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PROSTATIC SBRT: RAY PILOT'S DOSIMETRIC ANALYSIS

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POSTER

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INTRODUCTION

Stereotactic Body Radiation Therapy (SBRT) represents a cutting-edge approach in radiation oncology, delivering high radiation dose per fraction thanks to new technologies, such as Intensity-Modulated Radiation Therapy (IMRT) or Volumetric modulated arc therapy (VMAT). It empowers clinicians to administer shorter treatment courses with comparable outcomes and toxicity rates. This also improves the overall experience for patients by reducing the duration of their therapy.^{1,2}

Recently published 5-year results of PACE-B trial show similar outcomes and toxicity rates between SBRT and normofractionated radiation therapy schemes, establishing a new standard of care for low and favorable intermediate risk prostate cancer.³

RayPilot® System is a novel electromagnetic transmitter-based tracking system that permits monitoring intra-fractional prostate motion.

AIM

We performed a retrospective study, making a dosimetric comparison between two prostatic SBRT treatments: HYPO-RT scheme vs RayPilot® System.

METHOD

26 patients with low (13) or favorable intermediate risk (13) prostate cancer treated between September 2021 and July 2023 were compared: 13 using HYPO-RT scheme and 13 using RayPilot® System. CT scan was used to obtain planning images with a thickness of 3 and 1 mm respectively. Prescribed doses were 42.7 Gy in 7 fractions (alternate daily sessions) and 36.25 Gy in 5 fractions (consecutive daily sessions). Plans were optimized to achieve a D99 ≥ 90% and a D98 ≥ 95%. PTVs margins were designed with 5 mm (HYPO-RT) and 2 mm (RayPilot® had an additional 2 mm Urethra PRV).

An Elekta Synergy® LINAC was used, which includes a Cone Beam CT volumetric image system for the positioning of the patient.

RayPilot® System traces prostate motion thanks to a transmitter placed intra-urethrally by means of a catheter for 5 days, providing real-time localization of the prostate during treatment delivery.

RESULTS

- HYPO-RT group had a mean age of 70.77 ± 6.19 years and a mean initial PSA of 7.43 ± 2.65 ng/ml.
- RayPilot® group had a mean age of 70.23 ± 4.83 years and a mean initial PSA of 6.77 ± 1.55 ng/ml.

	HYPO-RT												BULB Mean dose	BULB max dose
	PTV D98%	PTV D99%	PTV V98%	PTV V99%	RECTUM V100%	RECTUM V75%	RECTUM V50%	RECTUM V20%	BLADDER V100%	BLADDER V75%	BLADDER V50%	BLADDER V20%		
MEAN	100.25	97.24	98.35	97.34	0.87	9.44	27.98	65	1.79	8.26	17.6	40.62	16.98	47.49
SD	1.01	1.93	1.4	1.76	0.62	3.39	9.98	17.46	1.38	3.58	7.53	19.26	11.34	29.97
	RAYPILOT												BULB Mean dose	BULB max dose
	PTV D98%	PTV D99%	PTV V98%	PTV V99%	RECTUM V100%	RECTUM V75%	RECTUM V50%	RECTUM V20%	BLADDER 100%	BLADDER V75%	BLADDER V50%	BLADDER V20%		
MEAN	98.16	95.94	98.12	96.73	0.31	5.17	13.19	44.3	1.56	9.05	17.89	34.03	10.12	27.53
SD	0.85	1.04	1.63	2.36	0.51	2.06	3.11	7.87	0.95	3.7	7	11.03	7.23	15.33

