

AbstractID: 10982 Title: Hybrid Image Guided Radiation Therapy for Hypofractionated Prostate IMRT: Feasibility Study

Purpose: In prostate IGRT employing hypofractionation, two methods are commonly used: patient re-positioning and re-planning. We propose a hybrid IGRT technique in this study. The dosimetric benefits and efficiency improvement of the technique is quantitatively evaluated by comparing with the two conventional techniques.

Method and Materials: Five prostate patients were studied, each had 1 planning CT and 11 daily CBCTs. The structure-of-interest (SOIs) including CTV (prostate and seminal vesicles), bladder, and rectum were contoured on CT and CBCTs. Initial IMRT plans were generated on Eclipse. Three IGRT techniques ("re-positioning", "re-plan", and "hybrid") were applied on each CBCT. "Re-positioning" utilizes target soft-tissue matching for patient position correction. "Re-plan" re-aligns the patient then re-optimizes the original plan using daily SOIs. "Hybrid" first finds the best-fit plan from plan-library for the daily CBCT. If no suitable plan found, "re-plan" is performed and new plan is added to library. The daily and cumulative doses were calculated and compared for all three techniques.

Results: (1) Cumulative dose: For CTV and bladder, the difference among the three IGRT techniques are <1% and <5% at all dose levels. "Re-positioning" slightly underdoses the CTV. For rectum, the differences between "re-plan" and "hybrid" are <2% at all dose levels. The Dmean/D30 doses to the rectum of the "re-positioning" are 5%/10% higher than those of "re-plan". (2) Daily dose: The average(min-max) D30 dose for "re-positioning" and "hybrid" are [rectum: 84%(67%-94%) and 70%(51%-78%)] and [bladder: 57%(42%-75%) and 59%(46%-70%)]. (3) "Hybrid" required the re-optimization to be performed 6, 4, 1, 2, and 3 times for patient 1 to 5, respectively.

Conclusion: Hybrid-IGRT retains the target coverage and critical structure sparing of the "re-plan", yet it reduces the workload of the re-optimization by >70% and therefore is a viable option for hypofractionated prostate IGRT.

Conflict of Interest: Research sponsored by Varian Medical Systems.