Laparoscopic Simple Prostatectomy: A Single Center Experience with A Long-Term Follow Up

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ABSTRACT

Purpose: The aim of this retrospective study is to assess the long-term outcomes and safety of laparoscopic simple prostatectomy.

Material and Methods: Between 2012 and 2019 80 patients with prostates volumes ≥ 80 mL were treated with laparoscopic simple prostatectomy at our department. Uroflowmetry, post void residual volume and standardized questionnaires were assessed pre- and postoperatively. Perioperative complications were categorized using the Clavien-Dindo classification.

Results: The mean specimen weight was 83 grams, and the mean operation time was 156 minutes. At a mean follow-up time of 40 months patients showed a significant improvement of Q_{max} ($P = .002$), IPSS ($P < .001$) and QoL ($P < .001$). Post void residual volumes decreased significantly.

Complications occurred in 11 patients (13.8%), nine had mild (grade 1 - 2) and two had severe (grade 3b - 4a) complications. One conversion to open surgery due to massive prostatic adherence from previous abscess formation was recorded and one patient needed blood transfusion intraoperatively.

Conclusion: laparoscopic simple prostatectomy is an effective and safe procedure for large volume prostate glands with a significant and stable long term symptoms improvement.

1 Introduction

Benign prostate hyperplasia is the most common aetiologic factor of lower urinary tract symptoms (LUTS) with a prevalence of 70% in aging male [(1)]. While men affected with mild to moderate LUTS are treated conservatively by either watchful-waiting or medical therapy, patients who suffer from severe obstructive LUTS should be treated with surgery. Transurethral resection of the prostate (TURP) is the current standard of surgical technique for patients with moderate to severe LUTS with prostate size of 30-80 mL [(2)]. According to the EAU guidelines, open simple prostatectomy (OSP), laser or bipolar enucleation should be offered to men with prostate size ≥ 80 mL. OSP is the oldest surgical treatment approach for large prostate glands. This extensive procedure is related with high complication rates as well as both long catheterization duration and length of hospital stay [(2)]. With the goal of reducing those comorbidities and the invasiveness of OSP, minimal invasive techniques, including laparoscopic and roboter-assisted simple prostatectomy (RASP), were implemented in the disease management of large prostate glands. The technique for laparoscopic simple prostatectomy (LSP) was first published in 2002 and for RASP in 2008 [(3,4)]. A review of randomized controlled trials concluded, that none of the above-mentioned techniques can be considered superior to another when treating large prostate adenomas [(5)]. Another recent review found that LSP is a viable alternative to OSP with comparable outcome and significant advantages in terms of blood loss, length of hospital-stay and catheterization period [(6)], though only a few case series were published on this matter [(7–11)].

The aim of this study was to report outcomes and complications of LSP over a long-term follow-up period.

2 Materials and Methods

Study population

The study was performed retrospectively with a total of 80 consecutive patients who underwent LSP between 2012 and 2019 at our department. The indication for LSP was moderate to severe LUTS with prostate larger than 80 mL measured by transrectal ultrasonography. Patients either did not respond to medical treatment or refused medical treatment but requested surgical intervention. Patients with previous urinary retention and indwelling catheter were included in the study.

Surgical technique

LSP was performed by two laparoscopically trained surgeons with an extraperitoneal approach as previously described by Mariano et al [(3)]. This study includes both of their learning curves for LSP. Access to the adenoma was achieved by a transcapsular incision first performed by Millin for OSP [(12)]. After extraction of the Adenoma, we used two V-loc™ sutures to close the prostate capsule. On the fourth postoperative day a routine cystography was performed to confirm bladder integrity before catheter removal.

Outcome assessment

Follow-up assessments were routinely done at three and six months postoperatively and then annually with uroflowmetry, post void residual volume (PVR) and standardized questionnaires, such as IPSS, IIEF and QoL. Charlson Comorbidity Index was used to assess comorbidities. The Clavien-Dindo classification of surgical complications was utilized to categorize postoperative complications [(13)].

