

Laparoscopic simple prostatectomy with prostatic urethra preservation for benign prostatic hyperplasia

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Objective: Laparoscopic simple prostatectomy for large volume benign prostatic hyperplasia (BPH) has been reported in the literature and may be a viable alternative to open surgery for large prostate glands. While previous publications have shown comparable outcomes between laparoscopic and open simple prostatectomy, there have been few publications describing improved laparoscopic operative technique to further improve these outcomes. The authors describe a novel technique of prostatic urethra preservation during laparoscopic simple prostatectomy.

Materials and methods: From January 2006 to September 2009, laparoscopic simple prostatectomy with prostatic urethra preservation was performed in 51 patients with symptomatic BPH. This technique included extraperitoneal insufflation of the retropubic space by balloon dilation, placement of five trocars in an inverted U shape, transverse prostatic capsular incision, development of a subcapsular plane, and removal of prostatic adenoma with preservation of the prostatic urethra followed by suturing of the prostatic capsule. Demographic, perioperative and outcome data were recorded.

Results: The mean operative time was 126±51.98 min and the estimated blood loss was 232.55±199.54 mL. Significant improvements were noted in the International Prostate Symptom Score (IPSS), quality of life (QOL) questionnaires and maximum flow rate (Q_{max}) of patients three months after surgery. No incontinence was reported in any patient. Moreover, there was no significant difference in the 5-Item International Index of Erectile Function (IIEF-5) score pre- and post- operatively in patients who had erectile function before surgery and no patient complained of retrograde ejaculation during the postoperative follow-up period.

Conclusions: Laparoscopic simple prostatectomy with prostatic urethra preservation for benign prostatic hyperplasia is feasible and reproducible. With this technique, postoperative morbidity can be reduced and antegrade ejaculation preserved.

Keywords: Benign prostatic hyperplasia; laparoscopy; prostate; prostatectomy

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Introduction

Surgery is the treatment of choice for patients with benign prostatic hyperplasia (BPH) who have failed medical treatment and watchful waiting (1). Transurethral resection of the prostate (TURP), transurethral incision of the prostate (TUIP) and open simple prostatectomy

are the conventional surgical options. Transurethral needle ablation, thermotherapy, and laser vaporization or enucleation have also been used to treat BPH (2). However, open simple prostatectomy remains the technique of choice in the majority of patients with BPH associated with a large prostate gland in many centers.

Laparoscopic simple prostatectomy has been reported as an alternative to open surgery with encouraging initial results (3-8). The surgical procedures published mimicked retropubic simple prostatectomy either in an extraperitoneal or transperitoneal fashion. They suggested comparable outcomes with regards to improved urinary symptoms but possible benefits with regards to hospital stay, duration of catheterization, and blood loss. Postoperatively, continuous bladder irrigation can be required in some patients due to excision of a portion of prostatic urethra during the operation. Retrograde ejaculation may also be a long term complication related to this operative technique (4). Here we describe a novel technique of laparoscopic simple prostatectomy with prostatic urethra preservation which may minimize both of these surgical morbidities.

Materials and methods

A retrospective review of all laparoscopic simple prostatectomies performed between January 2006 and September 2009 at a single institution was undertaken. Preoperative evaluation included history and physical examination, digital rectal examination, and uroflowmetry as well as routine laboratory tests including prostate specific antigen and serum creatinine. All patients were asked to complete the International Prostate Symptom Score (IPSS), and quality of life (QOL) questionnaires pre- and post-operatively. Patients' surgical outcomes were assessed utilizing the IPSS, QOL, and maximum flow rate (Q_{max}) three months after surgery. The pre- and post-operative erectile function was evaluated in 26 patients that were able to achieve and maintain erections adequate for sexual intercourse preoperatively, and the ejaculatory function was evaluated in 20 patients that regained erections postoperatively. The 5-Item International Index of Erectile Function (IIEF-5) questionnaire was administered before & after surgery. Statistical analysis was performed using bivariate analysis and a two-tailed paired test.

Surgical technique

During this procedure, the patient is given general anesthesia and placed in a steep Trendelenburg position. A 2-4 cm midline incision is made just above pubic symphysis. A self-made balloon is introduced into the space of Retzius and 1000 cc of air is injected into the balloon. This balloon dilation is maintained for 3 minutes to distend the extraperitoneal space. The right or left caudal-most trocar

