AbstractID: 7222 Title: Estimating rectal complication in prostate IMRT treatment planning using maximum dose gradient

Purpose: Optimize inverse planning for IMRT prostate by adjusting the DVH control points to achieve a higher dose gradient between the PTV and OAR.

Method and Materials: Dose distributions were generated from a Pinnacle^3 planning system for 15 patients using five-field and seven-field co-planar IMRT techniques with an escalated dose of 82 Gy. Dose profiles taken through the isocenter in the transverse and sagittal planes were analyzed to find the relation of maximum dose gradient (MDG) and reliable rectal dose–volume constraints for prostate patients.

Results: The steeper dose profile and higher MDG around the posterior direction can be obtained by modifying the planning technique or adjusting rectal DVH control points. The seven-field plan has a higher MDG than a five-field plan in the region where the PTV and rectum overlap, and has a much lower dose between 40-70Gy. With the seven-field plan, there is a natural reduction in the rectal percentage volumes; also it is possible to lower the rectal DVH control points further to obtain a better dose gradient without sacrificing or impacting on other constraints for any of the IMRT plans. The average rectal percentage volumes V_{D50}, V_{D60} and V_{D70} decrease 37%, 38% and 26%, respectively for the five-field plan by lowering rectal DVH control points, while for seven-field plan, the rectal percentage volumes decrease 16%, 19% and 13% respectively. The NTCP was reduced with a higher MDG between PTV and rectum.

Conclusion: Relative to a five-field plan, the seven-field plan demonstrates a higher MDG in the posterior direction causing lower rectal complications. To achieve the higher MDG, $V_{D70,}$ V_{D60} and V_{D50} of the rectal DVH are below 21%, 32% and 48%, respectively. These values are lower than RTOG guideline (25%, 35% and 55%, respectively) and do not compromise the dose distribution elsewhere.