AbstractID: 8299 Title: A method to implement rotational IMRT with single arc

Purpose: Rotational IMRT (rIMRT) is often approximated by a series of equi-spaced static beams. The purpose of this work is to investigate the optimal numbers of beams and segments for the implementation of rIMRT via a single arc.

Methods and Materials: The rIMRT plans were generated with static beams, equi-spaced by 10°, 5°, or 2.5° (corresponding to 36, 72, or 144 beams), each with the same number of segments of 1, 2, 3, or 4. An inverse planning system (Prowess Inc.) was used to generate rIMRT plans utilizing direct aperture optimization. The rIMRT plans generated for representative prostate and head and neck cases were compared with those generated by using Tomotherapy system with the same CT data and objectives.

Results: Although the rIMRT and Tomotherapy plans are generally comparable, the rIMRT plans provide slightly better dose uniformity. For organs-at-risk, volume receiving high dose was slightly higher for the rIMRT plans compared to that for Tomotherapy plans. For all rIMRT plans generated for a prostate case, the dose uniformity improves slightly with the increase of the numbers of beams and/or segments per beam, while the conformity goes in the opposite direction. For the bladder and rectum, the mean dose, V45 and V70 increase slightly with the numbers of beams and segments per beam. The plan with 144 beams and 1 segment per beam (144×1) is approximately equivalent in plan quality to the plans for 72×2 and 36×4. When delivery efficiency is considered, this plan is the best, which can be delivered with 500 MUs via a single arc with every 2.5° per segment of varying dose rate.

Conclusion: Rotational IMRT plans may be implemented via single arc with optimal numbers of static beams and segments per beam. More beams and/or segments per beam don't necessarily lead to a better plan.