Outcomes of the Holmium Laser Enucleation of the Prostate for Patients With Prior Benign Prostatic Hyperplasia Surgery

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Background: To assess the functional outcomes and morbidity in patients undergoing holmium laser enucleation of the prostate (HoLEP) with and without previous transurethral prostate surgery.

Methods: Patients were stratified into two groups, 558 patients who underwent primary HoLEP (group I) and 50 patients who underwent ‘secondary-HoLEP’ with prior transurethral prostate surgery (group II).

Results: There were no significant differences in the preoperative parameters (median age, International Prostate Symptom Score [IPSS], prostate-specific antigen [PSA], prostate volume, maximum urinary flow rate [Qmax], and postvoid residual urine volume [PVR]). No significant intraoperative differences were noted in the use of total energy, resected volume, enucleation time, resection efficiency, and mean catheterization time. There were significant improvements in Qmax, PVR, and IPSS in both groups. Complications in groups I and II included 19 (3.1%) and 1 (2.0%) bladder injuries, 25 (4.4%) and 2 (4.0%) recatheterization for transient voiding difficulty, 20 (3.5%) and 2 (4.0%) cases of severe hematuria requiring additional treatment, and 5 (0.8%) and 0 cases for remorcellation due to remaining adenoma. Transient incontinence was the most common complication for both groups I and II, 30 cases (5.4%) and 3 cases (6.0%) respectively. Urinary tract infection showed improvement subsequent to antibiotic treatment. During the 6 month follow-up period, urethral stricture occurred in 7 cases (1.3%) for group I and in 1 case (2.0%) for group II.

Conclusion: There were no significant differences in functional outcomes and morbidity between the two groups. ‘Secondary-HoLEP’ seems to be effective and safe for patients with prior BPH surgery.

Key Words: Holmium laser enucleation, Postoperative complications, Prostate, Transurethral prostate resection

INTRODUCTION

The prevalence rate of benign prostatic hyperplasia (BPH) has risen due to an increase in the aged population along with the awareness and desire for quality of life. Currently, surgical treatment should be considered in cases that show no symptom improvement despite medical treatment or re-

current complications such as urinary obstruction, infection, or bladder stones. While transurethral resection of the prostate (TURP) has previously been the chief surgical method in treating BPH, the holmium laser enucleation of the prostate (HoLEP) method is receiving growing attention and has been widely practiced since 1998, when it was first reported by Gilling and Fraundorfer. The HoLEP method had a significantly lower catheterization time, hospital stay, and blood loss compared with TURP or open prostatectomy. Also, HoLEP is more advantageous in that it is prostate-size independent. However, since HoLEP is a method that involves locating and peeling the anatomical capsule of the prostatic lobes, technical difficulty could be anticipated in ‘redo’ surgery patients (patients with previous prostate surgery) who may have absent anatomic planes or adhesions. Based on
such theoretical back ground, our objective was to compare the surgical outcomes and complications between patients who had undergone previous prostate surgery other than primary HoLEP and patients without previous prostate surgery.

MATERIALS AND METHODS

HoLEP was performed by a single surgeon on a total of 608 patients between July 2008 and August 2012 excluding patients with urethral stricture, prostatic cancer, and neurological bladder. Patients were stratified into two groups. Group I was comprised of 558 patients who underwent primary HoLEP for BPH with no previous prostate surgery and group II was comprised of 50 patients who had previous transurethral prostate surgery. In group II, the previous transurethral prostate surgery involved TURP for 40 patients, potassium-titanyl-phosphate laser vaporization of the prostate (KTP laser) in 9 patients, and transurethral needle ablation (TUNA) in 1 patient. A retrospective review of the surgical outcomes and complications between the two groups was done. Preoperatively, all patients were evaluated using the International Prostate Symptom Score (IPSS), digital rectal examination, transrectal ultrasound, serum prostate-specific antigen (PSA), maximum urinary flow rate (Qmax), and post-void residual urine volume (PVR). For patients with high PSA levels, prostatic biopsy was simultaneously done. Urodynamic assessments were performed in patients with indwelling catheters or those where bladder outlet obstruction was unclear. IPSS, QoL scores, uroflowmetry, and residual urine were determined as postoperative outcome measures at 6 weeks and 3 and 6 months after HoLEP and were compared with preoperatively obtained data. A questionnaire on complications was also administered concurrently.

