AbstractID: 7720 Title: A comparison of heterogeneity correction algorithms within a lung PTV

Purpose: To compare the measured dose distribution with the planned distribution over a PTV centrally located within the lung when heterogeneity corrections are taken into account.

Method and Materials: The Radiological Physics Center's anthropomorphic thorax phantom includes a target (~ 1 g/cm^3) centrally located in the left lung (~ 0.33 g/cm^3). The phantom was sent to 25 institutions, each of which was instructed to design and deliver a stereotactic treatment plan. The plan was intended to deliver 20Gy (homogeneous calculation) to ≥ 95% of the PTV and limit the lung dose at point 2 cm from the PTV edge to 11.7 Gy. The institutions were asked to recalculate the dose distribution with the heterogeneity correction using the monitor units determined from the homogeneous calculated plan. TLD and radiochromic films were used as dosimeters within the target region.

Results: A total of 17 institutions met the phantom irradiation criteria: +/- 5% for D_{TLD}/D_{Inst}, and +/- 5mm DTA on all sides of the PTV, based on the heterogeneous calculated plan. For these irradiations, the delivered doses over the central 80% of the PTV were compared to the planned doses along 3 orthogonal profiles through the PTV. An average of 85% of the points in the profiles from the cases calculated with the superposition/convolution algorithm were within 5% of the calculation, while only 69% of the points from the plans using pencil beam and Clarkson were within the 5% of the plan.

Conclusions: The superposition/convolution heterogeneity correction algorithm showed better agreement with the measured dose distribution across the PTV than the pencil beam and Clarkson algorithms because it more accurately accounted for the lack of lateral scatter.

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