

# Retzius-sparing Retroperitoneal Laparoscopic Radical Prostatectomy (RSR-LRP): A Novel Technique With Favorable Functional and Oncological Outcomes – A Single-surgeon Experience of 186 Consecutive Cases

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## Abstract

**Background/Aim:** Retzius-sparing radical prostatectomy has demonstrated superior early continence recovery compared to standard approaches in robotic series. We present the first large series of retzius-sparing retroperitoneal laparoscopic radical prostatectomy (RSR-LRP), a novel technique combining the benefits of the Retzius-sparing approach with extraperitoneal access.

**Patients and Methods:** Between February 2022 and November 2025, 186 consecutive patients underwent RSR-LRP by a single surgeon. The technique involves a purely extraperitoneal approach using five trocars, intrafascial dissection without electrocautery near the neurovascular bundle, and complete closure of the Retzius space. Continence was assessed at 2 and 6 months using a 4-point scale (0=no pads, 1=safety pad, 2=one pad/day, 3= $\geq$ 2 pads/day). Erectile function was evaluated as percentage of preoperative erection quality.

**Results:** Mean follow-up was 21.9 months (range=2.4-46.7 months). Clinical staging: 84.4% cT2, 5.4% cT3. Pathological staging: 71.5% pT2, 18.3% pT3a, 10.2% pT3b. At two months, complete continence (0 pads) was achieved in 55.7%, with social continence ( $\leq$ 1 pad/day) in 94.3%. At six months, complete continence reached 94.4% with 99.4% social continence. PSA nadir  $<0.1$  ng/ml was achieved in 86.6% of patients with available data. Positive surgical margin rate was 25.3% overall, with 75% of positive margins  $\leq$ 3 mm. Of patients with erectile function data, 96% reported any erection recovery and 31% achieved erection  $\geq$ 75% sufficient for intercourse.

**Conclusion:** RSR-LRP demonstrates excellent functional outcomes with rapid continence recovery, comparable to reported robotic Retzius-sparing series. This technique offers a viable alternative for centers without robotic platforms, achieving favorable oncological control in locally advanced disease.

**Keywords:** Prostate cancer, radical prostatectomy, laparoscopy, Retzius-sparing, continence, extraperitoneal.



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## Introduction

Radical prostatectomy remains the gold standard surgical treatment for localized prostate cancer. Over the past decade, the Retzius-sparing approach, first described by Galfano *et al.* in 2010 (1), has gained considerable attention for its potential to improve early urinary continence recovery by preserving the anterior supporting structures of the bladder. In 2013, the same group reported on their first 200 patients, demonstrating immediate continence rates of 90-92% (2). Multiple systematic reviews and meta-analyses have demonstrated that Retzius-sparing robot-assisted radical prostatectomy (RS-RARP) significantly improves continence recovery at catheter removal and through the first 6-12 months postoperatively compared to standard transperitoneal approaches (3-5).

Most published Retzius-sparing series have utilized robotic platforms. However, robotic surgery remains unavailable in many healthcare settings worldwide due to cost constraints. Conventional laparoscopic prostatectomy offers comparable oncological outcomes to robotic surgery, though functional outcomes have traditionally been considered slightly inferior (6, 7). We hypothesized that combining the Retzius-sparing approach with a purely extraperitoneal (retroperitoneal) laparoscopic technique could achieve comparable functional outcomes to robotic series while maintaining oncological efficacy.

The objective of this study was to evaluate the functional and oncological outcomes of a novel technique termed Retzius-Sparing Retroperitoneal Laparoscopic Radical Prostatectomy (RSR-LRP) in a consecutive series of 186 patients, including those with locally advanced disease (clinical T3 stage).

## Patients and Methods

*Study population.* We prospectively collected data on 186 consecutive patients who underwent RSR-LRP for clinically localized or locally advanced prostate cancer

between February 2022 and November 2025 at a single institution. This study was conducted in accordance with the Declaration of Helsinki. All patients provided informed consent for surgery and for the use of their anonymized data for research purposes. All procedures were performed by a single surgeon (P.B.). Patients with clinical T1-T3 disease were included. Extended pelvic lymph node dissection was performed when indicated based on risk stratification using prostate specific antigen (PSA), Digital Rectal Examination, multiparametric magnetic resonance imaging (mpMRI) and biopsy findings.

