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ORIGINAL PAPER

Perineal *versus* retropubic radical prostatectomy in localized prostate cancer: Extended analysis of a prospective randomized cohort

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Summary

Background: *Although radical perineal prostatectomy is performed less frequently, it represents a minimally invasive open approach that avoids the retropubic space and extensive pelvic dissection. Its long-term oncologic and functional equivalence to standard retropubic prostatectomy has not been adequately evaluated in randomized cohorts.*

Objectives: *To compare perioperative outcomes, short and long-term oncologic, and patient-reported outcomes of RPP and RRP, with or without PLND.*

Materials and Methods: *Men with cT1-T2N0M0 prostate cancer and a predicted lymph-node invasion risk < 5% were prospectively randomized to RPP, RRP, or RRP with PLND (40 patients per group). Data from 103 patients including 38 treated with RPP, 31 with RRP, and 34 with RRP with PLND were included in the analysis. Biochemical recurrence-free survival (BCRFS) was estimated using Kaplan-Meier analysis. Urinary, sexual, and satisfaction outcomes were assessed using selected items from the 'Expanded Prostate Cancer Index Composite' (EPIC) at baseline, 1 month, 1 year, and at long-term follow-up (10 years).*

Results: *Baseline characteristics were comparable across groups. Operative time was longest in the RRP+PLND group, while estimated blood loss was lowest with RPP ($p = 0.004$). Early complications were mostly minor; prolonged drainage and wound infection were more frequent after RPP without long-term sequelae. At 1 and 10 years, BCRFS rates were 82% and 71.2% for RPP, 89% and 79.6% for RRP, and 87% and 79.8% for RRP+PLND ($p = 0.157$ and $p = 0.679$). ISUP grade > 2, positive surgical margins, and pT3b stage independently predicted recurrence. Continence improved over time ($p < 0.001$), reaching similar 10-year rates across groups (68-73%). Erectile function recovery remained limited (19-28%) and comparable. Patient satisfaction remained high.*

Conclusions: *The perineal approach is associated with lower blood loss but may entail more wound-related complications. At both 1 and 10 years, RPP and RRP provide comparable oncologic, functional, and patient-reported outcomes.*

KEY WORDS: *Radical prostatectomy; Perineal prostatectomy; Retropubic prostatectomy; Long-term outcomes; EPIC questionnaire.*

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INTRODUCTION

Prostate cancer is the most frequently diagnosed solid malignancy in men, and the widespread use of PSA testing has shifted most cases toward earlier, localized stages amenable to curative surgery (1).

Radical prostatectomy remains a standard treatment option for clinically localized disease, and over time different open approaches have been refined with the aim of improving functional preservation without compromising oncologic control (2).

The retropubic approach, introduced with an anatomical understanding of the neurovascular bundles, enabled direct access to the pelvic lymph nodes and facilitated the adoption of systematic lymphadenectomy when indicated (3). The perineal approach – although historically the earliest method of prostate removal – has experienced renewed interest following improvements in exposure, hemostasis, and patient selection (4). Modern nomograms such as the Partin tables and Briganti model allow for accurate prediction of lymph-node invasion, helping surgeons decide when *pelvic lymph node dissection* (PLND) is necessary and when it can be safely omitted (5, 6).

Comparative studies suggest that oncologic outcomes of perineal and retropubic prostatectomy are broadly similar, while within the context of open surgical techniques, the perineal technique may offer perioperative advantages such as reduced blood loss in appropriately selected patients (7, 8). Functional recovery, particularly urinary continence, has also been reported to be comparable, although robust long-term data remain limited. Importantly, many prior analyses either lacked randomization or did not include a dedicated PLND arm, and few incorporated validated patient-reported tools such as the *Expanded Prostate Cancer Index Composite* (EPIC) to assess urinary and sexual quality-of-life outcomes (7-10).

Long-term prospective evidence is therefore essential to determine whether surgical approach or the addition of PLND influences oncologic endpoints or functional trajectories. This study provides a 10-year extended analysis of a prospective randomized cohort comparing radical perineal prostatectomy, retropubic prostatectomy, and retropubic prostatectomy with PLND in patients with localized prostate cancer.

