

AbstractID: 3496 Title: Effect of MLC leaf width and PTV margin on the treatment planning of intensity-modulated stereotactic radiosurgery or fractionated stereotactic radiotherapy

Purpose: To investigate the effect of MLC leaf width and PTV margin on intensity modulated radiosurgery (IMSRS) and radiotherapy (IMSRT) dose distributions.

Method and Materials: Twelve patients previously treated with IMSRS or IMSRT were retrospectively planned with a 5mm or 3mm MLC leaf width and a 3mm or 2mm PTV margin using the already contoured CTV, critical structures and organs at risk (OARs). The same beam arrangement, planning parameters and plan selection criteria were used in each four plans for a given patient. Same target coverage was achieved by renormalizing each plan so that the prescription dose covered at least 99% of the PTV. Plan indexes – D_{max} , D_{min} , and D_{mean} , conformity index (CI), V_{70} , V_{50} , D_{95} and V_{95} were calculated from the dose-volume histograms of PTV, normal tissue, or OARs. Ratios of plan indexes were computed and hypotheses tests were performed on the mean ratios to determine the significance of the relative changes.

Results: The PTV was well covered for all plans. The PTV was 25% smaller when 2mm instead of 3mm PTV margin was used; CI of 3mm MLC was 7% lowered than that of 5mm MLC. The decrease of MLC leaf width had a similar effect as that of PTV margin in reducing V_{70} and V_{50} of the normal tissue and D_{mean} of brainstem by ~10%. However, D_{mean} of optic nerve and chiasm was more sensitive to the change of PTV margin.

Conclusion: For IMSRT, the combination of 5mm MLC and 2mm PTV margin is dosimetrically equal to that of 3mm MLC and 3mm PTV margin for both PTV coverage and normal tissue sparing. The use of 5mm MLC and 2mm PTV margin for IMSRS is problematic because V_{70} and V_{5} are ~10% higher than that of 3mm MLC and 2mm PTV margin.