AbstractID: 13489 Title: The Role of IMRT and IMAT in Targets of Varying Complexity

Purpose: To evaluate the treatment plan quality and delivery efficiency of fixed-field IMRT and IMAT with different target complexities

Method and Materials: Four target shapes with different complexities (circular, "L", inverse "U" and "V" shapes) for a head and neck phantom and a pelvic-prostate phantom were used for treatment planning of IMRT and IMAT. Dose prescriptions of 70 Gy and 75.6Gy were given to the head and neck and prostate, respectively. Seven/nine-beam IMRT plans were generated using Pinnacle^3 planning system and in-house developed sequential linear program (SLP). Single-arc and double-arc IMAT plans were generated using Pinnacle SmartArc 9.0. Plan quality was compared with DVHs and isodose curves and delivery efficiency was compared with MUs and aperture number.

Results: Two-arc plans improve the plan quality compared to single-arc plans. For simple targets and large volume cases such as prostate, IMAT provides better plans than IMRT. As the target complexity increases, conventional fixed-field IMRT can provide better plan quality than IMAT plans. SLP provides even better quality plans than conventional IMRT and IMAT, especially for complex cases. 180 and 360 apertures were used in single-arc and double-arc plans respectively. Conventional IMRT plans reduce the number of aperture by 25-80% comparing to single-arc plans. SLP can further reduce 5-20% of the apertures, but used 1-7% more MUs. Two-arc plans used 10-50% more MUs than single-arc plans. IMAT plans used fewer MUs compared with IMRT.

Conclusion: Our results indicate that (1) as the complexity of the target increases, fixed-field IMRT plans (particularly the ones optimized using the SLP approach) become more competitive in dosimetric quality compared with IMAT and (2) IMAT plans result in greater delivery efficiency compared with IMRT. Thus, for complex cases involving concave targets, dosimetric plan quality is inversely proportional to plan delivery efficiency.

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