

HOLMIUM LASER ENUCLEATION OF THE PROSTATE FOR MEN WITH URINARY RETENTION

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ABSTRACT

Purpose: Holmium laser enucleation of the prostate (HoLEP) is an established procedure for the treatment of patients with benign prostatic hyperplasia. We performed a study to examine a group of patients in urinary retention treated by HoLEP.

Materials and Methods: A retrospective analysis of 164 consecutive patients with urinary retention who underwent HoLEP between January 2000 and August 2004 was performed.

Results: Mean patient age was 72.1 years (range 34 to 95). Mean duration of urinary retention was 28.9 days (range 2 to 365). Mean preoperative transrectal ultrasound measured prostate volume was 107.1 cc (range 5 to 242). Mean weight of resected tissue was 81.9 grams (range 2.5 to 271). Mean duration of postoperative catheterization and hospitalization was 22.5 hours (range 2 to 240) and 33.7 hours (range 2 to 144), respectively. All patients were able to void following treatment and remain catheter free.

Conclusions: HoLEP is an effective treatment, with low morbidity, for patients with urinary retention. These results suggest that HoLEP may be the ideal treatment for men with urinary retention due to benign prostatic obstruction.

KEY WORDS: prostatic hyperplasia, prostatectomy, holmium, lasers

Holmium laser enucleation of the prostate (HoLEP) is one of the most rigorously analyzed surgical techniques for the treatment of men with the obstructive symptoms of benign prostatic hyperplasia (BPH). No less than 5 randomized, controlled trials have been reported analyzing this modality.^{1–5} The holmium:yttrium-aluminum-garnet (Ho:YAG) laser allows precise enucleation of the prostate, with a hemostatic effect that limits bleeding during resection. The introduction of a mechanical tissue morcellator that can be passed transurethrally has improved the efficiency of this technique, as larger prostates may be more expeditiously resected.

For 24 to 42% of men undergoing a surgical intervention for BPH, urinary retention is the primary indication for the procedure.⁶ However, patients with urinary retention present a particular challenge to urologists, as they often experience inferior treatment outcomes, and a greater rate of complications compared with similar patients who do not have urinary retention. We performed a study to examine a group of patients in urinary retention treated by HoLEP.

MATERIALS AND METHODS

A retrospective analysis of 164 consecutive patients with urinary retention who underwent HoLEP between January 2000 and August 2004 was performed. Patients were excluded from analysis if they had been previously diagnosed with adenocarcinoma of the prostate. One patient who was hospitalized by the vascular surgery service for a large abdominal aortic aneurysm, and who underwent HoLEP to

achieve a catheter-free state followed by aneurysm repair, was also excluded from analysis.

All HoLEP procedures were performed by a single surgeon (JEL). A 100 watt Ho:YAG laser source was used, configured with a 550 nm laser fiber (Lumenis, Santa Clara, California). A 28Fr continuous flow resectoscope (Karl Storz Endoscopy, Culver City, California) with a laser bridge housing a 7Fr stabilizer catheter (Cook Urologic, Spencer, Indiana) is used for enucleation of the prostate. A standard video camera system is used to optimize visualization and maintain a safe working distance from the laser fiber. Normal saline is used as the irrigant in all cases.

The HoLEP procedure is performed as previously described.⁷ Briefly, the enucleation is performed at laser settings of 2 Joules and 50 Hertz for the lateral lobes, 2 Joules and 40 Hertz for the apical dissection, and 2 Joules and 20 Hertz to divide the apical mucosal bridges. Bleeding points are fulgurated by defocusing the laser several millimeters from the open vessel. Optimal hemostasis can be achieved by adjusting the laser setting to 2.5 Joules and 40 Hertz. The enucleated prostatic tissue is evacuated from the bladder with a VersaCut morcellator (Lumenis, Santa Clara, California). Following enucleation, morcellation, and evacuation of the prostate, a 20Fr 3-way catheter is secured in the bladder with a 60 cc balloon. If necessary, the catheter is placed to continuous bladder irrigation. The catheter is typically removed early in the morning of the first postoperative day.

