

AbstractID: 13376 Title: Homogeneity and Conformity Comparison of RapidArc and IMRS Radiosurgery for Multiple Brain Metastases

Purpose:

This study reports the dosimetric comparison of RapidArc (RA) and IMRS in treating multiple intracranial metastases. The pros and cons of the RapidArc plans were evaluated.

Method and Materials:

Twelve patients having 2-12 brain metastases treated by IMRS were re-planned with RapidArc. The prescribed dose (PD) was 18-20 Gy, normalized to 98% of PTV. The IMRS-plans used 9-11 IMRT beams. The RapidArc plans adopted a 2-coplanar arc approach and followed systematic strategies in optimization. An optimal RA-plan was selected from several trials for each patient. The maximal PTV doses (MD) and the volumes V_{100} and V_{50} enclosed by 100% and 50% of PD were investigated.

Results:

Homogeneity index (MDPD), conformity index (CI), and gradient index (GI) were calculated for all plans. The mean dose to normal brain and the maximal doses to brainstem, chiasm, eyes, and optic nerves were analyzed. It is found that the homogeneity of both plans is comparable, while the conformity and gradient indices are slightly higher in RA as compared to those in IMRS plans. The group averages are: $MDPD_{RA, IMRS} = 1.15$, (range 1.1-1.2); $CI_{RA} = 1.6$ (range 1.1-2.0) and $CI_{IMRS} = 1.3$ (range 1.1-1.4); $GI_{RA} = 2.3$ (range 1.4-3.8) and $GI_{IMRS} = 2.0$ (range 1.3-3.2). For organs at risk (OAR), the RA showed slightly larger doses than those in the IMRS plans.

Conclusion:

Apart from the benefit of MU reduction, RapidArc produced similar dose homogeneity as IMRS, owing to the same emphasis on PTV dose coverage in the optimization. The slightly higher conformity in RA is due to the difference of V_{100} in two plans, which was not adjustable in the optimization. The same observation is true for the gradient index. The leakage and transmission from the MLCs may contribute to OAR doses in RA, as larger field sizes are used for multiple brain lesions.