World Journal of Urology
https://doi.org/10.1007/s00345-019-02831-6

ORIGINAL ARTICLE

Feasibility of holmium laser enucleation of the prostate as a 1-day surgery

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Received: 27 December 2018 / Accepted: 29 May 2019

Abstract

Purpose To assess the safety and feasibility of HoLEP as a day-case procedure.

Methods We reviewed all consecutive patients who underwent HoLEP at our institution between February 2017 and March 2018. During this time, we began a prospective trial aimed at same-day discharge of specific patients. Baseline and demographic variables, and past medical, past urological, intra-operative and post-operative variables in addition to disposition and readmission data were collected. Bivariate analysis was conducted to compare patients based on the day of discharge and readmission. A multivariable model using multiple-regression analysis was used to assess predictors for early discharge or readmission.

Results There were 179 total HoLEP procedures that were performed during the study period. Forty-seven patients were suitable candidates for same-day discharge. Among this group, 28 (59.5%) patients were successfully discharged home on the same day. Nineteen patients (40.4%) could not be discharged. The most common cause of not to discharge patients was the degree of hematuria without continuous bladder irrigation. Pre-operative prostate volume was different between the two groups (88.4 ± 30.7 cc for discharged patients vs 69.0 ± 30.7 cc for admitted patients, $p = 0.033$). No other pre-operative differences were identified. There were five readmissions (17.8%) following same-day discharge. Readmitted patients had higher rates of history of urinary tract infection (80% vs 26.2%, $p = 0.0304$). On multivariable analysis, no statistically significant predictors were identified for early discharge or readmission.

Conclusions Same-day discharge following HoLEP is safe and feasible in well-selected patients.

Keywords Holmium · HoLEP · Prostate · Same day surgery · BPH

Introduction

Since the inception of holmium laser enucleation of the prostate (HoLEP) as a treatment option for benign prostatic hyperplasia (BPH), there have been several randomized clinical trials and meta-analyses that were conducted to assess its efficacy. Collectively, they demonstrated the advantages of this procedure with regard to superiority and durability of functional outcomes with a favorable recovery and cost-effective profile [1–4]. These results were reproduced when HoLEP was tested against multiple other interventions using a wide array of high-risk clinical scenarios such as large glands, and elderly and anticoagulated patients [4–8]. With rigorous testing, HoLEP has stood the test of time and proved itself as one of the most effective treatment options for BPH. It is the only current transurethral treatment option that provides outcomes that are comparable to open simple prostatectomy [9].

Holmium laser enucleation of the prostate is classically considered as a procedure that requires overnight hospitalization. The average length of stay following HoLEP is usually 1 day. This is mainly based on the perceived need for continuous bladder irrigation (CBI) and risk of hematuria or catheter dysfunction. The health care environment is currently challenged by stringent economic restrictions and the high cost of medical care. Duration of hospitalization is

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Published online: 13 June 2019

considered as one of the main reasons of increased health care costs for patients, insurers and health care facilities. This has resulted in an overall endeavor to shorten hospitalizations, enhance recovery and consider early discharges following selected surgical procedure [10].

There are few studies that assessed the feasibility of HoLEP as a same-day procedure with scientific rigor despite the fact that this may be the practice of many experienced centers. Little is known regarding the selection criteria for patients to be considered for early discharge. The specific aims of this study are: (1) to assess the safety and feasibility of same-day HoLEP, (2) to report predictors of failure to discharge and readmission and (3) to propose selection criteria for early discharge following HoLEP.

Patients and methods

A clinical improvement project was conceived at our institution in January 2017 to shorten hospitalization and attempt same-day discharge following HoLEP in BPH patients. Following institutional approval, this was implemented on all patients who were informed about the possibility of early discharge based on their intra-operative and immediate post-operative courses. Exclusion criteria for early discharge included the following pre-operative factors: presence of prostate cancer, American Society of Anesthesiology score > 3, prostate volume > 200 cc, age > 75 years, lack of care giver or if the location of residence is outside the city limits on the first post-operative day. Intra-operatively, patients were initially excluded whenever enucleation time was longer than 1 h, morcellation time was longer than 30 min, post-operative hemoglobin change was > 2 gm/dL or surgery end time was after 1 pm. However, we decided to include patients with longer enucleation and morcellation times as the study progressed as we felt more confident with same-day discharge regardless of this criterion. Patients were counseled regarding their ability to decline discharge at any point if they did not feel comfortable.