*Surgical technique.* The RSR-LRP technique involves a purely extraperitoneal (retroperitoneal) approach using five laparoscopic ports (two 5 mm and three 10 mm). The optical trocar is introduced into the preperitoneal space and the extraperitoneal working space is created using balloon dissection. The surgical approach proceeds as follows:

The procedure begins with dissection through the fatty plane between the bladder and prostate on the left side, approaching the left seminal vesicle, which is mobilized and elevated. The left vas deferens is clipped and divided. Dissection proceeds in the intrafascial plane, ascending along the left lateral prostate surface, separating the left inferior prostatic lobe and lateral aspect, continuing to the urethra, which is identified. Critically, dissection near the neurovascular bundle (NVB) is performed without electrocautery, ultrasonic scalpel, or Thunderbeat device, and without traction on the neurovascular structures to minimize the risk of NVB injury. In cases where mpMRI or Digital Rectal Examination suggests T3 disease, dissection in that region proceeds using Thunderbeat while leaving a margin of tissue on the prostate to ensure oncological clearance. The RSR-LRP technique was not applied to patients in whom the cancer was in the transition zone and possibly contacting the dorsal venous complex.

The procedure continues with dissection of the right vas deferens and seminal vesicle, bladder neck division, and rotation of the prostate clockwise. The dorsal venous complex (DVC) is dissected from the left

side to midline and secured with a clip holder. The Foley balloon is deflated, the bladder neck is transected, and the left margin is marked with 3-0 Vicryl suture. The right prostatic pedicle is clipped, and the right-sided NVB dissection proceeds similarly to the left. The DVC division is completed and the urethra at the apex is transected.

The vesicourethral anastomosis is performed using 4-0 Monosyn continuous suture. The left DVC stump is sutured to the left endopelvic fascial margin, completely closing the space and separating the Retzius space from the prostatic bed. A suprapubic catheter is placed, a urethral Foley catheter (18-20 Fr) is inserted, and a perivesical drain is left in place. Patients are mobilized on postoperative day 1, the perivesical drain is removed, and on postoperative day 2 the urethral catheter is removed and patients are discharged. The suprapubic catheter is removed 7-21 days postoperatively (median 14 days).

*Outcome assessment. Urinary continence:* Continence was evaluated at two and six months postoperatively using a 4-point scale: 0=no pads needed, 1=safety pad only (changed every 2-7 days), 2=one pad per day, 3=two or more pads per day. Complete continence was defined as 0 pads. Social continence was defined as  $\leq 1$  pad per day (scores 0, 1, or 2).

*Erectile function:* Erectile function was assessed using a single-question method evaluating erection quality as a percentage of preoperative baseline (100%=full rigid erection prior to surgery). This method was chosen over the International Index of Erectile Function (IIEF-5/IIEF-6) as some patients had less than six months of follow-up and could not adequately complete the validated questionnaires. Erections  $\geq 75\%$  were considered sufficient for penetrative intercourse. Patients were evaluated with or without phosphodiesterase type 5 (PDE5) inhibitors.

*Oncological outcomes:* PSA nadir was measured at approximately two months postoperatively, with successful biochemical control defined as PSA  $< 0.1$  ng/ml.

Surgical margin status was recorded as R0 (negative) or R1 (positive), with positive margin length measured in millimeters. Pathological staging was performed according to the Tumor, Node, Metastasis (TNM) classification, and histological grading according to the Grade Group system.

*Statistical analysis.* Descriptive statistics were calculated for all variables. Continuous variables are presented as mean  $\pm$  standard deviation or median (range) as appropriate. Categorical variables are presented as frequencies and percentages.

## Results

*Patient characteristics.* A total of 186 patients underwent RSR-LRP during the study period. Operations were performed between February 2022 and November 2025. Mean follow-up for the cohort was 21.9 months (median 21.3 months, range=2.4-46.7 months).

Clinical staging demonstrated: cT2 in 157 patients (84.4%), including cT2a (n=21), cT2b (n=15), and cT2c (n=4); and cT3 in 10 patients (5.4%), including cT3a (n=4) and cT3b (n=6). Notably, RSR-LRP was performed in patients with clinical T3 disease, which is typically considered a contraindication for standard Retzius-sparing approaches (1, 2) (Table I).

*Urinary continence outcomes.* Continence data at two months postoperatively were available for 174 patients. Complete continence (0 pads) was achieved in 97 patients (55.7%). An additional 48 patients (27.6%) required only a safety pad (changed every 2-7 days), 19 patients (10.9%) required one pad per day, and only 10 patients (5.7%) required two or more pads per day. Overall, social continence ( $\leq 1$  pad/day) was achieved in 164 patients (94.3%).

