

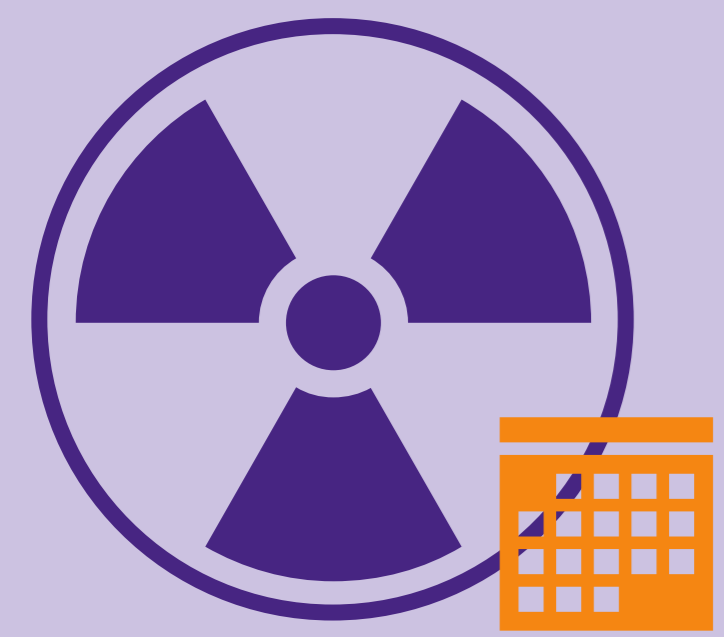
Salvage high-dose-rate brachytherapy for prostate cancer (SHARP study): Effect of pre-salvage template biopsies and fraction scheme on oncological and toxicity outcomes

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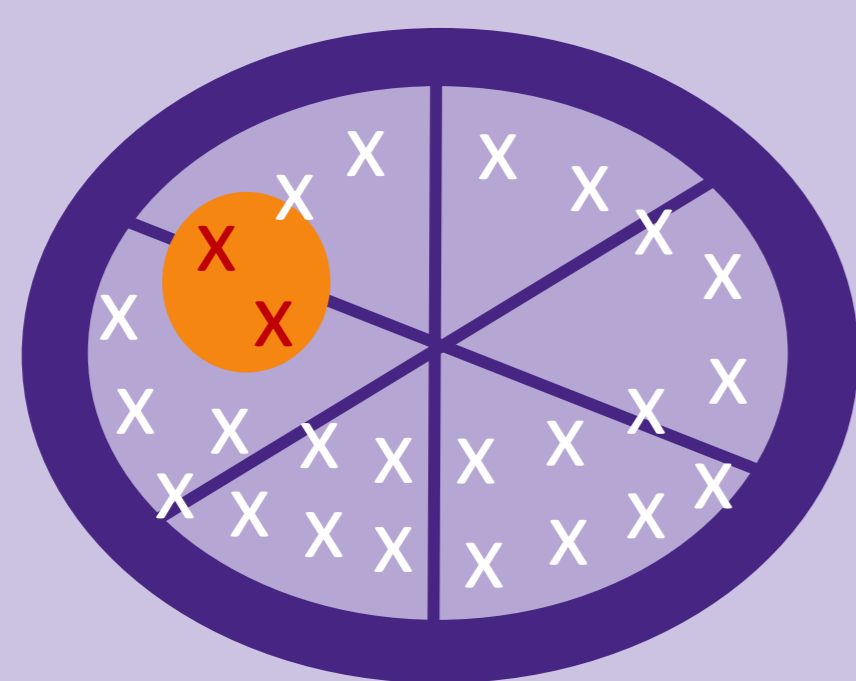
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INTRODUCTION

High-dose rate (HDR) brachytherapy for locally recurrent prostate cancer offers favorable tumor control and reduced toxicity compared to other salvage treatments (e.g., prostatectomy, HIFU, cryotherapy).¹ However, evidence is biased by heterogeneity between the HDR brachytherapy treatment plans across studies. This study reports our institutional results and assesses the effect of two major alterations in HDR brachytherapy care over the years:



Fractionation scheme
3 x 10 Gy to 2 x 13 Gy



Biopsy method
Target versus template

CONCLUSION

Overall **severe toxicity rate** (grade 3) was low using HDR brachytherapy for patients with prostate cancer recurrence following prior radiotherapy.

Hypofractionation

There were no significant differences between the fractionation schemes in terms of toxicity – although the 2-fraction schemes had an overall lower GU toxicity – and survival, showing the **safety** of hypofractionation.

Template biopsies

Using template biopsies resulted in an overall increase of radiation volume. However, this increase did not improve **survival outcomes**.

Next to a limited sample size and potential effect of confounding factors (fractionation scheme, rectal spacers), a **dose-volume effect** will be assessed using the equivalent uniform dose (EUD).

METHODS

Retrospective cohort study. Patients were eligible if they had previously received curative radiotherapy for primary prostate cancer. Initially, a **3 × 10 Gy** fractionation scheme was used, while a **2 × 13 Gy scheme** was introduced in March 2022. Prior to mid-2021, **targeted biopsies** were performed, whereafter **template biopsies** were implemented due to concerns regarding the diagnostic accuracy of PSMA-PET, which was used for radiation planning. Toxicity (based on CTCAE criteria), biochemical recurrence (BCR) and local recurrence-free survival were analyzed.



