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Modified Robotic Simple Prostatectomy Technique: A Retrospective Analysis of a Series of 162 Surgeries Performed by a High-volume Surgeon

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1. Abstract

Benign prostatic hyperplasia (BPH) affects up to 80% of men by age 80, and large-gland BPH is often treated by simple prostatectomy (SPE). This technique significantly improves symptoms but is associated with high rates of complications such as transfusions and infections. Minimally invasive techniques, including robotic-assisted laparoscopic simple suprapubic prostatectomy (RALSP), have emerged as alternatives. This study reports 162 patients who underwent RALSP from May 2018 to June 2023. The mean age of the patients was 69 years, the mean prostate volume was 144.8 cm³, the mean robot time was 78.7 min, and the mean blood loss was 183.1 mL. The results demonstrated significant improvements in the following parameters: prostate volume (mean decrease from 144.8 to 26.6 cm³), mean PSA level decreased from 7.8 to 0.8 ($p < 0.0001$), mean IPSS decreased from 23.0 to 4.4 ($p < 0.0001$), and mean uroflowmetry increased from 6.3 to 22.6 ml/s ($p < 0.0001$). No patient experienced worsening of erectile function after surgery. All patients showed an absence of stress urinary incontinence within 3 months. The catheterization time decreased from 4.2 to 2.6 days over the study period. The postoperative complication rate was 2.29%, with no need for surgical reintervention for complications. While the RALSP has shown promising results, further prospective studies are needed to compare it with other techniques. This study highlights the RALSP as a viable minimally invasive option for treating large volume BPH, as it offers reduced recovery times and fewer complications.

2. Introduction

Benign prostatic hyperplasia (BPH) is a highly prevalent condition in men, the incidence of which increases

progressively with age and affects up to 80% of men by age 80 [1]. Over the last few decades, a large variety of options for treating obstructive voiding symptoms and hematuria due to BPH have been developed, and various techniques, such as laser vaporization and enucleation, plasma vaporization, bipolar resection, and Holmium Laser Enucleation of Prostate (HoLEP), have proliferated. Despite these advancements, the standard treatment for obstructive urinary symptoms due to large-gland (> 80 g) BPH is simple prostatectomy (SP) [2]. In patients requiring surgery, the European Association of Urology (EAU) and American Urology Association (AUA) guidelines recommend open SP (OSP) for the surgical treatment of patients with large volume (>80 g) glands (www.EAU.org, www.AUA.org) [3, 4]. Obstructive adenomas are enucleated using the index finger, approaching from within the bladder (Freyer procedure) or through the anterior prostatic capsule (Millin procedure) [5, 6]. Open OSP substantially improved the International Prostate Symptoms Score (IPSS), urinary flow rate, quality of life, and postvoid residual volume. However, open SPs have also been associated with relatively high rates of perioperative transfusion, prolonged hospital stays, reoperations, and urinary infections [6]. Over the past few years, minimally invasive (laparoscopic and robotic-assisted) SPs have been implemented worldwide, with encouraging results. Minimally invasive techniques for OSP have been developed recently and may improve perioperative morbidity with equivalent treatment outcomes. Robotic-assisted laparoscopic simple suprapubic prostatectomy (RALSP) has been described as a novel alternative to open SP [6-8]. However, despite these promising results, few studies have reported the outcomes of the RALSP, and no prospective randomized comparative study of other enucleation techniques has proven its benefit [9]. Here, we describe our initial experience with the RALSP, with slight modifications to our technique to improve efficiency. Throughout the course of our practice, we have been able to reduce the postoperative bladdercatheterization time. We also report the simultaneous correction of inguinal hernias, thus highlighting this approach as a clear advantage. Additionally, we analyzed the associated morbidities and outcomes.

3. Materials and Methods

3.1 Patients and Materials

This was a retrospective analysis of the records of 162 patients who underwent surgery at two medical centers in the country by the same surgeon from May 2018 to June 2023. We included patients with a diagnosis of benign prostatic obstruction who underwent surgery for RALSP. The following data were collected: patient age, prostate volume preoperatively and up to 6 months after surgery, prostate-specific antigen (PSA) level preoperatively and postoperatively up to 6 months, IPSS preoperative and up to 6 months after surgery, urinary flow rate (Qmax) pre- and postoperative maximum, robotic surgical time, estimated blood loss during surgery, length of hospital stay, need for postoperative blood transfusion [3], duration of postoperative catheterization, use of anticoagulants or antiplatelets, presence of associated hernia, and need for reoperation. To assess differences, we used the nonparametric Wilcoxon test, adopting a significance level of 0.05, which corresponds to a 95% confidence interval. JMP Pro 13 (SAS Institute, Inc., Cary, NC, USA) was used for analysis.

