

AbstractID: 3029 Title: Impact of Ultrasound-guided Patient Setup on OAR Dose in Conformal Radiation Therapy for Prostate Carcinoma

Purpose: To evaluate the impact of daily ultrasound-guided patient repositioning on bladder and rectal dose in the treatment of prostate carcinoma with conformal radiation therapy.

Method and Materials: Standard-of-care for the treatment of low and intermediate risk prostate carcinoma currently includes 3D conformal radiation therapy (3D-CRT). During external beam therapy, ultrasound-guided isocenter realignment can be performed daily to correct patient setup for prostate motion (up to 1 cm) relative to bony anatomical landmarks. In this study, five patients with substantial ultrasound-documented inter-fraction prostate motion during their treatment course were selected. Starting with the original treatment plan, two additional plans were retrospectively generated for each patient. In one set, using the ultrasound documented displacements, organ contours were moved for each fraction, thus simulating positioning with misalignment caused by organ motion if ultrasound guidance were not used. In a second set of plans, the isocenter was shifted, as were the organ contours, simulating realignment based on the ultrasound image. In all cases, the number of planned monitor units was set to those of the original plan. For a given patient, isodose distributions, DVHs and EUDs were calculated for the prostate, bladder, and rectum for each fraction and then combined for each shift condition.

Results: In all reconstructed plans, there were no substantial changes in dose coverage of the prostate (<0.21 % change in EUD) compared to the original plan. However, in some cases with no realignment, higher dose maxima were predicted in the bladder and rectum, with the consequent EUD for each organ significantly greater compared to the original plan.

Conclusion: Although fractional organ motions may have little effect on the overall dose delivery to the prostate, the effect on the dose to OARs (rectum and bladder) can be significant if no daily realignment is performed.