DOI: 10.4081/aiua.2026.15886

ORIGINAL PAPER

Early functional and oncological outcomes after robot-assisted radical prostatectomy in D'Amico high-risk prostate cancer: A prospective cohort study

Jonathan Michel Keller, Mladen Stankovic, Teresa Wieder, Laura Wolff, Joao Mendes

Department of Urology, Salem Hospital, Academic Hospital - University of Heidelberg, Zeppelinstraße 11-33, Heidelberg, Germany.

Summary

Background: *Robot-assisted radical prostatectomy (RARP) is an established treatment option for D'Amico high-risk prostate cancer within multimodal therapy concepts. While oncological outcomes are well documented, data on very early functional recovery remain limited. This prospective study evaluated early continence outcomes and biochemical recurrence (BCR)-free survival after RARP in D'Amico high-risk patients.*

Methods: *Clinical, pathological, functional, and follow-up data from patients undergoing RARP between February 2021 and May 2024 were prospectively collected. Among 361 consecutive patients, 109 met D'Amico high-risk criteria and were included. Pre-operative variables included prostate-specific antigen (PSA), prostate volume, biopsy Gleason grade group, and clinical stage. Pathological outcomes comprised tumor stage, surgical margin status, lymph node involvement, and post-operative PSA nadir. Early continence was assessed using a standardized post-operative pad test and BCR-free survival was analyzed using Kaplan-Meier analysis.*

Results: *Median pre-operative PSA was 9.8 ng/mL, and most patients had biopsy Gleason grade group ≥ 3. Locally advanced disease predominated, with pT3a and pT3b tumors in 56.9% and 32.1% of patients, respectively. Positive surgical margins occurred in 36.7% of cases, while 61.5% achieved a PSA nadir of 0.01 ng/mL. After a median follow-up of 30.8 months, BCR occurred in 22.9% of patients. Serious peri-operative complications (Clavien-Dindo ≥ III) were rare (2.8%). Gleason score and tumor stage were significantly associated with BCR, and early pad test results strongly predicted continence at one year.*

Conclusions: *RARP provided acceptable early continence recovery and meaningful oncological control in D'Amico high-risk prostate cancer, supporting its role within multimodal treatment strategies.*

KEY WORDS: *Biochemical recurrence; Functional outcome; High-risk prostate cancer; Incontinence; RARP.*

Submitted 29 June 2026; Accepted 26 August 2026

INTRODUCTION

Prostate cancer is among the most frequently diagnosed malignancies in men worldwide, with a particularly high incidence in older populations (1).Given the ongoing demographic shift toward an aging society, its clinical and epidemiological relevance is expected to increase further (2).

Risk stratification according to D'Amico classifies prostate cancer into low-, intermediate-, and high-risk categories based on the likelihood of disease progression (3). This classification system is widely used in clinical practice.

Within this classification, high-risk disease represents a critical subgroup, characterized by a markedly increased risk of adverse pathological findings and biochemical recurrence (4). Optimal management of this heterogenous group is challenging and typically requires a multimodal treatment approach (5).

Radical prostatectomy has long been a cornerstone in the curative treatment of localized and locally advanced prostate cancer. Over the past decades, surgical treatment of prostate cancer has evolved from open retropubic radical prostatectomy (RRP) to minimally invasive approaches – initially laparoscopic and subsequently robot-assisted – fundamentally transforming its surgical management.

Since its introduction in the early 2000s, *robot-assisted radical prostatectomy* (RARP) has progressively replaced the open approach in many high-volume centers worldwide and is established as the standard curative treatment for patients with low- and intermediate-risk prostate cancer and an estimated survival of more than ten years (5).

The widespread adoption of RARP has been driven by several potential advantages, including enhanced three-dimensional visualization, improved instrument articulation, tremor filtration, and superior ergonomics. These technical refinements allow for more precise dissection, particularly in the apical region and along the neurovascular bundles (6).

RARP has also been associated with favorable oncological outcomes, including improved long-term cancer-specific survival in selected patient populations (7).

Recent meta-analyses also suggest that radical prostatectomy might be superior in terms of cancer-specific mortality compared to *external beam radiotherapy* (EBRT) with or without *androgen deprivation therapy* (ART) (8, 9).

