

Purpose: To compare different MLC systems for intensity modulated stereotactic radiotherapy (IMSRT) of intracranial tumours with different sizes and complexities.

Method and Materials: Radionics treatment planning and delivery systems, including a Mini Multileaf Collimator (MMLC) are routinely used at our institution for stereotactic radiotherapy of intracranial lesions. A Varian Millennium MLC has also been commissioned to eliminate the maximum field size limitation (10x12 cm) of MMLC. The two MLC systems have different dosimetric parameters, mainly due to different leaf thicknesses and isocentric distances. In this work we explore the effects of these differences on IMSRT of intracranial tumours. Radionics treatment planning system (XK-RT3) is used for planning 3 clinical cases in this study. Identical beam arrangement and optimisation parameters were chosen for the two systems. Comparison parameters include: 2D and 3D dose distributions, dose heterogeneity (DH), maximum, minimum and median doses as well as dose volume histograms (DVH) for the target volume; and maximum dose, median dose, dose of 10%, 20% and 50% volumes (D_{10} , D_{20} and D_{50}) and DVHs for the OAR. The OAR dose volume data are presented for a normalised dose, when 95% of the tumour received at least 95% of the prescribed dose.

Results: DVH data have shown that the two systems are overall comparable in terms of tumour dose coverage. However, Radionics MMLC had the advantage of delivering the prescribed doses using fewer segments and less number of monitor units by up to 35% and 48%, respectively and therefore less dose to the surrounding normal structures and better sparing of OARs by up to 7%.

Conclusion: In this work we have shown that the two MLC systems are overall clinically comparable, with Radionics MMLC marginally better sparing normal tissues. The Varian MLC however has the advantage of larger field size and better isocentric clearance.