Treatment of Prostate Cancer: a Planning Study Comparison of Direct Step and Shoot IMRT and VMAT Optimisation

M. Treutwein, M. Hipp, K. Weidner,
O. Kölbl, B. Dobler

Background and Purpose

Intensity modulated radiation therapy (IMRT) is an established technique for the treatment of prostate cancer. Volumetric modulated arc therapy (VMAT) has recently been introduced clinically. Nucletron BV (Veenendal, Netherlands) offers both optimisation algorithms on the same platform in Oncentra® MasterPlan 3.3.

They are compared regarding dose distribution and treatment time.

Material and Methods

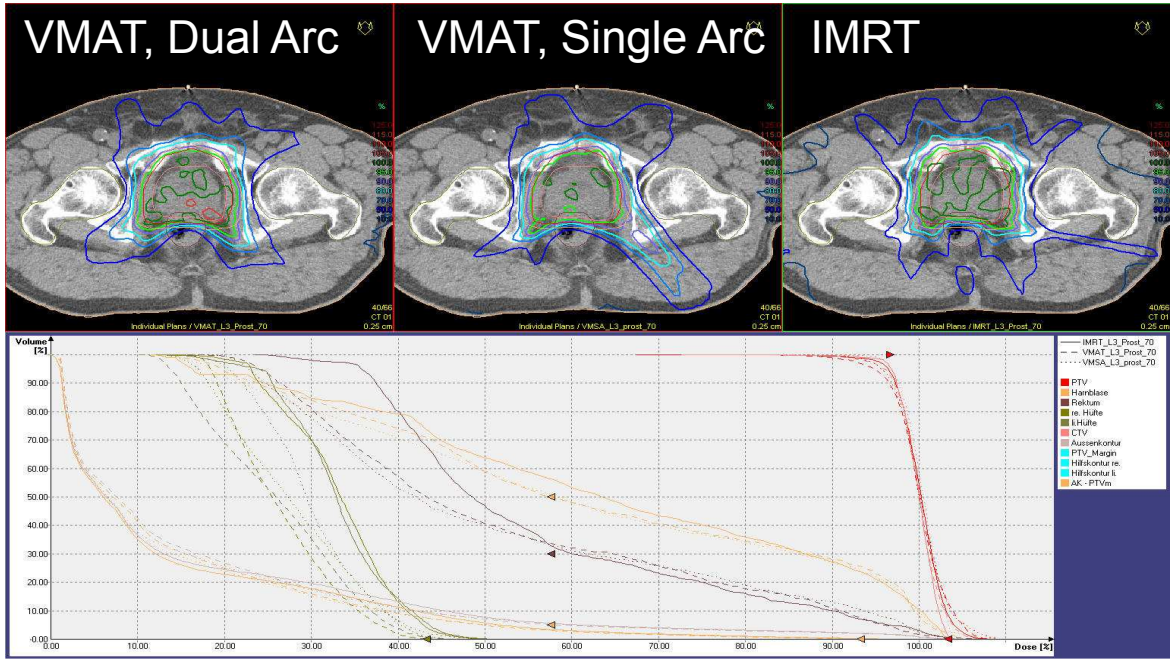
- 5 patients with localised prostate cancer
- Regions of interest:
  - PTV
  - Urinary bladder
  - Rectum
  - Femoral heads
- Linac: Elekta SynergyS with Beam Modulator
- Planning system: Oncentra MasterPlan, Nucletron

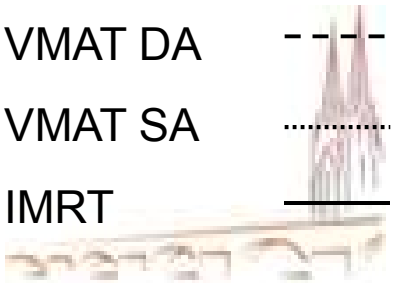
Planning Conditions

	IMRT	VMAT
Gantry	7 fields, equispaced, 0°, 51°, 103°, 154°, 206°, 257°, 308°	a)Dual arc, 182°-178°, CW and CCW b)Single arc, CW
Dose Volume Objectives	PTV min 68 Gy, 3000 PTV max 72 Gy, 3000 Urinary bladder 40 Gy, 50%, 1000 Rectum, 40 Gy, 30%, 1000 Femoral heads, max 30 Gy, 300	

Results

	IMRT	VMAT, Dual Arc	VMAT, Single Arc
Homogeneity $(D_5-D_{95})/D_{AV}$	0.094	0.088	0.094
Rectum vol. 30%	44.7 Gy	46.1 Gy	45.4 Gy
Bladder vol. 50%	44.1 Gy	43.3 Gy	40.4 Gy
Fem. Heads max.	32.1 Gy	34.1 Gy	31.7 Gy
Average MU	698	1016	794
Treatment time (one case)	10.14min/775 MU	8.09min/1088 MU	4.50min/845 MU





Conclusion

The results of the dose distribution are similar enough that VMAT is an interesting alternative to IMRT for the treatment of prostate cancer. The treatment time, which is the crucial factor regarding intrafractional organ movements is advantageous for both VMAT techniques, but again shorter for single arc with comparable plan quality.