Statistical Analysis

Statistical analysis was performed with the Wilcoxon signed-rank test using SPSS v 16 software program for Windows (SPSS®, Inc., Chicago, IL, USA). Continuous variables were summarized using medians and interquartile ranges (IQR). A p-value less than 0.05 was considered statistically significant.

3 Results

Preoperative characteristics are reported in **Table 1**. The mean preoperative prostate volume was 130 mL (115 - 150). 35 (43.8%) of our patients had an indwelling catheter prior to operation. Charlson comorbidity Index showed low (1 - 2 points), intermediate (3 - 4 points) and high risk (≥ 5 points) in 29 (36%), 49 (61%) and 2 (3%) respectively. 3 Patients needed bridging of their anticoagulation medication. Mean surgery time was 156 minutes (134 - 193) with an average measured resection weight of 83g (70 - 104). Concomitant hernia repair was performed in 15 patients (18.8%). Bladder calculi were removed in one patient. One patient (1.3%) needed blood transfusion intraoperatively. A conversion to open surgery due to massive prostatic adherence from previous abscess formation was necessary in one patient (1.3%). Four (5%) Patients showed urine extravasate in the cystography and they all achieved bladder integrity after extending catheterization for seven days.

The mean hospital stay was nine days (8 - 9). Histopathology revealed incidental prostate cancer in 12 (15%) patients. The mean follow-up time was 40 months (25 - 56).

Five patients developed mild stress incontinence which resolved within the first three postoperative months. Postoperative outcome is summarized in **Table 2**. A significant improvement of Q_{max} from 9.6 to 30.2 mL/s ($P < .001$) was recorded. The PVR decreased from 100 to zero mL. The PSA levels decreased from 11 to 1 ng/mL following LSP ($P < .001$). Both IPSS and QoL scores showed significant improvements ($P < .001$). No significant postoperative changes in IIEF score were recorded. During follow-up, none of our patient needed re-treatment for micturition problems.

Postoperative complications are reported in **Table 3**. Overall complication rate was 13.8%, most of which were grade one (7.5%).

4 Discussion

Our study confirms LSP to be an effective and safe surgical technique for large prostate glands. To date there are only a few publications covering LSP, mostly with small patient series [8–11]. The strength of our study is the large patient cohort in addition with the long follow-up period to evaluate the efficacy and the safety of LSP. Our study confirms significant improvements in clinical parameters and QoL, as reported by other studies [3,6,11]. So far, the main disadvantage of LSP seems to be the longer operating times compared to OSP [6]. A recent review compared operating times of LSP to RASP and concluded that LSP operating time seems to be shorter than RASP's [14]. We report a mean operating time of 156 minutes which is comparable to other LSP series, furthermore we observed higher prostate volumes (130 mL) than comparable studies (94 – 122 mL), which my contribute to longer operating times [8–11,15]. These findings could be biased by the learning curve of our surgeons. Lombardo analyzed the impact of the learning curve on duration of LSP [16]. They conclude that experienced laparoscopic surgeons needed 15 procedures to reach a plateau in operating time. Another quality feature is the length of hospitalization. The mean hospital stay of our patients was nine days, while other authors report shorter hospitalization periods from two to eight days. However, in some studies patients were discharged with indwelling catheters to reduce hospitalization [8–11,15]. None of our patients were discharged with indwelling catheters.

Laser enucleation of the prostate is already well implemented surgical technique to treat men with moderate-to-severe LUTS recommended by the EAU for large prostate glands. Randomized controlled studies concluded that Holmium-laser enucleation of the prostate (HoLEP) is as effective as OSP and TURP [2]. Recently two studies compared LSP with HoLEP. Juaneda observed similar short term functional outcomes with shorter hospital stays, shorter catheterization times and lower economic costs for the HoLEP arm [17].

Fuschi conducted the first prospective randomized controlled study comparing HoLEP with LSP and RASP [18]. No significant differences were found regarding functional and perioperative outcome.

Another recent study presented a head-to-head comparison between thulium laser enucleation of prostate and LSP. Bertolo et al concluded that both surgical techniques are comparable in relieving from benign prostate obstruction [19].

