

3385 Comparison of Brain SRS Treatment Plan Quality of Cyberknife and RapidArc

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Purpose/Objective(s): This work will evaluate the quality of brain SRS (stereotactic radiosurgery) treatment plan of Cyberknife from Accuray and RapidArc from Varian. Cyberknife is a cone based non-isocentric SRS system with 6MV X-ray, it can generate arbitrary dose shape with high conformality and rapid dose fall off. RapidArc is a MLC based volumetric modulated arc therapy system, it can potentially deliver dose shape typically required for brain SRS with 2.5mm HD MLC. This study will compare quality of treatment plans using RapidArc with treatment plans using Cyberknife for acoustic neuroma.

Materials/Methods: Clinical Cyberknife treatment plans for acoustic neuroma with target volumes between 1 and 4 cc (cubic centimeter) are selected to be re-planned using RapidArc with 6MV X-ray. Prescription is 18 Gy in 3 fractions covering at least 95% of the target volume while keeping minimum doses to brainstem and cochlea. The RapidArc plans are generated to have the same target coverage and dose constraints. CI (conformity index), CI_{50%} (ratio of volume getting 50% prescription dose to volume at prescription), V₈ (volume of brainstem getting more than 8 Gy), cochlea mean dose and maximum dose at 2cm from target are compared between the 2 modalities.

Results: Cyberknife plans are consistently superior to RapidArc plans. The RapidArc plans on average have 10% higher CI, 70% higher CI_{50%}, 50% more volume of brainstem getting more than 8 Gy, 15% higher cochlea mean dose and 45% higher maximum dose 2cm from targets than Cyberknife plans with same target coverage and similar target minimum.

Conclusions: For small brain lesions such as acoustic neuroma, RapidArc can generate plans with similar conformality to the target but with slower dose fall as well as higher dose to brainstem and cochlea than Cyberknife.

Conformity Index and Dose Fall Off			
Cyberknife CI	RapidArc CI	Cyberknife CI50%	RapidArc CI50%
1.37	1.35	2.27	5.28
1.19	1.31	4.40	6.03
1.07	1.30	2.71	4.90
1.26	1.50	2.92	4.97
1.17	1.35	2.54	4.50
1.11	1.16	2.58	5.45
1.32	1.42	2.67	5.30
1.12	1.18	3.75	4.75

Author Disclosure: A.T. Lo: None.