Figure 1. Relative dosimetric parameters: dose coverage and OAR doses

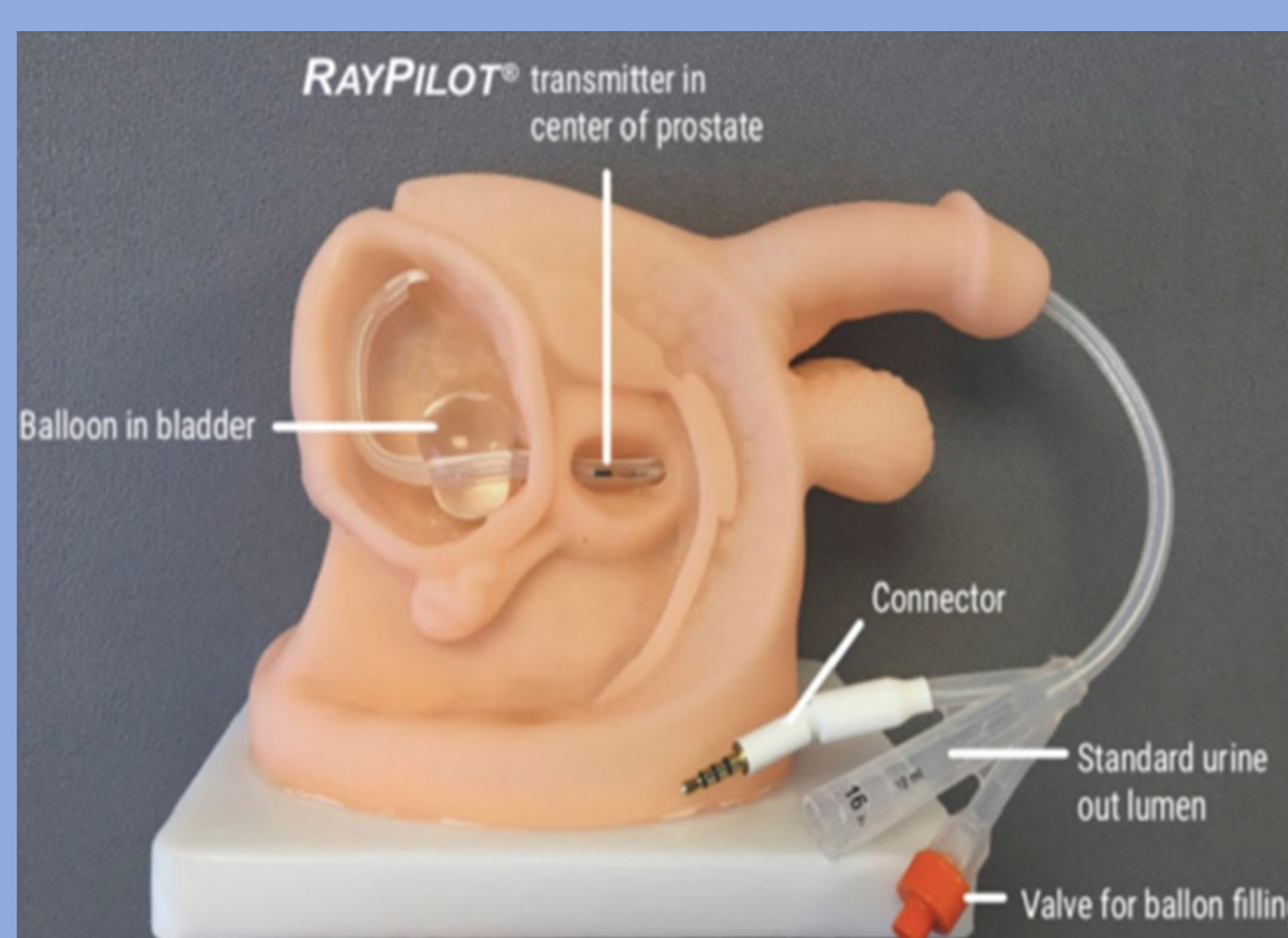


Figure 2. Example of RayPilot® System

