

Retzius-sparing Robotic-assisted Radical Prostatectomy Facilitates Early Continence Regardless of Neurovascular Bundle Sparing

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Abstract. *Background/Aim: Retzius-sparing robotic-assisted radical prostatectomy (RARP) has had better results in early continence rate and comparable oncological safety compared to the retropubic approach. However, the role the neurovascular bundle (NVB) sparing plays in the rate of early continence after catheter removal remains unclear. In this study, we sought to compare the early continence rate between Retzius-sparing RARP and the retropubic approach RARP to assess whether NVB sparing affects the continence rate in patients with prostate cancer. Patients and Methods: This was a retrospective case series of 133 patients who underwent RARP from 2004 to 2017. 92 patients underwent retropubic RARP and 41 patients underwent Retzius-sparing RARP. All procedures were performed by a single surgical team in a single institution. Baseline patient characteristics were recorded and analyzed. Continence results and oncological outcomes were compared between the two groups. Continence outcome of Retzius-sparing RARP with NVB sparing was also analyzed. Results: No differences in age, prostate size, pathology T stage, PSA, and NVB sparing were found between the two groups. The oncological results including surgical margin and biochemical recurrence rate at one year showed no difference between the two groups. With respect to immediate continence results, the Retzius-sparing group showed a better continence result compared to the retropubic approach (75.6% vs. 26.1 %, respectively, $p < 0.001$) after catheter removal. However, there was no difference between the two groups after 6 months.*

Furthermore, no significant difference in immediate continence result was found in the Retzius-sparing group between patients with NVB sparing (75 %) and those without (75 % vs. 78%, respectively, $p = 1.00$). Conclusion: Retzius-sparing RARP may provide a better immediate continent result compared to retropubic RARP. In Retzius-sparing RARP, NVB sparing did not enhance immediate continence after the operation.

Robotic-assisted laparoscopic radical prostatectomy (RARP) is currently the most widely adopted surgical procedure for the treatment of localized prostate cancer (1-3). In addition to erectile dysfunction, urinary incontinence following surgery is one of the most important indicators of quality of life and treatment satisfaction (4, 5). Many factors have been reported to affect the result of postoperative continence, long-term continence and time to continence, including age, prostate size, oncological factors, and neurovascular bundle (NVB) damage (6-8). Many surgical techniques have been introduced to improve postoperative continence outcomes including bladder neck preservation, bladder neck plication, urethral length preservation, NVB sparing radical prostatectomy (RP) and Retzius-sparing RARP (9-14). However, the effects of these methods remain controversial. Most of the techniques basically aim to maintain the normal anatomy and function of pelvic structures as much as possible by preservation, reconstruction or reinforcement (9).

NVB sparing RP is believed to improve potency after operation, but the role of NVB in continence is still not clear. A recent meta-analysis showed NVB sparing is associated with improvement of urinary continence rates in the first 6 months postoperatively (15) while others reported no detectable effects (16, 17).

Galfano and colleagues were the first to develop Retzius-sparing RARP. This modality was reported to result in a superior early urinary continence rate with ~90% of patients experiencing continence 1 week after catheter removal (18, 19). Many studies also reported a better early continence rate

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and safer oncological control using the Retzius-sparing approach compared to the conventional approach (18-20).

In this study, we compared the immediate continence rates between Retzius-sparing RARP and retropubic approach RARP in a medical center. Furthermore, we assessed the role of NVB preservation in the continence of patients who underwent Retzius-sparing RARP.

Patients and Methods

This was a retrospective, single-center, single surgical team case series of 150 patients who underwent RARP between 2004-2017. All procedures were performed by a single surgical team. Baseline patient characteristics were recorded at the preoperative clinic visit and included age, body mass index (BMI), clinical stage, biopsy Gleason score and last preoperative prostate-specific antigen (PSA) levels. There were two operative methods in this study period. We performed retropubic approach RAPA earlier. Retzius-sparing RARP was performed according to the surgical technique described by Galfano *et al.* (18). Intra-operative outcomes such as estimated blood loss (EBL) and operative (OP) time were recorded immediately after surgery by using a standardized, IRB-approved research form (CE17175B). Patients were managed routinely post-operatively, and were followed up on postoperative days 7-14 for a cystogram before Foley catheter removal. Follow-up data were obtained from patients who returned for a postoperative clinic visit, typically at 3-month intervals. We checked PSA levels in each patient during their follow up visit. Patients without complete data or with no follow-up were excluded. Continence was defined as 0 pads or one security liner per day. Immediate continence was defined as continence within one week after Foley removal. Biochemical recurrence was defined as two consecutive PSA levels >0.2 ng/ml after RARP.

Patient characteristics was analyzed with the Chi-Square test. Continence results between retropubic prostatectomy and Retzius-sparing prostatectomy were analyzed with Fisher's Exact test. Univariate and multivariate analyses were performed using logistic regression. All statistical tests were carried out using IBM SPSS version 22f or Windows (SPSS, Chicago, IL, USA), with *p*-values <0.05 being considered statistically significant.

