between 15 and 43 cm from the edge of the target. For the target in the brain, CyberKnife peripheral doses ranged from $1.2 \pm 0.02\%$ to $0.32 \pm 0.02\%$ of D_p at distances between 18 and 71 cm from the target edge. In comparison, the GK peripheral dose ranged from $0.63 \pm 0.03\%$ to $0.053 \pm 0.002\%$ of D_p , and the IMRT plan resulted in doses between $0.19 \pm 0.004\%$ and $0.043 \pm 0.002\%$ of D_p over the same range of distances.

Conclusion: Doses outside the irradiated volume for Cyberknife treatments are significantly higher than those encountered in standard radiation therapy. Peripheral doses given in AAPM Task Group Report No. 36 (Stovall, et al. Med. Phys. 22:63-82, 1995) for a 6-MV beam are between 0.2% and 0.02% of the dose at d_{max} at a distances ranging from 20 to 70 cm from the edge of a $5 \times 5 \text{cm}^2$ field. Furthermore, for the same target in the brain, CyberKnife peripheral doses were a factor of 2 to 6 times larger than those for GK, and a at least a factor of 6 times larger than those for IMRT.