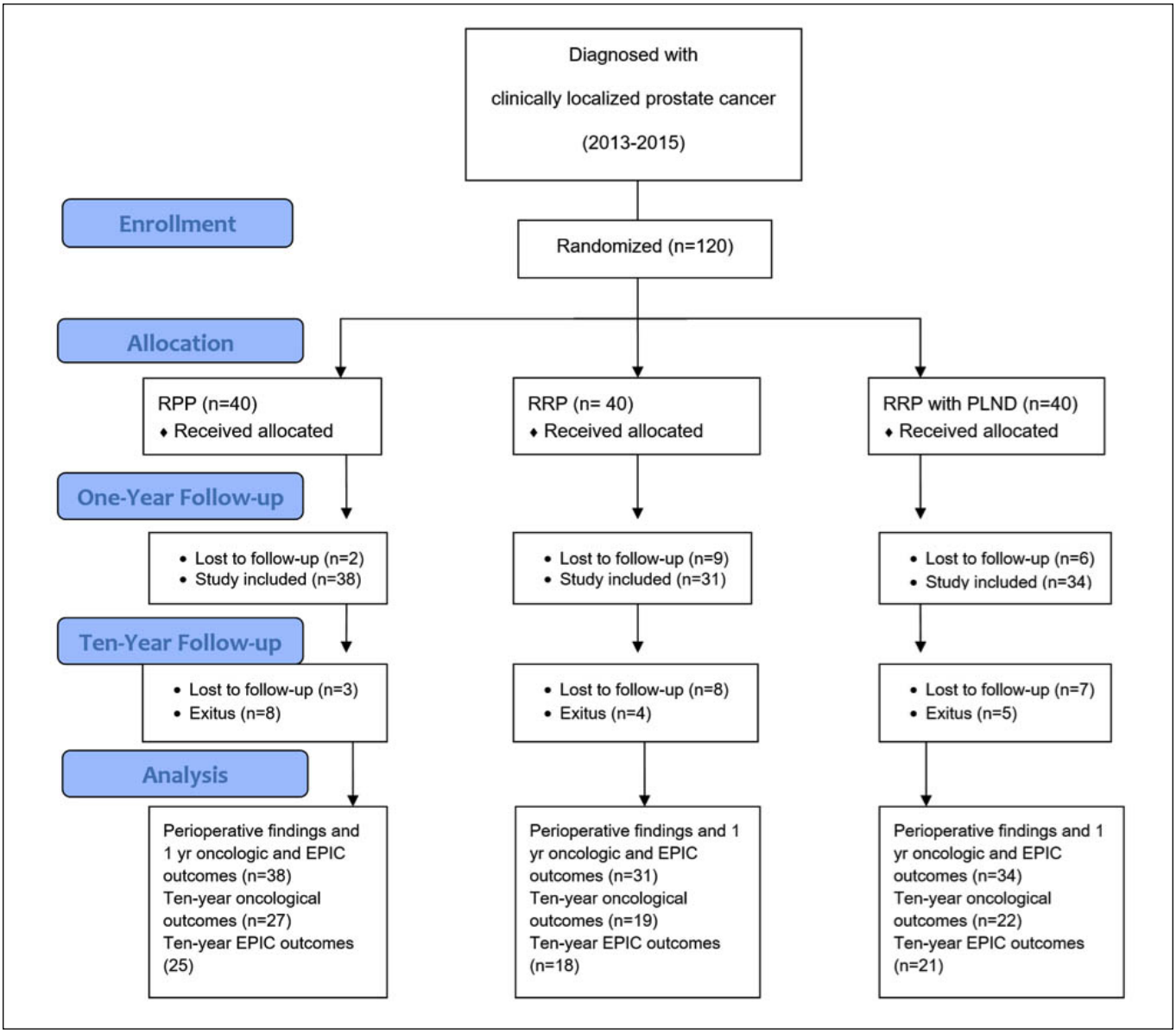
Materials and methods

Study design and ethics

This study represents a single-center, prospective randomized trial conducted at Kartal Dr. Lütfi Kırdar City Hospital, originally designed as a urology residency thesis, and includes perioperative clinical parameters as well as short and long-term oncologic and EPIC-based patient-reported outcomes with follow-up of up to 10 years. Patients diagnosed between 2013 and 2015 with clinically localized prostate cancer (cT1-T2N0M0) and a predicted lymph-node invasion risk of < 5% according to the Partin tables were eligible for inclusion. Following approval by the institutional ethics committee, eligible patients were prospectively enrolled, and a total of 120 patients were randomized in a 1:1:1 ratio to one of three treatment groups: *radical perineal prostatectomy* (RPP), *radical retropubic prostatectomy* (RRP), or radical retropubic prostatectomy with pelvic lymph node dissection (RRP + PLND), with 40 patients allocated to each group. Randomization was performed prospectively using a predefined allocation procedure. After exclusion of patients with incomplete records or insufficient follow-up, 103 patients constituted the final analytic cohort, including 38 treated with RPP, 31 with RRP, and 34 with RRP plus PLND. The study flow, including enrollment, allocation, follow-up, and analysis, is summarized in Figure 1 in accordance with CONSORT guidelines.

All operations were performed as open radical prostatectomy by two experienced surgeons who had completed the learning curve for both the perineal and retropubic approaches. Surgical procedures followed established anatomical principles as described by *Weldon et al.* and *Walsh* (11, 12), with optional unilateral or bilateral nerve-sparing performed according to intraoperative findings.

