Purpose: Estimation of deviations between planned and delivered dose in Pulsed Doserate (PDR) brachytherapy for prostate cancer.

Methods: A boost of 28.8 Gy is given with PDR brachytherapy in addition to 46 Gy delivered with External Beam RT. Brachytherapy is given in 24 pulses of 120 cGy, with an interpulse period time of 2.0 hours, resulting in a treatment time of over 46 hours. For 31 patients, additional CT-scans were made apart from the Treatment Planning CT, i.e., one at 24 hours after start of PDR treatment and one shortly before finishing PDR treatment. On the second and third CT, the brachytherapy catheters were newly reconstructed and the treating physician delineated the PTV and organs at risk. Dwell positions and dwell times as used for the original Treatment Plan were imported into the newly reconstructed catheters and the dose distribution was recalculated. Plan comparison parameters were prostate V100 and D90 and rectum and bladder D2cc.

Results: Averaged over 3 CT scans and all patients, the prostate V100 decreased 1.2% and D90 decreased 2.7%. For rectum, D2cc was within the tolerance dose (96 cGy/pulse) for all patients on the planning CT, but exceeded the tolerance dose on scan #2 in 7/31 patients with maximally 46% and in scan #3 in 5/25 patients with maximally 29%. Also for bladder D2cc was within the tolerance dose (120 cGy/pulse) for all patients on the planning CT. Here, the tolerance dose was exceeded on scan #2 in 2/31 patients with maximally 14% and in scan #3 in 3/25 patients with maximally 28%.

Conclusions: In PDR prostate brachytherapy the relatively long treatment time has no clinically relevant deteriorating effect on the dosimetric quality of the treatment. PTV dose hardly deviates from planned dose, while OAR tolerance doses are rarely exceeded and only in small volumes.