1. Surgical skills

The Versa Pulse Power Suite (LUMENIS, Yokneam, Israel)holmium laser was used for the enucleation of prostatic adenoma at a laser power of 80 to 100 W. In addition, a 26-Fr resectoscope (Karl Storz, El Segundo, CA, USA) with a laser bridge was used. Tissue morcellation was done by using a percutaneous nephrolithotomy nephroscope and a morcellator (VersaCut, Yokneam, LUMENIS). Briefly, the median and the lateral prostate lobes were dissected off the surgical capsule of the prostate in a retrograde direction from the apex and released into the bladder3,6). With the capsule plane secured, the capsule was then peeled off continuously from its top and bottom sides in a nine o'clock (right side) and three o'clock (left side) direction by using the “push and cut” technique. In this manner, all lateral lobes were removed. The remaining tissues were then trimmed and hemostasis was applied. Morcellation was then performed within the bladder. After the bladder was sufficiently filled, the removed tissues were grasped with the morcellator by suction. The tissues were then ground into small pieces by using forward and backward movements of the blades before being totally evacuated. After HoLEP, a 3-way 22-Fr urethral catheter was inserted and continuous irrigation was carried out. Bladder filling during HoLEP may cause temporary postoperative hypotonicity; thus, the urethral catheter is generally removed within 1 to 2 days following the operation. All retrieved tissues were examined histologically. The above technique was also used for group II, but was modified according to the extent and location of the residual or recurrent adenoma.

2. Morcellation technique

Morcellation using an inverse (downward) technique was used to improve the safety of the morcellation procedure7). During inverse morcellation, the blade is hung upside down such that it is directed toward the base of the bladder. By positioning a morcellator on top of prostatic tissues, the tissues can be held and evacuated from above by suction.

3. Statistical analysis

The mean values of continuous variables were used in the analysis. Ranges are shown in parentheses. The unpaired Student t-test was used to analyze differences between group mean values, and the Mann-Whitney U-test was used to analyze nonnormally distributed continuous variables. A p-value less than 0.05 was considered statistically significant.

RESULTS

1. Baseline characteristics

There were no statistically significant preoperative differences between the two groups in PSA, IPSS, Qmax, and PVR (Table 1). Although the mean age was slightly higher
and the mean preoperative prostate volume was lower in group II, they were not statistically significant as shown in Table 1. No additional prior transurethral prostate surgery performed in group II and the mean time interval from previous transurethral surgery to HoLEP was 47±13.4 months.

2. Intraoperative and early postoperative outcomes

According to the perioperative data shown in Table 2, more energy used, longer operation time, and less resected weight in group II compared with group I indicates that surgical efficiency was higher in group I. However, the differences between the two groups were not statistically significant. There were also no significant differences in the duration of catheterization between the two groups (Table 2).

Postoperative outcome values of Qmax (16.7 vs. 19.3 mL/sec), IPSS (11.0 vs. 9.3), and PVR (25.4 mL vs. 23.3 mL) in groups I and II respectively, were not statistically significant. Based on the preoperative and postoperative clinical parameters, the two groups both showed significant improvement (p<0.05).

3. Intraoperative and postoperative complications

The intraoperative and postoperative complications for groups I and II were, bladder injury in 19 cases (3.1%) and 1 case (2.0%), recatheterization due to early voiding failure

Table 1. Baseline characteristics of two groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group I (n=558)</th>
<th>Group II (n=50)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>67.2±7.3</td>
<td>69.2±6.7</td>
<td>0.076</td>
</tr>
<tr>
<td>Prostate volume (g)</td>
<td>54.2±40.1</td>
<td>51.7±25.6</td>
<td>0.591</td>
</tr>
<tr>
<td>PSA (ng/mL)</td>
<td>4.9±3.6</td>
<td>4.3±8.3</td>
<td>0.532</td>
</tr>
<tr>
<td>Qmax (mL/sec)</td>
<td>11.1±9.2</td>
<td>10.4±7.7</td>
<td>0.626</td>
</tr>
<tr>
<td>IPSS</td>
<td>24.9±6.8</td>
<td>25.6±6.4</td>
<td>0.599</td>
</tr>
<tr>
<td>PVR (mL)</td>
<td>83.3±111.5</td>
<td>72.4±89.5</td>
<td>0.504</td>
</tr>
</tbody>
</table>

Values are presented as mean±standard deviation.