Figure 1.
CONSORT flow diagram of patient enrollment and follow-up.



Preoperative variables (age, comorbidities, PSA, Gleason score, clinical stage) and perioperative data (operative time, blood loss, hospital stay) were prospectively recorded. Pathological staging and grading followed the 2009 TNM and Gleason systems, all reviewed by a single dedicated uropathologist.

The original study protocol and the subsequent 10-year follow-up analysis were conducted in accordance with the Declaration of Helsinki, and approved by the local ethics committee of the *Kartal Dr. Lütfi Kırdar City Hospital* (Approval No: 514/ 62/ 17 and 010.99/ 22/ 45). Written informed consent was obtained at enrollment, and verbal consent was renewed at the 10-year follow-up.

Follow-up and outcome measures

Oncologic outcomes were evaluated based on *biochemical recurrence-free survival* (BCRFS) and *cancer-specific survival* (CSS). Postoperative PSA levels were obtained at 1, 3, 6 and 12 months and annually thereafter. *Biochemical recurrence* (BCR) was defined as a postoperative serum *prostate-specific antigen* (PSA) level ≥ 0.2 ng/mL confirmed by a second consecutive increase.

The date of recurrence was recorded as the first detection of a PSA value meeting this criterion.

Cancer-specific survival was defined as the interval between surgery and death directly attributable to prostate cancer. Patients who remained recurrence-free or alive at the last follow-up were censored. Patients who received adjuvant or salvage radiotherapy or androgen deprivation therapy were included in survival analysis up to the initiation of secondary treatment and were censored thereafter.

Functional outcomes were assessed using validated questionnaires at baseline (pre-operatively) and at 1, 6, and 12 months postoperatively, including the *Expanded Prostate Cancer Index Composite* (EPIC) (9). At long-term follow-up (10 years after surgery), patients were re-evaluated through structured in-person or telephone interviews using selected EPIC items. Continence status was determined from EPIC item 27 of the urinary domain, which assesses pad usage ("*How many pads or adult diapers per day did you usually use to control leakage?*"); patients reporting no pad use were considered continent. Erectile function was determined from EPIC item 59 of the sexual domain ("*How would you describe your ability to have an erection firm enough for sexual intercourse?*"); patients reporting erections sufficient for penetrative intercourse, with or without pharmacologic support, were considered potent.

Overall treatment satisfaction was assessed using EPIC item 80 ("*Overall, how satisfied are you with the treatment you received for your prostate cancer?*"), with responses dichotomized as satisfied or dissatisfied.

All questionnaires were administered by a single physician through structured interviews.

Patients were excluded from the long-term analysis if they died or were lost to follow-up, had incomplete PSA or survival data, or declined or were unable to complete the EPIC questionnaires at long-term follow-up.

The primary endpoints were urinary and sexual function at both short and long-term follow-up, assessed using the EPIC urinary and sexual domains. Secondary endpoints included biochemical recurrence-free survival, cancer-specific survival, perioperative outcomes, and the impact of pelvic lymph node dissection on long-term outcomes

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics v22.0 (*IBM Corp., Armonk, NY, USA*). Continuous variables are reported as mean ± standard deviation or median (interquartile range), and categorical variables as counts and percentages. Missing data were not imputed; analyses were performed using available case data. Group comparisons used one-way ANOVA or Kruskal-Wallis tests, with appropriate post-hoc analyses, and categorical variables were compared using the chi-square test. Biochemical recurrence-free and cancer-specific survival were estimated with the Kaplan-Meier method and compared using the log-rank test, while Cox proportional-hazards models identified predictors of recurrence.

Longitudinal functional outcomes were analyzed using generalized estimating equations with a binary logistic model to account for repeated measures over time. An exchangeable correlation structure with robust standard errors was applied to assess the effects of surgical group, time, and their interaction. A two-sided p-value < 0.05 was considered statistically significant

Results

Baseline demographic and perioperative characteristics

Patient demographics were similar among the three surgical groups (Table 1). The mean age was 63.2 ± 5.9 years, and preoperative PSA ranged from 6.1 to 7.5 ng/mL ($p > 0.05$).

Operative time was longer in the RRP + PLND group (145 ± 40 min) than in RPP and RRP (both 117 min; $p = 0.001$), whereas blood loss was lowest with the perineal approach (645 ± 340 mL; $p = 0.004$). Other perioperative and pathological variables showed no significant differences ($p > 0.05$).

Oncologic data

Kaplan-Meier analysis (Figure 2) demonstrated no significant difference in BCRFS among the RPP, RRP, and RRP + PLND groups at either 1-year or 10-year follow-up (Log-rank $p = 0.157$ and $p = 0.679$, respectively).

The estimated 1-year RFS rates were 82%, 89%, and 87%, with mean BCRFS times of 9.9, 11.2, and 10.2 months for the RPP, RRP, and RRP + PLND groups, respectively.

