Purpose: Pelvic irradiation is controversial in prostate cancer and has been associated with significant late toxicity, but may be beneficial in patients with high risk disease. To evaluate dose reduction to organs at risk (OAR), we compared volumetric intensity modulated arc therapy with hypofractionated concomitant integrated prostate boost (VMAT) to sequential 3-D conformal 4 field pelvis plan and prostate IMRT boost (Sequential IMRT).

Methods: The planning CT's of 20 consecutive high risk prostate cancer patients were utilized for this study. Dose planning using triple A algorithm (Varian Eclipse). CTV included prostate and proximal seminal vesicles. These were expanded by 6 mm for the PTV1. Pelvic LN were delineated and expanded by 3 mm for the PTV2. Volume based equivalent dose at 2Gy/fx (EQD2) doses were calculated using alpha/beta ratios of 1.5 Gy for the prostate and 3 Gy for normal tissues. VMAT prescription was 73.6 Gy (EQD2-80 Gy) to PTV1 and 54.4 Gy to PTV2 (EQD2-50 Gy) in 32 fractions of 2.3 Gy and 1.7 Gy, respectively. Sequential prescription was 46 Gy to the pelvis and 34 Gy for IMRT boost to a total of 80 Gy in 40 fractions of 2 Gy each.

Results: A significant reduction in mean dose was observed for rectum, bladder, bowel, femur head, and penile bulb for VMAT vs. Sequential IMRT (p<0.001) (table 1). Rectal V75 and V70 was 6.2% and 11.2% for VMAT and 13.6% and 19% for Sequential IMRT (p<0.001). Bowel V50 was 0.35 cm³ vs. 24.1 cm³ (p<0.001), respectively. The 98% isodose conformity index for the PTV was 1.44 for VMAT vs. 1.69 for Sequential IMRT (p<0.001).

Conclusions: VMAT with concomitant boost significantly reduced dose to OAR compared to Sequential IMRT, potentially leading to less late toxicity, while providing excellent target coverage and conformity. Furthermore, reduction of treatment planning time and both individual fraction and overall treatment delivery time inherent in this approach, offer significant advantages for both providers and patients.