RESULTS

Table 1 summarizes the patient demographics. Mean patient age was 72.1 years (range 34 to 95). Mean duration of urinary retention was 28.9 days (range 2 to 365). At the time of surgery, 84 patients had been treated with an α -blocker, 50 patients had been treated with a 5 α -reductase inhibitor, 28 patients had been treated with an α -blocker and a 5 α -reductase inhibitor, and 2 patients had not received any medical therapy. All patients who had been prescribed phar-

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TABLE 1. *Demographics*

	Mean (range)	
Age	72.1	(34–95)
Days retention	28.9	(2–365)
Preop transrectal ultrasound calculated prostate vol (cc)	107.1	(5–242)
Preop PSA (ng/ml)	8.2	(1.03–34.20)

macotherapy were refractory to such treatments. Thirty-five patients managed their bladder with clean intermittent catheterization. Mean preoperative transrectal ultrasound measured prostate volume was 107.1 cc (range 5 to 242). Mean preoperative prostate specific antigen (PSA) was 8.2 ng/ml (range 1.03 to 34.2). Table 2 summarizes perioperative parameters. Mean enucleation and morcellation times were 97.8 minutes (range 12 to 485, SD 52.5) and 22.1 minutes (range 3 to 120, SD 8.2), respectively. Mean weight of retrieved tissue was 81.9 gm (range 2.5 to 271), or 0.84 gm per minute of enucleation time. Pathological evaluation of the tissue demonstrated benign prostatic hyperplasia in 154, and adenocarcinoma in 10. Of these 10 patients 8 were found to have Gleason 3 + 3, and 2 were found to have Gleason 3 + 4.

Mean duration of postoperative catheterization was 22.5 hours (range 2 to 240, SD 27.63) and mean duration of postoperative hospitalization was 33.7 hours (range 2 to 144, SD 34.91). Average preoperative hemoglobin was 13.6 g/dl and average postoperative hemoglobin was 12.0 g/dl. No patient required a transfusion of blood or blood products.

The standard followup regimen entailed office visits at one month, six months, and one year following the procedure. Due to the referral nature of our practice, which draws patients from throughout the state of Indiana as well as, in this series, from 9 additional states, we were unable to obtain followup in all cases. At each visit, the patient completed an American Urological Association (AUA) symptom score questionnaire, and performed a urine flow and post-void residual study. These findings are summarized in table 3. In addition, at the 6-month visit, a serum PSA was obtained. A total of 164 patients were evaluated at the 1-month followup. Mean AUA symptom score was 7.7 (range 0 to 28). Mean urine flow rate was 22.1 ml per second (range 4.0 to 49.8), and mean post-void residual was 38.1 ml (range 0 to 300). During this followup period, 2 patients each experienced a single episode of gross hematuria with clot retention requiring a short course of Foley catheter placement and continuous bladder irrigation. Seven patients also experienced urinary tract infection, which in all cases resolved promptly with oral antibiotic therapy. Sixteen patients had urinary incontinence that required the use of absorbent pads. A total of 140 patients were evaluated at the 6-month followup visit. Mean postoperative PSA was 1.18 ng/ml (range 0.01 to 7.41). This represents a reduction of 85.7% from the mean preoperative value of 8.22 ng/ml. This was a statistically significant difference ($p < 0.05$). Mean AUA symptom score was 5.4 (range 0 to 25). Mean urine flow rate was 26.7 ml per second (range 4.3 to 54.8) and mean post-void residual was 32.5 ml (range 0 to 150). In this period 1 patient had an episode of urinary retention, which was self-limiting and resolved after catheter placement, and 1 patient had an episode of gross

hematuria with clot retention requiring placement of a Foley catheter and bladder irrigation. One patient required a secondary procedure, an optical internal urethrotomy, for a urethral stricture. Three patients experienced urinary tract infection, which, again, in all cases responded promptly to oral antibiotic therapy. Five patients complained of urinary incontinence that required the use of absorbent pads. Thirty-eight patients were evaluated at the 1-year followup. Mean AUA symptom score was 4.4 (range 0 to 19). Mean urine flow rate was 34.1 ml per second (range 26.3 to 52.6), and mean post-void residual was 8.6 ml (range 0 to 34). In this period a urethral stricture developed in 1 patient which was treated with urethral dilation in the office, and 1 patient had an episode of epididymitis, which responded promptly to oral antibiotic therapy. One patient complained of urinary incontinence that required the use of absorbent pads.

