Original Article

Comparative study of extraperitoneal singe-port robot-assisted radical prostatectomy and transperitoneal multiport robot-assisted radical prostatectomy using propensity score matching

Ji Hyung Yoon, Taekmin Kwon^, Seong Cheol Kim, Sungchan Park, Sang Hyeon Cheon

Department of Urology, Ulsan University Hospital, University of Ulsan College of Medicine, Ulsan, Korea

Contributions: (I) Conception and design: T Kwon, SH Cheon; (II) Administrative support: T Kwon, SH Cheon; (III) Provision of study materials or patients: SH Cheon; (IV) Collection and assembly of data: JH Yoon, SC Kim; (V) Data analysis and interpretation: JH Yoon, S Park; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Taekmin Kwon, MD, PhD. Department of Urology, Ulsan University Hospital, University of Ulsan College of Medicine, 877 Bangeojinsunwando-ro, Dong-gu, Ulsan 44033, Korea. Email: tmkwon@uuh.ulsan.kr.

Background: With the introduction of the da Vinci single-port (SP) robot platform, surgery in a narrow space has become easier, and using this, extraperitoneal radical prostatectomy has been frequently performed recently. However, studies comparing it with existing methods are still lacking. Therefore, in this study, we compared the initial extraperitoneal single-port robot-assisted radical prostatectomy (spRARP) with intraperitoneal multiport robot-assisted radical prostatectomy (mpRARP) and tried to investigate the feasibility of extraperitoneal spRARP.

Methods: We retrospectively analyzed patients who underwent RARP performed between January 2019 and April 2023. A total of 184 consecutive patients were enrolled in this study: 64 underwent spRARP and 120 underwent mpRARP. Patient characteristics before and after surgery were investigated, and period of passing gas, foley maintenance period, length of hospital stay, and pain changes were compared and analyzed to estimate post-surgery recovery. To address inherent biases stemming from differing patient characteristics at baseline, we performed an additional analysis after propensity score matching (PSM) (ratio, 1:1).

Results: After PSM, both the spRARP and mpRARP groups consisted of 64 patients each. On preoperative examination, there were no significant differences in prostate-specific antigen level, Gleason score (GS), prostate volume, magnetic resonance imaging T stage, or Prostate Imaging-Reporting and Data System score between the two groups. Following surgery, there were no significant differences in operative and console time between the two groups. Notably, the estimated blood loss was considerably lesser in the spRARP group than in the mpRARP group (P=0.049). When comparing pathologic outcomes, the GS, T stage, positive surgical margin, extracapsular extension, and seminal vesicle invasion rates showed no significant differences between the two groups. Four patients who underwent spRARP and six who underwent mpRARP suffered Clavien-Dindo classification grade 3 and 4 complications. After 3 months, there were no significant differences in incontinence or potency between the two groups. However, even after PSM, the period of passing gas was earlier in the spRARP group than in the mpRARP group.

Conclusions: In this study, both the extraperitoneal spRARP and transperitoneal mpRARP groups exhibited similar complication rates and surgical outcomes. Furthermore, the spRARP group had a short surgical time and demonstrated early recovery. Therefore, extraperitoneal spRARP is a feasible procedure that is expected to become increasingly popular in the future.

Keywords: Extraperitoneal; single port; robotic radical prostatectomy

^ ORCID: 0000-0003-2280-319X.

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Introduction

Prostate cancer is the leading cancer among men in the United States and the third most prevalent cancer in Korea, with the fastest-growing incidence rate (1,2). Radical prostatectomy serves as the primary surgical treatment for intermediate- and high-risk prostate cancers, and is commonly performed (3). Given the nature of prostate cancer, although post-surgical oncological results take precedence, functional recovery, such as urinary incontinence and erectile dysfunction, is also very important. Accordingly, the use of robotic surgical techniques has increased dramatically (3,4), particularly since the introduction of the da Vinci robotic system. Multiport robot-assisted radical prostatectomy (mpRARP) is now the established standard treatment for localized prostate cancer (3,5,6). It is known for its advantages in providing easier to access the narrow pelvic space, minimizing invasiveness, and decreasing complications, leading to improved functional and oncological outcomes (7).