At six months postoperatively, data were available for 160 patients. Complete continence improved dramatically to 151 patients (94.4%). An additional seven patients (4.4%) required a safety pad only, and one patient (0.6%)

Table I. Characteristics of the 186 patients who underwent retzius-sparing retroperitoneal laparoscopic radical prostatectomy for clinically localized or locally advanced prostate cancer.

Variable	n (%)
Clinical stage	
cT2 (all)	157 (84.4)
cT3a	4 (2.2)
cT3b	6 (3.2)
Pathological stage	
pT2	133 (71.5)
pT3a	34 (18.3)
pT3b	19 (10.2)
Pathological N stage	
N0/Nx	183 (98.4)
N1	3 (1.6)
Grade group	
Grade Group 1	53 (28.5)
Grade Group 2	115 (61.8)
Grade Group 3	13 (7.0)
Grade Group 4-5	5 (2.7)
Cribriform pattern present	9 (4.8)
Stage migration (cT2→pT3)	43 (24.4)

required two pads per day. No patient required more than two pads six months after RSR-LRP. Social continence rate reached 99.4% at 6-9 months after RSR-LRP (Table II).

**Erectile function outcomes.** Erectile function data were available for 129 patients. Three patients were excluded from analysis due to absent preoperative erectile function or unwillingness to restore function. Of evaluable patients, 121 (96.0%) reported any erection recovery (>0% of baseline), with only five patients (4.0%) reporting complete absence of erection. Thirty-nine patients (31.0%) achieved erection quality ≥75% of baseline, considered sufficient for penetrative intercourse. The mean erection quality was 57.2% (SD=26.8) of preoperative baseline, with a median of 60% (range=0-100%). Five patients reported spontaneous erections without PDE5 inhibitors.

**Oncological outcomes.** PSA nadir data at approximately two months postoperatively were available for 127 patients. PSA nadir <0.1 ng/ml was achieved in 110 patients (86.6%), and PSA <0.2 ng/ml (indicating biochemical cure) in 118 patients (92.9%). Seventeen

Table II. Urinary continence outcomes of patients at 2 and 6-9 months after retzius-sparing retroperitoneal laparoscopic radical prostatectomy.

Continence Level	2 Months (n=174)	6-9 Months (n=160)
Complete (0 pads)	97 (55.7%)	151 (94.4%)
Safety pad only	48 (27.6%)	7 (4.4%)
One pad/day	19 (10.9%)	1 (0.6%)
≥2 pads/day	10 (5.7%)	1 (0.6%)
Social continence (≤1 pad/day)	164 (94.3%)	159 (99.4%)

Table III. Oncological outcomes of patients with clinically localized or locally advanced prostate cancer, 2 months after retzius-sparing retroperitoneal laparoscopic radical prostatectomy.

Parameter	Result
Prostate-specific antigen nadir (n=127)	
<0.1 ng/ml	110 (86.6%)
<0.2 ng/ml	118 (92.9%)
Surgical margins (n=186)	
R0 (negative)	139 (74.7%)
R1 (positive)	47 (25.3%)
Positive margin rate by stage	
pT2	30/133 (22.6%)
pT3a	8/34 (23.5%)
pT3b	9/19 (47.4%)
Positive margin length, mm (n=44)	
Mean	2.95
Median	1.95
≤3 mm	33 (75.0%)
>3 mm	11 (25.0%)

patients (13.4%) had PSA ≥0.1 ng/ml, with the highest values observed in patients with adverse pathological features or nodal involvement.

Positive surgical margins (R1) were identified in 47 patients (25.3%), with negative margins (R0) in 139 patients (74.7%). The positive margin rate varied by pathological stage: pT2 22.6%, pT3a 23.5%, and pT3b 47.4%. Among patients with positive margins and known margin length (n=44), the mean margin length was 2.95 mm (median 1.95 mm). Importantly, 33 patients (75.0%) had positive margins ≤3 mm, which has been associated with increased biochemical recurrence risk but not with metastatic progression or cancer-specific mortality in recent large studies (Table III).

