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Original article

Robotic simple prostatectomy: Initial single-center experience in Taiwan

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ABSTRACT

Objective: For patients with symptomatic large volume benign prostate hyperplasia, open simple prostatectomy has traditionally been the treatment of choice but laparoscopic simple prostatectomy (LSP) has become an effective surgical option. Since the first case of LSP was described in 2002, surgeons have continued to expand the use of minimally invasive surgery. In 2008, the first case of robotic simple prostatectomy (RSP) was reported. We herein report our initial experience with robotic simple prostatectomy.

Materials and methods: We performed retropubic robotic simple prostatectomy using a transperitoneal approach in 10 patients. All of them had significant symptomatic prostate enlargement confirmed by abdominal or transrectal ultrasound (mean 138.2 mL). Demographic data, perioperative outcomes, and functional outcomes were recorded.

Results: The median age of patients was 68 years (range 60–76 years). The median International Prostate Symptom Score at baseline was 24 (range 18–34). The median operation time was 150 minutes (range 130–180 minutes). The median estimated blood loss was 100 mL (range 50–850 mL). Intraoperative blood transfusion was required in one patient (10%). The median resected prostate weight was 77.5 g (range 60–120 g). The median hospital stay was 5 days (range 3–5 days). The median urethral catheterization was 12 days (range 9–14 days). All of these patients gained significant improvement in maximum urine flow rate (preoperative vs. postoperative 9.8 mL/min vs. 21.5 mL/min, $p = 0.001$) and postvoid residual urine (preoperative vs. postoperative 125 mL vs. 10 mL, $p = 0.001$).

Conclusion: Robotic simple prostatectomy is a feasible alternative for a greatly enlarged prostate gland with acceptable complications.

1. Introduction

Benign prostatic hyperplasia (BPH) is the most common cause of lower urinary symptoms in the aging male population. The most common surgical intervention for BPH is transurethral resection of the prostate. However, prolonged resection time can lead to hemorrhage or transurethral resection syndrome. For patients who have a greatly enlarged prostate, open simple prostatectomy (OSP) provides good long-term functional outcome.[1] However, OSP was associated with a significant risk of perioperative complications and prolonged hospitalization.[2,3] After the first pure laparoscopic simple prostatectomy (LSP) described by Mariano et al[4] in 2002, several subsequent series demonstrated encouraging outcomes.[5] However, LSP did not gain popularity among urologists because of its technical difficulties. In 2008, Sotelo et al[6] reported the first case of robotic simple prostatectomy (RSP). The steep learning curve associated with conventional laparoscopy was overcome using the robotic system.[7] Recently, the minimally invasive approach has been used more frequently in urologic surgery. Robot-assisted laparoscopic surgery is an alternative surgical option with potential benefits. In this report, we describe our initial experience and evaluate the feasibility of robot-assisted simple prostatectomy.

2. Materials and methods

Robotic simple prostatectomy was performed in 10 patients in our institution. All of them had symptomatic benign prostate

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hyperplasia and failed medical therapy. All patients had a prostate volume >80 mL, as estimated by either abdominal or transrectal ultrasound. Five patients (50%) experienced urinary retention and two patients (20%) were catheter dependent prior to the operation. One patient (10%) experienced gross hematuria. All patients received transrectal biopsy due to high prostate-specific antigen (PSA) levels (range 4.5–60.6 ng/mL) and all biopsy specimens were reported to be benign prostate hyperplasia cases. Preoperative evaluation included medical history review, physical examination, PSA test, International Prostate Symptom Score, uroflowmetry data, and postvoid residual urine (PVR) test. For patients with hematuria, preoperative urine cytology examination, intravenous pyelography, and cystourethroscopy were performed for detection of urinary lesions. Postoperative assessment included pathologic data, PSA, uroflowmetry, and PVR.

2.1. Surgical technique

Each patient was given general anesthesia and was positioned in the steep Trendelenburg position. We used a four-arm da Vinci surgical system with six ports and adapted the transperitoneal approach. The bladder was mobilized using standard procedure and Retzius' space was reached. Preprostate fat was cleared and the anterior surface of the prostate was exposed. Two rows of hemostatic sutures for control of the Santorini plexus were used. A transverse capsular incision was made with electrocautery, approximately 2 cm from the vesicoprostatic junction. Dissection of the adenoma from the prostatic capsule was performed using robotic curved scissors and blunt dissection. The bulging bilateral lobes were enucleated separately. If a median lobe was present, it was subsequently dissected while preserving a strip of the overlying mucosa. Lastly, the apical lobe was dissected and transected from the point of the urethra carefully to avoid injury to the external sphincter. The bladder neck mucosa was approximated to the prostate apex using a 3-0 Monocryl suture to achieve retrigonization. The anterior prostatic capsule was closed in a watertight manner. A silicon Foley balloon was inflated with 40 mL of distilled water and traction was applied.