RASP offers many advancements of the surgical technique, as recently reported [20,21]. Simone et al described a complete urethral-sparing approach intended for young men interested in obtaining antegrade ejaculation [20]. In a subsequent paper this new surgical approach was compared to standard RASP utilizing the BPH-6 score, a validated outcome and quality of life assessment for endourological treatment of LUTS [22]. They concluded that the urethral sparing approach significantly reduces ejaculatory dysfunction.

Generally, the choice of surgical treatment mainly depends on the technical equipment and the surgeon's preference.

In our population we registered mild to moderate erectile function preoperatively without deterioration postoperatively. Sotelo and Autorino reported no significant deterioration in erectile function too [8,23].

Overall, we report complications in 13% of our patients, from which the vast majority were minor. A recent large-scaled review of 843 patients who underwent LSP at 23 international institutions made a thorough breakdown of all complications. They reported 74 (8.8%) complications most of which were minor (93.3%) [23]. Another systematic review with a mixed field of LSP and RASP found an overall complication rate of 13.6% with hemorrhage requiring transfusion being the most common [6]. The most recent literature review reported adverse events in 26.1% percent of all included LSP cases [14].

Only 1.3% of our patients needed intraoperative blood transfusion which compared to international data (3.3% to 29.4%) implies an insignificant loss of blood at our department [8–11,15].

Regarding perioperative complications a recent review found no significant difference between laparoscopic and open surgery with hemorrhage requiring blood transfusion being the most common one [6]. These conclusions differ from another review which suggests that LSP is associated with lower complication rates [14].

Our series is not devoid of limitations. Certainly, the retrospective nature of this study could imply selection bias. The before-after design is prone to regression to the mean, which must be considered in the interpretation of the outcome.

5 Conclusions

LSP is a safe and effective surgical technique for large prostate glands and seems to be equivalent to currently recommended treatment options with low complication rate in a trained laparoscopic center. Further randomized-controlled studies need to be conducted to confirm these conclusions.

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Abreviations:

HoLEP – Holmium-laser enucleation of the prostate

IQR - inter quartile range

LSP - laparoscopic simple prostatectomy

LUTS - lower urinary tract symptoms

OSP - open simple prostatectomy

PVR - post void residual

RASP - roboter-assisted simple prostatectomy

TURP - transurethral resection of the prostate

Table 1. Perioperative characteristics of laparoscopic simple prostatectomy.

	Mean	**Inter-Quartile Range**
Age, year	69	65 - 74
BMI, kg/m²	27	24.4 - 28.7
Prostate volume by TRUS, mL	130	115 - 150
Specimen weight, g	83	70 - 104
Operating time, minute	156	134 - 193
Length of stay, day	9	8-9

Abbreviations: BMI**,** Body Mass Index; TRUS, Trans Rectal Ultrasonography.

Table 2. Outcome of laparoscopic simple prostatectomy.

	Pre-op (IQR)	**Post-op (IQR)**	***P*-value**
Q^{max}, mL/s	9.6 (5.9 - 11.3)	30.2 (22.2 - 39.8)	= .002
IPSS	21 (16 - 27)	3 (1 - 6)	< .001
QoL	5 (4 - 5)	1 (0 - 1)	< .001
PVR, mL	100 (50 - 200)	0 (0 - 10)	< .001
PSA, ng/mL	11.0 (4.9 - 15.8)	1.0 (0.4 - 2.1)	< .001

Abbreviations: IQR, Inter Quartile Range; IPSS, International Prostate Symptom Score; QoL, Quality of Life; PVR, Post-void Residual Volume; PSA, Prostate-Specific Antigen

Table 3. Postoperative complications of laparoscopic simple prostatectomy.

Complications	**Number (%)**	**Clavien-Dindo**
Extravasat	4 (5)	1
Prevesical hematoma	2 (3)	1
Epididymitis	2 (3)	2
Atrial fibrillation	1 (1)	2
Rebleeding	1 (1)	3b
Ventricular tachycardia	1 (1)	4a