At 10 years, corresponding BCRFS rates were 71.2%, 79.6%, and 79.8%, with mean RFS durations of 7.2, 8.0, and 8.0 years, again showing no significant intergroup difference.

During long-term follow-up, 20 of 68 patients (29.4%) received adjuvant or salvage radiotherapy – most commonly after RRP (36.8%) – followed by RPP (29.6%) and RRP + PLND (22.7%) ($p = 0.613$).

Androgen-deprivation therapy (ADT) was required in 21.2% of cases, with comparable distribution across groups (RPP 20.0%, RRP 31.6%, RRP + PLND 13.6%; $p = 0.368$).

Systemic progression to castration-resistant prostate cancer occurred in 6 patients (9.2%), without significant association to surgical type ($p = 0.467$).

No prostate-cancer-related deaths were observed, indicating excellent long-term oncologic control regardless of surgical approach.

Table 1.
Summary of perioperative data and pathology results.

	RPP (n = 38)	RRP (n = 31)	RRP+PLND (n = 34)	p value
Preoperative data				
Mean age, yr (SD)	63.3 (6.8)	62.7 (5.1)	63.5 (5.9)	0.875
Mean, prostate-specific antigen, ng/ml (SD)	6.1 (2.3)	6.6 (2.8)	7.5 (3.2)	
Gleason score at biopsy, n (%)				
2-6	31 (82%)	28 (90%)	26 (77%)	0.334
7	7 (18%)	3 (10%)	8 (23%)	
Charlson comorbidity score, Mean (SD)	1.2 (1)	0.6 (0.8)	1(0.9)	0.055
Intra and postoperative data				
Amount of bleeding (cc), Mean (SD)	645 (340)	960 (468)	890 (420)	0.004 (RPP < RRP and RRP+PLND)
Mean operative duration, min (SD)	117 (25)	117 (40)	145 (40)	10.001 (RPP and RRP < RRP+PLND)
Nerve sparing procedures, n (%)				
Unilateral interfascial	15	12	7	0.273
Bilateral interfascial	5	5	10	
Intraoperative anastomotic leakage, n (%)	1 (3%)	0 (0%)	0 (0%)	
Mean hospital stay, days (SD)	5.2 (3.2)	4.6 (2.1)	4.6(1.9)	0.845
Pathology results				
Median prostate volume, ml (SD)	43.5 (25.5)	43 (30)	50 (21.3)	0.357
Gleason score, n (%)				
2-6	17 (45)	8 (26)	14 (41)	0.242
≥ 7	21 (55)	23 (74)	20 (60)	
Stage, n (%)				
pT2	25 (66)	25 (81)	23 (68)	0.353
pT3	13 (34)	6 (19)	11 (32)	
Positive Surgical Margin, n (%)	9 (24)	8 (26)	6 (18)	0.710

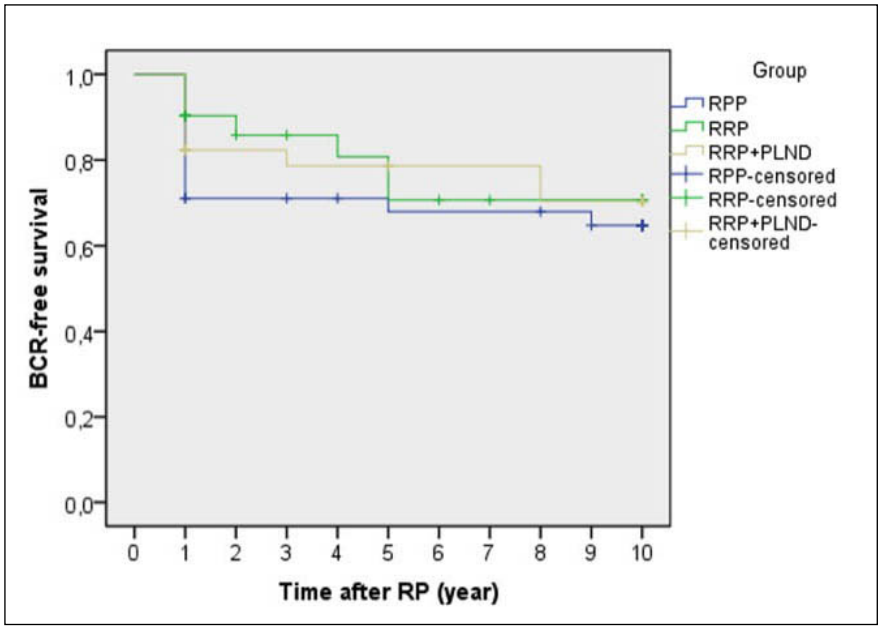


Figure 2.
Kaplan–Meier curves for recurrence-free survival among patients who underwent RPP, RRP, and RRP + PLND: The 1-year recurrence-free survival rates were 82%, 89%, and 87% (Log-rank p = 0.157), and the 10-year rates were 71.2%, 79.6%, and 79.8% for the RPP, RRP, and RRP + PLND groups, respectively (Log-rank p = 0.679).