3. Results

We successfully performed retropubic robotic simple prostatectomy with a transperitoneal approach in 10 patients. The baseline clinical characteristics of the 10 patients are presented in Table 1. The perioperative outcomes are summarized in Table 2. Robotic simple prostatectomy allows for a concomitant procedure. In one of the 10 patients, right-side inguinal hernioplasty using mesh was performed. Two patients (20%) had urethral catheter occlusion caused by blood clots, which required recatheterization and bladder irrigation. Postoperative cystogram was routinely performed, which revealed a small leak in two asymptomatic patients (20%) that required longer catheterization (13 days and 14 days, respectively). Adenocarcinoma of the prostate was identified in one patient (Gleason score 3 + 3 = 6, tumor amount 1%). This patient received observation initially but was lost to follow up after 1 year. Functional outcomes are shown in Table 3. The median postoperative PSA was 0.58 ng/mL (range 0.13–1.42), indicating a 94% reduction compared with the preoperative PSA. Both postoperative Q_{max} and PVR showed significant improvement when compared with the preoperative baseline data.

Table 1
Baseline clinical characteristics of patients.

Variable	Mean	Median	Mode	Range
Age (y)	67.9	68	68	60–76
BMI (kg/m^2)	25	24.9	23.2	23.1–28.3
I-PSS preoperative (ng/mL)	25.1	24	18,24	18–34
PSA preoperative (ng/mL)	15.9	10.5	N/A	4.5–60.6
Estimated prostate volume (mL)	138.2	139	N/A	91–187
Q_{max} preoperative (mL/s)	9.9	9.8	9.8	5.9–13.1
PVR preoperative (mL)	127.3	122	N/A	100–184

BMI = body mass index; I-PSS = International Prostate Symptom Score; N/A = not available; PSA = prostate-specific antigen; PVR = postvoid residual urine; Q_{max} = maximum flow rate.

Table 2
Perioperative data.

Variable	Mean	Median	Mode	Range
Operation time (min)	146	150	150	130–180
Blood loss (mL)	208	100	100	50–850
Resected adenoma weight (g)	79	77.5	60	60–120
Hospitalization (d)	4.5	5	5	3–5
Catheterization (d)	11.6	12	13	9–14

4. Discussion

To select the appropriate surgical intervention for symptomatic BPH, the size of the prostate gland is an important consideration. For prostate adenoma <80 mL, transurethral resection of the prostate is recognized as the standard of surgical treatment. For patients with prostate adenoma larger than 80 mL, both OSP and transurethral holmium laser enucleation are recommended by European Association of Urology guidelines.[8]

In 1894, Eugene Fuller performed the first suprapubic prostatectomy and it was popularized by Peter Freyer in 1900.[9] In 1945, Terence Millin first performed retropubic simple prostatectomy.[10] The retropubic approach provides better prostate exposure, direct visualization of prostate adenoma during enucleation to ensure complete removal, direct visualization of prostate fossa after enucleation to control bleeding, and precise division of prostatic urethra to preserve urinary continence and minimize bladder trauma. The suprapubic approach allows better visualization of the bladder neck and ureteral orifices, which is suitable in patients with a protruding median lobe, concomitant bladder diverticulum, and large bladder calculus. Retropubic simple prostatectomy can be more challenging in patients with a large median lobe. Incision was made over the overlying mucosa at the level of bladder neck and the median prostate adenoma was dissected carefully from bladder neck muscle. By preserving the bladder neck, injury to the iatrogenic ureteral orifices can be avoided. In addition, prophylactic insertion of ureteral stents and intravenous injection of indigo carmine dye could help identify

Table 3
Prostate-specific antigen, maximum flow rate, and postvoid residual urine on follow up.

Variables	Mean	Median	Mode	Range	*p*
PSA preoperative (ng/mL)	15.9	10.5	N/A	4.5–60.6	0.014
PSA postoperative (ng/mL)	0.55	0.58	N/A	0.13–1.42	
Q_{max} preoperative (mL/s)	9.9	9.8	9.8	5.9–13.1	0.001
Q_{max} postoperative (mL/s)	24.5	21.5	N/A	11.6–36.5	
PVR preoperative, mL	180	125	N/A	100–430	0.001
PVR postoperative (mL)	14.3	10	10	6–29	

N/A = not available; PSA = prostate-specific antigen; PVR = postvoid residual urine; Q_{max} = maximum flow rate.