Nonetheless, the functional outcomes for the high-risk prostate cancer patient group after RARP still remain challenging. These patients often require wider resection mar-

gins and non-nerve-sparing procedures. Therefore, the balance between radicality and functional preservation becomes particularly challenging in this group and leads to an increased risk of urinary incontinence compared to the low- and intermediate-risk group (10).
Despite the widespread use of RARP in high-risk disease, data specifically addressing very early functional outcomes in this subgroup remain limited.
Therefore, the aim of this prospective study was to evaluate very early continence outcomes and *biochemical recurrence* (BCR)-free survival following RARP in patients with D'Amico high-risk prostate cancer.

Materials and methods

We prospectively analyzed the medical records of patients who underwent RARP between February 2021 and May 2024 at our institution. This study was approved by the ethics committee of *State Medical Chamber of Baden-Württemberg* (F-2021-049). The clinical data were obtained from the routine hospital information system (*CGM Clinical*®). During the study period, 361 patients were treated with RARP. According to the D´Amico classification, *high-risk prostate cancer* (HRPC) was defined by a PSA level > 20 ng/ml and/ or a clinical stage >= cT2c and/or a Gleason score of 8-10 (3).
Of these 361 patients, 109 patients met D'Amico criteria for HRPC and were hence included in the study.
The preoperative variables included prostate specific antigen (PSA), prostate volume, biopsy Gleason grade group and clinical stage (Table 1).
Preoperative staging with bone scintigraphy or PSMA-PET/CT was performed as clinically indicated to rule out metastatic disease.
All procedures were performed by two experienced surgeons, using Da Vinci© model Xi. A transperitoneal approach was used, including incision of the endopelvic fascia and an anterograde dissection of the prostate. The vesicourethral anastomosis was constructed using a single continuous suture with two needles. An *extended pelvic lymph node dissection* (ePLND) was performed in all patients according to current guideline recommendations. The dissection included the external iliac, obturator, and internal iliac regions and was extended cranially to the common iliac bifurcation.
Post-operative complication rates were documented using the Clavien-Dindo classification (11). The pathological outcomes comprised tumor stage, surgical margin status, lymph node involvement and post-operative PSA nadir.
All patients underwent standardized postoperative care. Early urinary continence was assessed using a standardized pad test performed one day after catheter removal. Cystography, typically performed on postoperative day 5, was used to confirm an intact anastomosis without evidence of leakage. If no leakage was detected, the urinary catheter was removed, followed by one day of pelvic floor training. For the standardized pad test, patients with a sonographically confirmed bladder filling of at least 150 ml and a subjective urge to void wore a urine pad for one hour while performing predefined physical activities. The pad was weighed before and after the test to determine urine loss. Complete continence was defined as a urine loss between 0 and 10 grams (Grade I). Mild incontinence (Grade II) was defined as a urine loss between 10 and 25 grams. Grade III was defined as urine loss between 25 and 50 grams. A urine loss greater than 50 grams (Grade IV) indicated severe early incontinence. See Table 2 for an overview of the standardized pad test.
Long-term continence was evaluated at 12 months post-operatively and categorized as either 1 pad/day or ≥ 2 pads/day. Categorical variables were summarized using frequencies and percentages. The association between early PAD score and continence at one year was assessed using the chi-square test. Logistic regression analysis was performed to evaluate the predictive value of the PAD score for long-term incontinence (defined as ≥2 pads/day). Results are reported as *odds ratios* (ORs) with 95% *confidence intervals* (CIs).

Table 1.
Baseline and perioperative characteristics.

Variable	Value
Number of patients	109
Age, years	66.3
Preoperative PSA, ng/mL	9.8 (IQR 6.3–17.4)
Prostate size	54.9 ml
Biopsy Gleason score ≥ 8, n (%)	29 (26.6%)
Pathological T stage	
- pT2	11 (10.1%)
- pT3	63 (57.8%)
- pT4	35 (32.1%)
Lymph node status	
- pN0	95 (87.2%%)
- pN1	14 (12.8%%)
Positive surgical margins, n (%)	40 (36.7%)
Nerve-sparing approach	
- None	78 (71.6%)
- Unilateral	13 (11.9%)
- Bilateral	18 (16.5%)
Length of hospital stay, days	6 (IQR 5–7)
Perioperative complications	
- No complications (Clavien–Dindo 0)	99 (90.8%)
- Grade I–II	6 (5.5%)
- Grade ≥ III	3 (2.8%)
Early continence (PAD score = 1), n (%)	78 (71.6%)
Biochemical recurrence, n (%)	25 (22.9%)
Follow-up, months	30.8 (median)

Table 2.
Incontinence grades and overview of the standardized pad test.