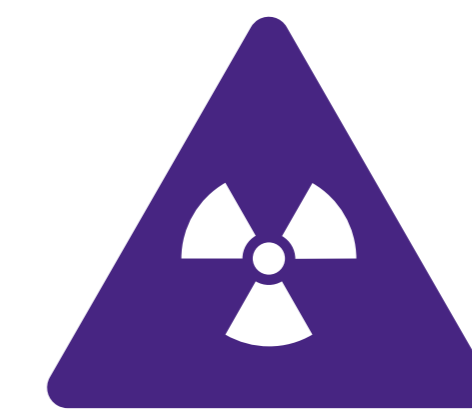
March 2017 – May 2025



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Single center



Toxicity
GU & GI



Survival
BCR, local

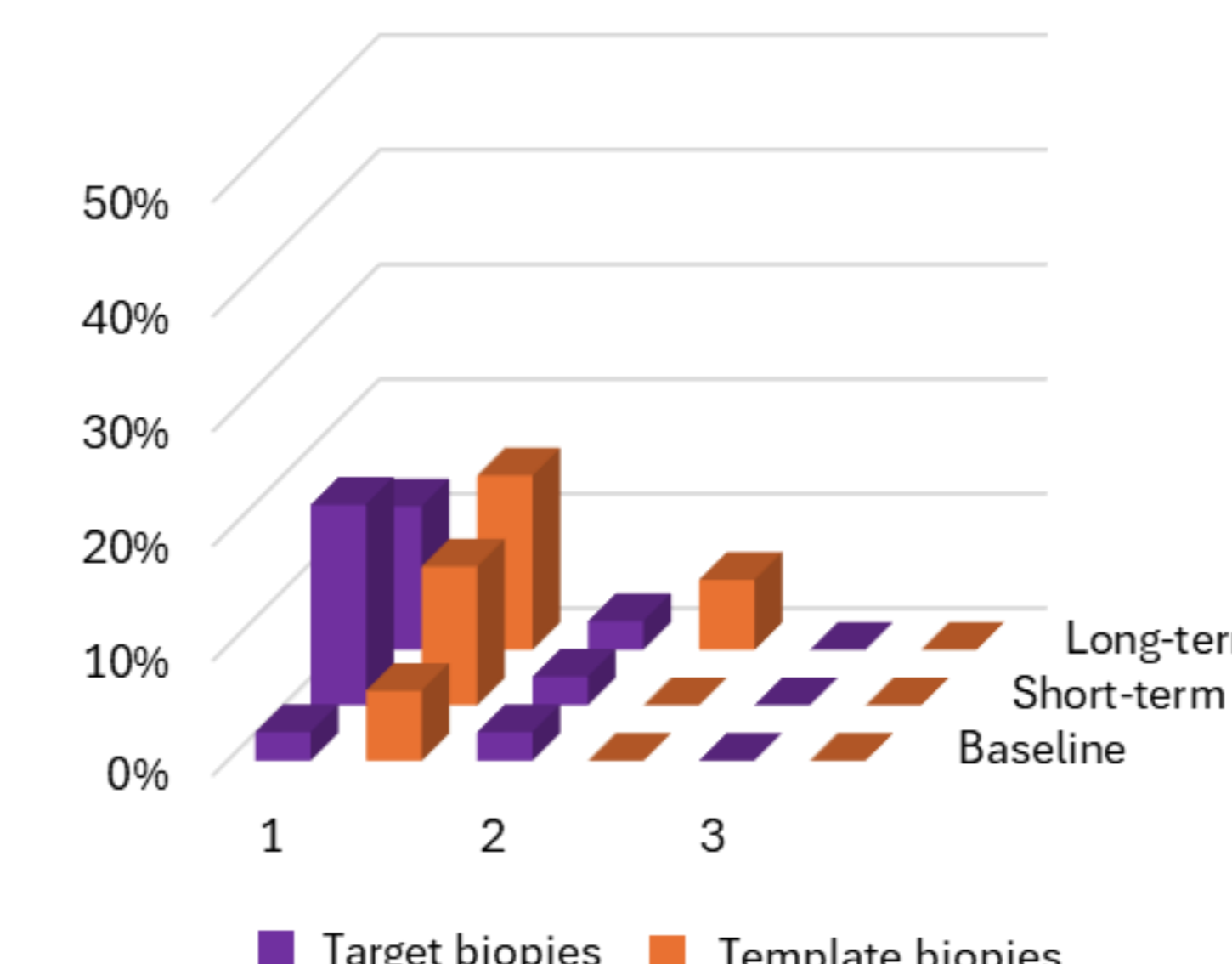
