Purpose: To evaluate the impact of beam energy and intermediate-low dose bath on normal tissue when comparing volumetric modulated arc therapy (VMAT) with conventional IMRT.

Methods: A total of 10 prostate patients were randomly chosen for this study. The clinical IMRT plans were designed with 5 coplanar 10 MV photon beams. To investigate impacts of energies and delivery methods, we created 2 additional IMRT plans with 6 and 15 MV photons and 3 VMAT plans with 6, 10, and 15 MV photons in the Pinnacle treatment planning system. All plans were evaluated in terms of target coverage, clinical endpoints for organs-at-risks (OAR), and intermediate-low dose distributions to normal tissue, for which endpoints of V5Gy, V10Gy, V20Gy, V30Gy, V40Gy, and V50Gy were used. For this study, normal tissue was further divided into near region (5 cm thick concentric shell of normal tissue surrounding the target) and far region (concentric shell of normal tissue surrounding the near region and target). Longitudinally, the total normal tissue in calculation was limited to 10 cm from field edges.

Results: No significant differences were found among 6 types of treatment plans in terms of target coverage, OAR sparing, plan quality, intermediate-low doses to the near region, and integral dose to the total normal tissue (p > 0.05). VMAT deposited less intermediate doses of 30-50 Gy and more low doses of 5-10 Gy to the far region than IMRT. For example, mean average V40Gy and V10Gy were 51 and 2,967 cc for VMAT, and 140 and 2,618 cc for IMRT, respectively.

Conclusions: VMAT and IMRT plans created with different photon energies are comparable for target coverage and OAR sparing. For prostate treatment, VMAT redistribute normal tissue doses from intermediate range into low dose range while keeping the similar the integral dose as IMRT.