

AbstractID: 3938 Title: A clinical comparison of two IMRT planning systems for small field conformal therapy of intracranial lesions

Purpose:

To evaluate BrainLab (BL) IMRT dose distributions for small intracranial lesions by comparing target dose coverage, homogeneity and conformity, and critical structures sparing, as well as agreement with measurements to a clinical Eclipse IMRT system.

Method and Materials:

Three clinical cases with varying volume lesions enclosing portions of organs at risk (OAR) were planned with BL and Eclipse IMRT modules for dynamic 120-leaf MLC delivery on a Varian 21EX. Anatomical structures were contoured, and transferred to both systems to ensure a common starting point. Optimization was carried out using identical non-coplanar beam orientations in combination with similarly specified dose goals and constraints. For two of the cases, highest priority was placed on PTV coverage, while the third required OAR sparing at the expense of PTV coverage. Plans were evaluated by dose-volume histograms (maximum dose, conformity indices), and isodose lines (hot spots, 50% isodose volume irregularity). BL dose distributions were validated with chamber (absolute dose) and film (fluence) measurements, and Eclipse dose calculations for imported BL dynamic MLC files.

Results:

Ignoring the superior immobilization of the BL system for patient set-up, BL and Eclipse IMRT modules provided clinically comparable target coverage and dose homogeneity, with differences in target dose conformity, critical structures sparing, and agreement with measurements. BL plans showed better dose homogeneity up to 5% for the smaller tumors, conformity up to 25% for the larger tumors, and consistently better critical structures sparing up to 11%. Absolute dose measurements were in closer agreement for the BL plans, while selected line profiles through the fluences revealed departures from experiment in the low dose penumbra region for BL plans and high dose/high gradient regions for Eclipse plans.

Conclusion:

BL and Eclipse IMRT modules generate effective treatment plans with differences requiring further investigation, including determination of their clinical significance.