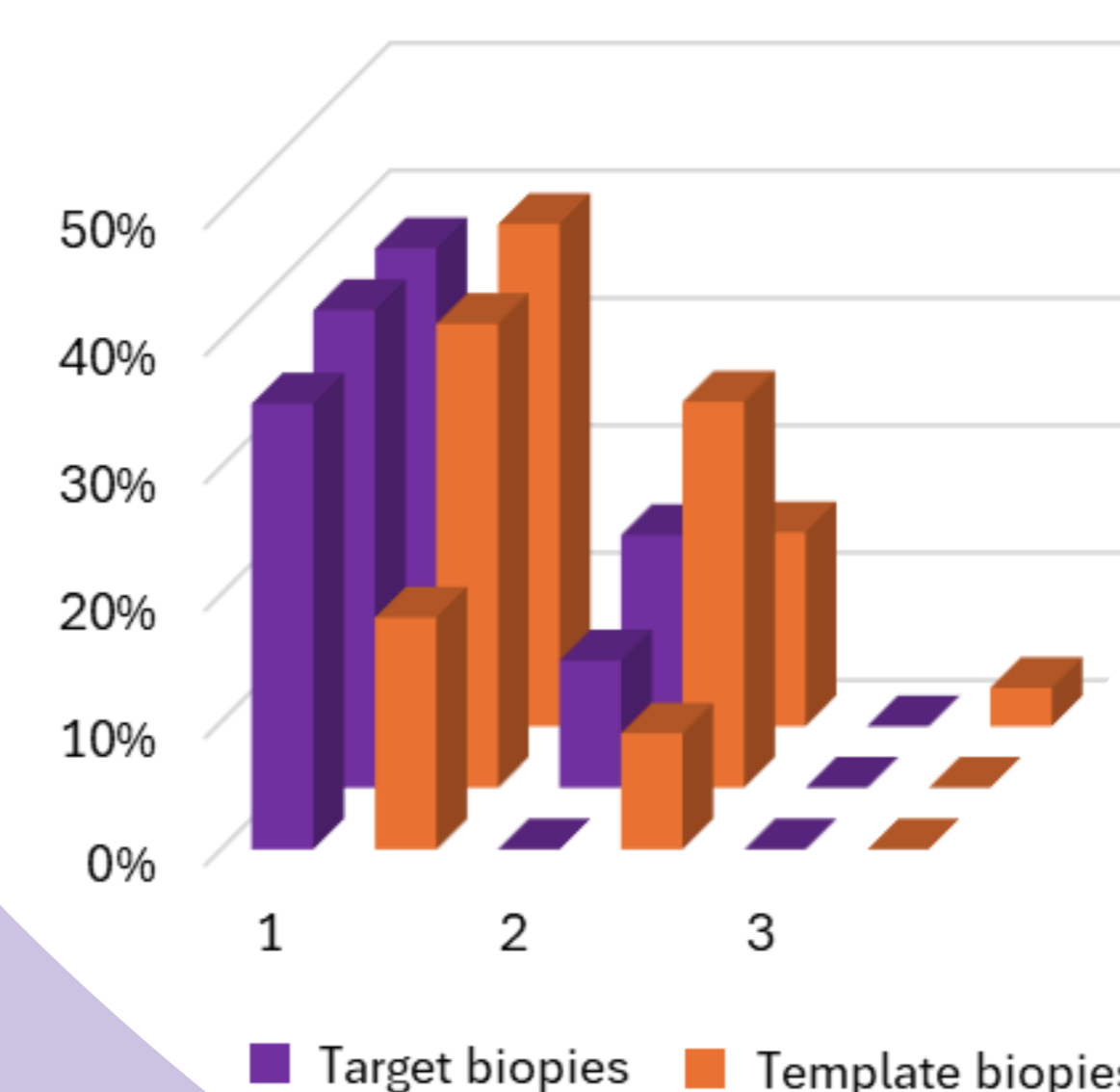
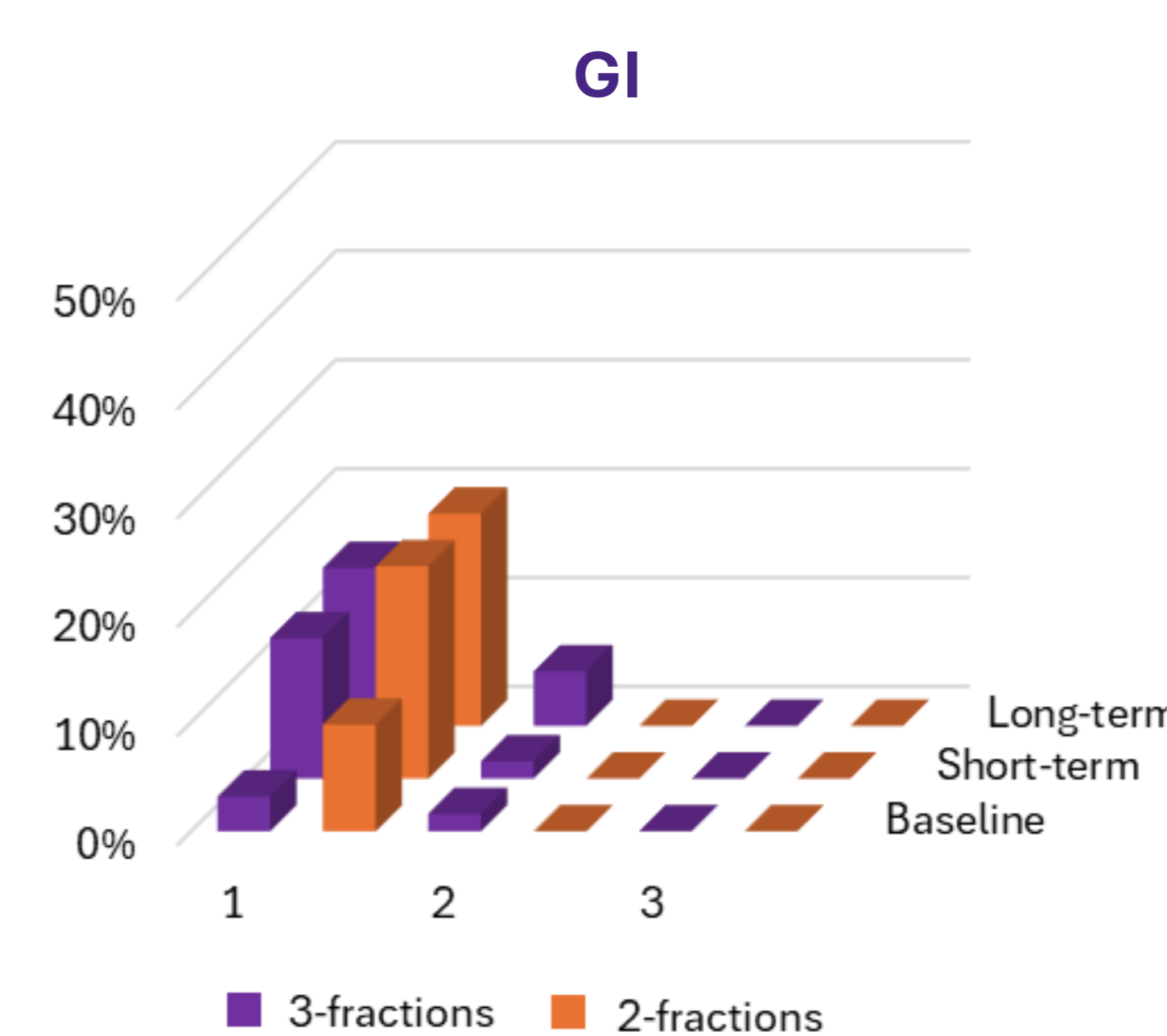
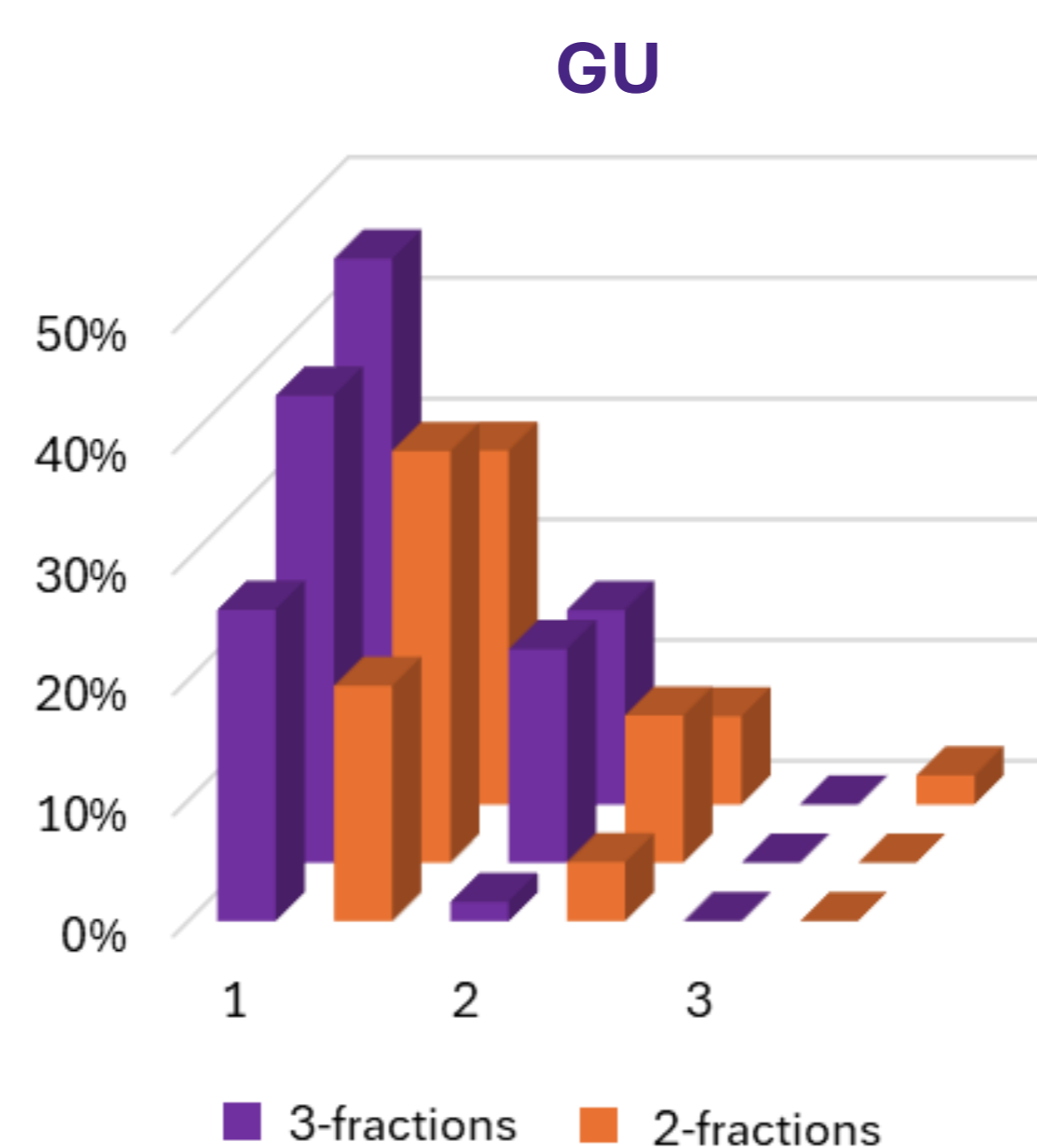
RESULTS