is then inserted through a separate skin incision under guidance by an index finger. Once the laparoscope is placed through this first trocar, the other 4 trocars are inserted under direct vision. In this fashion, the five extraperitoneal trocars are placed forming an inverted U shape. Blunt dissection is then used to clear the fatty tissue overlying the prostate. Once the anterior surface of the prostate capsule is reached, the dorsal venous complex is controlled by the Ligasure™ device, then a transverse incision is made through the prostatic capsule by J-hook electrocautery or harmonic scalpel. The plane of cleavage is defined between the adenoma and the capsule with careful blunt and sharp dissection using the harmonic scalpel. After freeing up the anterior and lateral surfaces of each lateral lobe, the anterior midline of the adenoma is incised. The anterior surface of the urethra can be seen clearly at this point by pulling the 18-Fr catheter introduced at the start of surgery back and forth. Each lateral lobe is then separated from the urethra by sharp scissor or harmonic scalpel dissection, while the remainder of the adenoma is removed by either blunt or sharp dissection from the posterior capsule. A sponge is placed temporarily within the prostatic fossa for hemostasis. The integrity of the urethra is then tested by irrigating the bladder and any visible urethral defect is closed using 3-0 polyglactin suture. The prostatic capsule is closed with a 2-0 polyglactin running suture. A Jackson-Pratt drain is inserted at the end of the case and the specimen is bagged and extracted from the suprapubic incision. In our series, 3 patients were known to have bladder calculi and during that case, the bladder was opened and bladder stones were removed. The cystotomy was subsequently closed primarily. Another patient had a bladder diverticulum, and laparoscopic diverticulectomy was performed after the simple prostatectomy portion of the procedure was completed.

Results

From January 2006 to September 2009, laparoscopic simple prostatectomy with prostatic urethra preservation was performed in 51 patients with BPH at our institution. The average patient age was 70.5 ± 7.38 years (range 47-83 years). For all patients, the indication for prostatectomy was obstructive lower urinary symptoms which had failed medical therapy. Preoperative transrectal ultrasound (TRUS) revealed mean estimated prostatic gland weight of 126.3 ± 54.84 gm (range 62-365 gm). There were two conversions to open simple prostatectomy in our series, and these patients were excluded from subsequent

analyses. One conversion was due to difficulty establishing extraperitoneal insufflation secondary to prior appendectomy, while the other conversion was due to the presence of a large median lobe of the prostate resulting in severe bleeding. For patients included in this analysis, the mean operative time was 126 ± 51.98 min (range 37-270 min). Mean estimated blood loss was 232.55 ± 199.54 mL (range 50-1000 mL). Mean surgical specimen weight was 65.12 ± 48.53 gm (20-249 gm). Two patients received blood transfusions. During the first two cases of this series, the prostatic urethra was injured secondary to blunt dissection of the urethra from surrounding adenoma. Our technique was changed to sharp dissection using scissors or harmonic scalpel for all subsequent cases. The urethra was preserved intact in 28 cases and in 19 cases, a small urethral perforation was noted. Each of these injuries was easily repaired at the time of surgery.

Overnight postoperative continuous bladder irrigation was initiated for cases where urethral injury was deemed to have been more significant during surgery by the operative surgeon. Forty (81.6%) patients did not need bladder irrigation. The mean Foley catheter duration was 7.39 ± 3.1 days (range 2-14 days). All patients ambulated and started oral intake on postoperative day 1. There were no significant postoperative complications experienced. Histopathology reported BPH in 46 patients, and 31 cases were associated with inflammation. Prostate cancer was found incidentally in 2 patients, and benign fibroma was reported in 1 patient.

Laparoscopic simple prostatectomy with prostatic urethra preservation resulted in significant improvement in mean IPSS score (23.5 ± 6.1 preoperatively *vs.* 5.22 ± 2.9 postoperatively, $P < 0.01$), QOL (4.85 ± 0.74 preoperatively *vs.* 1.11 ± 0.84 postoperatively, $P < 0.01$) and Q_{max} (5.5 ± 3.17 mL/s preoperatively *vs.* 18.47 ± 5.76 mL/s postoperatively, $P < 0.01$) three months after surgery. No patients reported any postoperative incontinence. Moreover, there was no significant difference regarding IIEF-5 score pre- and post- operatively (12.62 ± 3.11 *vs.* 11.65 ± 4.09 , $P > 0.05$) in 26 patients who had reported erections adequate for intercourse before surgery. Twenty of these 26 patients who were sexually active before surgery regained erections postoperatively and all of them reported normal antegrade ejaculation postoperatively although 4 patients did complain of ejaculatory pain.

Discussion

TURP, TUIP and open prostatectomy are the conventional

surgical options for patients who have failed medical management for their BPH. TUIP is efficacious for glands up to 30 cc, while TURP is the long established gold standard endoscopic surgical procedure for adenomas larger in size. The operative morbidity of TURP increases when it is performed for prostatic adenomas larger than 45 gm, in procedures lasting more than 90 minutes, or in patients older than 80 years of age or with a history of acute urinary retention (9,10). Open prostatectomy is the treatment of choice for large glands not amenable to TURP. However, open surgery is associated with a longer hospitalization and recovery period. The incidence of wound infection is relatively high and duration of urethral catheterization can be quite long.

