

AbstractID: 7593 Title: Dosimetric effects of daily localization for prostate cancer patients using MV-CBCT

Purpose: To evaluate the effect of daily shifts observed with mega-voltage cone beam CT (MV-CBCT) localization on the IMRT dose distribution received by prostate cancer patients.

Method and Materials: Eight patients who received a dose of 77.4 Gy to the PTV, which included the prostate and the seminal vesicles with a 1 cm margin, were selected for this retrospective study. Prior to each daily treatment fraction, the prostate was localized using MV-CBCT, and the treatment couch position was corrected accordingly in the lateral (RL), longitudinal (SI) and vertical (AP) directions. The shifts for each of the 308 fractions were recorded, and the 308 corresponding dose distributions that the patients would have received if the shifts were not applied were calculated. Dose volume histograms (DVH) and mean dose for target and organs-at-risk were derived from these dose distributions, and compared to the treatment plan.

Results: The average shifts for each patient were less than 6, 5 and 5 mm in the RL, SI and AP directions, respectively, with standard deviations ranging from 2 to 7 mm. The relative mean dose difference for the prostate was less than 1%, however effects as large as 15% and 20% were observed for the rectum and bladder, respectively. Rectum dose differences were correlated to AP shifts, while the bladder dose was affected by the SI shifts.

Conclusion: For IMRT plans with a 1 cm margin, daily localization of the prostate is necessary to reduce the risk of bladder and rectum complication. The dose to these organs is very sensitive to systematic errors, while the effects of random errors cancel each other due to the essentially spherical shape of the dose distribution. Our results show that accurate patient positioning is an important step in any dose-escalation and/or margin reduction strategy to further improve the therapeutic ratio.