In total, 102 patients were included. Sixty-two patients had undergone a **3-fractionation scheme**, whereas 40 the **2-fractionation scheme**. After excluding missing data, 40 patients had undergone **targeted biopsies**, with an average number of biopsies of 2 (0 – 4) collected and irradiated volume of 28 cm³ (17 – 37), and 32 patients **template biopsies**, with an average number of biopsies of 16 (13 – 20) and irradiated volume of 36 cm³ (24 – 47).

Toxicity

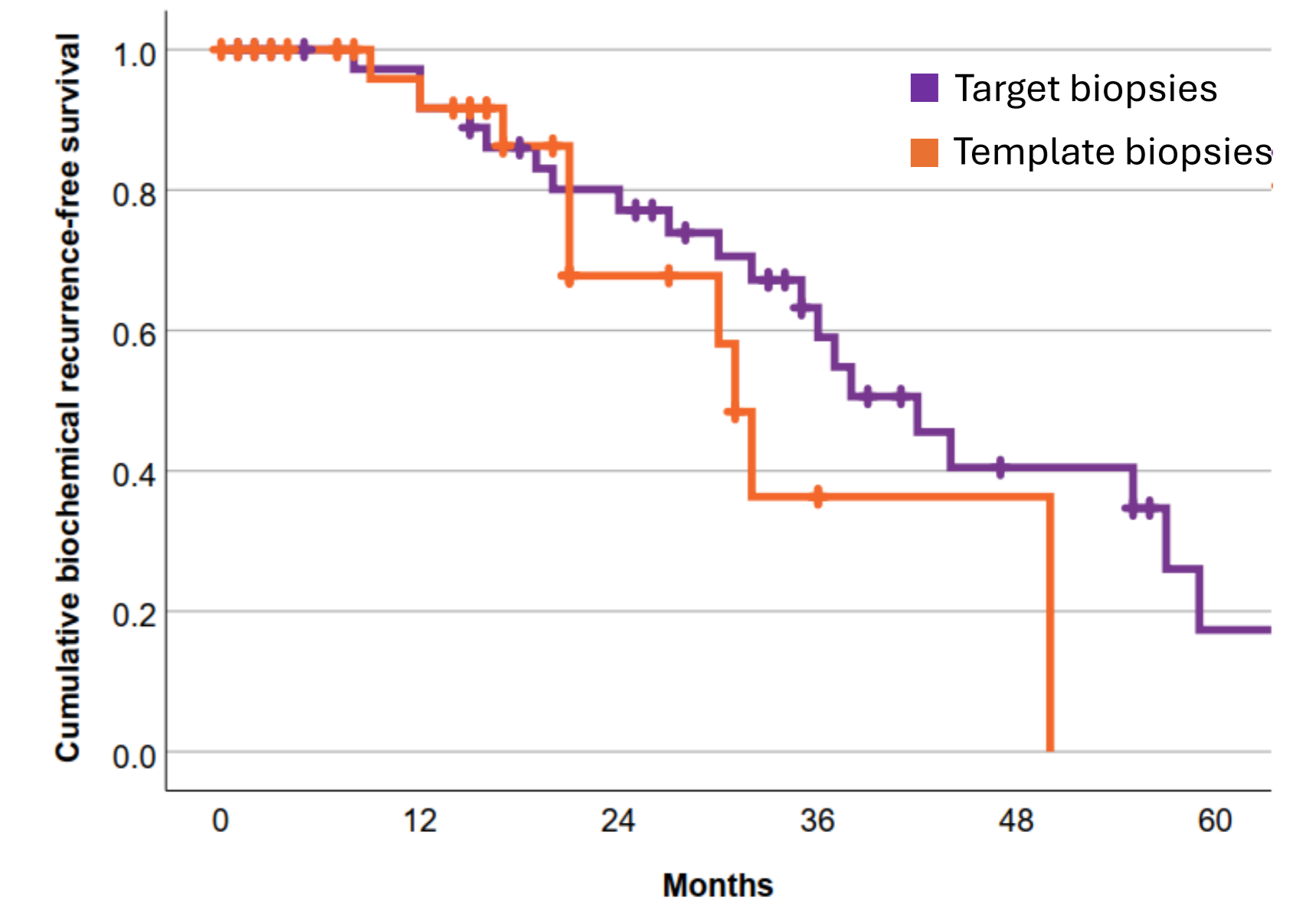