RPP = radical perineal prostatectomy; RRP = radical retropubic prostatectomy; PLND = pelvic lymph node dissection.

In univariate Cox regression analysis (Table 2), higher pathologic Gleason grade (ISUP > 2), positive surgical margins, and advanced pathological stage (T3b) were significantly associated with an increased risk of biochemical recurrence.

Specifically, ISUP > 2 (HR = 2.5, 95% CI 1.2-5.3; p = 0.016), positive margins (HR = 2.7, 95% CI 1.3-5.7; p = 0.009), and T3b stage (HR = 3.3, 95% CI 1.1-9.8; p = 0.033) were independent risk indicators.

Preoperative PSA level showed borderline significance

Table 2.
Univariate Cox proportional hazards models for biochemical recurrence-free survival.

Covariates	HR (95% CI)	P value
Univariate model		
Age (> 65 *vs* ≤ 65)	1.06 (0.5-2.3)	0.790
Prostate-specific antigen (ng/ml)	1.12 (0.9-1.3)	0.066
Pathologic Gleason score		
ISUP > 2 *vs* ISUP ≤ 2	2.5 (1.2-5.3)	0.016
Margins (positive vs negative)	2.7 (1.3-5.7)	0.009
T stage		
T3a vs T1-2	1.7 (0.8-3.9)	0.201
T3b vs T1-2	3.3 (1.1-9.8)	0.033

HR = hazard ratio; CI = confidence interval.

(Table 3). In the GEE model, time was a significant predictor for both outcomes (Wald χ^2 = 761.4, df = 3, p < 0.001 for continence; Wald χ^2 = 72.0, df = 2, p < 0.001 for potency), indicating progressive postoperative recovery. However, recovery levels remained lower than baseline, particularly for erectile potency. At 10 years, urinary continence was achieved in 68-73% and potency in 19-28% of patients across all surgical groups.
Neither surgical approach (p = 0.613 for continence; p = 0.547 for potency) nor the group × time interaction (p = 0.368 and p = 0.996, respectively) demonstrated statistical significance, suggesting comparable long-term functional trajectories among radical perineal, retropubic, and retropubic with pelvic lymph node dissection techniques. The effect of nerve-sparing surgery was not included in the GEE model due to limited subgroup sample size, which precluded adequate statistical power for reliable comparison.

Table 3.
Continence and potency outcomes by surgical approach based on EPIC questionnaire.

N (%)	All patients	RPP	RRP	RRP+PLND	p (time)	p (group)	p (interaction)
EPIC Urinary							**Group x Time**
Continence							
Preoperative	101/103 (98%)	38/38 (100%)	29/31 (94%)	34/34 (100%)	-	0.613	0.368
At 1 month	45/103 (44%)	11/38 (29%)	14/31 (45%)	20/34 (59%)	< 0.001		
At 1 year	78/89 (88%)	28/30 (93%)	23/29 (79%)	27/30 (90%)	< 0.001		
At 10 years	44/65 (68%)	19/26 (73%)	10/18 (56%)	15/21 (71%)	< 0.001		
EPIC Sexual							
Potency							
Preoperative	75/103 (73%)	28/38 (74%)	24/31 (77%)	23/34 (68%)	-	0.547	0.996
At 1 month	0/103 (0%)	0/38 (0%)	0/31 (0%)	9/34 (0%)	< 0.001		
At 1 year	14/90 (16%)	5/31 (16%)	6/30 (20%)	3/29 (10%)	< 0.001		
At 10 years	16/65 (25%)	7/26 (27%)	5/18 (28%)	4/21 (19%)	< 0.001		

Continence was defined as complete urinary control without pad usage (EPIC item 27), and potency as erections sufficient for penetration (EPIC item 59). GEE results for continence: Time effect significant (p < 0.001); group and interaction effects non-significant (p = 0.613, p = 0.368); GEE results for potency: Time effect significant (p < 0.001); group and interaction effects non-significant (p = 0.547, p = 0.996).

(p = 0.066), while age were not significantly associated with recurrence.

Perioperative and long-term complications

Early postoperative complications (first 6 weeks) were mostly minor (Clavien grade I-II) and comparable among groups. Prolonged drainage was more frequent after RPP (7 patients, 18%) compared with RRP (1 patient, 3%) and absent in the RRP+PLND group.
Wound infection occurred in 4 RPP, 1 RRP, and 3 RRP+PLND patients, while urinary tract infection was seen in two RRP and one RRP+PLND cases. In the late postoperative period (6 weeks-1 year), anastomotic stricture developed in 1 RPP, 5 RRP, and 2 RRP+ PLND patients, all successfully managed endoscopically.
During long-term follow-up (1-10 years), two RRP and one RPP patient required re-intervention for recurrent anastomotic stricture, and one RRP+PLND patient underwent urethrotomy for urethral narrowing.

