

DOSIMETRIC COMPARISON OF VOLUMETRIC MODULATED ARC THERAPY AND INTENSITY-MODULATED RADIOTHERAPY FOR BILATERAL HIP PROSTHESES PROSTATE CANCER PATIENT

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INTRODUCTION

Prostate Cancer is one of the most common male cancers treat in our Center. Volumetric Modulated Arc Therapy (VMAT) is a common technique for prostate cancer patients, due to the conformation of the dose distribution. Nevertheless, the high atomic number of the hip prostheses generates streak artefacts in Computed Tomography images, and the high Hounsfield Units (HU) of the prostheses, avoiding beam entry through the prostheses, makes this treatment a kind of challenge.

PURPOSE

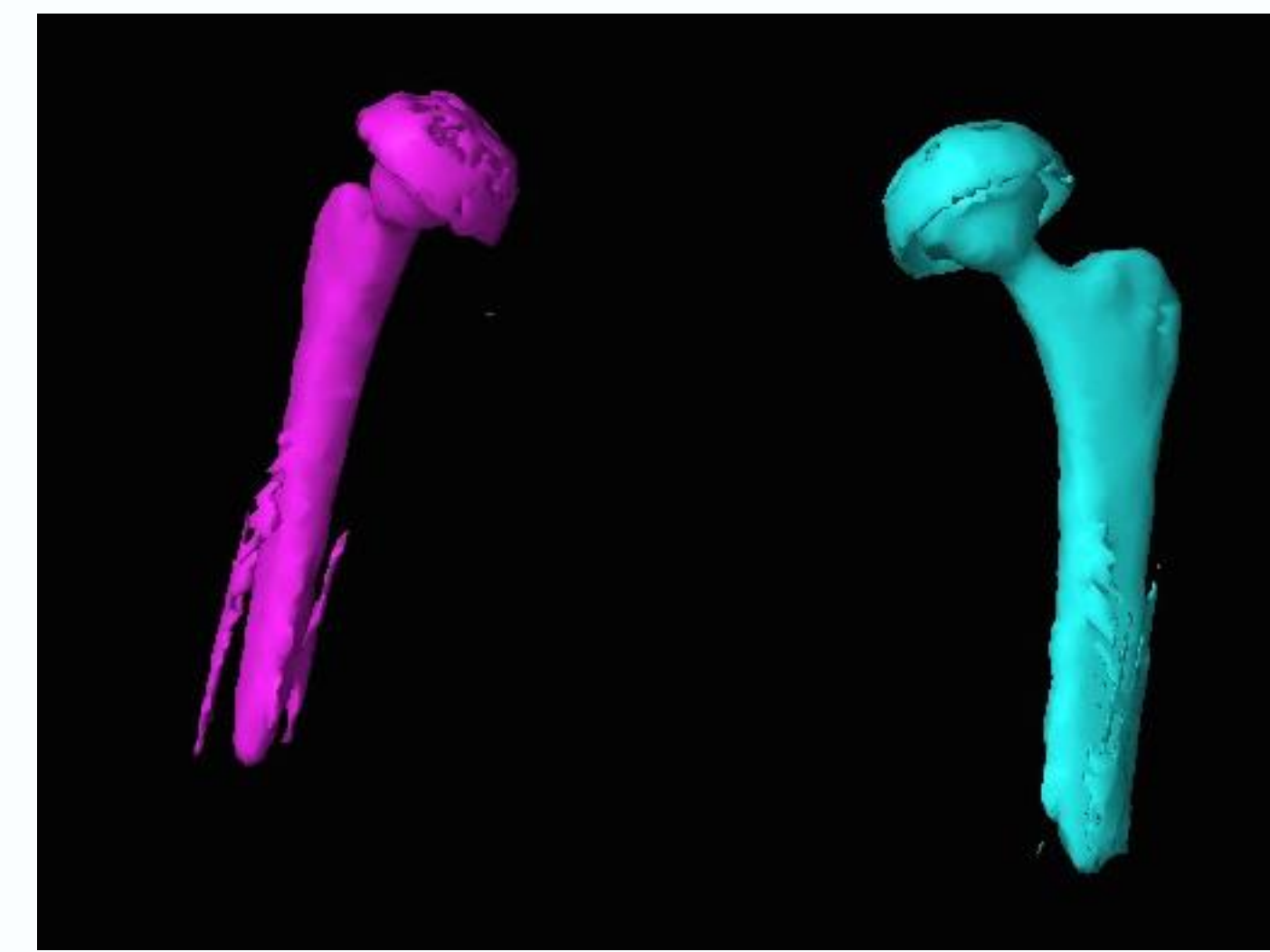
- Present the methodology of our center of treatment planning for bilateral hip prostheses prostate cancer patients.
- Compare the dosimetric quality of Intensity-modulated radiotherapy (IMRT) using sliding-window, with VMAT for the treatment of prostate cancer in patients with bilateral hip prostheses.