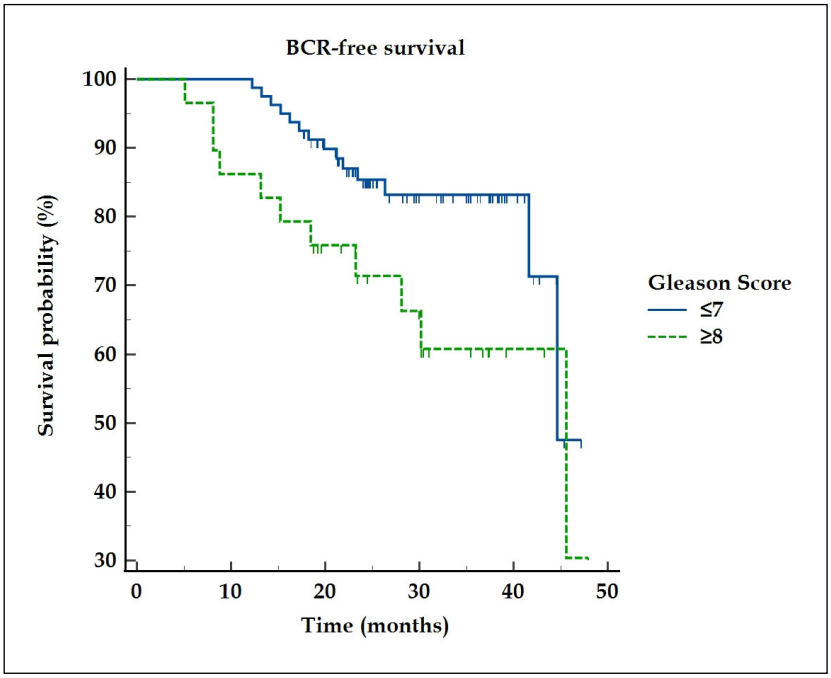
Variable	Value
Grade I	≤ 10 ml urine loss
Grade II	10 - 25 ml urine loss
Grade III	25 - 50 ml urine loss
Grade IV	> 50 ml urine loss

For clinical applicability, PAD scores were additionally dichotomized into low-risk (PAD = 1) and high-risk (PAD ≥ 2) groups. Diagnostic performance metrics including sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated. Discriminative ability was assessed using *receiver operating characteristic* (ROC) curve analysis and the *area under the curve* (AUC). A p value < 0.05 was considered statistically significant.

Follow-up was conducted in accordance with EAU guidelines, with PSA measurements obtained every 3-6 months during the first two years and thereafter every 6 months. Imaging was performed in cases of suspected biochemical recurrence.

Biochemical recurrence survival rates were calculated using Kaplan-Meier survival analysis. All statistical analyses were conducted using MedCalc© Vers.20.1 and SPSS Software v23., with statistical significance set at $p < 0.05$.

Figure 1.
BCR-free survival Gleason Score.



Results

A total of 361 patients were treated with RARP during the time between February 2021 and May 2024. Of these, 109 patients met the D'Amico criteria for high-risk prostate cancer and were included in the analysis. The median preoperative PSA was 9.8 ng/ml (range 3.2-84.8 ng/ml), median age was 66.3 years and median prostate size was 54.9 cm^3. Most patients had a Gleason Grade group ≥ 3. Histopathological analysis demonstrated predominantly locally advanced disease with pT3a tumors in 56.9% and pT3b tumors in 32.1% of patients. Lymph node involvement was reported in 14 patients. A postoperative PSA-nadir of 0.01 ng/ml was achieved in 67 patients (61.5%).

The patients were followed up for a median period of 30.8 months. During follow-up, 25 patients (22,9%) developed BCR. Of these, 21 patients received *androgen deprivation therapy* (ADT) combined with *radiotherapy* (RT), while four were managed with observation alone.