3.2. Surgical Technique

All surgical procedures were performed using the Da Vinci robotic platform (Si, X, or Xi) via the same surgical technique and by the same surgeon. The technique described below was modified from that described by Patel in 2011 [10]. Six transperitoneal trocars were used, four of which were robotic, as follows: one 8-mm supraumbilical

trocar; two 8-mm robotic trocars bilaterally in line, 8 cm apart from the first trocar; and the last robotic trocar in line on the left, 8 cm from the previous trocar. Additionally, a 12-mm trocar in line on the right, at least 8 cm from the lateral trocar, and a 5-mm trocar bisecting between the camera ports and the right side, at least 5 cm from both, were used. The patient was positioned in the Trendelenburg position with a tilt of 25 to 28 degrees. The robotic instruments used were monopolar scissors, fenestrated bipolar forceps, tenaculum, and needle holders. A 0-degree camera was used throughout the procedure. An incision was made in the peritoneum while the bladder was lowered, and the fat was dissected during the vesicoprostatic transition. Preventive hemostatic ligatures in the vesicoprostatic transitions or the prostatic capsule, as described by Patel et al.[10], were not used. A capsular incision was made near the vesicoprostatic junction. The plane between the adenoma and the prostatic capsule was identified and dissected via a combination of cauterization and blunt dissection. The anterior vesical neck was then sectioned, followed by maximum anterior and lateral dissection of the adenoma. Next, the anterior commissure was sectioned until the urethra was reached, defining the apical limit medially. Unlike previously described techniques, the dissection of prostatic adenoma was through segmentation (sliced), allowing better access and clear visualization of the apex, with safer dissection of the urethra without injury to the sphincter (Figures 1 and 2). The lateral adenomas were first removed, with good identification of the posterior vesical neck limits, followed by resection of the apices and, when applicable, the median lobe. Dissection at the end of the posterior vesical neck, with or without a median lobe, allows for secure identification of the posterior adenoma, preventing residual benign tissue from being left behind. After complete removal of the adenoma, we reviewed hemostasis and suturing if necessary at points of greater bleeding with 3-0 Caprofyl. A 360 degree colo-urethral anastomosis was then performed using the shooting technique with two 3-0 V-lok sutures, following a modified van Velthoven technique (Figure 3), and a 20 fr Foley ureteral catheter was placed. Finally, the anterior prostatic capsule was hemostatically sutured to the anterior bladder wall. The fragments of the specimen were then placed in the endocath and removed through the small umbilical incision. In cases of associated inguinal hernia, classical dissection and reduction of hernia sacs were performed before the prostatectomy, with mesh placement at the end and peritoneal closure. Postoperatively, patients remained with bladder irrigation, received a light diet as soon as they were fully awake and were encouraged to ambulate early. Generally, irrigation was stopped after 24 hr, and patients were discharged between 24 and 48 hr after surgery.

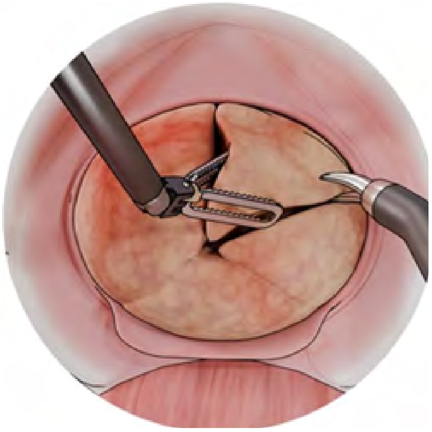


Figure 1: Adenoma segmentation.

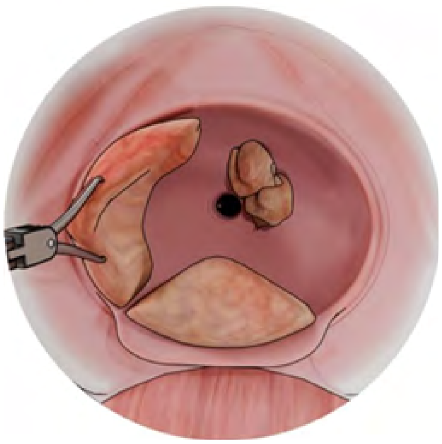


Figure 2: Clear visualization of the apex.

Figure 3: Modified van Velthoven anastomosis.