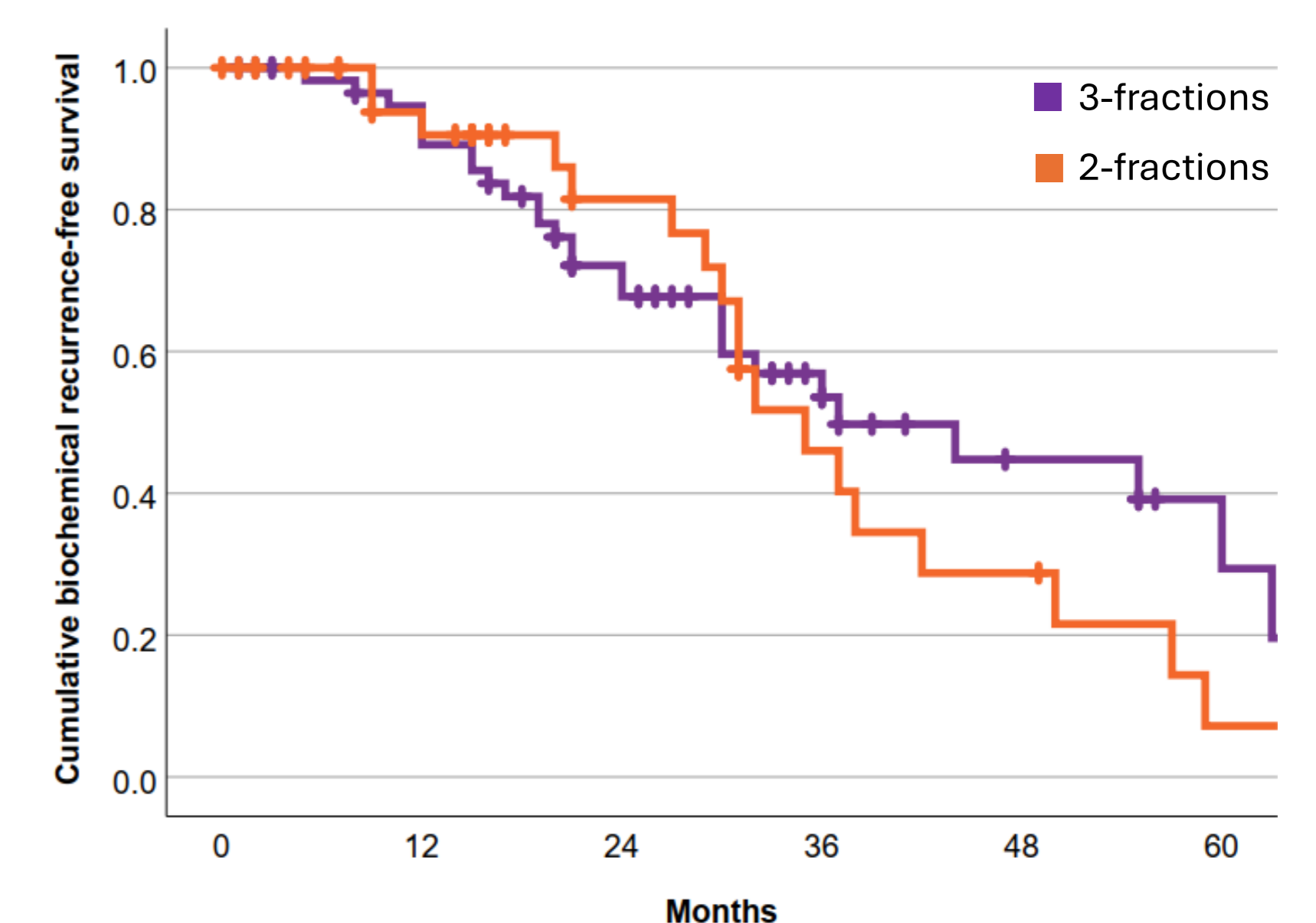
Short-term toxicity is defined as less than 3 months. No significant differences were shown between both groups.

Grade	GU (urinary)			GI		
	Baseline	Short-term	Long-term	Baseline	Short-term	Long-term
1	23%	37%	39%	6%	16%	17%
2	3%	16%	13%	1%	1%	3%
3	0%	0%	1%	0%	0%	0%



Survival

No significant differences were found between the groups for **biochemical recurrence-free survival** data.



Local recurrence-free survival analyses were limited by a considerable proportion of missing data.