DISCUSSION

As the population ages, the prevalence of BPH, and its accompanying voiding symptoms, is increasing.⁸ The natural history of BPH is often one of progression, with mild symptoms becoming more bothersome over time. Indeed, among 50-year-old men, the lifetime incidence of surgical or medical intervention for BPH is estimated to be 35%.⁹ Wasson et al found that in a 3-year, multicenter, randomized controlled trial comparing men with moderate symptoms of BPH treated by either watchful waiting or transurethral resection of the prostate (TURP), 24% of men in the watchful waiting arm underwent surgical intervention.¹⁰

Urinary retention, the ultimate failure of conservative management of patients with BPH, is not a rare outcome. Wasson et al, in the aforementioned study, also found that 2.9% of men randomized to the watchful waiting arm developed urinary retention.¹⁰ McConnell et al reported that 4% of men with BPH who were in the placebo arm of a randomized controlled trial experienced a spontaneous episode of acute urinary retention, and even those patients randomized to 5 α -reductase therapy recorded a 1% incidence of urinary retention.¹¹ Although these incidence rates are based on a population of men who have already been defined as having obstructive voiding symptoms, there have been other, more generalized, population based studies that have reported similar findings. Hunter et al performed a population survey of men age 50 years or older, and found a 5.1% prevalence of urinary retention.¹² Jacobsen et al performed a population based, prospective, cohort study of community men, and found an incidence rate of 0.7% per year.¹³ Furthermore, for a man aged 60 to 69 years, they reported that the risk of developing urinary retention by the time he reached 80 years of age was greater than 20%.

Patients with urinary retention typically require surgical intervention, and this cohort has been previously reported to be at significant risk for adverse perioperative events. Pickard et al performed a prospective study of 3,966 men undergoing prostatectomy, of whom 1,242 presented with urinary retention.⁶ The authors found that the urinary retention group had an increased risk of perioperative morbidity, including significantly greater rates of intraoperative complications, most commonly characterized as either uncontrolled bleeding or cardiorespiratory problems, blood transfusion, and unplanned return to the operating room, most commonly for bleeding compared with the group of men not in urinary retention. Similar findings were reported by Doll et al and Thorpe et al.^{14, 15} Mebust et al, in a multicenter trial involving 3,885 patients, documented that patients in urinary retention had an almost 3-fold greater rate of infection than comparable patients not in retention.^{16, 17}

In our study patients in urinary retention treated with HoLEP did not experience such significant rates of adverse events, perhaps due to the inherent advantages of the Ho-

TABLE 2. *Perioperative parameters*

	Mean (range)	
Mins enucleation	97.8	(12–485)
Mins morcellation	22.1	(3–120)
Tissue retrieved (gm)	81.9	(2.5–271.0)
Hrs catheterization	22.5	(2–240)
Hrs hospitalization	33.7	(2–144)

TABLE 3. Postoperative followup

Mos	No. Pts	Mean AUA-Symptom Score	Mean Urine Flow Rate (cc/sec)	Mean Post-Void Residual (cc)	No. Incontinence Requiring Pads
1	164	7.7	22.1	38.1	16
6	140	5.4	26.7	32.5	5
12	38	4.4	34.1	8.6	1

YAG laser compared to electrocautery. The hemostatic action of the laser enables a clear visual field during the enucleation process, and minimizes the risk of significant bleeding necessitating a blood transfusion. Notably, although our cohort of patients had large prostates (mean transrectal ultrasound volume 107.1 cc, mean weight of tissue retrieved 81.9 grams) no patient required a blood transfusion. Additionally, normal saline can be used as an irrigant throughout the procedure, eliminating the risk of dilutional hyponatremia (TUR syndrome), as well as minimizing physiological fluid shifts that may induce cardiac or pulmonary difficulties.