There was no deviation from our standard pre-operative or intra-operative pathway. Pre-operative evaluation included detailed history and physical examination, assessment of urinary and sexual function, and quality of life through International Prostate Symptom Score (IPSS) and Sexual Health Inventory for Men Score (SHIM). All patients undergo basic laboratory work-up, prostate-specific antigen testing, uroflowmetry, cystoscopy and transrectal ultrasound for prostate volume estimation. All patients are advised to hold their anticoagulant or antiplatelet medication (other than aspirin) prior to surgery. Further urological testing (such as urodynamic study or prostate biopsy) is dictated by the results of the above evaluation. Routine pre-operative medical evaluation and anesthetic risk stratification are done for all patients undergoing major surgery at our institution.

All cases were supervised by a single endourology fellowship-trained urologist. No restrictions were applied to trainees' participation during these cases. Our HoLEP technique was reported in previous publications [11, 12]. No technical modifications were implemented during this study period. Post-operatively, all patients were transferred to postanesthetic care unit (PACU) for observation. The resuscitation protocol in PACU was the same regardless of intention of discharge and was managed by the anesthesiologist and PACU nursing team. The nursing staff was already skilled in managing HoLEP patients in immediate post-operative period and transitioning care to the general urology ward prior to this study. In preparation of this study, they were all educated regarding the new discharge pathway and protocol of the study. The protocol parameters were based on a postanesthetic recovery score that takes into account the level of consciousness, vital signs (blood pressure, heart rate, and respiratory rate), oxygen levels, nausea, and pain levels. During the recovery, all patients had a three-way Foley catheter (size 22 F, with 30–50 ml of sterile water in the balloon) placed in the operating room and kept on mild traction with continuous saline bladder irrigation (CBI) for 2 h which was then stopped for two additional hours. The nursing staff documented the degree of hematuria based on a visual scale at arrival, and 2 and 4 h following the procedure (Fig. 1). All patients had routine blood testing in the PACU which included a complete blood count and basic metabolic profile. Following that, patients were assessed for possible discharge by the urology team. Patients were deemed ready for discharge if they met PACU discharge criteria based on the postanesthesia recovery discharge score [13].

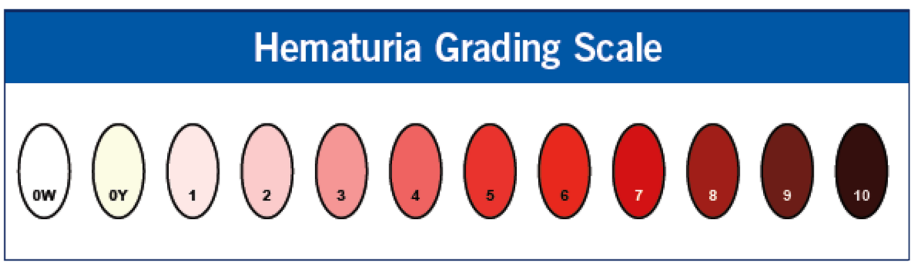

Fig. 1 Hematuria grading scale

They should have acceptable hematuria scores without CBI (4 or less) as shown in Fig. 1, should have appropriate post-operative laboratory values, were tolerating diet, were ambulating independently and demonstrated adequate ability to manage their urinary catheter.

Upon discharge, all patients had routine catheter care and discharge instructions provided, and were given the necessary supplies for irrigation at home if needed (1 l of normal saline bag, irrigation kit that include a sterile 60-cc irrigation syringe, 500-ml container and a tray). Patients were educated on catheter irrigation and were asked to demonstrate their ability and understanding of this maneuver by irrigating the catheter themselves prior to discharge. They were prescribed the same multimodal oral analgesics, stool softener and antibiotics with the same frequency and strengths as in every post-HoLEP patient taking into account individual allergies and sensitivities. Patients were instructed to resume all regular medications on first post-operative day. Catheter removals and voiding trials were prescheduled on first post-operative day in the clinic.

