AbstractID: 1387 Title: Evaluating Dosimetric Benefit of Image-guided Stereotactic IMRT for Prostate Cancer through "Real-Time" Dose Reconstruction

The purpose of this work is to evaluate dosimetric benefit of CT-based image-guided stereotactic IMRT (SIMRT) for prostate cancer. In this study, a stereotactic body localizer was used for patient immobilization and stereotactic treatment planning. A pretreatment (simulation) and three during-treatment (approximately 2 weeks apart) CT scans were taken to examine the dosimetric differences in target coverage on different days. The planning target volume was generated by growing the clinical target volume (CTV) by 4 mm. Only the CTV was contoured in the during-treatment CT-scans. The optimized treatment intensity map planned from the patient simulation CT was applied to the during-treatment CT scans. The dose distributions before correcting target interfraction motion, correcting only the setup error, and after target interfraction motion correction were compared. The setup errors were patient-CT-scan-specific and were obtained in a previous study. The differences in dose distributions were assessed by dose-volume histograms. For five patients with fifteen dose reconstructions the average improvements in D_{95}, V_{100} and D_{100} before and after target interfraction motion correction are 13.6% (±8.4%), 6.7%(±8.4%), and 60.6%(±8.4%), respectively. The correction for setup error contributes also to the improvements. The differences in the DVH parameters between the simulation plans and during-treatment interfraction corrected plans were also compared and were all found to be less than 0.5%. It is expected that dosimetric differences will be large for the rectum if interfraction motion is not corrected. Our results indicate that image-guided SIMRT corrected for interfraction motion by CT will ensure accurate dose delivery to the target.