Kaplan-Meier analysis demonstrated significant differences in BCR-free survival according to Gleason score and pathological tumor stage. Higher Gleason scores were significantly associated with reduced BCR-free survival (p = 0.014). Gleason score 9 was associated with a significantly increased risk of biochemical recurrence compared to Gleason score 7 (HR 3.12, 95% CI 1.12-8.72) (see Figure 1).

Advanced pathological tumor stage was also significantly associated with impaired BCR-free survival (log-rank p = 0.028). Patients with pT3 disease had an increased risk of recurrence compared to pT2 tumors (HR 4.82, 95% CI 1.22-19.02) (Figure 2).

Neither surgical margin status (p = 0.123) nor lymph node involvement (p = 0.056) significantly affected BCR-free survival, although node-positive patients showed a

Figure 2.
BCR-free survival T-stage.

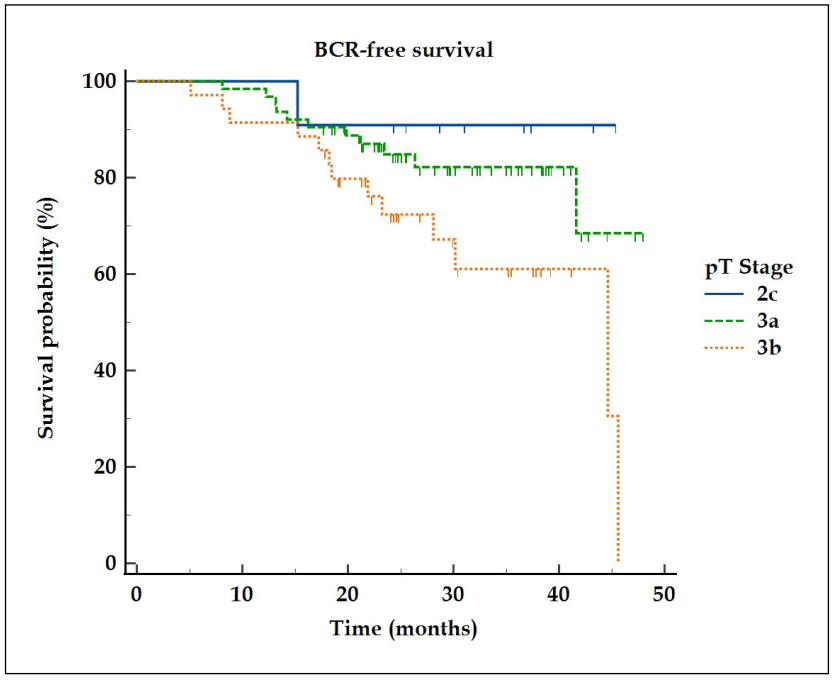


Figure 3.
BCR-free survival L-status.

