AbstractID: 4849 Title: Evaluation of heterogeneity corrections algorithms through the irradiation of a lung phantom

Purpose: To evaluate the impact of applying heterogeneity corrections to the calculation of prescribed doses to a target located within the lung.

Method and Materials: The Radiological Physics Center's (RPC) anthropomorphic lung phantom was sent to institutions nationwide. This phantom simulates a patient not only in dimensions but also in densities for imaging and treatment purposes. This design includes two lungs with density of 0.33 g/cm^3 and a target centrally located in the left lung with density near 1 g/cm^3. TLD and radiochromic films were used as dosimeters within and near the target region. Institutions that received the phantom were requested to image, plan and treat the phantom as if a patient. The prescription dose, based on a stereotactic plan, was 20 Gy to the target, calculated without applying heterogeneity corrections. The institutions were asked to submit both the homogeneous and heterogeneity corrected treatment plans using the same number of monitor units.

Results: Twenty-one irradiations, mostly with 6 MV x-rays, were analyzed from 7 different Treatment Planning Systems (TPS). The ratio of dose to the target from the plan with to the plan without heterogeneity corrections was calculated and analyzed based on the algorithms used for the heterogeneity correction. A comparison of corrected dose given by the TPS and dose given by TLD was performed. The average ratio between dose with to dose without the heterogeneity correction was 1.18 with values ranging from 1.12 to 1.21. The superposition convolution algorithms agreed better with measurements than the other algorithms studied. The average TLD/Inst dose ratio in the target was 0.97 ranging from 0.92 to 0.99.

Conclusions: There continues to be a differences in the heterogeneity corrected tumor doses within the lung from different planning systems.

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