Continuous efforts have been made to minimize the morbidity of surgery, faster recovery, and improve cosmetic results, from laparotomy to laparoscopic and laparoendoscopic single-site surgery. More recently, the introduction of the da Vinci single-port (SP) system, equipped with an articulating camera and three jointed robotic instruments, all within a single 25-mm port, represents a remarkable advancement within the field of robotic surgery (8,9). Using this system, radical prostatectomy has been attempted through various approaches, using a small port within 25 mm, such as the transperitoneal, extraperitoneal, perineal, and transvesicle approaches.

Among the different surgical approaches, the extraperitoneal approach offers several advantages when compared with the transperitoneal approach. It results in less bowel irritation, facilitating early postoperative dietary intake and contributes to quicker patients recovery (10). Additionally, adopting a less steep Trendelenburg position is associated with fewer respiratory and cardiovascular complications (11). Since the introduction of extraperitoneal single-port robot-assisted radical prostatectomy (spRARP) by Kaouk *et al.* (12), numerous positive experiences and reports have been published (13-15). However, studies comparing this method with the existing approaches are lacking. Therefore, in this study, we compared the initial experiences of extraperitoneal spRARP, conducted by a single surgeon, with those of transperitoneal mpRARP using propensity score matching (PSM). Additionally, we investigated the feasibility of extraperitoneal spRARP. We present this article in accordance with the STROBE reporting checklist (available at https://tau.amegroups.com/article/view/10.21037/tau-23-534/rc).

Highlight box

Key findings

- Both extraperitoneal single-port robot-assisted radical prostatectomy (spRARP) and transperitoneal multiport robot-assisted radical prostatectomy groups showed similar surgical outcomes without high complications.

What is known and what is new?

- The extraperitoneal approach offers several advantages when compared with the transperitoneal approach.
- The extraperitoneal spRARP group showed a short surgical time and demonstrated early recovery.

What is the implication, and what should change now?

- The extraperitoneal spRARP is viable procedure that is expected to become increasingly popular in the future.

Methods

Study participants

Between January 2019 and April 2023, we conducted retrospective analyses of patients who underwent RARP performed by a senior surgeon (S.H.C.) at Ulsan University Hospital. A total of 184 consecutive patients were included in this study: 64 underwent spRARP and 120 underwent mpRARP. All patients underwent bone scans to check for bone metastases, multiparametric magnetic resonance imaging (mpMRI), and computed tomography. Patients who had pre-existing metastases before surgery or who had undergone prior treatment, such as hormone therapy or chemotherapy were excluded. Additionally, patients with a history of previous surgeries or procedures on the prostate

were also excluded.

Outcomes measures

To compare the patients' basic characteristics, their age, body mass index (BMI), and comorbidities, such as diabetes and hypertension, were identified. As preoperative factors, biopsy results, such as prostate-specific antigen (PSA), Gleason score (GS), and mpMRI results, such as the Prostate Imaging-Reporting and Data System (PI-RADS) score, were evaluated. The surgical factors included operative time, preservation of the neurovascular bundle, and estimated blood loss (EBL). The postoperative pathological stages (T stage, GS, and margin status) were compared with the surgical results. To confirm the validity of the SP extraperitoneal approach, the oncological results of the surgery, complications, and degree of recovery were compared. Hospital factors, Foley sustaining days, hospital days, period of passing gas, pain numeric rating scale (NRS), and use of oral or intravenous analgesics (opioids) were assessed. In addition, the degree of urinary incontinence and recovery of erectile function at 3 months were compared. Continence was defined as no reliance on pads, and potency was defined as the ability to maintain an erection sufficient for intercourse, with or without phosphodiesterase five inhibitors.

Surgical procedures

spRARP

Patients were positioned supine with 10–15° Trendelenburg tilt. A 3-cm subumblical incision was made to create extraperitoneal access and space using fingers and a balloon dissector (Spacemaker®, Minneapolis, USA). A 12-mm left lower abdominal incision was made to facilitate port placement. The 25-mm SP (Lapsingle®, Paju, Korea) was used. Prostatectomy followed an anterior approach. After skipping bladder dissection, the steps of the procedure were bladder neck dissection, seminal vesicle dissection, posterior dissection, lateral dissection, pedicle ligation, urethral dissection, and anastomosis (15).

mpRARP

Patients were placed in the lithotomy and 30° Trendelenburg positions. Four 10-mm incisions along the umbilicus for the robot arms and two 12-mm incisions for assist were made for assistance. After transperitoneal access, the bladder was dissected. Afterwards, prostatectomy was performed as in spRARP.