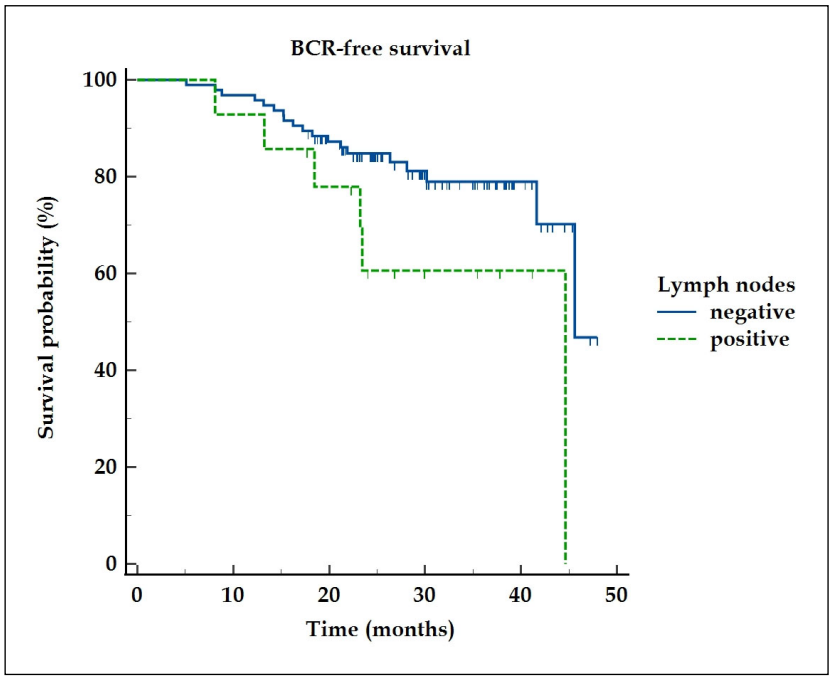
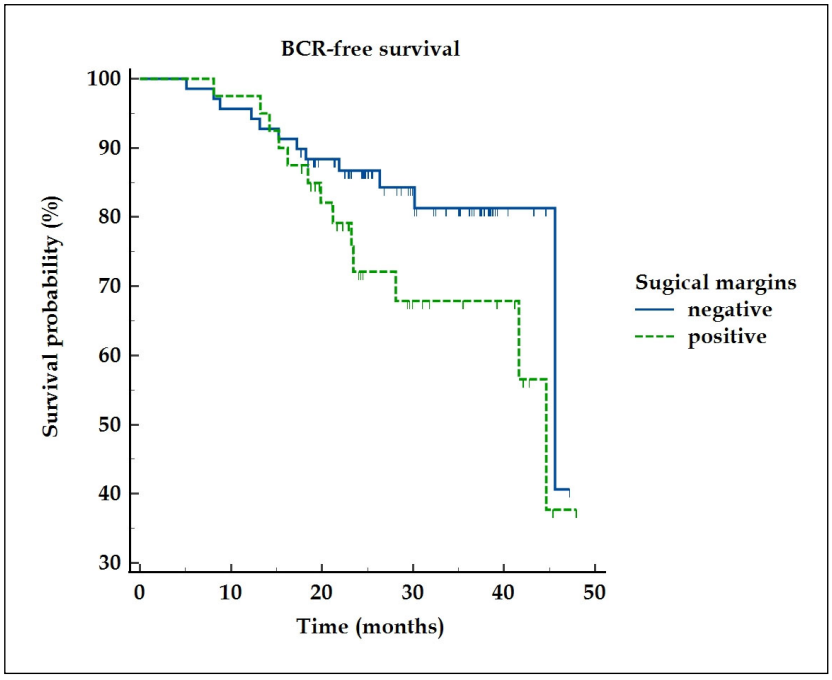


Figure 4.
BCR-free survival surgical margins.



trend toward worse outcomes (HR 3.30, 95% CI 0.97-11.20) (Figures 3, 4).
On multivariate analysis, the model demonstrated limited explanatory power (R^2 = 0.146; adjusted R^2 = 0.105). Gleason score (p = 0.02) and pathological tumor stage (p = 0.03) remained the variables most strongly associated with biochemical recurrence, whereas surgical margin status and lymph node involvement did not demonstrate independent significance. Complete continence (PAD score 1) was achieved in 78 patients (71.6%). Mild, moderate and severe incontinence (PAD score 2, 3 and 4) were observed in 14.7%, 8.3%, and 5.5% of patients, respectively.
Early continence status was strongly associated with continence at one year (χ^2 = 45.0, p < 0.001).
Early PAD score significantly predicted long-term incontinence (OR 7.4, 95% CI 3.2-17.4, p < 0.001).
ROC analysis demonstrated good discriminative ability of the PAD test for predicting long-term continence outcomes (AUC 0.82).
Perioperative complications were low, with 99 patients (90.8%) experiencing no complications. Serious complications (Clavien-Dindo ≥ III) occurred in 3 patients (2.8%).

Discussion

In this prospective cohort of patients with D'Amico high-risk prostate cancer, 22.9% developed biochemical recurrence during a median follow-up of 30.8 months. These results are consistent with previous studies evaluating BCR in high-risk patients after RARP (12). Given the aggressive tumor biology in this subgroup, our observed recurrence rate seems acceptable and underlines the role of RARP within a multimodal treatment strategy.
BCR represents the earliest measurable indicator of disease recurrence and has been shown to precede clinical progression, metastatic spread and *prostate-cancer-specific mortality* (PCSM) (13). BCR after radical prostatectomy is commonly described as a PSA-level of ≥ 0.2 ng/mL, confirmed by a second measurement, which was also applied in our study according to EAU guidelines (14, 15). However, varying PSA thresholds may limit comparability between studies.
It is important to highlight that BCR, even in high-risk disease, does not inevitably lead to metastatic disease or cancer-specific death. Long-term data from trials such as ProtecT suggest low overall PCSM across treatment modalities - however, these findings must be interpreted cautiously as high-risk patients were underrepresented (16). Therefore, in high-risk cohorts, BCR should be seen as a significant warning signal requiring structured surveillance and timely consideration of further therapy, while still avoiding reflexive overtreatment in patients with indolent biochemical relapse. Careful individual risk stratification remains essential to balance oncological

control versus treatment-related morbidity and psychological burden (12).