¹Valle et al. "A Systematic Review and Meta-analysis of Local Salvage Therapies After Radiotherapy for Prostate Cancer (MASTER)." European urology vol. 80,3 (2021): 280-292. doi:10.1016/j.eururo.2020.11.010



Reliability of PSMA-PET imaging and impact of prostate biopsy strategy – template versus targeted – in salvage HDR brachytherapy planning and oncological outcomes

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INTRODUCTION

Because our clinic has observed microscopic tumor extension beyond the PSMA-PET-defined lesions following high-dose-rate (HDR) brachytherapy for recurrent prostate cancer, the reliability of the diagnostic PSMA-PET has been questioned. To improve the precision of radiation planning for salvage HDR brachytherapy and thereby minimizing the risk of local recurrence beyond the irradiated volume, our clinic adopted **template-guided prostate biopsies** as the standard of care in 2021. This retrospective cohort study evaluates the differences in planned radiation volume and oncological outcomes between pre-salvage template and **targeted biopsies** and diagnostic performance of PSMA-PET imaging.

METHODS

Target biopsies



40

Inclusion



March 2017 – May 2025

Template biopsies



32

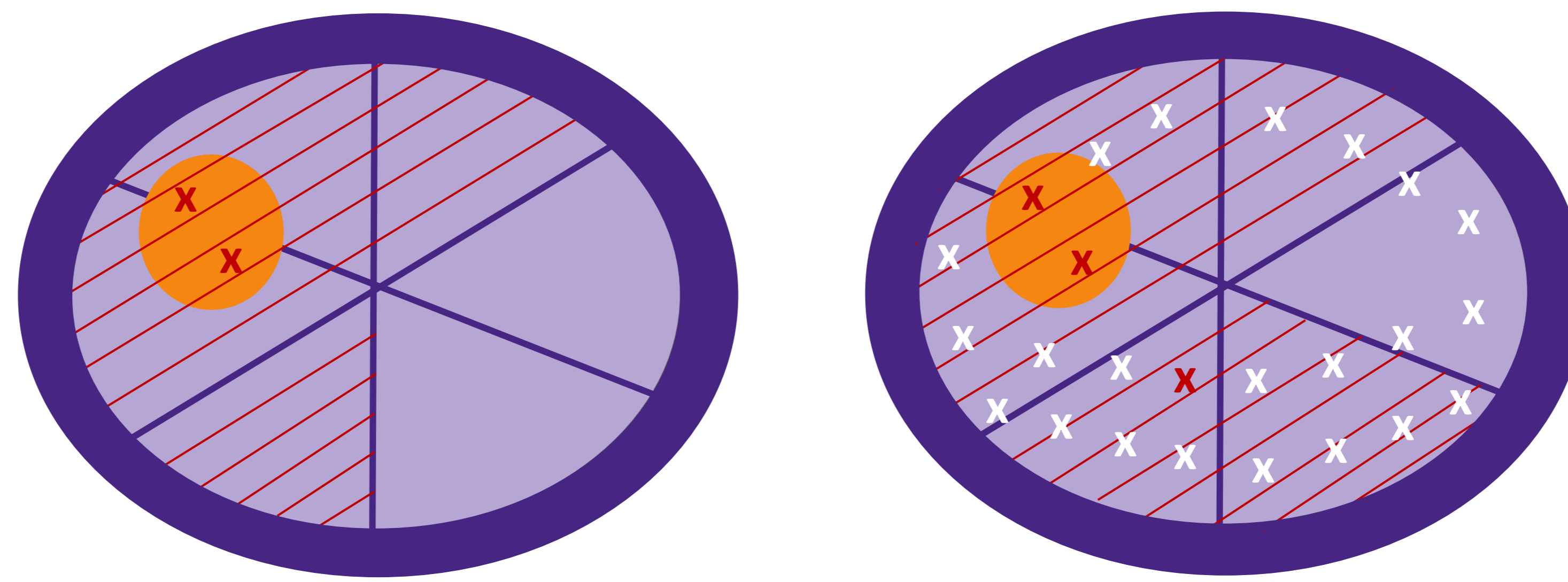
Survival



BCR, local

HDR brachytherapy planning

The prostate is divided into sextants for radiation planning. Biopsy locations are shown with an “x”. Patients who had undergone **targeted biopsies**, each sextant containing **PSMA-PET-avid** and pathology-confirmed lesions and its adjacent sextants are irradiated (red stripes). With **template biopsies**, sextants with **pathology-confirmed biopsies** and its adjacent sextants are irradiated.



Target biopsies

Template biopsies

PSMA PET scan

The correlation between the PSMA-PET avid and pathology-confirmed diagnosis was assessed per sextant based on **template biopsies**.

