AbstractID: 12843 Title: Volumetric Modulated Arc Therapy (VMAT) for GBM Boost: The Impact of Multileaf Collimator Leaf Width and Calculation Grid on Planning Quality and Delivery Efficiency

Purpose:

Volumetric modulated arc therapy (VMAT) is a relatively new treatment modality characterized by variable angular dose rate arc delivery. The purpose of this study was to compare treatment plans for multileaf collimators (MLCs) with different leaf widths and different dose calculation grids, in order to determine the optimal planning quality and delivery efficiency for VMAT of GBM boost plans.

Method and Materials:

CT images of 10 GBM patients were used for this study on an ERGO++ Treatment planning system ((ELEKTA; Crawley, UK). Two dose grids were used. The first grid was 2mm and the second 3mm. We used the Elekta Beam Modulator (4mm leaf) and Elekta MLCi (1cm leaf). The same dose constraints and beam parameters were used for optimization. Tissue inhomogeneity corrections were applied during optimization and dose calculation. Plans were optimized such as that the CTV received 14 Gy in 7 fractions. Dose distributions to the target and normal structures were evaluated. The number of monitor units (MU) and delivery times were used to evaluate delivery efficiency.

Results:

The doses to the CTV, eyes, optic nerves, tracts, brain stem, pituitary gland and optic chiasm were calculated. The 3mm grid with the 4mm leaf width used 303±18 MU and 0.66±0.068 conformity index (CI). The 3mm grid with the 1cm leaf width used 274±19 MU and 0.61±0.048 CI .The 2mm grid with the 4mm leaf width used 280±25MU and 0.67±0.064CI. The 2mm grid with the 1cm leaf width used 264±20MU and 0.64±0.060CI.

Conclusion:

Treatment plans generated with the 2mm dose grid and the 4mm leaf width seem to be optimal for both plan quality and delivery efficiency. While this study was specifically designed for the ERGO++ Treatment planning system combined with the ELEKTA linear accelerator/MLC and IMPAC R&V system, the conclusions drawn have ramifications for other environments as well.