Predictors of Postoperative Urinary Incontinence After Holmium Laser Enucleation of the Prostate: 12 Months Follow-Up

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OBJECTIVE To identify pre- and perioperative factors associated with incontinence after holmium laser enucleation of the prostate for benign prostatic hyperplasia.

METHODS Retrospective review of our single-surgeon database identified 88 patients with 12 months’ follow-up who underwent surgery between December 2014 and November 2016. Postoperative urinary incontinence was defined as 1 or more pads per day. Patients were evaluated at 6 weeks, 6 months, and 12 months postoperatively.

RESULTS Preoperative variables associated with incontinence at all follow-ups included pre-existing incontinence and higher detrusor voiding pressure. Higher maximum urinary flow and lower postvoid residual were predictors of transient urinary incontinence. On multivariate analysis, pre-existing incontinence remained significant as a 12-month predictor, whereas a higher detrusor voiding pressure was only significant as a 6-week predictor. De novo incontinence at 12 months was identified in only 1/44 patients (2%). Among patients with pre-existing incontinence, 30/40 (75%) reported resolution of their incontinence at 12 months. Numerous demographic, urinary, urodynamic, and operative factors were not significant for predicting incontinence. The mean decrease in pads per day between 6 weeks and 6 months was −1.6 and between 6 months and 12 months was −0.75. Medical management did not significantly impact rates of postoperative incontinence when compared to observation alone.

CONCLUSION Pre-existing urinary incontinence and/or higher detrusor voiding pressure may predict urinary incontinence 12 months after holmium laser enucleation of the prostate. UROLOGY 124: 213 −217, 2019. © 2018 Elsevier Inc.

Holmium laser enucleation of the prostate (HoLEP) is a well-studied, contemporary surgical treatment for benign prostatic hyperplasia (BPH), with multiple series reporting on its efficacy and safety. In these reports, varying rates of postoperative urinary incontinence (UI) have been described. During the early postoperative period, UI is common, but typically transient. Reported postoperative incontinence rates at less than 6 months range from 16.6% to 29.4%, with rates at 12-month follow-up decreasing to 0%-3.3%.1−3,7,9 These rates compare similarly to rates of incontinence after transurethral resection of the prostate (TURP) in randomized trials at 12-month follow-up, 0%-1.1%.7

Previous studies describing associations with post-HoLEP UI have reported various findings. However, associations between urodynamic parameters and postoperative UI are lacking in the literature. Some studies reporting on postoperative UI have excluded patients with preoperative incontinence, leaving the reported numbers to only include de novo incontinence.4 However, many patients presenting for surgical management of BPH experience incontinence prior to surgery.5−7 In order to accurately counsel all patients regarding anticipated postoperative urinary symptoms, we sought to identify factors predicting incontinence in all patients undergoing HoLEP, regardless of preoperative continence status.
Patients with 12 months or greater follow-up were evaluated based on their continence status at 6 weeks, 6 months, and 12 months postoperatively. We hypothesized that detrusor instability (DI) and pre-existing incontinence could be used to predict postoperative incontinence. The data were analyzed to identify pre-operative variables associated with postoperative incontinence. Further analysis was performed to assess interval improvements in continence over the follow-up periods to determine whether medical management (eg, anticholinergics or beta-3 agonists) has an impact on rates of postoperative incontinence.

MATERIALS AND METHODS

After obtaining Institutional Review Board approval, retrospective review of our single-center, single-surgeon HoLEP database was performed. All patients with a 12-month postoperative assessment of urinary symptoms and continence were included. Of 117 patients with 12-month postoperative visits, only 15 were excluded due to inadequate documentation. Patients were excluded if they underwent holmium laser ablation of the prostate, a concomitant bladder diverticulectomy or if they had lack of capacity. Based on the above criteria, 88 patients were identified who underwent surgery between December 2014 and November 2016.

Preoperative variables collected included demographics, comorbidities (eg, hypertension, diabetes), body mass index, any pre-existing incontinence, International Prostate Symptom Scores (I-PSS), urodynamic parameters, and cystoscopy findings. Preoperative UI did not include postvoid dribbling. Urodynamic studies (UDS) were recommended to all patients by routine, and 65 (74%) of the included patients had completed preoperative UDS. Reasons that studies were not completed included urgent surgery, patient disinterest, and/or patient discomfort. Urodynamic interpretation was performed by a urologist who was not involved in the surgical and/or postoperative management of the patients. If a patient was unable to void for urodynamic testing, a maximum urine flow rate (Qmax) of 0 was assigned and postvoid residual (PVR) was recorded as the bladder capacity.

All surgeries were performed by a single-surgeon (JEP, Jessica E Paonesa) with fellowship training in HoLEP, who supervised residents. Enucleation was accomplished using either a 100 or 120 watt holmium: yttrium-aluminum-garnet (YAG) laser with a 550 micron end-firing laser fiber, a Storz 28-French continuous flow resectoscope (Karl Storz, Tuttingen, Germany) and a 7-French stabilizing catheter to hold the laser fiber. Enucleation technique involved creation of a 5-7 o’clock dissection plane which was carried laterally to remove each lobe individually. Each lobe was dissected in either a retrograde or antegrade fashion, 1 of which would include the median lobe, if present. Morcellation was completed using a rigid offset nephroscope and a Lumenis VersaCut morcellator system (Lumenis, Yokney, Israel). Prostate tissue volume was measured (in grams) on a scale in the operating room immediately following the procedure. Most patients had their catheter removed on postoperative day 1.