Results

There were 150 patients who underwent RARP from May 2004 to June 2017 and were enrolled in this study. After exclusion of patients with incomplete data and those lost to follow-up, a total of 133 patients were included. The Retzius-sparing RARP was applied to 41 patients and the retropubic RARP was employed in 92 patients. The demographic, preoperative and perioperative features are summarized in Table I. There were no differences between the two groups in terms of age, PSA, pathological T stage, nerve sparing, operation time, days of Foley removal post-operation, margin positive rate, or biochemical recurrence. The amount of estimated blood loss (EBL) was relatively high in the retropubic group compared to the Retzius-sparing group (156.3 ± 115.2 vs. 268.0 ± 299.4 , $p=0.048$, respectively). The Gleason score was slightly higher in the Retzius-sparing group compared to the retropubic group (7.1 ± 0.6 vs. 6.8 ± 0.9 ,

respectively, $p=0.026$). Prostate volume was smaller in the Retzius-sparing group (37.6 ± 13.6 vs. 44.0 ± 15.9 , $p=0.042$) (Table I).

Table II revealed the continence outcome between the two groups. The Retzius-sparing RARP group had a better continence rate compared to the retropubic group up to six months postoperatively (75.6%, 87.8%, 95.1% and 100% vs. 26.4%, 34.8%, 66.3% and 83.7%, $p<0.001$, $p<0.001$, $p=0.001$ and $p=0.005$, respectively). There was no difference in the postoperative one-year continence rate (100% vs. 93%, $p=0.177$). In univariate analysis of immediate continence, age, PSA, OP time, EBL, prostate volume, operation method and NVB preserving were associated with continence (Table III). However, in multivariate analysis, only age and Retzius-sparing RARP accounted for immediate continence. Older age shared lower continence rates (OR=0.91, 95%CI=0.85-0.98, $p=0.015$) and Retzius-sparing RARP had extremely higher immediate continence rates than the retropubic procedure (OR=9.09, 95%CI=3.44-25, $p<0.001$). The factors affecting continence results of immediate continence and post-operative one-month continence were similar, with age and Retzius-sparing also showing association with continence in multivariate analysis (OR=0.93, 95% CI=0.86-0.99, $p=0.035$; OR=12.5, 95% CI=4.26-33.33, $p<0.001$, respectively). Three months post-operation, OP time, Retzius-sparing and pathology stage accounted for continence (OR=0.99, 95% CI=0.98-0.999, $p=0.046$; OR=10, 95% CI=2.17-50, $p=0.003$; OR=0.92, 95% CI=0.12-0.72, $p=0.008$, respectively). Six months post-operation, only OP time and pathology stage were associated with continence (OR=0.99, 95%CI=0.98-0.999, $p=0.022$; OR=0.18, 95% CI=0.05-0.7, $p=0.013$, respectively). The average time to continence was 3.29 weeks in the Retzius-sparing group and 14.83 weeks in the retropubic group.

Discussion

Since Retzius-sparing RARP was introduced, many studies have shown better early continence and oncological safety compared with outcomes achieved using conventional surgical modalities (18-20). In our study, Retzius-sparing RARP also resulted in an early continence result that was superior to that of the retropubic group; the former showed significant continence impact in immediate, one month and 3 month continence (OR=9.09, 12.5 and 10.0, respectively). However, this continence benefit became non-significant after 6 months; our results correspond to other radical prostatectomy studies, indicating that patient continence could be achieved after a recovery period (5, 6, 21). We also found age to be a poor predicting factor for early continence. This result is similar to other studies and was associated with a delayed recovery in older patients (6, 22). OP time and pathology stage showed impact on continence 3 and 6 months after the operation, which may result from disease

Table I. Clinical characteristics of patients receiving retropubic prostatectomy and Retzius-sparing prostatectomy.

	Retzius-sparing (n=41)	Retropubic (n=92)	Total (n=133)	p-Value
Age	64.8±6.4	65.6±6.4	65.4±6.4	0.489
PSA	11.2±8.2	14.2±9.9	13.3±9.5	0.063
Gleason score	7.1±0.6	6.8±0.9	6.9±0.9	0.026*
Prostate volume	37.6±13.6	44.0±15.9	42.0±15.5	0.042*
OP time	216.9±64.5	216.4±56.4	216.6±58.8	0.669
EBL	156.3±115.2	268.0±299.4	233.6±261.8	0.048*
Nerve-sparing				0.116
Non	9 (22.0%)	37 (40.2%)	46 (34.6%)	
Unilateral	21 (51.2%)	38 (41.3%)	59 (44.4%)	
Bilateral	11 (26.8%)	17 (18.5%)	28 (21.1%)	
Foley removal	6.5±3.6	4.8±1.4	5.3±2.4	0.054
Pathology stage				0.464
T1	0 (0.0%)	2 (2.2%)	2 (1.5%)	
T2	24 (58.5%)	46 (50.0%)	70 (52.6%)	
T3	17 (41.5%)	44 (47.8%)	61 (45.9%)	
Margin involved	13 (31.7%)	24 (26.1%)	37 (27.8%)	0.647
BCR at one year	4 (9.8%)	21 (22.8%)	25 (18.8%)	0.123

Chi-Square test. * $p < 0.05$, ** $p < 0.01$. PSA: Prostate-specific antigen; OP time: operative time; EBL: estimated blood loss; BCR: biochemical recurrence.

