

AbstractID: 8324 Title: Dosimetric considerations of treating larger target volumes with Perfexion

Purpose: To quantify the background absorbed dose to the uninvolved brain as a function of target volume for varying isocenter spacing and collimator sizes using Perfexion™.

Method and Materials: Multiple treatment plans were generated for a series of spherical targets, using a sphere-packing algorithm to automatically determine the isocenter coordinates. Target volumes investigated ranged from 2.1 cm³ (diameter=16 mm) to 33.5 cm³ (diameter=40 mm), with isocenter spacing for each volume ranging between 3.2 mm and 8 mm. The dose was determined for each scenario at fixed distances from 3 cm to 7 cm from the edge of the target volume and expressed as a percentage of the dose to the target edge. Dose was calculated using Gamma Plan (v8.0) and measured using EBT Gafchromic film inserted in a plastic spherical phantom (8 cm radius).

Results: No statistically significant difference in background dose was found between isocenter spacing levels. Relative dose at each point from the edge of the target increased with increasing target volume. Using only 4-mm collimated isocenters, the background dose at 7 cm from the target edge was 0.5% (23 isocenters) and 4.6% (226 isocenters) for 2.1 cm³ and 33.5 cm³ targets, respectively. For a given volume size, background dose was higher when using 16-mm compared to 4-mm collimated isocenters. Using only 16-mm collimated isocenters, the average dose rate at 7 cm from the target edge was 2.3% (1 isocenter) and 6.8% (9 isocenters) for 2.1 cm³ and 33.5 cm³ targets, respectively.

Conclusion: Treating larger target volumes with Perfexion™ results in larger background dose to uninvolved brain, irrespective of what spacing is used between isocenters. The use of 4-mm collimated isocenters yields lower background dose levels than 16-mm collimated isocenters for equivalent target volumes.

Conflict of Interest: Research sponsored by Elekta Instruments AB