Outcomes and statistical analysis

We reviewed all the pertinent variables related to the feasibility of same-day discharge following HoLEP. Our database was comprehensive and thoroughly annotated and included all consecutive patients who underwent HoLEP between February 2017 and March 2018. It included baseline and demographic variables, and past medical, past urological, intra-operative and post-operative variables in addition to disposition and readmission data. A general readmission score was included. This is routinely calculated in our institution using an automated electronic medical record calculator that estimates a 30-day readmission score [14]. Comorbidities were assessed by Charlson Comorbidity Index (CCI) [15]. Reason for failure to discharge, readmission and complications were reported. All complications were reported using the modified Clavien–Dindo classification system [16]. Categorical variables were tested using Fisher's exact and reported using frequencies and percentages. Continuous variables were tested using Mann–Whitney rank-sum test and reported using means and standard deviations. Differences between day of discharge and readmission were determined using Mann–Whitney *U* test. A multivariable model using multiple-regression analysis was used to assess possible predictors for early discharge or readmission. To assess the nursing staff learning curve effect, we reported the discharge success rate in relation to date of the procedure. p values < 0.05 were considered significant. All statistical testing was performed using SAS version 9.4 (SAS Institute Inc.)

Results

There were 179 total HoLEP procedures that were performed during the study period in our institution. Forty-seven patients met the qualification criteria and were found to be suitable candidates for same-day discharge. Among this group, 28 (59.5%) patients were successfully discharged home on the same day. Nineteen patients (40.4%) were not discharged due to hematuria in 15 patients and social reasons/anxiety in 4 patients.

Table 1 demonstrates a comparison between pre-operative characteristics of patients who were successfully discharged on day 1 vs those who were not. Pre-operative prostate volume was the only statistically significant difference between the two groups (88.4 ± 30.7 cc for discharged patients vs 69.0 ± 30.7 cc for admitted patients, $p = 0.033$). Although not statistically significant, there were more patients in the discharged group who were on 5-alpha reductase inhibitors. There were no intra-operative differences between the two groups (Table 2). Post-operatively, the time spent in recovery unit was 339.7 ± 105 min for discharged patients vs 269.6 ± 58 min for admitted patients, $p = 0.0004$. The hematuria score was lower for patients who were discharged home. Most of these patients had low scores (82% with a score of 0–4, 13.6% with a score of 5–6 and 4.5% with a score of 7-8) ($p = 0.0005$). Following the voiding trial on post-operative day 1, 10 patients had to be re-catheterized for 2–3 additional days. Only one patient continued to use self-intermittent catheterization due to bladder hypotonia.

With regard to readmissions, 28% (8/28) of discharged men presented to the emergency department and 17.8% (5/28) were readmitted for hematuria. Amongst the readmitted patients, four patients presented on same day of surgery and one patient presented to the emergency room on post-operative day 1. There were no transfusions or reoperations needed in any patient in this cohort. When the readmitted patients were compared to the rest of the group, history of urinary tract infection was higher in readmitted patients (80% vs 26.2%, $p = 0.0304$) as seen in Table 3. No intra- or post-operative differences were identified between the two groups (Table 4). Among the patients who were successfully discharged home, there were six complications in four patients. This included one episode of epididymoorchitis (grade II), two fossa navicularis strictures requiring office dilations (grade IIIa), two urinary tract infections (grade II) and one episode of clot retention following initiation of anticoagulation that required catheter insertion and manual irrigation (grade IIIa).

On multivariable analysis, no statistically significant predictors were identified for early discharge or readmission. A separate analysis was performed to explore the

Table 1 Comparison of pre-operative and baseline characteristics of patients who were discharged on post-operative day 0 versus patients who were admitted

