

AbstractID: 79 Title: Dosimetry verification for IMRT of thoracic cancers using experimental and Monte Carlo approaches

Dose distribution of IMRT for thoracic cancers may be affected by electron disequilibrium caused by tissue heterogeneity and multiple small segments used in IMRT. In this work, we investigated the dose accuracy of thoracic IMRT for two commercial treatment planning systems (Pinnacle and Corvus). IMRT plans were designed on the two systems for thoracic cancers (lung cancer and mesothelioma). MLC leaf sequences derived from the Corvus plans were transferred to Pinnacle for recomputation and comparison of the doses calculated from the two systems. Dose distributions were measured with ion chambers for individual IMRT fields in a water phantom, and with TLDs for the composite plan in an anthropomorphic phantom. Measurement points were chosen within both high and low dose regions that included heterogeneities and their boundaries. An in-room CT-on-rail was used to determine precise locations of the measurement points. Monte Carlo simulations (based on the EGS4 system) were also used to compute the dose distributions. Results showed that each treatment planning system predicted the IMRT dose distributions using its own leaf sequences reasonably well within clinically acceptable criteria except in low-dose regions. However, when leaf sequences from one system were used with another planning system, large dose discrepancies were observed, presumably caused by inadequate modeling of the beams with MLCs for IMRT. Thus, each planning system is optimized and limited for dose computations with its own internally generated leaf sequences. Tissue heterogeneities do not appear to be a significant source of error for IMRT dose calculations for the cases studied.