In our cohort, Gleason score and pathological tumor stage were significantly associated with BCR, consistent with previous reports (17, 18). Higher Gleason groups are well established predictors of recurrence, metastatic progression, and mortality (14). Interestingly, although *positive surgical margins* (PSM) are widely recognized as risk factor for BCR - particularly in high-risk disease - PSM did not reach significance in our study cohort (19).

This may be attributable to the relatively limited sample size or to the interaction between margin status and other high-risk pathological features such as tumor stage. Furthermore, the extent and location of the positive margin, which were not further analyzed in this study, may influence recurrence risk.

Overall, our findings support that RARP provides meaningful oncological control in patients with D'Amico high-risk prostate cancer. However, the high prevalence of adverse pathological features underscores the importance of structured postoperative surveillance and timely integration of multimodal treatment strategies when indicated (16).

Postoperative incontinence is often cited as one of the greatest concerns among patients undergoing radical prostatectomy (20). Despite its clear relevance for quality of life, data specifically addressing early postoperative continence – particularly in patients with D'Amico high-risk prostate cancer – remain rare.

Most studies in this group predominantly focus on oncological outcomes, whereas functional recovery, especially in the immediate postoperative phase, has received considerably less attention. In the few studies existing on this precise topic, continence rates after RARP can be as low as 17% or 49,3% directly after urethral catheter removal and improving to 56% after one month (21, 22). This is understandable as high-risk disease often means extracapsular involvement and thus wider excision margins and non-nerve-sparing surgical procedure.

Nonetheless, in our study cohort, 71.6% of the patients achieved good very early postoperative continence (graded as PAD-score I).

In the present study, we also demonstrate that very early postoperative urinary continence, assessed using a standardized PAD test one day after catheter removal, is strongly associated with continence status at one year. Objective assessments performed immediately after catheter removal are rarely reported, particularly in oncologically high-risk cohorts.

Our findings indicate a pronounced dose-response relationship between early PAD score and persistent incontinence at 12 months. Each one-point increase in PAD score was associated with a more than sevenfold increase in the odds of long-term incontinence, and ROC analysis demonstrated good discriminative accuracy (AUC 0.82). These results suggest that early continence status is not merely a transient postoperative phenomenon but rather reflects the underlying functional recovery potential of the continence mechanism.

The standardized PAD test represents an objective, reproducible, and easily implementable assessment tool. Despite its simplicity, such structured early and long-term testing is not routinely used in many institutions, where continence assessment often relies on subjective reporting at later follow-up visits and incontinence is solely defined as the usage of more than urinary pad per day (23-26). However, in our opinion, subjective reports are naturally predisposed to bias and lack objective reproducibility. Also, in our opinion, pad count alone does not objectively quantify urinary leakage and may substantially overestimate true continence rates. Modern pads can absorb up to approximately 150 ml of urine, meaning that patients classified as "*continent*" under this definition may still experience clinically relevant leakage. Therefore, the count of the pad usage does not necessarily reflect full continence and lacks the precision required for objective functional outcome assessment.

In this context, the usage of an early standardized PAD test provides a more objective and biologically meaningful assessment of continental function. By directly quantifying urinary leakage rather than relying on pad usage as a surrogate parameter, subtle yet clinically relevant differences in early and long-term postoperative continence can be detected.

Our data also suggest that early standardized PAD-test-based risk stratification may enable individualized postoperative management. Patients classified as high-risk (PAD-test ≥ 2) may benefit from intensified pelvic floor rehabilitation, early referral to specialized continence services, or closer functional monitoring. Conversely, patients with a PAD-test score of 1 demonstrated excellent long-term functional outcomes, potentially allowing for more streamlined follow-up and patient reassurance.