Table II. Continence result between retropubic prostatectomy and Retzius-sparing prostatectomy.

Continence	Retzius-sparing (n=41)	Retropubic (n=92)	Total (n=133)	p-Value
Immediate	31 (75.6%)	24 (26.1%)	55 (41.4%)	<0.001**
1 month	36 (87.8%)	32 (34.8%)	68 (51.1%)	<0.001**
3 months	39 (95.1%)	61 (66.3%)	100 (75.2%)	0.001**
6 months	41 (100%)	77 (83.7%)	118 (88.7%)	0.005**
1 year	41 (100%)	86 (93.5%)	127 (95.5%)	0.177

Fisher's exact test. * $p < 0.05$, ** $p < 0.01$. R-S: Retzius-sparing.

status differences. Longer OP times maybe be confounded by advanced tumor stage. Advanced pathology stage patients may receive adjuvant therapy after 3 months of surgery which can decrease the continence rate (22-24). There have been many studies that have shown benefit of nerve sparing surgery in continence among radical prostatectomy patients (25-27). A recent meta-analysis showed NVB sparing was associated with improvement of urinary continence rates in the first 6 months postoperatively (15). However, in our study, NVB sparing RP did not show a significantly difference in time to continence or long-term continence between Retzius-sparing RARP and retropubic RARP. We think this is because anatomical reconstruction such as Retzius-sparing is more important in early continence.

Retzius-sparing RARP is thought to play a role in the maintenance of continence and potency through the preservation of increased pelvic structure (18). Our previous study also found less bladder neck descent in Retzius-sparing

RARP, which may also possibly contribute to early continence (20). Therefore, a greater preservation of normal pelvic anatomy appears to be more important than the NVB sparing with respect to early continence.

There were some limitations in this study, including small patient numbers and selection bias. Pre-operative international prostate symptom score (IPSS), bladder function, potency, and complications were also not assessed. These factors might have affected postoperative time to continence and long-term continence. It should also be noted that we used a relatively loose definition of continence, defined as 0 pads or one security liner per day.

Conclusion

Retzius-sparing RARP showed an early continence benefit up to 6 months post-urethral catheter removal compared to retropubic RARP regardless of NVB sparing. The role of

Table III. *Variate correlation analysis with continence outcome.*

	Univariate analysis (immediate)			Multivariate analysis (immediate)			Multivariate analysis (one month)			Multivariate analysis (3 months)			Multivariate analysis (6 months)		
	OR	95% CI	p-Value	OR	95% CI	p-Value	OR	95% CI	p-Value	OR	95% CI	p-Value	OR	95% CI	p-Value
Age	0.92	(0.86-0.97)	0.004**	0.91	(0.85-0.98)	0.015*	0.93	(0.86-0.99)	0.035*						
PSA	0.92	(0.87-0.97)	0.004**												
OP time	0.99	(0.99-0.999)	0.028*										0.99	(0.98-0.9999)	0.046*
EBL	0.998	(0.996-0.9999)	0.041*												
Prostate volume	0.97	(0.94-0.99)	0.008**	0.98	(0.95-1.00)	0.095	0.98	(0.95-1.01)	0.170						
Gleason score	1.18	(0.78-1.77)	0.432												
Foley Group	0.96	(0.83-1.12)	0.634												
Conventional	Ref.			Ref.			Ref.			Ref.			Ref.		
R-S	9.09	(3.70-20.00)	<0.001**	9.09	(3.44-25.00)	<0.001**	12.50	(4.26-33.33)	<0.001**	10.00	(2.17-50.00)	0.003**			
NVB preserve															
Non	Ref.			Ref.						Ref.					
Unilateral	1.68	(0.75-3.79)	0.211	0.92	(0.34-2.47)	0.867							2.02	(0.82-5.00)	0.127
Bilateral	3.05	(1.15-8.10)	0.025*	1.36	(0.39-4.71)	0.630									
NVB preserve															
Non	Ref.						Ref.								
Sparing	2.04	(0.96-4.34)	0.065				1.71	(0.68-4.26)	0.251						
Pathology stage															
Stage I+II	Ref.									Ref.					
Stage III	0.67	(0.33-1.34)	0.255										0.29	(0.12-0.72)	0.008**
Margin															
Negative	Ref.														
Positive	1.11	(0.52-2.40)	0.784												0.013*

Logistic regression. * $p < 0.05$, ** $p < 0.01$. PSA: Prostate-specific antigen; OP time: operative time; EBL: estimated blood loss; BCR: biochemical recurrence; R-S: Retzius-sparing; NVB: neurovascular bundle; Ref.: reference.

Retzius-sparing seems to be more important than the NVB sparing for early continence.

Conflicts of Interest

All Authors declare no conflicts of interest.

Authors' Contributions

Po-Chi Liao: Manuscript writing and revision. Sheng-Chun Hung: Data collection. Ju-Chuan Hu: Data collection. Kun-Yuan Chiu: Study design, surgery performer.

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