MATERIALS AND METHODS

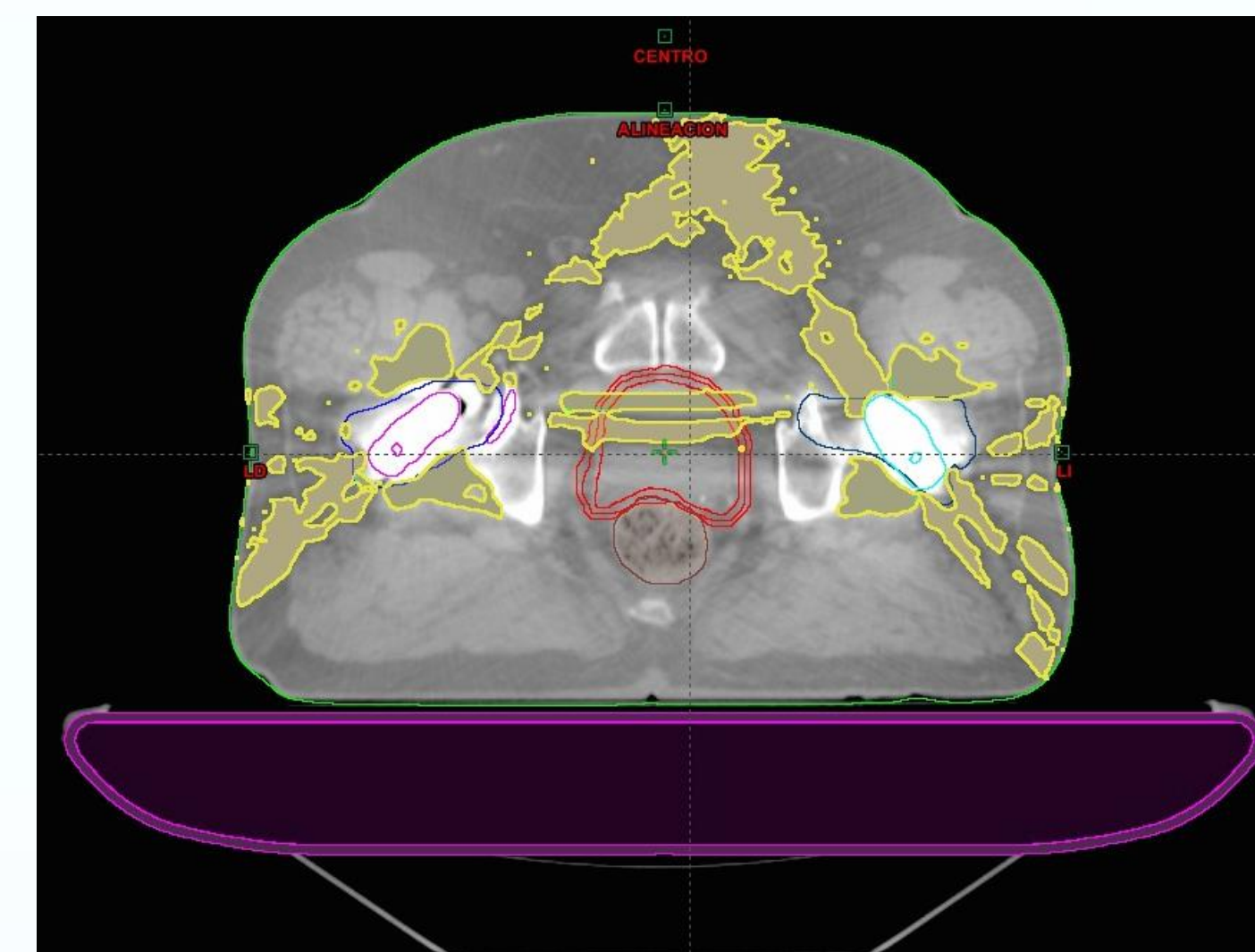
- Plans for IMRT and VMAT were optimized, prescribing 78Gy/39 fractions. All plans were prescribed 100% of the prescribed dose covering 95% of PTV Volume.
- First, both prostheses were contoured in order to avoid them during treatment, and soft tissue density was overridden to the artifact CT areas.