Group I, primary HoLEP with no previous prostate surgery; group II, HoLEP with previous transurethral prostate surgery history.

PSA, prostate-specific antigen; Qmax, peak urinary flow rate; IPSS, International Prostate Symptom Score; PVR, postvoid residual urine; HoLEP, Holmium Laser Enucleation of the Prostate. *p-values obtained by Student t-test and the Mann-Whitney U-test.

DISCUSSION

Until now, TURP was considered the ‘gold standard’ for the surgical treatment of BPH. However, interest in minimally invasive treatments has increased and has led to the development of various new treatment methods. The HoLEP
method involves endoscopically removing all prostate adenomas along the surgical capsule. Thus, the HoLEP technique could theoretically remove more adenoma, more efficiently than other existing endoscopic surgical methods. However, since the HoLEP involves detecting and peeling the anatomical capsule of the prostatic lobes, technical difficulty could be anticipated in redo surgery patients who may have modified anatomical planes or adhesions. Based on such theoretical background, previous transurethral surgery for BPH could be challenging and considered an exclusion criterion for transurethral enucleation procedures. In the present study, we provided the possibility of surgically overcoming BPH in recurrent patients by introducing the term ‘secondary-HoLEP’ for patients with previous transurethral prostate procedure experience.

Reoperation is generally an undesirable outcome, implying persistent symptoms and progression of the underlying disease. The most frustrating aspect of minimally invasive procedures is the chance of recurrence, and requiring a reoperation. Repeat surgeries can be a financial burden to patients by adding otherwise unnecessary cost. Under an economic model, the HoLEP has the potential to be more cost effective than TURP or other current ablative therapies if one HoLEP procedure provides long-term relief of BPH symptoms. Many studies provide the evidence that support the low reoperation rate after an initial HoLEP with preserved long-term efficacy. Kuntz et al. reported that all 42 patients treated with HoLEP in their study did not require reoperation for BPH at 5-year follow-up. Gilling et al. confirmed that HoLEP is at least equivalent, if not superior to TURP in its long-term outcomes, requiring fewer reoperations. According to Elliott et al., approximately 20% of the patients required repeat surgery for BPH after primary treatment with transurethral microwave therapy, TUNA, or laser therapies at 5 years of follow-up. This is more evidence illustrating the low chance of reoperation and supporting HoLEP as a cost-effective option. In recent studies, the term ‘secondary-HoLEP’ was introduced for HoLEP performed on patients who had undergone previous BPH surgery. Their results suggested marked improvement in postoperative voiding parameters. Elshal et al. retrospectively reviewed 76 patients with histories of previous BPH surgery (secondary-HoLEP) and 978 patients with no previous BPH surgery who underwent HoLEP (primary HoLEP) and suggested there were no significant differences in postoperative voiding parameters and complications. Also, Jaeger and Krambeck comparing 37 patients who underwent HoLEP after previous BPH surgery and 74 patients without prior BPH surgery, showed that secondary-HoLEP postoperative voiding parameters suggested meaningful improvement. Our results, regardless of the disparity of sample size, follow-up duration, and different types of previous transurethral BPH surgery, were comparable to previous published studies. Also, ‘secondary-HoLEP’ is done safely in patients with previous transurethral prostate procedures including HoLEP. Three cases that had recurrent adenoma in the TURP group safely underwent HoLEP and 3 patients (0.5%) of 603 with recurrent BPH obstruction were successfully re-treated with HoLEP. Thus, the above studies show that secondary-HoLEP is costeffective and safe, and therefore, a more favorable method, compared to other ablative therapies for patients with previous transurethral surgeries.

As predicted, the mean age was slightly higher and the mean preoperative prostate volume was lower in group II than group I, though the difference was not statistically significant. Although group I had a larger mean gland size than group II, the amount of laser energy used during the operation and the length of the surgery was greater and the amount of removed prostatic tissue was less in the latter group. It could be interpreted that such results in secondary-HoLEP patients was affected by several factors such as a change in the anatomical plane from previous surgery, asymmetrical adenoma, and postoperative adhesion. There were no statistically significant preoperative and postoperative differences between the two groups for Qmax, IPSS, and PVR. However, there was a significant improvement in voiding parameters postoperatively.

