Impact of different prescription isodoses on normal tissue for linac-based stereotactic radiosurgery systems using dynamic conformal arcs

Thierry Gevaert 1, Mark Levivier 2, Constantin Tuleasca 3, Benedikt Engels 4, Dirk Verellen 5, Mark De Ridder 5


Corresponding author: Thierry Gevaert, thierrygevaert@hotmail.com

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Abstract

Objectives: The aim of this study is to investigate if prescription isodose with linac-based approach can be adjusted to achieve better conformity and gradient indices in order to reduce the gap with Gamma Knife Perfexion.

Methods: We enrolled randomly 45 patients with vestibular schwannoma (Koos I-III) treated with Gamma Knife Perfexion (Elekta AB, Sweden) and replanned them with different prescription isodoses, on a dedicated linac-based system. Paddick conformity index (CI) and gradient index (GI) were used for analysis.

Results: For the patients treated with Gamma Knife Perfexion, a mean CI of 0.72 (SD0.09) and GI of 3.08 (SD0.41) were found. For the Novalis system, using the original prescription isodose (80%), a mean CI of 0.67 (SD0.07) and GI of 4.44 (SD0.42) were found. A mean value of 63% (SD4%) prescription isodose was calculated to be relevant for improved CI and GI. Comparable mean CI of 0.67 (SD0.08) and a significant reduction of 19% in the mean GI (3.73 SD0.30) (p<0.01) were found.

Conclusions: The adaptation of the prescription isodose for linac-based radiosurgery for each patient will lead to a better dose fall-off, while maintaining same high conformity, suggesting that the prescription isodose must be chosen on individual basis.