In addition to the increased risk of perioperative complications, patients with urinary retention who undergo surgical intervention often experience inferior treatment outcomes. Pickard et al reported that 9.2% of men with urinary retention were unable to void following surgery and required postoperative catheterization, which was a permanent condition for 0.9%; in contradistinction, those patients who were not in retention reported rates of 2.3% and 0.1%, respectively.⁶ Mebust et al reported an 11% incidence of failure to void for patients with urinary retention undergoing TURP.^{16,17} Similarly, Chacko et al reported a randomized controlled trial comparing TURP with Neodymium (Nd):YAG laser prostatectomy for men with urinary retention; mean length of catheterization for the TURP cohort was 3.2 days compared with 30.3 days for the Nd:YAG cohort.¹⁸ The number of men who required further surgery for inability to void was 1 in the TURP cohort and 7 in the Nd:YAG cohort. Unfortunately, the authors did not report prostate volumes or the quantity of tissue resected during TURP, which would facilitate a reasonable comparison with our data.

Our cohort of HoLEP patients did not experience a long postoperative duration of catheterization; in fact, all patients were ultimately able to void spontaneously following treatment. We ascribe this to the completeness of adenoma removal that is achieved with HoLEP. The enucleation of the transition zone of the prostate, identical to that achieved with open simple prostatectomy, creates a large cavity in the prostatic urethra, which facilitates voiding. In our series mean preoperative transrectal ultrasound volume was 107.1 cc and mean tissue retrieved was 81.9 grams, or 76.4% of the total measured volume of the prostate. The completeness of resection is further suggested by the dramatic reduction of PSA from a mean of 8.22 ng/dl preoperatively, to a mean of 1.18 ng/dl postoperatively, a reduction of 85.7%. We hypothesize that, since the majority of PSA originates in the transition zone of the prostate, the complete removal of tissue that is accomplished during HoLEP accounts for the improvement in voiding symptoms as well as the decrease in PSA. Furthermore, PSA allows for an objective measure of the completeness of resection, which may be compared across different treatment modalities.

CONCLUSIONS

Although open simple prostatectomy was once considered the standard treatment for patients with bladder outlet obstruction due to BPH, this technique was supplanted by TURP, an efficacious and less morbid alternative. When applied to patients with urinary retention, though, TURP has been associated with an increased rate of adverse events and less than optimal treatment outcomes. The data presented

here demonstrate that HoLEP is a particularly safe and effective treatment for patients with urinary retention. Furthermore, HoLEP appears to be the closest approximation of an open simple prostatectomy, when criteria such as the amount of tissue retrieved and PSA decrease following enucleation are examined. As all of the patients in this series were able to void following treatment, and are currently maintained catheter-free, HoLEP may be the ideal treatment for men with urinary retention due to benign prostatic obstruction.

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EDITORIAL COMMENT

The introduction of medical therapies for treating lower urinary tract symptoms secondary to BPH in the last 15 years resulted in a significant reduction of the number of surgical interventions for this indication. On the other hand not all patients respond adequately to medical treatment. Those patients frequently are left for prolonged periods on α -blockers and many of them only come to our attention as

surgeons when they are older, sicker, anticoagulated, with larger glands and in acute urinary retention (AUR).

This article includes a large number of patients presenting with AUR. We recently reviewed our experience in 169 patients presenting with AUR and treated with HoLEP. We came to the same conclusion about the age of the patient, prostate size and the outcome. In our series 3 patients could not adequately evacuate the bladder requiring intermittent or permanent drainage. These patients had bladder capacities of greater than 1,000 ml at the time of initial catheterization. This underlines the importance of bladder function in this equation of an elderly patient on medical treatment who goes into chronic retention and the fact of real life that not all of them will be able to empty in spite of a wide prostatic fossa. In the present series surprisingly no patient had any problem evacuating their bladder, which could be due to selection bias whereby patients with chronic retention were not offered HoLEP.

The incontinence data are interesting because they underline the fact that HoLEP allows for a more complete removal of the adenoma irrespective of size and that the external sphincter could be stretched or weak from lack of use which explains the eventual recovery of continence over time which is not always the case with other techniques where the sphincter is damaged or resected. I would like to second the authors conclusions that HoLEP is an effective treatment for prostates of any size and in higher risk patients with acceptable morbidity with or without urinary retention.

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