Statistical analysis

The clinicopathological features of the two groups were compared using Pearson's chi-squared test for categorical variables and Student's *t*-test for continuous variables. Quantitative data were expressed as the mean ± standard deviation. To address inherent biases stemming from differing patient characteristics at baseline, an additional analysis was performed after PSM (ratio 1:1). The PSM was determined using a stepwise logistic regression model with the surgical method as the dependent variable and age, BMI, comorbidities, pre-biopsy PSA level, prostate volume, GS, and MRI findings as covariates. All tests were two-sided, and statistical significance was set at $P<0.05$. We preformed all analyses using the R software environment for statistical computing and graphics (version 3.4.3).

Ethics statement

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Institutional Review Board of the Ulsan University Hospital (No. 2023-08-048). The requirement for informed consent was waived because clinical data, including patient information and laboratory test results, were retrospectively obtained and analyzed.

Results

In total, 184 patients were included in this study: 64 in the spRARP group and 120 in the mpRARP group. The preoperative patient and pathological characteristics are presented in *Table 1*. Notably, the preoperative PSA levels were significantly higher (17.1±22.2 *vs.* 11.9±9.2 ng/mL, P=0.03) and the prostate volume was significantly larger (38.5±17.2 *vs.* 26.7±5.9 cc, P=0.001) in the mpRARP group than in the spRARP group. However, other characteristics were not significantly different between the two groups.

The postoperative outcomes are shown in *Table 2*. The mpRARP group exhibited a higher EBL (488.2±496.7 *vs.* 314.5±236.4 cc, P=0.002) and significantly longer hospitalization (11.2±6.6 *vs.* 9.3±2.1 days, P=0.004) compared with the spRARP group. On the other hand, the spRARP group achieved faster recovery in terms of gas passage than the mpRARP group (1.8±1.1 *vs.* 2.3±0.9 days, P=0.009). Although analgesic use after surgery showed

Table 1 Baseline characteristics of entire cohorts

Characteristics	spRARP (n=64)	mpRARP (n=120)	P value
Age (years), mean ± SD	68.9±7.1	68.9±7.6	0.96
Body mass index (kg/m^2), mean ± SD	23.8±3.2	24.7±3.1	0.07
Hypertension, n (%)	30 (46.9)	62 (51.7)	0.64
Diabetes, n (%)	13 (20.3)	21 (17.5)	0.79
PSA (ng/mL), mean ± SD	11.9±9.2	17.1±22.2	0.03
Biopsy GS, n (%)			0.57
6	26 (40.6)	44 (36.7)	
7	29 (45.3)	48 (40.0)	
8	8 (12.5)	21 (17.5)	
9	1 (1.6)	6 (5.0)	
10	0 (0)	1 (0.8)	
MRI T stage, n (%)			0.19
No lesion	6 (9.4)	6 (5.0)	
T2	46 (71.9)	76 (63.3)	
T3	12 (18.8)	38 (31.7)	
PI-RADS score, n (%)			0.55
0	6 (9.4)	6 (5.0)	
3	3 (4.7)	10 (8.3)	
4	27 (42.2)	48 (40.0)	
5	28 (43.8)	56 (46.7)	
Prostate volume (cc), mean ± SD	26.7±5.9	38.5±17.2	0.001

spRARP, single-port robot-assisted radical prostatectomy; mpRARP, multiport robot-assisted radical prostatectomy; SD, standard deviation; PSA, prostate specific antigen; GS, Gleason score; MRI, magnetic resonance imaging; PI-RADS, Prostate Imaging-Reporting and Data System.

no significant difference, the spRARP group reported significantly higher NRS scores on post-operative day (POD) 5 compared with the mpRARP group (1.8±1.2 *vs.* 1.3±1.2, P=0.008).

After PSM, both the spRARP and mpRARP groups consisted of 64 patients each. The preoperative characteristics are shown in *Table 3*. There were no significant differences in age (68.9±7.1 *vs.* 68.7±8.3 years, P=0.85) or BMI (23.8±3.2 *vs.* 24.2±2.9 kg/m^2, P=0.50) between the two groups. Likewise, presence of comorbidities, such as hypertension (30 *vs.* 32, P=0.86) and diabetes (13 *vs.* 12, P>0.99), was not significantly different between the groups. In the preoperative examination, PSA (11.9±9.2 *vs.* 12.6±18.6 ng/mL, P=0.80), GS (P=0.96), prostate volume (26.7±5.9 *vs.* 28.3±7.8 cc, P=0.21), MRI T stage (P=0.58), and PI-RADS score (P=0.53) showed no significant differences between the two groups.