	Admitted ($N = 19$)	Discharged ($N = 28$)	Total ($N = 47$)	p value
Distance from the Hospital (miles)				0.6332[a]
Mean (SD)	150.9 (210.1)	298.0 (580.7)	238.5 (469.6)	
Median	27.4	30.5	30.0	
Range	(5.9–743.1)	(5.9–2534.1)	(5.9–2534.1)	
Marital status				0.2154[b]
Married	18 (94.7%)	22 (78.6%)	40 (85.1%)	
Non–married	1 (5.3%)	6 (21.4%)	7 (14.9%)	
Age at time of surgery				0.3513[a]
Mean (SD)	71.6 (6.5)	69.8 (6.6)	70.5 (6.6)	
Median	71.1	69.0	69.7	
Range	(56.9–82.7)	(59.3–83.0)	(56.9–83.0)	
BMI kg/m^2				0.9395[a]
Mean (SD)	27.0 (3.1)	27.4 (4.2)	27.2 (3.8)	
Median	27.2	27.3	27.2	
Range	(22.9–34.3)	(20.8–38.1)	(20.8–38.1)	
Charlson Index points				0.5999[a]
Mean (SD)	3.6 (1.7)	3.5 (1.9)	3.6 (1.8)	
Median	3.0	3.0	3.0	
Range	(1.0–7.0)	(2.0–9.0)	(1.0–9.0)	
Preoperative Indwelling Catheterization	3 (15.8%)	7 (25.0%)	10 (21.3%)	0.7180[b]
Duration of catheterization				0.1632[a]
Mean (SD)	6.0 ()	2.2 (2.0)	2.7 (2.4)	
Median	6.0	1.0	1.0	
Range	(6.0–6.0)	(1.0–6.0)	(1.0–6.0)	
BPH medications				
Alpha Blockers	13 (68.4%)	20 (71.4%)	33 (70.2%)	1.0000[b]
5AR inhibitors	4 (21.1%)	9 (32.1%)	13 (27.7%)	0.4093[a]
PDE5 inhibitors	1 (5.3%)	2 (7.1%)	3 (6.4%)	1.0000[b]
Prostate size				0.0331[a]
Mean (SD)	88.4 (30.7)	69.0 (30.7)	77.0 (31.8)	
Median	83.0	65.0	70.6	
Range	(47.0–165.0)	(20.0–151.0)	(20.0–165.0)	
History of blood thinners	5 (26.3%)	4 (14.3%)	9 (19.1%)	0.4525[2]
Previous intervention for BPH	1 (5.3%)	7 (25.0%)	8 (17.0%)	0.1188[2]
History of UTI	7 (36.8%)	8 (28.6%)	15 (31.9%)	0.7507[b]
Preoperative HGB				0.2317[a]
Mean (SD)	14.5 (1.2)	14.8 (1.6)	14.7 (1.5)	
Median	14.5	15.1	14.8	
Range	(11.4–16.4)	(10.6–17.6)	(10.6–17.6)	
ASA score				0.7631[b]
2	12 (63.2%)	19 (67.9%)	31 (66.0%)	
3	7 (36.8%)	9 (32.1%)	16 (34.0%)	
Readmission score				0.6841[a]
Mean (SD)	6.1 (3.2)	5.7 (3.1)	5.9 (3.1)	
Median	6.0	6.0	6.0	
Range	(0.0–14.0)	(0.0–13.0)	(0.0–14.0)	

[a]Kruskal Wallis

[b]Fisher exact

Table 2 Comparison of intra- and post-operative characteristics of patients who were discharged on post-operative day 0 versus patients who were admitted

	Admitted ($N = 19$)	Discharged ($N = 28$)	Total ($N = 47$)	p value
Total operative time (minutes)				0.6180[a]
Mean (SD)	96.5 (29.7)	104.8 (39.0)	101.4 (35.4)	
Median	99.0	97.5	98.0	
Range	(45.0–143.0)	(39.0–190.0)	(39.0–190.0)	
Enucleation time (minutes)				0.9551[a]
N				
Mean (SD)	44.2 (25.8)	46.1 (28.7)	45.3 (27.3)	
Median	33.5	40.0	35.5	
Range	(17.0–99.0)	(16.0–126.0)	(16.0–126.0)	
Intraoperative fluid volume				0.4963[a]
N				
Mean (SD)	673.7 (237.7)	810.7 (484.6)	755.3 (405.7)	
Median	700.0	700.0	700.0	
Range	(300.0–1200.0)	(100.0–2200.0)	(100.0–2200.0)	
Morphine equivalence in PACU				0.6759[a]
N				
Mean (SD)	14.6 (9.1)	14.9 (7.4)	14.8 (8.0)	
Median	10.0	10.0	10.0	
Range	(2.5–40.0)	(0.0–30.0)	(0.0–40.0)	
Time of arrival to PACU				0.5462[b]
Before 11 am	8 (42.1%)	9 (32.1%)	17 (36.2%)	
After 11 am	11 (57.9%)	19 (67.9%)	30 (63.8%)	
Timing of surgery during the day				1.0000[b]
Before noon	15 (78.9%)	22 (78.6%)	37 (78.7%)	
Afternoon	4 (21.1%)	6 (21.4%)	10 (21.3%)	
Time in PACU (minutes)				0.0004[a]
N				
Mean (SD)	339.7 (105.0)	269.6 (58.0)	297.9 (86.6)	
Median	338.0	269.0	296.0	
Range	(82.0–633.0)	(124.0–396.0)	(82.0–633.0)	
Urine color at 4h in PACU				0.0005[b]
0–4	3 (21.4%)	18 (81.8%)	21 (58.3%)	
5–6	6 (42.9%)	3 (13.6%)	9 (25.0%)	
7–8	5 (35.7%)	1 (4.5%)	6 (16.7%)	

[a]Kruskal Wallis

[b]Fisher exact

effect of nursing staff learning curve on discharge outcomes and there was no difference identified when the group was divided into different categories based on the date of the operation. However, there was a general trend to achieve successful same-day discharge later in the study as seen in Fig. 2.