## Discussion

This study presents the first large series of RSR-LRP, demonstrating excellent functional outcomes comparable to published robotic Retzius-sparing series. Our social continence rate of 94.3% at two months and 99.4% at 6-9 months compares favorably with the MASTER meta-analysis of RS-RARP which reported pooled continence rates of approximately 90% at six months (4, 8). These results are also comparable to the original Galfano series, which reported 90-92% immediate continence (0-1 pad) at one week and 96% at one year (2).

The landmark systematic review and meta-analysis by Ficarra *et al.* (2024) demonstrated that the Retzius-sparing approach offers significant advantages in urinary continence recovery during the first 12 postoperative months compared to standard transperitoneal approaches (3). Our results confirm that these benefits can be achieved with conventional laparoscopic instrumentation using an extraperitoneal approach, without the need for robotic assistance. The recent analysis by Yaxley and Gianduzzo similarly concluded that RS-RARP provides significant early continence advantages, though this benefit diminishes by 12 months (5).

The key technical elements of RSR-LRP that may contribute to the favorable continence outcomes include: (i) complete preservation of the Retzius space and anterior bladder supports, (ii) intrafascial dissection without electrocautery near the neurovascular bundles to minimize thermal injury, (iii) absence of mechanical traction on the neurovascular structures during dissection, and (iv) complete closure of the Retzius space at the end of the procedure, providing additional support to the vesicourethral anastomosis. These principles are consistent with the anatomical rationale originally proposed by Galfano *et al.* (1, 2).

An important finding of our study is that RSR-LRP was successfully performed in patients with clinical T3 disease, including seminal vesicle invasion (cT3b). The RS-RARP technique was not applied to patients in whom the cancer was in the transition zone and possibly

contacting the dorsal venous complex. Standard Retzius-sparing approaches have traditionally been considered contraindicated in locally advanced disease due to concerns about oncological safety (1, 2). In our series, we did not observe a significantly higher positive margin rate in the T3 cases compared to published non-Retzius-sparing series for similar stage disease, suggesting that the technique can be safely extended to selected locally advanced cases with appropriate modifications to the surgical approach in regions of suspected extraprostatic extension.

The overall positive margin rate of 25.3% in our series is higher than that reported in some high-volume robotic centers but must be interpreted in the context of our patient population, which included 28.5% pT3 disease and 5.4% clinical T3 disease at baseline. The meta-analysis by Ficarra *et al.* noted that RS-RARP demonstrated a tendency toward higher positive margin rates in patients with  $\geq$ pT3 tumors, consistent with our findings (3). Importantly, recent studies have sought to define clinically meaningful positive surgical margins (9). Data from the EAU Robotic Urology Section demonstrated that unifocal positive margins  $<$ 3 mm were not associated with increased mortality (10), while only multifocal margins or margins  $\geq$ 3 mm conferred increased risk of metastasis in patients with aggressive pathological features (10, 11). In our series, 75% of positive margins were  $\leq$ 3 mm, suggesting that the majority of these cases may not have adverse long-term oncological implications.

The erectile function outcomes in our series showed that 96% of patients reported some degree of erection recovery, with 31% achieving erections  $\geq$ 75% sufficient for intercourse. These results are comparable to published laparoscopic and robotic series (7, 12, 13), particularly considering that our cohort included a substantial proportion of locally advanced disease where more aggressive dissection was required in some cases.

**Limitations.** First, this is a single-surgeon, single-center experience which may limit generalizability. Second, the erectile function assessment used a simplified percentage-based method rather than validated questionnaires; however, this approach was necessitated by the variable

follow-up intervals and has been used in other published series. Third, longer follow-up is needed to assess biochemical recurrence-free survival and metastasis-free survival. Fourth, the absence of a comparative group limits our ability to definitively attribute outcomes to the Retzius-sparing component *versus* other technical factors.

## Conclusion

RSR-LRP is a feasible and effective technique that achieves excellent early continence recovery comparable to robotic Retzius-sparing series (2-5). The technique can be safely extended to selected patients with locally advanced disease. RSR-LRP offers a viable alternative for urological centers without access to robotic platforms, potentially improving functional outcomes for prostate cancer patients worldwide.

## Conflicts of Interest

The Authors declare no conflict of interest in relation to this study.

## Artificial Intelligence (AI) Disclosure

During the preparation of this manuscript, a large language model (Claude, Anthropic) was used solely for language editing and stylistic improvements in select paragraphs. No sections involving the generation, analysis, or interpretation of research data were produced by generative AI. All scientific content was created and verified by the authors. Furthermore, no figures or visual data were generated or modified using generative AI or machine learning-based image enhancement tools.

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