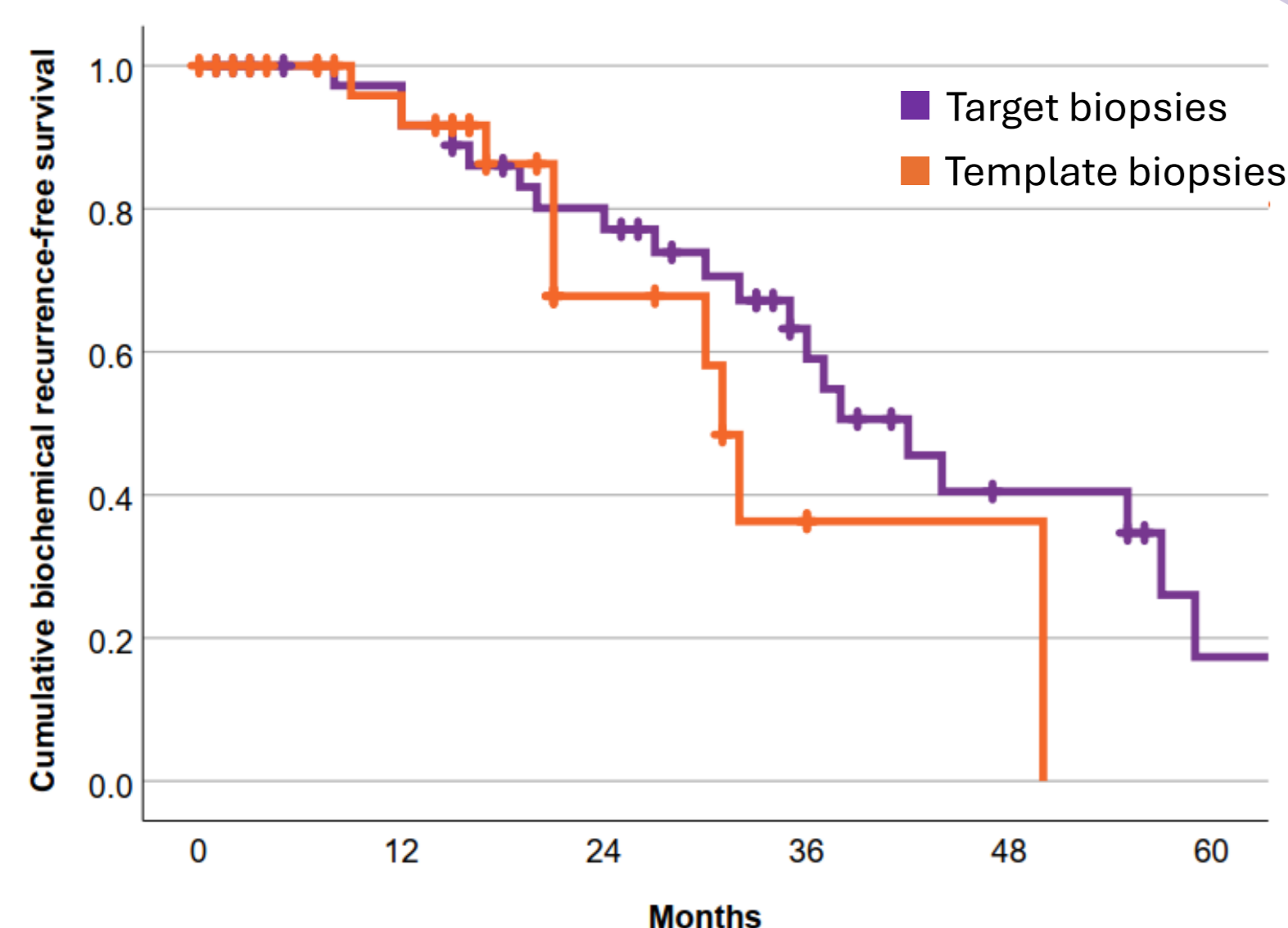
Sensitivity, specificity, positive predictive value and negative predictive value was analyzed to determine the diagnostic performance of the PSMA PET scan as tool for radiation planning.

RESULTS

Forty patients had undergone targeted biopsies, with an average number of biopsies of 2 (0 – 4) and irradiated volume of 28 cm³ (17 – 37), and 32 patients template biopsies, with an average number of biopsies of 16 (13 – 20) and irradiated volume of 36 cm³ (24 – 47).

Survival

Only biochemical recurrence-free survival data is shown. No significant differences were found between the groups. Local recurrence-free survival analyses were limited by a considerable proportion of missing data. A data-sharing agreement is currently ongoing to request the data.



PSMA PET performance

PSMA PET scans were available of 13 patients. The other PSMA-PET scans will be requested from the referred hospital.

PSMA-PET avid	Pathology-confirmed tumor		
	Yes	No	
+	20	9	29
-	16	32	48
	36	41	77*

* Template biopsies of 1 sextant was not sufficient for pathological assessment

Sensitivity | 56% **PPV | 69%**

Specificity | 78% **NPV | 67%**

CONCLUSION

Based on preliminary data, template biopsies result in improved histopathological mapping and increased irradiated volume. Strikingly, it does not seem to translate in improved treatment effectiveness.

Next to a limited sample size, missing data, and potential effect of several confounding factors (e.g., fractionation scheme, rectal spacers), a **dose-volume effect** will be assessed using the equivalent uniform dose (EUD). Larger irradiated volumes may result in lower peripheral doses (i.e., outer edges, sparing organs at risk), leading to a reduced mean EUD and biological effect.

