Volumetric Modulated Arc Therapy for Prostate Radiation: A Dosimetric Comparison between VMAT Techniques and IMRT

Introduction: VMAT is widely used in many tumor sites such as prostate radiation treatment. We cross compared dosimetric merits of treatment plans for prostate cancer generated using IMRT and four VMAT techniques, including Monaco VMAT, Eclipse RapidArc, Pinnacle SmartArc and Helical Tomotherapy.

Results: Dosimetric metrics for PTV, bladder, rectum, etc for 5 prostate patients using biological based Monaco VMAT, RapidArc, SmartArc and helical TomoTherapy techniques, 7-field IMRT plans on Pinnacle were also generated and compared (Table 1).

Figure 1 Isodose distributions in transverse view for a representative case using (1) Monaco (2) RapidArc (3) SmartArc (4) TomoTherapy and (5) Pinnacle 7-field IMRT plan. Isodose lines of 7000, 6000, 5000, 4000, 2000, 1000 cGy were shown.

Figure 2: Average MUs for 4 VMAT techniques and 7-field fixed beam IMRT plans.

Conclusions: All single-arc VMAT under study produced comparable treatment plans with more efficient dose delivery compared to prostate IMRT plans. RapidArc plans required least MUs while SmartArc provided most homogenous plans. All VMAT plans demonstrate significantly reduced MUs to achieve comparable dosimetric plans compared to Tomotherapy.