AbstractID: 10166 Title: An Inter-fraction Adaptive Strategy for High-Dose Rate Prostate Brachytherapy

Purpose: To determine the dosimetric impact of interfraction organ-catheter displacements and settle on an adaptive strategy to maintain the quality of the implant. **Methods & Material:** 10 patients received HDR prostate implants on Day-1 with CT-based dose plan optimized with the inverse planning tool IPSA to deliver the first of two fractions of 9.5 Gy. On Day-2 before the second fraction, a CBCT was acquired and fused with the Day-1 CT. Initial prostate and urethra contours were transferred to CBCT images. Bladder and rectum contours were drawn and catheters digitized on the CBCT. Day-1 dwell times were applied to the CBCT dataset. The plan was also re-optimized with IPSA using the volumes from CT, catheters from CBCT, and the same constraints as Day-1. The same physician re-contoured the prostate and urethra on CBCT, and two new plans were obtained as above. Four adaptive scenarios per patient were thus created with the CBCT images, using initial/new contours with initial/new plannings. For each strategy, the prostate V100 and V150, urethra V120, bladder and rectum V75 from Day-2 were compared to Day-1. **Results:** Relative organ-to-catheter displacements on Day-2 cause prostate V100 to decrease and dose to other organs to increase as compared to Day-1. Relative organ-catheter displacements of more than 6 mm can be used to trigger a replanning. Among adaptive strategies, re-optimizing the plan with the catheters defined on the CBCT was found sufficient to maintain the quality of the implant, while minimizing workload increase. **Conclusion:** Visual inspection of catheters on fused CBCT-CT allows for an accurate and rapid evaluation of the integrity of the implant. When replanning is required, dwell times can be reoptimized using the catheters defined on CBCT, insuring that all dosimetric indices are within required values at each delivered fraction. This work is supported in part by Nucletron.