Functional data

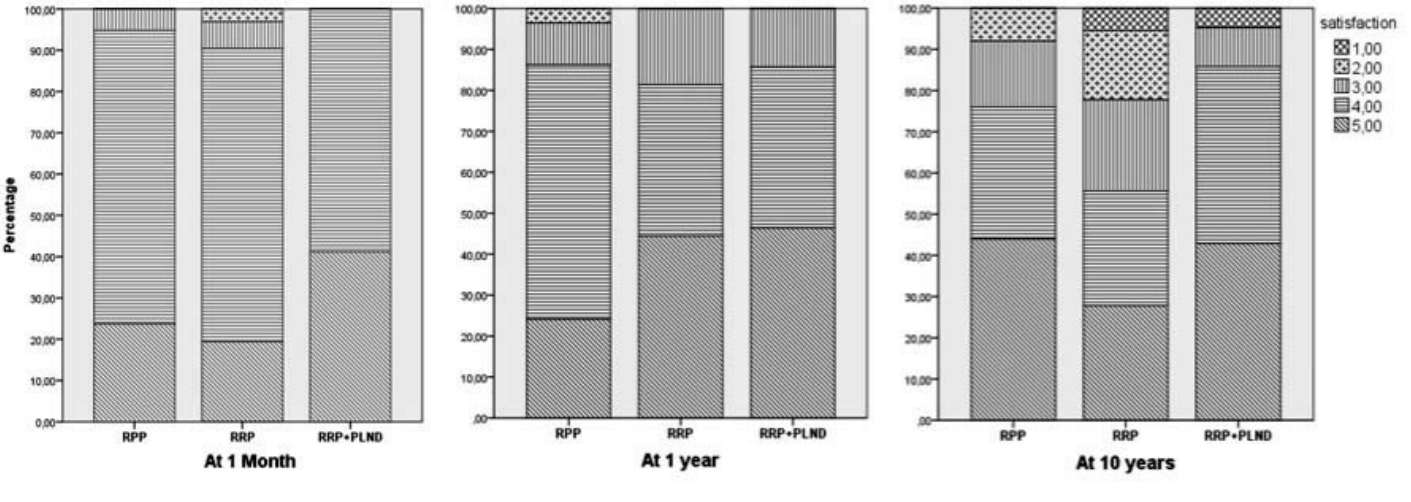
Urinary continence and erectile potency showed significant longitudinal variation after radical prostatectomy

Continence was defined as complete urinary control without pad usage (EPIC item 27), and potency as erections sufficient for penetration (EPIC item 59). GEE results for continence: Time effect significant (p < 0.001); group and interaction effects non-significant (p = 0.613, p = 0.368); GEE results for potency: Time effect significant (p < 0.001); group and interaction effects non-significant (p = 0.547, p = 0.996).

Patient satisfaction

Postoperative satisfaction levels did not significantly differ among surgical groups (RPP, RRP, and RRP+PLND) at any follow-up point. Most patients reported being "satisfied" or "extremely satisfied" (scores 4-5) across all evaluations – 94-100% at 1 month, 80-85% at 1 year, and 70-80% at 10-12 years – with no significant intergroup difference (χ^2 = 8.03, p = 0.236; χ^2 = 7.18, p = 0.305; χ^2 = 7.28, p = 0.507). As shown in Figure 3, satisfaction remained consistently high, though a modest decline was observed over time, indicating overall durable patient-perceived benefit regardless of surgical approach.

Figure 3.
Distribution of patient satisfaction levels according to Expanded Prostate Cancer Index Composite (EPIC) item 80 at 1 month, 1 year, and 10 years after surgery: Item 80 of EPIC asks: "Overall, how satisfied are you with the treatment you received for your prostate cancer?" Responses were recorded on a five-point Likert scale (1 = extremely dissatisfied, 2 = dissatisfied, 3 = uncertain, 4 = satisfied, 5 = extremely satisfied). Each bar represents the percentage distribution of satisfaction levels within surgical groups (RPP, RRP, and RRP + PLND) at each time point.



Discussion

The long-term outcomes of open radical prostatectomy remain clinically relevant despite the widespread adoption of minimally invasive techniques. Differences between perineal and retropubic approaches have traditionally been discussed in terms of perioperative parameters and early functional recovery, while robust long-term comparative data remain limited. A randomized design with extended follow-up allows evaluation of whether these early surgical differences translate into meaningful long-term differences in oncologic control or patient-reported functional outcomes.

