AbstractID: 11861 Title: Radiobiological evaluation of inhomogenity corrections in tissue for lung cancer patients

Purpose: To radiobiologically quantify dose difference induced by the inhomogeneity corrections in tissues for lung cancer patients using complication-free tumor control probability (P_+).

Method and Materials: One lung cancer patient was retrospectively selected to quantify the difference in clinical effectiveness due to inhomogeneity correction in treatment planning. Four 3D conformal plans were generated for this patient. These treatment plans include two plans with and without tissue inhomogeneity corrections in tissues using 6 MV photon beams. Also, the other two plans were produced with and without inhomogeneity corrections using 18 MV photon beams. The common prescription for four plans was 40 Gy delivered in 20 fractions. The uniform dose that causes the same tumor control probability or normal tissue complication rate as the actual dose given to the patient was evaluated using the biologically effective uniform dose,*BEUD*.

Results: From physical dose evaluation, the treatment plans without inhomogeneity corrections in tissues had up to 8% lower mean dose estimated in the target. From radiobiological assessment, for the plans generated using 18 MV photon beams, the under-estimated dose of 1 Gy in the mean dose of the target resulted in 3% lower P_+ in the plans without inhomogeneity corrections. For the plans generated using 6 MV photon beams, the under-estimated dose of 2 Gy in the mean dose of the target results in 5% lower P_+ in the plans without inhomogeneity corrections.

Conclusion: The dose deviation resulting from the lack of inhomogeneity corrections in tissues for lung cancer patients can be quantified into difference in clinical effectiveness using P_+. Treatment plans without inhomogeneity corrections tend to under estimate the P_+. Therefore, treatment plans that have limit access to account for tissue inhomogeneity should be reviewed with caution regarding the accuracy in the physical dose and the resulting clinical outcome of P_+.