AbstractID: 13424 Title: Clinical Evaluation of Fixed-Field IMRT Plans and IMAT Plans in Locally Advanced Head and Neck Cancer

Purpose: To evaluate the treatment plan quality and delivery efficiency of fixed-field IMRT and IMAT in locally advanced head and neck cancer cases.

Method and Materials: Ten locally advanced head and neck cases were included. For each case, the treatment targets involve primary tumor, positive lymph node(s), high risk and low risk nodal volumes. Organs-at-risk included both parotids and spinal cord. Seven-beam IMRT plans were generated using the Pinnacle^3 planning system and an in-house developed sequential linear program (SLP) optimization approach. The SLP approach solved the corresponding dose optimization problem by dividing the problem into sub-problems, each of which was solved using LP while maintaining a global view of the full problem. Single-arc and double-arc IMAT plans with 180 and 360 total apertures, respectively were generated using Pinnacle SmartArc 9.0. Plan quality was compared with DVHs and quantitative dose-volume measures and delivery efficiency was compared with MUs and aperture number.

Results: Single-arc plans did not provide enough coverage for all three targets. Two-arc plans improved the plan quality compared to single-arc plans. Conventional fixed-field IMRT and SLP plans resulted in better plan quality than IMAT plans with SLP plans outperforming the other approaches. Improvements in parotid dose-volume levels and maximum cord dose were 12% and 90% when SLP was compared to two-arc plans. Approximately 160 to 230 apertures were used with conventional IMRT plans. SLP used fewer apertures than conventional IMRT but used more monitor units. Double-arc plan used more monitor units than the single-arc plan. Overall, IMAT plans used fewer MUs than IMRT plans.

Conclusion: Our results indicate that (1) fixed-field IMRT plans (particularly the ones optimized using the SLP approach) result in superior dosimetric quality compared with IMAT and (2) IMAT plans result in greater delivery efficiency compared with IMRT.

Conflict of Interest: NIH grant CA130814