The postoperative outcomes after PSM are shown in *Table 4*. The operation time (170.8±43.3 *vs.* 169.8±65.4 min, P=0.92) and console time (120.8±41.3 *vs.* 115.8±63.5 min, P=0.60) were not significantly different between the two groups. EBL was significantly lesser in the spRARP group than in the mpRARP group (314.5±236.4 *vs.* 455.8±499.0 cc, P=0.049). When comparing pathologic outcomes, the GS (P=0.56), T stage (P=0.18), positive surgical margin (P=0.47), extracapsular extension (P=0.44), and seminal vesicle invasion (P>0.99) rates were not significantly different between the two groups. Four patients who

Table 2 Surgical outcomes of entire cohorts

Variables	spRARP	mpRARP	P value
Date from biopsy to surgery (days), mean ± SD	64.2±48.3	70.5±102.8	0.58
Total surgery time (min), mean ± SD	170.8±43.3	185.7±74.6	0.09
Console time (min), mean ± SD	120.8±41.3	131.7±70.8	0.19
Neurovascular bundle save, n (%)	57 (89.1)	94 (78.3)	0.30
Lymph node dissection, n (%)	1 (1.6)	14 (11.7)	0.04
Estimated blood loss (cc), mean ± SD	314.5±236.4	488.2±496.7	0.002
Post operative GS, n (%)			0.39
6	11 (17.2)	23 (19.2)	
7	43 (67.2)	79 (65.8)	
8	7 (10.9)	6 (5.0)	
9	3 (4.7)	12 (10.0)	
Pathologic_T stage, n (%)			0.28
T2a	7 (10.9)	5 (4.2)	
T2c	35 (54.7)	73 (60.8)	
T3a	12 (18.8)	20 (16.7)	
T3b	10 (15.6)	22 (18.3)	
Positive surgical margin, n (%)	27 (42.2)	44 (36.7)	0.57
Lymph node involvement, n (%)	0 (0.0)	7 (5.8)	0.12
Extracapsular extension, n (%)	22 (34.4)	42 (35.0)	>0.99
Seminal vesicle invasion, n (%)	10 (15.6)	22 (18.3)	0.80
Complication, n (%)	4 (6.2)	10 (8.3)	0.83
Continence 3 months after surgery, n (%)	30 (46.9)	50 (41.7)	0.90
Potency 3 months after surgery, n (%)	13 (20.3)	27 (22.5)	0.70
Hospital day (days), mean ± SD	9.3±2.1	11.2±6.6	0.004
Period of foley insertion (days), mean ± SD	7.2±1.9	8.5±7.1	0.07
Period of passing gas (days), mean ± SD	1.8±1.1	2.3±0.9	0.009
NRS at immediately after surgery, mean ± SD	5.5±1.7	5.3±1.5	0.61
NRS at post op date #1, mean ± SD	3.3±1.3	3.5±1.5	0.49
NRS at post op date #5, mean ± SD	1.8±1.2	1.3±1.2	0.008
Frequency of analgesics used, mean ± SD	2.6±3.1	2.5±2.3	0.88

spRARP, single-port robot-assisted radical prostatectomy; mpRARP, multiport robot-assisted radical prostatectomy; SD, standard deviation; GS, Gleason score; NRS; numeric rating scale.

underwent spRARP and six who underwent mpRARP suffered Clavien-Dindo classification grade 3 and 4 complications. Three months post-surgery, there were no significant differences in incontinence (46.9% *vs.* 42.2%, P=0.72) or potency (20.3% *vs.* 17.2%, P=0.82) between the two groups. However, even after PSM, the period of passing gas and NRS on POD 5 were earlier and higher, respectively, in the spRARP group than in the mpRARP