4. Results

We analyzed 162 medical records and identified 131 patients with complete data who underwent procedures

from January 6, 2018, to June 1, 2020. The mean age of the patients was 69.1±7.4 years, the mean prostate

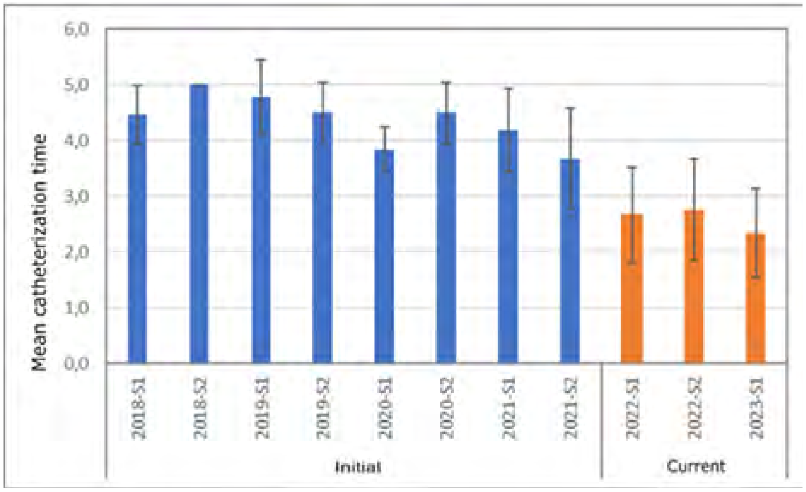
volume was 144.8±47.1 cm³ (90-478), the mean robot time was 78.7±9.3 min, and the mean blood loss was

183.1±9.3 mL (50-560) (Table 1). Among the 131 patients, 26 (19.8%) had an associated inguinal hernia and underwent correction during the same surgical procedure. In total, 24 patients (18%) had previously undergone transurethral resection of the prostate, and 24 (18%) were on antiplatelet or anticoagulant medication. Seven patients had an indwelling catheter before surgery due to urinary retention. Four patients had International Society of Urologic Pathologists grade 1 prostate adenocarcinoma and subsequently underwent robotic radical prostatectomy. During the evaluation period, the postoperative [6]. Catheterization time significantly decreased from 2018 to 2021 ($p < 0.0001$), from 4.2 days to 2.6 days (Graph 1). We evaluated patients by prostate volume, IPSS, PSA level, and uroflowmetry before and up to 6 months after surgery. The mean volume decreased from 144.8 to 26.6 ($p < 0.0001$), and the mean PSA level decreased from 7.8 to 0.8 ($p < 0.0001$). The mean IPSS decreased from 23.0 to 4.4 ($p < 0.0001$), and the mean uroflowmetry increased from 6.3 to 22.6 ml/s ($p < 0.0001$).

No patient experienced worsening of erectile function after surgery. All patients showed an absence of stress urinary incontinence within 3 months. To verify whether the differences between the groups were significant, we used the nonparametric Wilcoxon signed-rank test because the same patient was evaluated at both time points, as shown in Table 2. The postoperative complication rate was 2.29%, with no need for surgical reintervention for complications (Dindo-Clavien Grade I). Only three patients presented bladder clots postoperatively, which were resolved by bladder irrigation and clot aspiration via the bladder catheter. No patients required a blood transfusion.

We had no cases of urethral or vesicourethral anastomosis stricture requiring intervention. One patient required readmission for clinical treatment of an abdominal wall infection. The presence of postoperative incisional hernia was not evaluated.

Graph 1: Mean catheterization time.



The data are the mean±SD.

Table 1: Summary of analyzed variables.

Variable	Mean±SD	Median	Range	IQR
Age, years	69.1±7.4	69	47–90	65–74
Volume	144.8±47.1	140	90–478	118–160
Preoperative PSA level	7.8±3.9	6.7	1.9–18.8	4.7–9.8
IPSS	23.0±3.6	22.5	16–34	20–26
Robot time, min	78.7±9.3	77.5	62–128	72.5–82
Hospital stay, days	1.6±0.5	2	1–4	1–2
Blood loss, mL	183.1±93.4	150	150-560	120–220
Catheter time	3.6±1.1	4	02-6	2–4

IQR, interquartile range; PSA, prostate-specific antigen; IPSS, International Prostate Symptoms Score

Table 2: Comparison of variables before surgery and after 6 months.

