

Purpose: To analyze 634 irradiations of the stereotactic radiosurgery (SRS) anthropomorphic phantom.

Method and Materials: The anthropomorphic SRS head phantom consists of a water-fillable head shaped plastic shell that has been altered to accept imaging and dosimetry inserts. The water-fillable imaging insert houses a 1.9 cm diameter nylon sphere that allows localization with either CT or MRI. The dosimetry insert houses TLD and radiochromic film. Institutions imaged, planned and treated the phantom. Plans were designed to deliver 30 Gy to the center of the target that was covered by an isodose line typically between 50% and 85%. The treated volume, assumed to be an ellipsoid defined by the prescription dose, was calculated from film profiles and compared to distances reported by the institution.

Results: Between 2000 and 2010, 125 of the irradiations were performed with Gamma Knife and 509 were performed with linear accelerators. Most of these irradiations were performed as a method of independent verification of treatment delivery. Gamma Knife TLD and treatment volume results were on average 0.98 ± 0.03 and 1.09 ± 0.11 , respectively. Linear accelerator TLD and treatment volume results were on average 1.00 ± 0.03 and 1.04 ± 0.15 , respectively. The percentage of institutions, using accelerators, meeting the QA guidelines for dose to the target, treated volume, ratio of measured treated volume to target volume and minimum dose to target were 93%, 90%, 80%, and 80%, respectively. For Gamma Knives the corresponding percentages were 91%, 98%, 88%, and 49%. The percent of institutions meeting all four criteria were 54% and 39% for accelerators and Gamma Knife, respectively.

Conclusion: Though most SRS phantom irradiations met several of the individual criteria, only 50% met all four. Failure to plan adequate target coverage and/or deliver adequate target coverage contributed to the low percentages for minimum dose to target compliance.

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