Table 3 Baseline characteristics after propensity score matching

Characteristics	spRARP (n=64)	mpRARP (n=64)	P value
Age (years), mean ± SD	68.9±7.1	68.7±8.3	0.85
Body mass index (kg/m^2), mean ± SD	23.8±3.2	24.2±2.9	0.50
Hypertension, n (%)	30 (46.9)	32 (50.0)	0.86
Diabetes, n (%)	13 (20.3)	12 (18.8)	>0.99
PSA (ng/mL), mean ± SD	11.9±9.2	12.6±18.6	0.80
Biopsy GS, n (%)			0.96
6	26 (40.6)	23 (35.9)	
7	29 (45.3)	31 (48.4)	
8	8 (12.5)	9 (14.1)	
9	1 (1.6)	1 (1.6)	
MRI T stage, n (%)			0.58
No lesion	6 (9.4)	3 (4.7)	
T2	46 (71.9)	48 (75.0)	
T3	12 (18.8)	13 (20.3)	
PI-RADS score, n (%)			0.53
0	6 (9.4)	3 (4.7)	
3	3 (4.7)	5 (7.8)	
4	27 (42.2)	32 (50.0)	
5	28 (43.8)	24 (37.5)	
Prostate volume (cc), mean ± SD	26.7±5.9	28.3±7.8	0.21

spRARP, single-port robot-assisted radical prostatectomy; mpRARP, multiport robot-assisted radical prostatectomy; SD, standard deviation; PSA, prostate specific antigen; GS, Gleason score; MRI, magnetic resonance imaging; PI-RADS, Prostate Imaging-Reporting and Data System.

group.

Discussion

Robotic SP prostatectomy was introduced in 2008; however, its adoption was limited owing to excessive collisions between robot arms and the need for excessive bending of the patient's back to secure space because of the use of an existing robot platform. However, after the da Vinci SP system was introduced in 2018, SP prostatectomies using various access routes have been introduced (16-18). Compared with multi-port prostatectomy, SP prostatectomy has numerous advantages, including faster recovery, reduced blood loss, fewer incisions, and higher patient satisfaction (14,19). One notable benefit of the use of SP system is the ease of extraperitoneal access through a subumblical incision. It is well known that the extraperitoneal approach results in less intestinal irritation than the transperitoneal approach, facilitating early postoperative diet, and the less steep Trendelenburg position leads to fewer anesthetic complications (20,21). In line with these advantages, our study found that passing gas occurred faster in the spRARP group both before and after PSM, with no difference in the occurrence of complications.

Another advantage of SP extraperitoneal access is the reduction in pain caused by small wounds. We expect that patients undergoing spRARP experience less pain and require lesser use of analgesics because of the minimal incision and the use of the extraperitoneal approach. However, in this study, the NRS score at POD 5 was higher in the spRARP group than in the mpRARP group. Furthermore, although not statistically significant,

Table 4 Surgical outcomes after propensity score matching

Variables	spRARP	mpRARP	P value
Date from biopsy to surgery (days), mean ± SD	64.2±48.3	66.9±54.7	0.58
Total surgery time (min), mean ± SD	170.8±43.3	169.8±65.4	0.92
Console time (min), mean ± SD	120.8±41.3	115.8±63.5	0.60
Neurovascular bundle save, n (%)	57 (89.1)	58 (90.6)	0.96
Lymph node dissection, n (%)	1 (1.6)	5 (7.8)	0.21
Estimated blood loss (cc), mean ± SD	314.5±236.4	455.8±499.0	0.049
Post operative GS, n (%)			0.56
6	11 (17.2)	13 (20.3)	
7	43 (67.2)	46 (71.9)	
8	7 (10.9)	3 (4.7)	
9	3 (4.7)	2 (3.1)	
Pathologic_T stage, n (%)			0.18
T2a	7 (10.9)	2 (3.1)	
T2c	35 (54.7)	45 (70.3)	
T3a	12 (18.8)	8 (12.5)	
T3b	10 (15.6)	9 (14.1)	
Positive surgical margin, n (%)	27 (42.2)	22 (34.4)	0.47
Lymph node involvement, n (%)	0 (0.0)	2 (3.1)	0.48
Extracapsular extension, n (%)	22 (34.4)	17 (26.6)	0.44
Seminal vesicle invasion, n (%)	10 (15.6)	9 (14.1)	>0.99
Complication, n (%)	4 (6.3)	6 (9.4)	0.74
Continence 3 months after surgery, n (%)	30 (46.9)	27 (42.2)	0.72
Potency 3 months after surgery, n (%)	13 (20.3)	11 (17.2)	0.82
Hospital day (days), mean ± SD	9.3±2.1	10.5±4.5	0.054
Period of foley insertion (days), mean ± SD	7.2±1.9	7.5±2.8	0.49
Period of passing gas (days), mean ± SD	1.8±1.1	2.3±1.0	0.03
NRS at immediately after surgery, mean ± SD	5.5±1.7	5.4±1.4	0.74
NRS at post op date #1, mean ± SD	3.3±1.3	3.4±1.5	0.87
NRS at post op date #5, mean ± SD	1.8±1.2	1.4±1.2	0.050
Frequency of analgesics used, mean ± SD	2.6±3.1	2.5±2.4	0.88

spRARP, single-port robot-assisted radical prostatectomy; mpRARP, multiport robot-assisted radical prostatectomy; SD, standard deviation; GS, Gleason score; NRS; numeric rating scale.

