

Dosimetric comparison between Perfexion and RapidArc for Various Cranial Stereotactic Radiosurgery Cases

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Abstract

Objectives: In this work, we present an inter-institutional collaborative dosimetric comparison of stereotactic radiosurgery (SRS) treatment platforms for six cases commonly encountered in neuro-radiation oncology. It has previously been shown that equivalent plan quality between Gamma Knife 4C and RapidArc is possible for multiple metastasis SRS. Our purpose here was to determine if the high quality of SRS treatments delivered with Perfexion could be also replicated with RapidArc in several different types of cranial radiosurgery.

Methods: Six different intracranial SRS cases treated with Perfexion at CCF were re-planned in Eclipse for RapidArc on the TrueBeam STx with the SRS method employed by UAB. The cases were: pituitary adenoma, meningioma (x2), acoustic neuroma, solitary metastasis, metastases (x3), and metastases (x9) with multiple prescriptions. Plan quality was compared via conformality, 12 Gy isodose volume, V25%, and mean dose to healthy tissue.

Results: For each case treated with PFX, a clinically equivalent RapidArc plan was generated. Mean conformity was similar between the two sets of plans (CI_PFX=1.40, CI_VMAT = 1.12), as were mean dose (Mean_PFX = 100 cGy, Mean_VMAT = 110.9 cGy), twelve gray isodose volume (V12Gy_PFX = 32.3cc, V12Gy_VMAT = 25.3cc), low dose spill (V4.5Gy_PFX = 163.1cGy, V4.5Gy_VMAT = 206.2 cGy), and KARE index (KARE_PFX = 2.75, KARE_VMAT = 1.61).

Conclusions: We show here that for six representative intracranial SRS cases, the high plan quality of a Gamma Knife Perfexion can be replicated with RapidArc on the TrueBeam STx. For most cases, well-planned STx deliveries can be expected to exhibit equivalent or improved conformity and equivalent moderate/low isodose spill when compared to PFX. However, in cases with very high numbers of targets, PFX may retain a small advantage in low isodose spill. Treatments on the TrueBeam STx can be delivered substantially more quickly than with cobalt-based sources such as Perfexion.

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Abstract

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