

AbstractID: 5380 Title: Analysis of the impact of skull scaling deviations in Gamma Knife radiosurgery

Purpose: To investigate the impact of variations in skull scaling measurements in Gamma Knife radiosurgery.

Method and Materials: We developed an in-house planning algorithm able to calculate the boundary of the skull directly from an image set. We imported 11 patient plans and obtained the skull contours from the image set. We then manually replicated GammaPlan's skull scaling interpolation directly into our algorithm, and noted the change in times and isodose line distribution produced by such changes.

Results: Dipstick measurements on average deviated from our skull measurements on average 8 mm. Prescription isodose lines were not visibly affected by the differences in skull scaling. Time calculations were affected by skull scaling differences; in multi-shot plans, shot times differed from 0.6% to 2.9%. Prescription isodose lines did not shift significantly despite significant differences in skull scaling. Differences were similar regardless of lesion location. For single shots, times differed depending on the proximity of the shot to large differences in skull boundary; thus shots placed in the frontal region demonstrated discrepancies of approximately 5%, whereas shots placed superiorly (where the interpolation tends to be successful) and centrally (far from skull boundaries) showed differences of less than 1%.

Conclusion: For most lesions, skull scaling will not affect the treatment times by more than 3%. Single shots placed near a defective skull interpolation will be the most strongly affected, with discrepancies in time calculations of 5%. It is important to consider the quality of the skull interpolation surrounding the lesion to be treated, as the quality of the treatment could be impacted.