AbstractID: 10126 Title: A Practical Method to Measure and Evaluate Different Dose Calculation Algorithms in Varian Eclipse Treatment Planning System

Purpose: Electron Density Phantom (EDP) was used to evaluate dose calculation algorithms in Varian Eclipse Treatment Planning System (TPS) and to commission the Anisotropic Analytical Algorithm (Version 8.1.17, AAA_8117) with inhomogeneity correction for treatment planning.

Methods and Materials: The EDP with various tissue equivalent plugs used to calibrate the CT simulator for dose calculation in Varian Eclipse TPS (Version 8.1.1.17) was adopted to evaluate different dose calculation algorithms in the TPS by measuring the actual dose delivered to the EDP prescribed by treatment plans. The treatment plans with field sizes of 20×20, 10×10, and 4×4 were created in the TPS using CT images of the EDP. The 200 cGy per fraction was prescribed to a point that is 4 cm behind the 8.2 cm long exhale-lung tissue equivalent plug. Dose calculation for each plan was performed with calculation models of Pencil Beam Convolution (PBC_8117), the AAA_8117 without inhomogeneity correction, and the AAA_8117 with inhomogeneity correction, respectively. Then the individual plans were delivered to "treat" the EDP for measuring the actual dose. The 2-D dose distributions were measured and analyzed with two independent methods (1) MapCheck, and (2) EDR-2 film with RIT VXR-16 Dosimetry Vidar System. The prescribed point dose was measured using an ion chamber. All the measured doses were compared with the calculated doses from the associated treatment plans.

Results: The AAA_8117 with inhomogeneity correction is superior to the other algorithms in our study. The dose discrepancy is within 1% at the prescribed area.

Conclusion: A practical method to evaluate different dose calculation algorithms in a TPS was proposed and performed in our study. Results suggest that the AAA_8117 with inhomogeneity correction should be used for treatment planning, especially when lung tissue is involved in the radiation field.