Laparoscopy has become a well-established tool in the management of prostatic carcinoma. In 2002 Mariano *et al.* first reported the use of laparoscopic prostatectomy for benign prostatic hypertrophy (11). Recently, these authors published their six-year experience with laparoscopic simple prostatectomy for BPH in larger sized glands. Sixty patients were treated with transperitoneal laparoscopic prostatectomy with vascular control. The average prostate gland weight was 144.50 ± 41.74 gm with mean operative time of 138.48 ± 23.38 minutes and mean estimated blood loss of 330.98 ± 149.52 mL. None of these patients experienced postoperative urinary incontinence (4). Van Velthoven *et al.* reported their initial experience with laparoscopic extraperitoneal Millin prostatectomy in 18 patients. Their technique included hemostatic control of lateral venous vesicoprostatic pedicles, transverse anterior incision of the prostate capsule, adenoma enucleation using harmonic scalpel, and reconstruction of the posterior bladder neck and prostate capsule. Mean operative time was 145 minutes and mean blood loss 192 cc (5). Sotelo *et al.* published their experience with laparoscopic simple retropubic prostatectomy in 17 patients. This technique included transverse cystotomy just proximal to the prostatovesical junction, subcapsular development of the surgical plane, prostatic adenomectomy, prostatic fossa trigonization, and prostatic capsule suture repair. Mean operative time was 156 min (range 85-380 min). Mean blood loss was 516 mL (range 100-2500 mL). All patients reported complete continence during a follow-up period of 1 month to 2 years (3).

Baumert *et al.* compared laparoscopic and open simple prostatectomy and concluded that laparoscopic simple prostatectomy was superior to open technique with regard to hospital stay, duration of urethral catheterization,

and blood loss (12). Porpiglia *et al.* also concluded that laparoscopic technique was comparable to that of open surgery but offered the advantage of lower peri-operative blood loss (13). As the experience of routine laparoscopic simple prostatectomy has increased, robot-assisted and single port laparoscopic techniques have been applied to the field with promising results (14,15).

All these reports have demonstrated that laparoscopic prostatectomy for BPH associated with a large gland is feasible and promising. However, with the exception of a single published case performed with robotic assistance, the prostatic urethra was not preserved during surgery, which can lead to retrograde ejaculation (4). In addition, with these techniques, bladder irrigation was needed in the vast majority of patients postoperatively. Also, urethral stricture may be a potential long-term complication of any procedure requiring excision and re-approximation of the prostatic urethra.

Our concept of preservation of the prostatic urethra was based on the Madigan prostatectomy technique (16,17). Initially, blunt dissection of the adenoma off the anterior prostatic urethra resulted in significant urethral injury, but shifting to sharp scissors or the harmonic scalpel to cut the connective tissue along the plane between the adenoma and urethra subsequently resulted in the urethra being well-preserved. In cases of small incidental perforation of the urethra, a repair could be very easily performed using 3-0 polyglactin suture at the time of surgery. With our technique, the prostatic capsule is not closed as described by conventional Madigan technique. Rather, the prostatic capsule is closed using a running suture for both prevention of urinary leakage in the case of possible urethral perforation, and also to assist in hemostasis. Since the urethra is well preserved with our technique, bladder irrigation is not needed in the majority of patients.

We use several other modifications for our technique compared to techniques previously published in the medical literature. We make a 2-4 cm incision above the pubic symphysis and used a balloon to dilate the pre-peritoneal space. The most caudal trocar on the right of left side is inserted into the extraperitoneal space guided by an index finger introduced through the incision. Once the laparoscope is placed through the first trocar all other trocars are then inserted under direct vision. This initial midline incision is then used to extract the specimen at the end of surgery. In our experience, this method of insufflating the extraperitoneal space is easy to perform and very useful. While most authors make use of a hemostatic stitch on the dorsal venous complex to prevent backbleeding

before enucleation of the adenoma, we did not find this necessary. In our experience the bleeding was not severe and easy to control after entering the plane between adenoma and capsule. A final technical modification is selection of a transverse incision at the base of the prostate made as broadly as possible. We find that this incision is adequate for dissection of the adenoma so that it becomes unnecessary to open the endopelvic fascia.

Using our technique, significant improvements in the maximum urinary flow, IPSS and QOL were achieved, comparable to results previously published. Furthermore, we found no significant difference in erectile function before and after surgery, and all patients who regained erections postoperatively reported normal antegrade ejaculation. These results are very encouraging and may represent improved morbidity for laparoscopic simple prostatectomy, though more experience is needed.

Only patients with large benign adenoma lacking a median lobe were included in this series, since a median lobe was believed to be a contraindication for a Madigan prostatectomy. This may be a limitation for laparoscopic simple prostatectomy with prostatic urethra preservation. The presence of a median lobe was evaluated by ultrasound or MRI preoperatively. In the one patient where a median lobe was unrecognized, the procedure was converted to open surgery since it was extremely difficult to remove the median lobe while preserving the urethra. Our recent practice has been to routinely perform cystoscopy before laparoscopic simple prostatectomy in order to ensure the absence of a significant median lobe. In patient with a large median lobe, we would offer alternative surgical treatment such as TURP or simple open prostatectomy.

In summary, laparoscopic simple prostatectomy with prostatic urethra preservation for BPH with large-sized prostatic glands is feasible and reproducible. Postoperative bladder irrigation can be avoided and antegrade ejaculation preserved.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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