In this study, baseline characteristics were well balanced across the three groups, allowing a more reliable interpretation of subsequent oncologic and functional outcomes. Previous comparative series were often limited by uneven preoperative risk distributions; for instance, *Coronato et al.* reported higher baseline PSA levels among patients undergoing the retropubic approach, which may have contributed to increased margin rates in organ-confined disease (13). Similarly, *Prasad et al.* highlighted differences in baseline tumor risk and selective use of pelvic lymph node dissection as major sources of bias in population-based comparisons (14). In contrast, randomized allocation and restriction to men with a predicted nodal risk < 5% in the present study minimized selection bias. The resulting balance in PSA, biopsy Gleason grade, clinical stage, and comorbidity indices strengthens the validity of comparisons across perioperative, pathological, and long-term quality-of-life outcomes.

Beyond baseline comparability, our intraoperative and pathological findings were consistent with previously published reports. Prior studies have shown lower estimated blood loss and shorter hospitalization with perineal prostatectomy, particularly in lower-risk patients, and our perioperative findings were in agreement with these observations (7). This difference is generally attributed to the confined operative field of the perineal approach and avoidance of the Retzius space, which reduce dissection around the dorsal venous complex. Positive surgical margin rates in our cohort were within the 20-30% range reported in large open radical prostatectomy series and pooled analyses (15, 16). Similarly, postoperative upstaging rates were comparable to those reported in both perineal and retropubic series (7, 15). These findings indicate that our surgical and pathological outcomes are consistent with established data and provide a reliable basis for long-term oncologic and functional comparisons.

The long-term oncologic outcomes in our cohort did not differ significantly among the perineal, retropubic, and retropubic with PLND approaches, consistent with previous studies showing that surgical approach has limited impact on recurrence when baseline risk is comparable (13, 14). The 10-year BCRFS rates of 71-80% observed in our study are consistent with population-based data; for example, *Peacock et al.* reported a 10-year event-free survival rate of 79% after radical prostatectomy in a large provincial cohort (17). Similar rates of adjuvant or salvage radiotherapy use and comparable initiation of androgen deprivation therapy further indicate the absence of a long-term oncologic advantage for any specific open approach. Progression to castration-resistant disease was uncommon and evenly distributed, and no prostate cancer-specific deaths were observed. Overall, these findings suggest that in appropriately selected patients, both perineal and retropubic prostatectomy provide durable long-term cancer control, and that surgical approach should be guided primarily by perioperative considerations and surgeon experience rather than anticipated oncologic superiority.

The predictors of biochemical recurrence identified in our cohort – higher pathologic Gleason grade, positive surgical margins, and pT3b disease – are consistent with established risk factors after radical prostatectomy. ISUP grade > 2, margin positivity, and pT3b stage were each

associated with a significantly increased risk of recurrence. *Freedland et al.* (18) similarly identified Gleason grade and extracapsular extension as major determinants of postoperative failure. *Stephenson et al.* (19), in a large multi-institutional nomogram, demonstrated that Gleason score, margin status, and seminal vesicle invasion were the dominant independent predictors of recurrence. *Boorjian et al.* (20) further showed that pathological features outweigh surgical approach and baseline clinical variables in determining long-term outcomes. The borderline association observed for preoperative PSA in our study aligns with evidence suggesting limited prognostic value once postoperative pathology is taken into account. Overall, the concordance between our findings and these large external datasets supports the robustness of our results and underscores that long-term oncologic outcomes are primarily driven by tumor biology.

In our cohort, prolonged drainage and wound infection occurred more frequently after RPP and were associated with a longer hospital stay. These findings were less prominent in most published RPP series (7, 14), suggesting that anatomical characteristics of the perineal approach and sensitivity to surgical experience may influence early wound-related outcomes. Despite these early differences, late complications such as anastomotic stricture were uncommon and successfully managed in all groups, indicating no meaningful impact on long-term morbidity.

At long-term follow-up, functional outcomes were assessed using selected EPIC items rather than full domain scores to reduce respondent burden in an aging cohort and to maintain data completeness during extended follow-up. Selected items focused on clinically relevant and objective outcomes, allowing the use of short and easily interpretable questions, particularly in the context of telephone-based assessments. Long-term urinary and sexual outcomes in our cohort, showed gradual postoperative improvement, with continence stabilizing at 68-73% and potency at 19-28% at 10 years. These patterns are consistent with prior comparative studies reporting similar functional recovery after perineal and retropubic prostatectomy, without clear functional superiority of either approach. *Wronski et al.* reported comparable urinary and sexual outcomes for RPP relative to retropubic and minimally invasive techniques in appropriately selected patients (10). More recent multicenter data have suggested favorable mid-term functional results with RPP, including high pad-free continence rates and improvements in sexual health scores (21). In contrast, population-based analyses indicate minimal long-term functional differences across surgical approaches, emphasizing the role of nerve-sparing technique, age, and disease characteristics over operative route (8). The lower potency rates observed in our cohort compared with high-volume nerve-sparing series (22) likely reflect limited nerve-sparing use and the absence of structured penile rehabilitation. Despite these differences, sustained patient satisfaction across all groups suggests durable perceived benefit regardless of surgical approach.

