AbstractID: 10080 Title: Impact of Tissue Heterogeneity Corrections in Stereotactic Body Radiation Therapy Treatment Plans for Non Small Cell Lung Cancer Patients

Purpose: To study the effect of tissue heterogeneity corrections on the dosimetry of stereotactic body radiation therapy treatment plans for patients with non-small cell lung cancer.

Materials and Methods: Data from 15 stage I non-small cell lung patients was used. Treatment planning was done with 6 MV non-opposing coplanar beams using Varian Eclipse TPS (PBC Algorithm with Modified Batho Power Law). Prescription dose was 60 Gy in 3 fractions with tissue heterogeneity corrections. Plans were normalized to deliver prescription dose to 95% of the planning target volume (PTV) maintaining the spinal cord dose under 10 Gy. Separate plans were generated by recalculating the optimized treatment plans without heterogeneity correction while keeping identical beam arrangements, monitor units, and fluences.

Results: Compared with the heterogeneity corrected plans, the uncorrected plans had lower minimum, mean, and maximum tumor doses by at least 12.5%, 7.7%, and 6.0%. The PTV receiving less than prescription dose was significantly higher (>25%) in the uncorrected plans. The percentage of uninvolved lung volume receiving minimum doses of 10 Gy, 15 Gy, 20 Gy, and 30 Gy was ≤ 10% for both treatment plans. However, the uncorrected plans calculated slightly less dose to normal lung. The average maximum spinal cord dose was 8.56 Gy and 9.73 Gy for corrected and uncorrected plans respectively.

Conclusions: Treatment plans optimized with tissue heterogeneity corrections were generated to satisfy planning goals and constraints. Re-calculating such plans without tissue heterogeneity corrections and keeping identical conditions of beam and monitor units resulted in target underdosing because the planning system assumed that more tissue attenuation was present than is actually the case. By extension, failure to use tissue heterogeneity correction to plan complex beam arrangements to treat tumors within the lung will lead to delivery of higher doses than are prescribed to less than optimum dose distributions.