### Table 3. Intraoperative and postoperative complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Group I (n=558)</th>
<th>Group II (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bladder injury</td>
<td>19 (3.1)</td>
<td>1 (2.0)</td>
</tr>
<tr>
<td>Recatheterization</td>
<td>25 (4.4)</td>
<td>2 (4.0)</td>
</tr>
<tr>
<td>Clot retention</td>
<td>20 (3.5)</td>
<td>2 (4.0)</td>
</tr>
<tr>
<td>Remorcellation for remaining adenoma</td>
<td>5 (0.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Transient incontinence</td>
<td>30 (5.3)</td>
<td>3 (6.0)</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>8 (1.4)</td>
<td>1 (2.0)</td>
</tr>
<tr>
<td>Urethral stricture</td>
<td>7 (1.3)</td>
<td>1 (2.0)</td>
</tr>
<tr>
<td>Bladder neck contracture</td>
<td>4 (0.7)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Values are presented as number (%).
In this study, transient incontinence, a complication of HoLEP, was mild and improved within 3 months after use of anticholinergic agent. Occurrence was not significantly different between the two groups: 5.3 and 6% in groups I and II, respectively. The surgical process of HoLEP could be divided into two stages: enucleation of the prostate adenoma and removal of residual adenoma tissue through morcellation from the bladder1,18. Bladder injury is the most dangerous complication that could occur during morcellation. Hence, preoperative hemostasis and bladder distention along with the use of inverse technique, which could safely secure a visual field were implemented. In some cases, there may be urine extravasations or massive bleeding due to severe perforation from bladder injury requiring open surgery17,18. However, the possibility of bladder injury during morcellation is less than 10% and many research reports that the extent of bladder injury was not severe19. This study was comparable with previous studies in preventing and reducing the extent of bladder injury. Superficial injuries were treated by maintaining catheterization postoperatively for a certain duration. Bladder injury was reduced by using the inverse technique, which prevents tissue from blocking the visual field of the posterior wall of the bladder, allowing an appropriate distance between the wall and the equipment.

Postoperatively, early voiding failure or dysuria is more likely due to primary detrusor failure and other than an incomplete resection of the adenoma. Such complications could be treated by clean self-intermittent catheterization or suprapubic catheterization20,21. In the current study, recatheterization was a highly frequent complication but as recent studies18 have shown, most cases were resolved by short-term management.

According to research, the HoLEP procedure resulted in less hemorrhage than TURP, the most common procedure in group II, because Holmium laser is hemostatic. The laser simultaneously vaporizes the tissue and stops the bleeding from minor to medium sized vessels22-24. Thus, the overall incidence of cases necessitating transfusion is minuscule even for procedures in large-sized prostates25. Clot retention induced by hemorrhage was managed without transfusion due to declined hemoglobin levels or endoscopic hemostasis. Occasionally, there have been reports of secondary surgeries to remove residual prostate tissues10,22,26. However, in the current study, reconfirmation for any remaining adenoma postoperatively after removal of catheterization was done through a cystoscope. There was only 5 cases (0.8%) in group I that required a second morcellation. It could be predicted that group II would have more cases of urethral stricture, a complication affected by frequency of transurethral procedures and duration of the procedure. However, in our study, the number of urethral stricture cases was not significantly different between group I (7 cases, 1.3%) and group II (1 case, 2%). These results are also comparable with recent studies27. Regarding intraoperative and postoperative complications, all incidences were negligible and easily resolved, and the two groups did not show statistically significant differences. Similarly, when we compared the group treated with initial HoLEP and the group with previous transurethral surgery, both groups showed significant and comparable improvement in voiding parameters. Such result is meaningful not only because it suggests that previous transurethral surgery does not considerably affect the intraoperative and postoperative outcomes in HoLEP, but also that HoLEP is a feasible and legitimate option for recurrent BPH patients. Thus, ‘secondary-HoLEP’ seems to be a safe and efficient procedure for patients with a history of previous transurethral surgery experiencing severe BPH symptoms due to remaining adenoma. Although the plane between the surgical capsule and the adenoma may be ambiguous, it is still sufficiently accessible, and considering our 6-month follow-up results and outcome, performing the HoLEP in patients with previous transurethral surgeries is worth considering.

Limitations of this work may be its retrospective nature and the disparity of the sample size.

Conflict of Interest Disclosures: The researchers claim no conflicts of interest.

REFERENCES

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