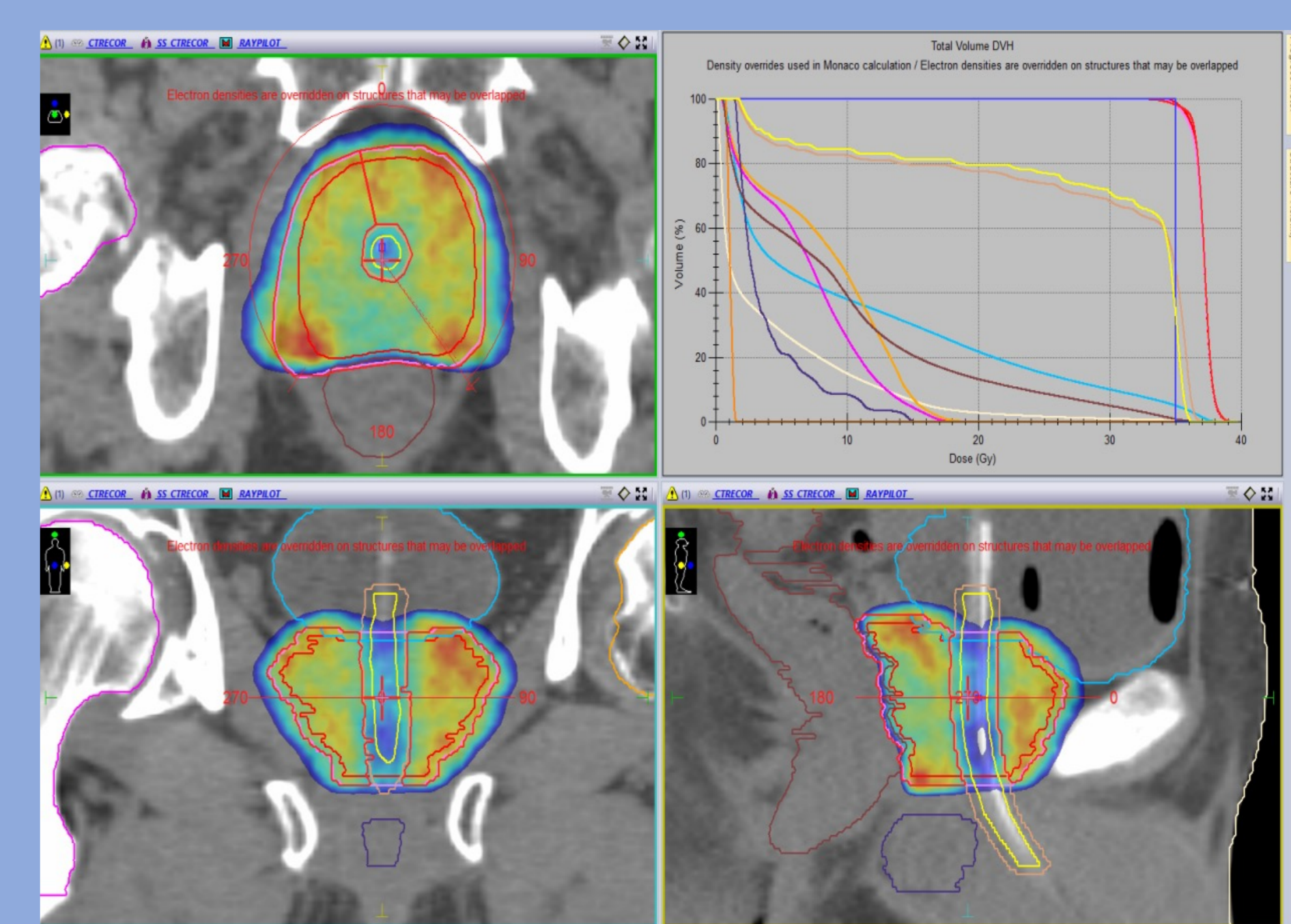


Figure 3. Real SBRT plan with a 2 mm PTV (red) and a urethra PRV (green) designed

