AbstractID: 5604 Title: The impact of random and systematic errors of MLC leaves on Head-and-Neck IMRT plans

Purpose: To investigate dosimetric effect of the random and systematic errors of MLC leaf positions on the IMRT plans for patients with head and neck cancer.

Method and Materials: For six clinical IMRT plans, random errors (from -2 to 2 mm) and systematic errors (±0.5 mm and ±1 mm) MLC positioning errors were introduced into the each segment for these plans, simulating the mechanical uncertainties and potential mis-calibration of the MLC. The altered MLC segments for each plan were imported to a commercial treatment planning system to evaluate dosimetric changes of the plan. The altered plans were compared to the original plans, based on DVHs and defined endpoint doses.

Results: With the up-to-2 mm random errors in MLC positions, the dose changes to the 95% of the tumor volumes were (-1.247±1.153)%. For serial structures, the dose changes to the 0.1 cc of the brainstem and spinal cord were (0.230±0.794)% and (–0.340±1.254)%, respectively. The dose changes to the 50% of the parotids varied from patient to patient, from 0.536% to 11.333%, (1.641±4.274)% and (4.910±5.322)% overall. With systematic errors in MLC positions up to 1 mm, the dose changes to the 95% of the tumor volumes were (-0.078±1.048)%. The dose changes to the 0.1 cc of the brainstem and spinal cord for all patients except one were (0.591±1.058)%. The dose changes to the 50% of the parotids overall were (7.782±3.111)%, beyond 5% limit.

Conclusion: The dosimetric changes introduced by the random errors for each leaf within 2mm were not significant compared to the original plans. The systematic error up to 1mm for each leaf did not significantly changed the target dose and the maximum doses to the serial structures while the doses changes to the parotid could be significant.

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