MATERIALS AND METHODS

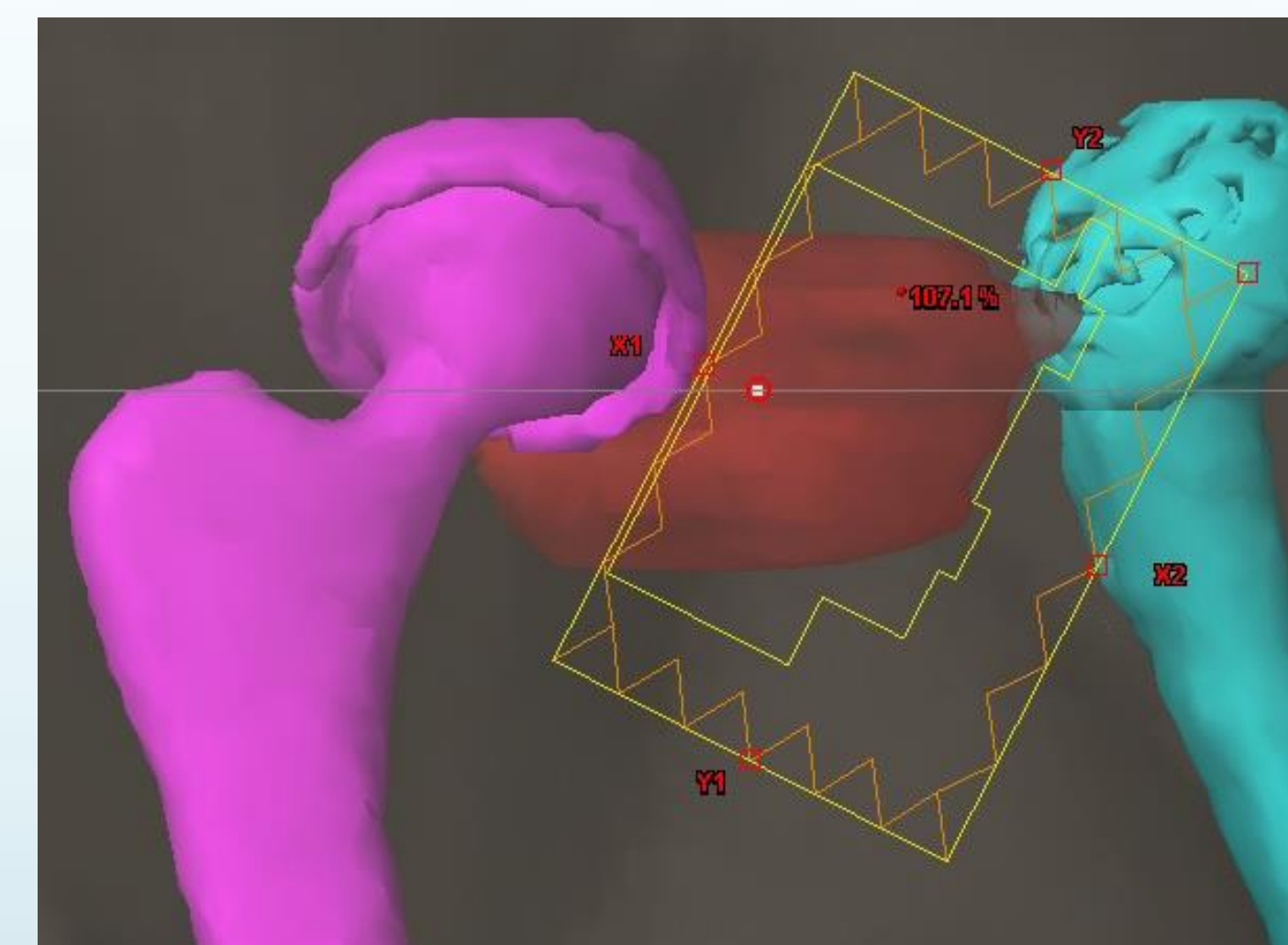
Prostheses Contoured



Artifact Areas



Fixing jaws

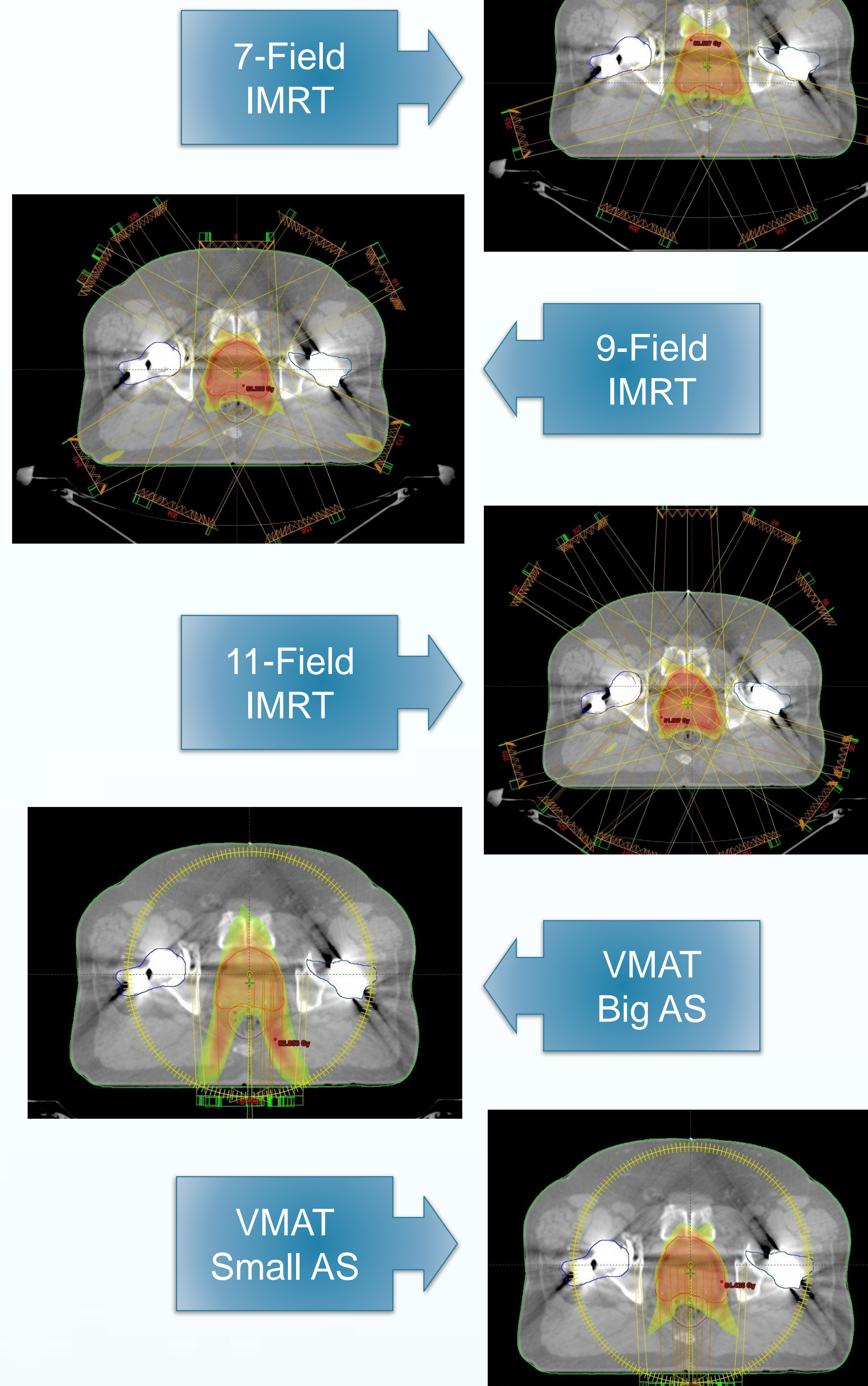


- Three IMRT treatment plans were proposed. 7-field, 9-field and 11-field, all optimized with constrained beam inverse planning, fixing jaws during the optimization, to avoid entry through prostheses.

- Two VMAT treatment plans were optimized with avoiding sectors (AS), one with large AS, and one with small AS, both VMAT plans were optimized with two arcs.