Declarations

Ethical approval and consent for participate: *The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki and its subsequent amendments. The study was approved by the ethics committee of the State Medical Chamber of Baden-Württemberg (No: F-2021-049) and informed consent was obtained from all individual participants.*

Availability of data and material: *The datasets used and/ or analyzed during the current study are available upon reasonable request from the corresponding author.*

Competing interests: *All authors declare no conflict of interest.*

Funding: *This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors*

Authors' contributions: *Jonathan Michel Keller - Writing - original draft, Data curation; Mladen Stankovic - Project administration, Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing - review and editing; Teresa Wieder - Data curation, Investigation; Laura Wolff - Data curation, Investigation; Joao Mendes - Data curation, Investigation.*

Acknowledgments: *Not applicable.*

Complication rates in our study cohort were low with the vast majority of our patients experiencing no complications (Clavien-Dindo 0). The distribution of higher-grade complications was minimal, supporting the safety of RARP even in a high-risk population.

Compared with open radical prostatectomy, minimally invasive approaches have been associated with reduced blood loss, shorter hospitalization and lower perioperative morbidity (27). Shorter hospital stays may also reduce secondary complications such as nosocomial infections or pneumonia (28). These findings further support RARP as a safe surgical approach in appropriately selected high-risk patients.

Several limitations of this study need consideration. First, this was a single-center study, which may limit the generalizability of our findings. Institutional expertise, surgical technique, perioperative management, and rehabilitation protocols may have influenced the outcomes.

Second, although prospectively collected, our sample size was moderate. This may have limited the statistical power to detect associations for certain pathological variables.

Third, our median follow-up with 30.8 months remains relatively short compared to long-term follow-up studies. Given the often-prolonged course of prostate cancer, longer follow-up is necessary to fully analyze metastate-free survival and prostate-cancer-specific mortality.

Conclusions

In our study cohort of patients with D'Amico high-risk prostate cancer, RARP provided acceptable early functional outcomes and meaningful short- to mid-term oncological control. Biochemical recurrence remains frequent in this biologically aggressive subgroup and underlines the importance of structured follow-up and timely multimodal therapy.

Very early standardized PAD-test-based continence assessment offers strong prognostic value for long-term functional outcomes and may serve as a practical tool for individualized postoperative risk stratification.

Integrating objective early functional testing into routine postoperative clinical practice could improve patient counseling, tailored rehabilitation and overall quality of life outcomes in this challenging patient population.

References

1. Johns LE, Houlston RS. A systematic review and meta-analysis of familial prostate cancer risk. BJU Int 2003; 91:789-94.

2. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2021; 71:209-49.

3. D'Amico AV, Whittington R, Malkowicz SB, et al. Biochemical outcome after radical prostatectomy, external beam radiation therapy, or interstitial radiation therapy for clinically localized prostate cancer. JAMA 1998; 280:969-74.

4. Stewart SB, Boorjian SA. Radical prostatectomy in high-risk and locally advanced prostate cancer: Mayo Clinic perspective. Urol Oncol 2015; 33:235-44.

5. Mottet N, van den Bergh RCN, Briers E, et al. EAU-EANM-ESTRO-ESUR-SIOG guidelines on prostate cancer – 2020 update. Part 1: Screening, diagnosis, and local treatment with curative intent. Eur Urol 2021; 79:243-62.

6. Liu S, Hemal A. Techniques of robotic radical prostatectomy for the management of prostate cancer: which one, when and why. Transl Androl Urol 2020; 9:906-18.

7. Lantz A, Bock D, Akre O, et al. Functional and oncological outcomes after open versus robot-assisted laparoscopic radical prostatectomy for localised prostate cancer: 8-year follow-up. Eur Urol 2021; 80:650-60.

8. Greenberger BA, Zaorsky NG, Den RB. Comparison of radical prostatectomy versus radiation and androgen deprivation therapy strategies as primary treatment for high-risk localized prostate cancer: a systematic review and meta-analysis. Eur Urol Focus 2020; 6:404-18.

9. Wang Z, Zhang Y, Wang X, et al. The efficacy and safety of radical prostatectomy and radiotherapy in high-risk prostate cancer: a systematic review and meta-analysis. World J Surg Oncol 2020; 18:42.

10. Wu X, Wong CHM, Gandaglia G, Chiu PKF. Urinary continence in high-risk prostate cancer after robot-assisted radical prostatectomy. Curr Opin Urol 2023; 33:482-7.

11. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004; 240:205-13.

12. Falagario UG, Martini A, Wenzel M, et al. Biochemical recurrence and risk of mortality following radiotherapy or radical prostatectomy. JAMA Netw Open 2023; 6:e2332900.

13. Tilki D, Preisser F, Tennstedt P, et al. Prostate-specific antigen level at the time of salvage therapy after radical prostatectomy for prostate cancer and the risk of death. J Clin Oncol 2023; 41:2428-35.

14. Spratt DE, McHugh DJ, Morris MJ, Morgans AK. Management of biochemically recurrent prostate cancer: ensuring the right treatment of the right patient at the right time. Am Soc Clin Oncol Educ Book 2018; 38:355-62.

15. Preisser F, Tilki D, Bandini M, et al. European Association of Urology biochemical recurrence risk classification as a decision tool for salvage radiotherapy: a multicenter study. Eur Urol 2024; 85:164-70.

16. Hamdy FC, Donovan JL, Lane JA, et al. Fifteen-year outcomes after monitoring, surgery, or radiotherapy for prostate cancer. N Engl J Med 2023; 388:1547-58.

17. Lysenko I, Kattan MW, Vickers AJ, et al. Prognostic value of Gleason score at positive surgical margin in prostate cancer: a systematic review and meta-analysis. Clin Genitourin Cancer 2020; 18:e517-22.

18. Marcq G, Rozet F, Beauval JB, et al. Risk of biochemical recurrence based on extent and location of positive surgical margins after robot-assisted laparoscopic radical prostatectomy. BMC Cancer 2018; 18:1291.

19. Hagman A, Stranne J, Carlsson S, et al. Positive surgical margin and oncological outcomes after robot-assisted radical prostatectomy in different Cancer of the Prostate Risk Assessment risk groups. BJU Int 2025; 136:135-42.

20. Albertsen PC, Nease RF Jr, Potosky AL. Assessment of patient preferences among men with prostate cancer. J Urol 1998; 159:158-63.

21. Haga N, Horie S, Yamaguchi A, et al. Comprehensive approach for post-prostatectomy incontinence in the era of robot-assisted radical prostatectomy. Fukushima J Med Sci 2017; 63:46-56.

22. Chen WH, Lee YK, Kuo HC, et al. Oncological and functional outcomes of high-risk and very high-risk prostate cancer patients after robot-assisted radical prostatectomy. PLoS One 2023; 18:e0282494.

23. Tienza A, Akin Y, Rassweiler J, Gözen AS. A match-pair analysis of continence in intermediate and high-risk prostate cancer patients after robot-assisted radical prostatectomy: the role of urine loss ratio and predictive analysis. Prostate Int 2018; 6:94-8.

24. Murphy DG, Kerger M, Crowe H, et al. Operative details and oncological and functional outcome of robotic-assisted laparoscopic radical prostatectomy: 400 cases with a minimum of 12 months follow-up. Eur Urol 2009; 55:1358-67.

25. Greco KA, Meeks JJ, Wu S, Nadler RB. Robot-assisted radical prostatectomy in men aged ≥70 years. BJU Int 2009; 104:1492-5.

26. Wille S, Heidenreich A, von Knobloch R, et al. Impact of comorbidities on post-prostatectomy incontinence. Urol Int 2006; 76:223-6.

27. Wang J, Liu X, Wang Z, et al. Robot-assisted versus open radical prostatectomy: a systematic review and meta-analysis of prospective studies. J Robot Surg 2023; 17:2617-31.

28. Qin Y, Li P, Wang Z, et al. Comparison and trend of perioperative outcomes between robot-assisted radical prostatectomy and open radical prostatectomy: nationwide inpatient sample 2009-2014. Int Braz J Urol 2020; 46:754-71.

Correspondence

Jonathan Michel Keller (Corresponding Author)
jonathan.keller@t-online.de

Mladen Stankovic
mladen.stankovic@krankenhaus-salem

Teresa Wieder
teresa.wieder@krankenhaus-salem.de

Laura Wolff
laura.wolff@krankenhaus-salem.de

Joao Mendes
joao.mendes@krankenhaus-salem.de

Department of Urology, Salem Hospital, Academic Hospital - University of Heidelberg, Zeppelinstraße 11-33, 69121, Heidelberg, Germany