opioid use was also higher in the spRARP group than in the mpRARP group. Several factors and variables may contribute to this observation. Firstly, discerning the difference between the two groups can be challenging because mpRARP is known for its relatively low pain levels when compared with traditional open or laparoscopic surgery (22,23). No differences were observed immediately after surgery or on POD day 1. Notably, the presence or

absence of gas inflation and the use of pressure maintenance system (AirSeal®, CONMED, Utica, NY, USA) can be a significant factor. This instrument is currently used not only for robotic surgery but also for laparoscopy and various surgeries (24,25). However, during the initial extraperitoneal spRARP operation at our hospital, it was difficult to maintain abdominal pressure due to the absence of this equipment. Additionally, subcutaneous air leakage occurred, and some patients complained of pain. However, the introduction of AirSeal® resulted in significant reduction in subcutaneous emphysema. Recent reports have highlighted the impact of using this equipment on postoperative of pain and surgical outcomes (24,25). We are hopeful that our research will also contribute to the advancement of spRARP and encourage its use. In addition, we routinely administer a patient-controlled analgesia pump after surgery; therefore, most patients do not complain of massive pain. Additionally, the NRS is a subjective scale for use by patients and nurses. The patient's pain level differed at each time point; however, we checked the NRS score at various times, except postoperatively.

Although extraperitoneal spRARP has various advantages, it also has certain limitations. First, there is a limitation of lymph node dissection. This is because the limited movement of an SP increases the difficulty of lymph node dissection. However, this is a limitation due to the extraperitoneal approach and is not a problem with the SP platform itself. Although it was difficult to analyze this limitation in our study because lymph node dissection was performed in a limited number of patients, several other spRARP studies have reported that sufficient lymph node dissection is possible (8,18,19). Another limitation is the lack of power of the arm compared with the multiport and the narrowness of the working space. To overcome this problem, we preferentially performed spRARP on small prostates. This could be a limitation of the study. Therefore, PSM was performed, and the feasibility of spRARP was confirmed by comparing the results after matching. In addition, we are now performing spRARP regardless of prostate size after our initial experience has been accumulated.

This study has limitations as it applied the SP robot system to a specific, small group of patients. The retrospective design also presents an important limitation, as it involved the selective inclusion of appropriate cases based on an initial experience with spRARP. To overcome this limitation, we conducted a PSM analysis; however, larger, well-designed comparative studies are needed. Nevertheless, our study provides a basis for improving spRARP in the future. In the era of precision prostate cancer surgery, it is important to maximize the patient's quality of life when oncological and functional outcomes are equivalent (8,26). The da Vinci SP platform embodies this endeavor. Its greatest strength lies in its ability to further reduce invasiveness without compromising safety and efficacy. In summary, spRARP demonstrated comparable or superior results to mpRARP and holds promise as a good surgical procedure that can be actively utilized in the future.

Conclusions

In our study, both extraperitoneal spRARP and transperitoneal mpRARP groups showed similar surgical outcomes without high complications. Furthermore, the spRARP group showed faster recovery. Therefore, extraperitoneal spRARP is viable procedure that is expected to become increasingly popular in the future. Of course, more research is needed for this.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://tau.amegroups.com/article/view/10.21037/tau-23-534/rc

Data Sharing Statement: Available at https://tau.amegroups.com/article/view/10.21037/tau-23-534/dss

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://tau.amegroups.com/article/view/10.21037/tau-23-534/coif). The authors have no conflicts of interest to declare.

Ethical Statement: 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 (as revised in 2013). The study was approved by Institutional

Review Board of the Ulsan University Hospital (No. 2023-08-048). The requirement for informed consent was waived because clinical data, including patient information and laboratory test results, were retrospectively obtained and analyzed.

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