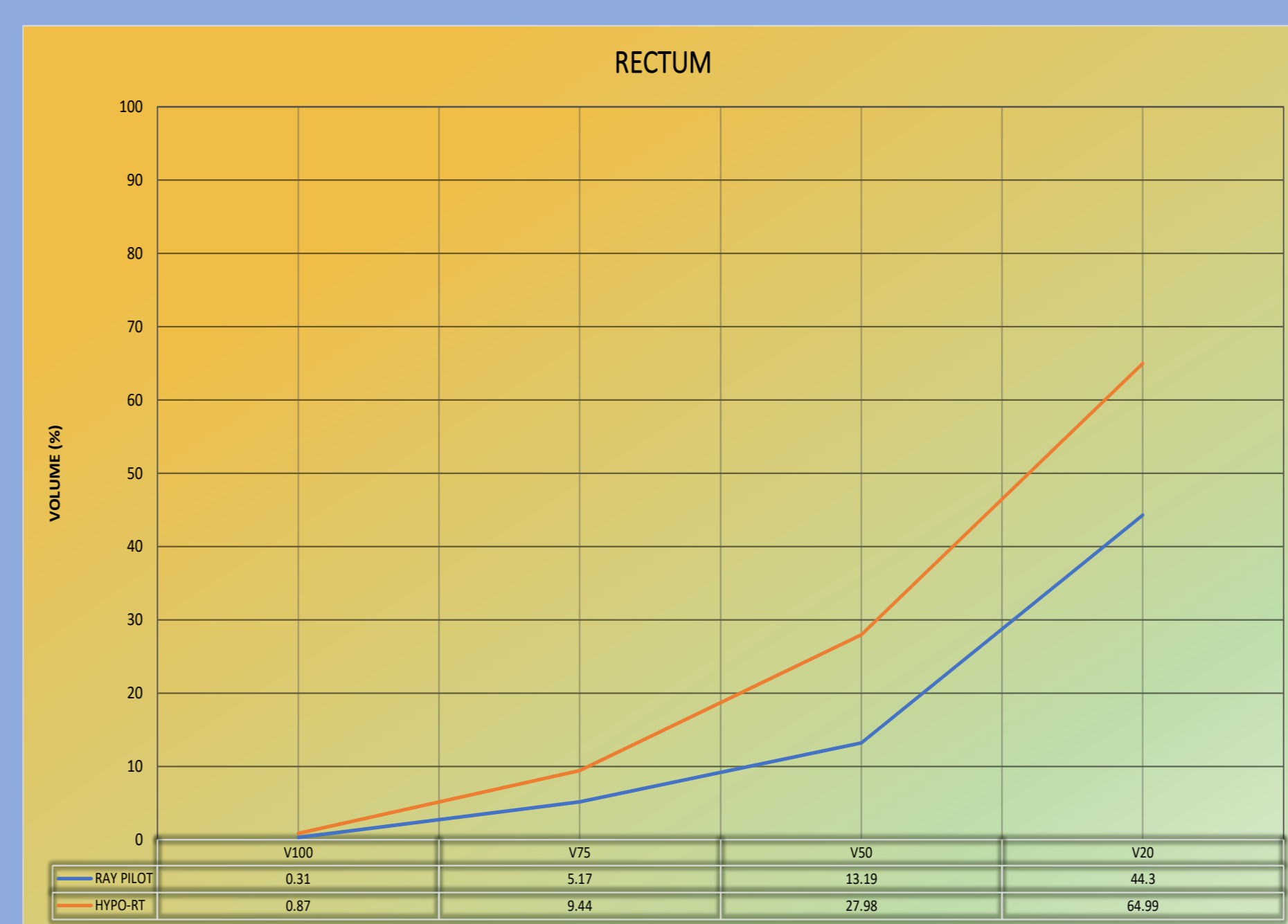


Figure 4. Comparison of rectum doses

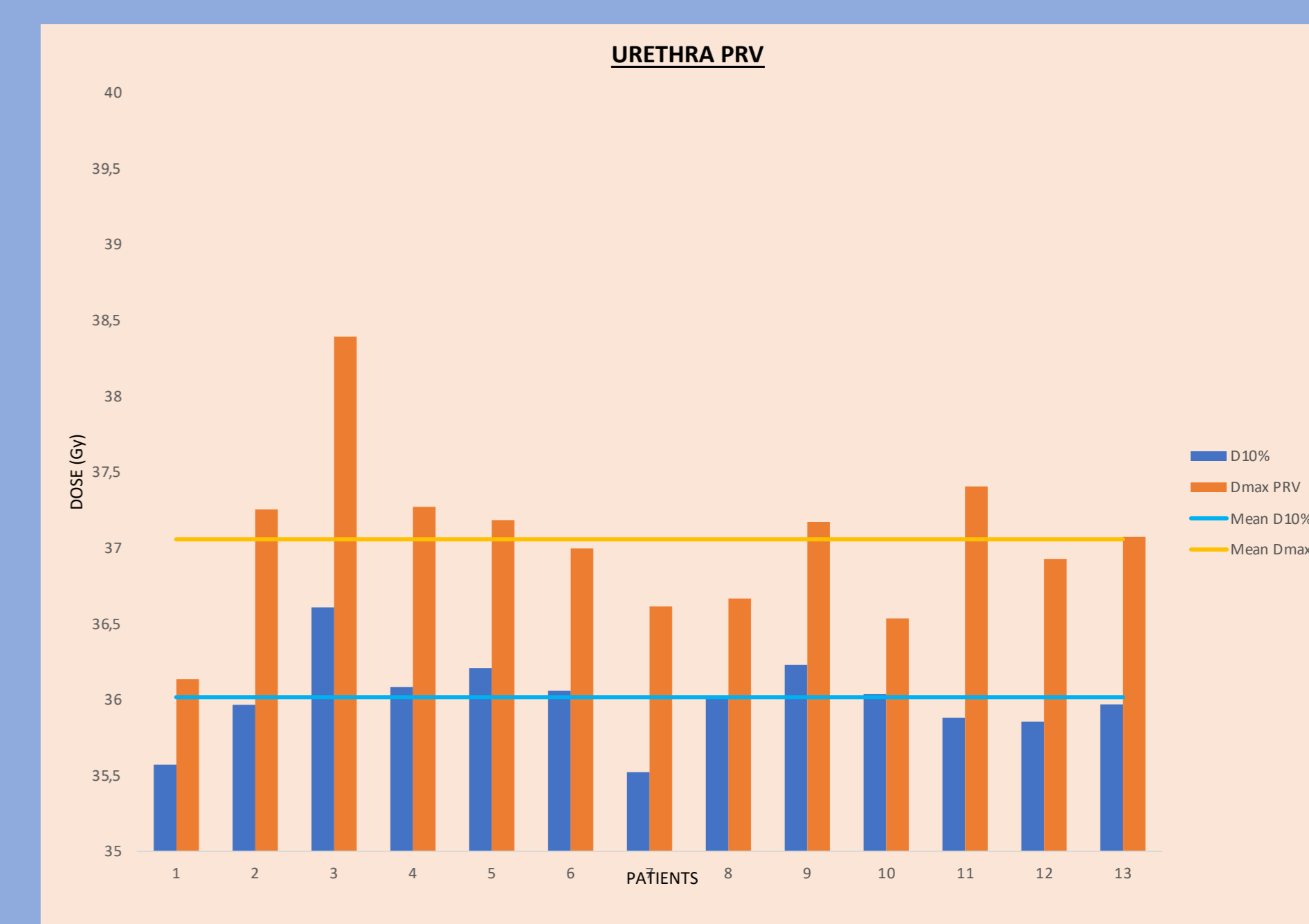


Figure 5. D10% and maximum dose delivered to our Urethra PRV

CONCLUSIONS

- RayPilot® System showed remarkable dosimetric advantages, primarily in rectum and penile bulb, over HYPO-RT scheme.
- Regarding PTV dose coverage and bladder, both techniques obtained similar results except for the V20 of the bladder, in which a substantial difference was observed in favour of RayPilot® System.
- Urethra PRV ensures minimizing
- We can conclude that real-life prostatic localization allows us to contour treatment volumes with less margin and more certainty in terms of dosimetric outcomes.
- It appears to be a secure and reliable SBRT technique in comparison with HYPO-RT scheme. However, validation on a larger scale is needed to implement it in our daily-basis clinical practice.

REFERENCES

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