

AbstractID: 8678 Title: Comparison of Intensity-Modulated Radiation Therapy, Intensity-Modulated Arc Therapy and Arc-Modulated Radiation Therapy

Purpose: Arc-modulated radiation therapy (AMRT) is a new technique that delivers comparable dose distributions to IMRT in a single gantry rotation and thereby reduces the delivery times to approximately 2 to 5 minutes. To evaluate the clinical feasibility of AMRT, plan quality and delivery times are compared to conventional IMRT and multi-arc intensity-modulated arc therapy (IMAT).

Method and Materials: 12 IMRT cases including 3 HN, 3 brain, 3 lung and 3 prostate were selected for this study. For each case, static IMRT plans utilizing 7 to 9 fields were produced in the Pinnacle TPS. IMAT plans with 5 to 11 arcs were generated for each case using a two-step planning approach: ideal intensity maps for 36 static beams were optimized in Pinnacle using the same optimization objectives as in the corresponding IMRT optimization. The ideal intensity maps were segmented into a deliverable IMAT sequence using the k-link IMAT leaf sequencer. For AMRT, the same ideal intensity maps were used to translate into a deliverable single-arc sequence using a graph algorithm. The resultant AMRT sequences were designed to have an equivalent number of segments as in the corresponding IMAT plans.

Results: Multi-arc IMAT plans outperformed AMRT and IMRT for all cases in terms of target coverage, target dose uniformity and sparing of OARs. AMRT attained better or comparable dose distributions as compared with IMRT in all cases even for the challenging HN cases. The delivery times for AMRT were approximately 20% less than IMRT and 50% less than IMAT while the number of MU is 3 times more than IMRT and 1.3 times more than IMAT in general.

Conclusion: AMRT is a promising technique that may become a viable alternative to IMRT. The main benefit is the reduced treatment times. A refined planning algorithm may further improve AMRT plan quality.