Postoperative evaluations were routinely scheduled at 6 weeks, 6 months, and 12 months. At each follow-up, patients were questioned regarding the presence of any urinary symptoms, urinary control, pad use, and medications. Uroflowmetry, PVR, I-PSS, and quality of life (QOL) questionnaires were also obtained at each visit. Postoperative UI was defined as 1 or more pads per day (PPD). Postoperative UDS were not obtained; therefore, UI was not divided into stress or urge categories. Patients with and without UI were compared based on multiple pre- and perioperative factors. Patients with postoperative UI were routinely offered a trial of anticholinergic and/or beta-3 agonist medications at follow-up visits. A subgroup analysis of incontinent patients was performed comparing those electing medical management to those who elected observation.

Statistical analyses were performed using IBM SPSS (version 23) 2-tailed and nonparametric statistics: Fisher’s exact test, independent samples t test quality of means, and binary regression for multivariate analyses. Statistical significance was considered at P < .05.

RESULTS

Eighty-eight patients met inclusion criteria with a mean age of 73 and mean prostate volume of 100 mL. Some degree of pre-existing UI was reported by 40/84 (48%) of the patients. Univariate analyses are detailed in Table 1. Preoperative variables associated with reported UI at all postoperative follow-ups included any pre-existing UI and higher maximum detrusor voiding pressure. Higher preoperative Qmax was associated with UI at 6-week and 6-month follow-ups (4.7 [standard error 0.9] vs 2.6 [0.5] mL/s; 5.7 [1.2] vs 2.8 [0.5] mL/s). Age, body mass index, diabetes mellitus, DI, catheter dependence, I-PSS, QOL score, operative times (enucleation, morcellation), resected tissue volume, and multiple other variables (Table 1) were not significant predictors of UI at any follow-up.

Figure 1 illustrates the relationship between pre-existing UI and postoperative UI at each follow-up. De novo UI at 12 months was identified in only 1/44 patients (2%). Among patients with pre-existing UI, 30/40 (75%) reported resolution of UI by 12 months.

Figure 2 summarizes the association between preoperative Pdet and postoperative UI. In general, higher preoperative Pdet was associated with higher postoperative UI rates. At 6- and 12-month follow-up, patients with preoperative Pdet between 80 and 120 had the highest rates of UI. Patients with postoperative UI at 12-month follow-up had a mean Pdet of 96 cm H2O [7.7] compared to 73 cm H2O [6.1] for those without.

A multivariate analysis was performed for each follow-up period. At 12-month follow-up, only pre-existing UI maintained statistical significance (P = .02). Higher Pdet was only found to be significant at 6 weeks postoperatively (P = .01). No other variables maintain significance.

Both patient groups showed improvement in I-PSS and QOL scores from pre- to postoperative evaluation. However, questionnaire scores were found to be significantly different between groups. I-PSS and QOL scores were higher for those with postoperative UI at all follow-ups. The mean QOL score in patients with UI at 6 weeks was 3.1 (3 = “mixed-about equally satisfied and dissatisfied”) vs 1.5 (2 = “mostly satisfied”) in those who were dry (P = .01). Patients with UI at 12 months reported mean QOL scores of 2.5 vs 0.8 (1 = “Pleased”; P < 0.01). Similarly, improvements in QOL scores from pre- to postoperative evaluation were less dramatic in patients with UI (6 weeks: −0.6 vs −2.8, P = .01; 12 months: −1.8 vs −3.3, P = .01). I-PSS scores showed comparable trends and statistical significance (6 week: 13.6 vs 9.0, P = .03; 12 months: 9.1 vs 4.4, P = .03).
For patients reporting UI at 6 weeks post-HoLEP, the mean decrease in PPD at 6-month follow-up was $-1.6$. For those with UI at 6 months, the mean decrease in PPD at 12-month follow-up was $-1.3$. At 6-month follow-up, 15 of 32 patients with postoperative UI had elected a trial of anticholinergics and/or beta-3 agonists at the preceding visit. At 12-month follow-up, 10 of 17 had previously elected for medical management. Medications did not significantly impact the change in pad requirement at either follow-up period (6 months: $-1.8$ vs $-1.6$; 12 months: $-0.5$ vs $-1.4$; $P = .71$ and $.20$). Patients with pre-existing UI were significantly more likely to be interested in a trial of medical therapy at the 6-month interval (93% vs 44%, $P = .01$). I-PSS, QOL scores, PPD, and PVRs were not significantly different between groups.