Y	Time	N	Mean	Median	Range	IQR	p value
Volume	Presurger	131	144.8	140	90–478	118–160	<0.0001
	y		±47.1				
	6 months	127	26.6±7.2	27	5–42	20–32	
PSA	Presurger						
	y	131	7.8±3.9	6,7	1.9–18.8	4.7–9.8	<0.0001
	6 months	129	0.8±0.4	0.85	0.2–2.2	0.6–0.99	
IPSS	Presurger	108	23.0±3.6	22.5	16–34	20–26	<0.0001
	y						
	6 months	131	4.4±1.6	4	2–1	3–6	
Uroflow metry	Presurger	34	6.3±1.6	6.1	3.8–10	4.925–7.5	<0.0001
	y						
	6 months	34	22.6±3.0	22.75	16.7–28	20.22	
						24.57	

IQR, interquartile range; PSA, prostate-specific antigen; IPSS, International Prostate Symptoms Score

5. Discussion

The surgical approach for prostatic hyperplasia has evolved significantly with the use of the robotic platform, and various surgical techniques have been described. Our technique for robotic prostatectomy seems safe and effective for treating BPH. We observed significant improvements in prostatic symptoms (preoperative vs postoperative IPSS 23 ± 3.6 vs 4 ± 1.6, $p < 0.0001$), urinary flow rate (6.3 ± 1.3 vs 22.6 ± 3, $p < 0.0001$), and prostate volume (144 ± 47 vs 26.6 ± 7.2, $p < 0.0001$). In addition to the improvements described by Patel et al. [10], we believe that our modification allows for safer access to the prostatic apex and surgical planes. Prostate resection occurs

under complete visualization when we dissect the specimen in fragments. This approach reduces sphincter traction and facilitates the identification of the boundaries between the capsule and adenoma, allowing for more anatomical dissection, a better surgical field, improved hemostasis, less bleeding, and better [8] preservation of the bladder neck. Furthermore, even without suturing the prostatic capsule, we found less blood loss than that described by other groups [7,11]. A reduction in catheter time was possible because we observed good surgical outcomes with very low complication rates. Initially, in selected patients, we began to gradually reduce the catheter time while

maintaining good results. Today, a good proportion of patients are discharged within 48 hr without an indwelling bladder catheter. Younger patients with good bladder capacity, good-quality vesicourethral anastomosis, and no postoperative complications are candidates for early catheter removal. Conversely, older patients on antiplatelet or anticoagulant medications with previous urinary retention or prior transurethral resection of the prostate probably have longer catheterization times. In our study, earlier postoperative catheter removal did not affect surgical outcomes or increase the number of complications. No prospective randomized study has compared the RALSP with other techniques. However, a recent review by Kordan et al.[13] demonstrated that the technique can indeed be considered a minimally invasive surgery for prostates > 80 g, as indicated by functional results for IPSS, postvoid residual urine, Qmax, and quality of life as well as complication rates, blood loss, and hospitalization time compared with other techniques such as thulium laser vapoenucleation of the prostate (ThuLEP) and HoLEP.

In a recent meta-analysis [14], the RALSP was shown to be associated with longer hospital stays and catheterization times and greater TRs than was laser endoscopic enucleation of the prostate. However, when comparing the results from our study, the hospitalization times were similar for the RALSP and other techniques (hospital stay 1.6 vs 1.71 days). The same study [14] demonstrated the superiority of the ThuLEP over the RALSP in terms of surgical time. This superiority was not demonstrated when considering the mean surgical time of our case series (78.7 vs 85 min). According to the meta-analysis of Pandolfo et al. [9], the catheterization time was significantly shorter in patients who underwent HoLEP and ThuLEP than in other patients. However, compared with those in the second phase of our study, which involved a shorter catheterization time, the catheterization time was shorter for patients who underwent RALSP than for those who underwent laser enucleation (2.6 vs 3.54 days). Given these comparisons, the RALSP may be superior to other techniques for hospitalization, catheterization, and surgical time. A potential disadvantage of our technique could be the difficulty in resecting the intravesical component of a larger median lobe. For less experienced surgeons, lower prostatic exposure due to the subcapsular, extravesical approach might hinder identification of the intravesical median lobe. The limitations of this study include its retrospective design and the reliance on results from a single surgeon. However, the number of cases reviewed, the reproducibility of the surgical technique, and the uniformity of the identified data greatly favor the applicability of the method. We believe that access to the robotic platform is increasingly feasible for most urologists, and by providing updated information on the clinical outcomes of robotic adenectomy, we hope to contribute to clinical decision-making and assist colleagues in choosing the best surgical approach for patients with BHP [9].

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