Although all patients were selected based on a predicted lymph node invasion risk of < 5%, a dedicated PLND arm was intentionally included to evaluate the independent im-pact of pelvic lymph node dissection on perioperative and long-term functional outcomes in patients with comparable baseline oncologic risk. This design allowed assessment of whether PLND itself influences urinary, sexual, or quality-of-life outcomes, independent of tumor biology. In our cohort, pelvic lymph node dissection did not increase perioperative or long-term morbidity, nor did it negatively affect urinary, sexual, or overall quality-of-life outcomes on EPIC assessment. This aligns with contemporary data showing that although reported PLND complication rates vary widely, clinically significant events remain uncommon in low-risk prostate cancer. *Daimon et al.* similarly found no biochemical recurrence-free survival benefit from PLND in low-risk patients undergoing laparoscopic radical prostatectomy, while noting shorter operative times when PLND was omitted (23). More contemporary evidence confirms that the incremental morbidity associated with standard-template PLND is generally modest, and that its primary value lies in im-proving pathological staging accuracy rather than conferring a therapeutic benefit (24). Importantly, the absence of an oncologic or functional benefit from PLND observed in this study applies only to low-risk patients and should not be extrapolated to intermediate- or high-risk prostate cancer populations, in whom PLND may still play a role in staging and treatment decisions.

Declarations

Ethical approval and consent for participate: *The original study protocol and the subsequent 10-year follow-up analysis were conducted in accordance with the Declaration of Helsinki, and approved by the local ethics committee of the Kartal Dr. Lütfi Kırdar City Hospital (Approval No: 514/ 62/ 17 and 010.99/ 22/ 45).*

Informed Consent Statement: *Written informed consent was obtained at enrollment, and verbal consent was renewed at the 10 year follow-up.*

Consent for publication: *Not applicable. This study does not contain any individual patient data, personal information, or identifiable images.*

Availability of data and material: *The data presented in this study are available on request from the corresponding author due to ethical and privacy restrictions related to patient confidentiality.*

Competing interests: *The authors declare no conflicts of interest.*

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Authors' contributions: *For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, U.C. and C.G.; methodology, U.C., A.C.; software, U.C.; validation, U.C., A.C.; formal analysis, U.C..; investigation, U.C., C.G., B.E.; resources, U.C., B.E.; data curation, U.C., A.C.; writing – original draft preparation, U.C.; writing – review and editing, U.C., C.G., A.C., B.E..; project administration, U.C. All authors have read and agreed to the published version of the manuscript."*

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The main strength of this study is its prospective randomized design with long-term follow-up, allowing reliable comparison of oncologic and functional outcomes across surgical approaches. To our knowledge, it is the first prospective randomized study to compare radical perineal and retropubic prostatectomy, with and without pelvic lymph node dissection, using extended follow-up. The use of validated prostate cancer-specific instruments such as EPIC further strengthens the functional assessment.

Several limitations should also be noted. The relatively small sample size limits the power of subgroup analyses, particularly for nerve-sparing procedures. As a single-center study, the results may reflect institutional practice patterns, and surgical techniques inevitably evolved during the long follow-up period. In addition, postoperative rehabilitation protocols were not standardized and could not be fully analyzed. Furthermore, attrition during long-term follow-up may have introduced attrition bias and reduced the statistical power of long-term functional analyses, although baseline characteristics were comparable between patients with and without available long-term data. Erectile function outcomes are highly dependent on nerve-sparing technique. Because nerve-sparing could not be included in the GEE model due to limited power, equivalence in long-term potency out-comes across surgical approaches should be interpreted cautiously. Another limitation is that partial EPIC assessment may reduce sensitivity to subtle quality-of-life changes, and telephone-based data collection may introduce recall bias; these factors should be considered when interpreting long-term functional results. Finally, the limited number of biochemical recurrence events precluded reliable multivariable Cox regression modeling. Inclusion of multiple pathological covariates would have increased the risk of model overfitting and unstable estimates; therefore, univariate analyses were considered more appropriate. Despite these limitations, the prospective design and extended follow-up provide meaningful insight into durable outcomes after radical prostatectomy.

Conclusions

In this prospective randomized study with 10-year follow-up, perineal and retropubic radical prostatectomy, with or without pelvic lymph node dissection, achieved durable oncologic control and comparable long-term functional and quality-of-life outcomes. Early perioperative differences did not translate into long-term disadvantages. Therefore, surgical approach should be guided by patient selection and surgeon expertise rather than presumed differences in long-term efficacy.

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