RESULTS

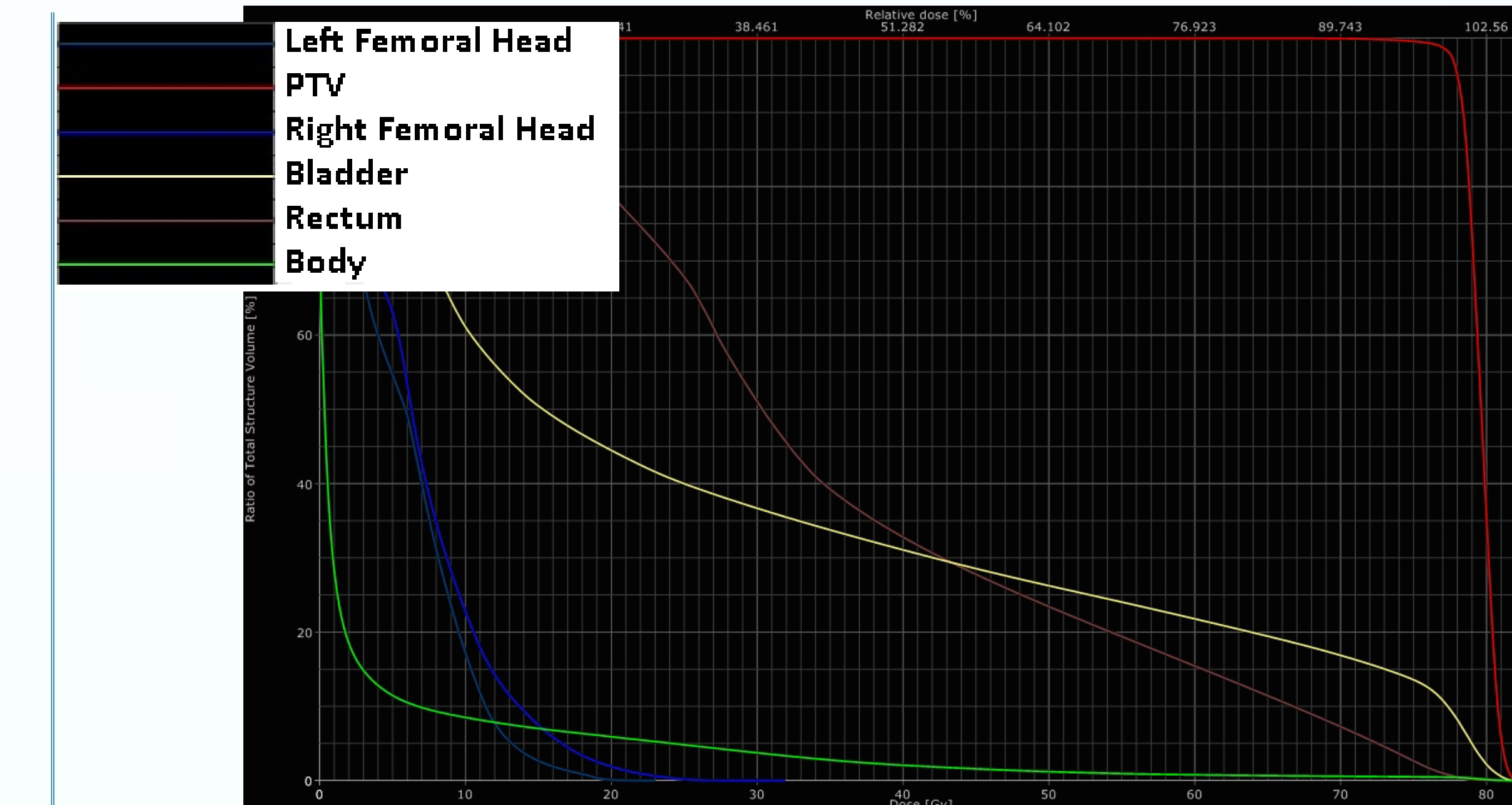
- 62Gy Isodose:



IMRT technique has better dose distribution than VMAT technique. 11-field IMRT showed the best dose conformation, and in VMAT technique, small AS was the best solution.

	7-field IMRT	9-field IMRT	11-field IMRT	VMAT Big AS	VMAT Small AS
Monitor Units	1163	1209	1262	593	787
D ₂	82,908 Gy	81,983 Gy	81,345 Gy	84,480 Gy	83,280 Gy
D ₉₈	77,574 Gy	77,558 Gy	77,653 Gy	76,830 Gy	77,110 Gy
D ₅₀	79,710 Gy	79,632 Gy	79,381 Gy	81,290 Gy	80,420 Gy
Rectum V ₅₀	32,08%	35,35%	28,50%	51,51%	40,90%
Bladder V ₅₀	27,50%	26,75%	26,40%	32,89%	28,29%
γ Index	0,067	0,056	0,046	0,094	0,077
Conformity Index	1,210	1,134	1,103	1,651	1,130

- Final DVH 11-Field IMRT:



CONCLUSIONS

All solutions could be implemented for bilateral hip prostheses prostate cancer treatment planning. On the other hand, 11-field IMRT showed better conformation across PTV and lower rectal and bladder dose comparing to the other plans analyzed, despite of its larger treatment time and number of UM.

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