**COMMENT**

Previous studies aiming to identify associations with post-HoLEP UI have reported various findings. Three studies focused on surgeon experience and the learning curve’s impact on postoperative UI, with higher rates for surgeons...
with lower case density (procedures performed per month)² and when the number of procedures performed is less than 20 cases.⁵,⁸ One study focused on HoLEP technique, favoring an antegrade dissection for which the authors reported a significant decrease in short-term (2 weeks) UI.⁶ Several other factors including age, diabetes, detrusor overactivity, prostate volume, surgeon mentorship, increased blood loss, and longer enucleation times have been associated with post-HoLEP UI in series with variable n and follow-up periods.³-⁵,¹⁰

UI following bladder outlet obstruction surgery is often attributed to iatrogenic sphincter damage and subsequent stress UI. However, it is difficult to find literature that supports this thought objectively with the support of urodynamic testing. Series that have looked at changes in UDS findings after HoLEP reported significant improvements in Qmax, Pdet, and PVR; but these studies did not characterize any UI outcomes with these assessments.⁷,¹¹-¹³ One study assessing post-TURP urinary complaints, including a 36% incontinence complaint, reported that urodynamic findings identified an 8% rate of sphincter deficiency, while 38% had persistent obstruction, 25% impaired contractility, and 50% DI. The same study reported that men who had undergone 2 or more TURP procedures had a 20% rate of sphincteric incontinence; however, 80% of those patients also had DI, 27% had impaired contractility, and 27% had continued obstruction.¹⁴ To better understand post-HoLEP UI, additional studies are needed to assess the urodynamic findings of patients both before and after surgery.

In this study, the single patient with de novo UI refused urological follow-up after being diagnosed with an elevated PVR at 6-week follow-up. However, follow-up via a third party reported the use of multiple PPD and treatment for recurrent urinary tract infections 12 months after surgery. Therefore, the etiology of his de novo incontinence has been incompletely characterized and a cause other than intrinsic sphincter deficiency is suspected.

The results of this study suggest an intrinsic physiological risk may predispose some men to the development of postoperative UI when pre-existing UI has been reported. Some studies evaluating post-HoLEP UI have excluded patients with pre-existing UI, leaving the reported outcomes to include only de novo UI.⁴ In an early randomized prospective trial comparing HoLEP to TURP, Gilling et al found that 56% of patients reported some degree of pre-existing UI and all patients with UI at 12 months had been in this group.⁷ Similarly, a study by Kuntz et al, comparing HoLEP to TURP, found that 30% of men reported some degree of pre-existing incontinence with 16.7% having persistent incontinence at 12-month follow-up.¹⁵

Further, the definitions used for postoperative incontinence have been broad in the literature. Examples include patient surveys with a self-report of UI “all or most of the time,”¹¹ a standardized 1-hour pad test,² at least 1 or 2 PPD,⁴,⁶,⁷ any report of UI,³,⁹ grade 2 stress incontinence,¹⁵ or are unspecified in the article.⁸

The association between higher Pdet and postoperative UI reported in this study appears to be a novel finding and suggests that UDS may be a valuable tool to provide pre-operative counseling about the risk of postoperative UI. Furthermore, prior studies have not emphasized or explored the impact of pre-existing UI as highlighted in this study. Further study should be done to assess for whether our findings can be reproduced for other bladder outlet surgical procedures such as TURP.

All patients are strongly encouraged to perform Kegel exercises after surgery. Those reporting bothersome urinary symptoms (eg, frequency, urgency, and incontinence) in the absence of infection or retention are routinely offered a trial of medical therapy. In this study, there is lack of perceivable benefit from the use of anticholinergics and/or beta-3 agonists in the management of postoperative UI. This finding supports the notion that postoperative UDS may assist in determining the best treatment for patients with post-HoLEP UI.

The present study has several limitations including its retrospective nature and total number of patients.

![Figure 2. Incidence of pre-existing and post-HoLEP urinary incontinence for variable Pdet ranges.](image-url)
Regarding our patient selection, it is important to note that many patients who presented for HoLEP at our referral center were not candidates for TURP or simple prostatectomy. This may reflect a chronicity of symptoms as surgical therapy has been delayed, a larger gland size, and/or the presence of co-morbidities that preclude simple prostatectomy risk, among other criteria. As such, our series would not be expected to reflect average BPH patients.

Patients did not routinely undergo postoperative UDS, which prevented further characterization of the type of incontinence (eg, stress, urge). Lack of objective UI measurements (ie, pad tests/weights) did not allow for quantification of the degree of incontinence. However, the authors believe preoperative counseling about the likelihood of long-term pad dependence is important for patient decision-making, regardless of the type of incontinence.

**CONCLUSION**

Preoperative patient counseling regarding anticipated urinary symptoms after any bladder outlet procedure is prudent. Patients can be advised that pre-existing UI and/or higher maximum detrusor voiding pressure may predict UI 12 months after HoLEP. Medical management may not significantly impact rates of postoperative incontinence when compared to observation alone.

**Acknowledgment.** The authors would like to acknowledge and thank the following collaborators and study tool:

- Joseph Hartnett BS
- Portia Thurmond MD
- JC Trussell MD
- REDCap electronic data capture tools hosted at SUNY Upstate Medical University

**REFERENCES**