Discussion

In this study, almost 60% of the original cohort were discharged home successfully and 18% of those who were discharged were readmitted. The most common cause of failure to discharge was the appearance of urine in PACU while off CBI following the procedure. This may reflect the subjective nature of evaluating urine appearance after surgery and what can be considered safe for discharge. In this prospective study, a more conservative approach to patient discharge was adopted to minimize patient risks. There were no significant predictors identified for early discharge or for readmission using a multivariable analysis. The main reason for readmission was hematuria and inability or lack of comfort with irrigating the catheter by the patient at home with most of these readmissions taking place on the same day of discharge.

Table 3 Comparison of pre-operative characteristics between patients who were readmitted versus patients who were not readmitted

	Not readmitted	Readmitted	Total	*p* value
Distance from Mayo Hospital (miles)				0.5230[a]
Mean (SD)	237.4 (491.7)	248.2 (239.2)	238.5 (469.6)	
Median	28.7	318.4	30.0	
Range	(5.9–2534.1)	(7.5–564.3)	(5.9–2534.1)	
Marital status				1.0000[b]
Married	35 (83.3%)	5 (100.0%)	40 (85.1%)	
Non-married	7 (16.7%)	0 (0.0%)	7 (14.9%)	
Age at time of surgery				0.0533[a]
Mean (SD)	69.9 (6.3)	76.3 (6.3)	70.5 (6.6)	
Median	69.4	76.6	69.7	
Range	(56.9–83.0)	(66.8–82.7)	(56.9–83.0)	
BMI				0.3005[a]
Mean (SD)	27.3 (3.7)	26.1 (5.0)	27.2 (3.8)	
Median	27.4	24.7	27.2	
Range	(20.8–38.1)	(21.9–34.3)	(20.8–38.1)	
Charlson Index points				0.4884[a]
Mean (SD)	3.5 (1.6)	4.4 (2.8)	3.6 (1.8)	
Median	3.0	3.0	3.0	
Range	(1.0–7.0)	(2.0–9.0)	(1.0–9.0)	
Preoperative Catheterization? (Y)	9 (21.4%)	1 (20.0%)	10 (21.3%)	1.0000[b]
Duration of Catheterization				0.1632[a]
Mean (SD)	2.2 (2.0)	6.0 ( )	2.7 (2.4)	
Median	1.0	6.0	1.0	
Range	(1.0–6.0)	(6.0–6.0)	(1.0–6.0)	
BPH medications				
Alpha blockers	29 (69.0%)	4 (80.0%)	33 (70.2%)	1.0000[b]
5AR inhibitors	11 (26.2%)	2 (40.0%)	13 (27.7%)	0.5185[a]
PDE5 inhibitors	3 (7.1%)	0 (0.0%)	3 (6.4%)	1.0000[b]
Prostate size				0.4802[a]
Mean (SD)	75.7 (30.0)	88.0 (47.1)	77.0 (31.8)	
Median	69.8	90.0	70.6	
Range	(27.0–165.0)	(20.0–151.0)	(20.0–165.0)	
History of Blood thinners (Y)	7 (16.7%)	2 (40.0%)	9 (19.1%)	0.2397[b]
Previous intervention for BPH	7 (16.7%)	1 (20.0%)	8 (17.0%)	1.0000[b]
History of UTI	11 (26.2%)	4 (80.0%)	15 (31.9%)	0.0304[b]
Preoperative HGB				0.9424[a]
Mean (SD)	14.7 (1.4)	14.3 (2.3)	14.7 (1.5)	
Median	14.8	15.0	14.8	
Range	(11.0–17.6)	(10.6–16.4)	(10.6–17.6)	
ASA score				0.3202[b]
2	29 (69.0%)	2 (40.0%)	31 (66.0%)	
3	13 (31.0%)	3 (60.0%)	16 (34.0%)	
Readmission score				0.6490[a]
Mean (SD)	5.7 (3.0)	7.2 (4.2)	5.9 (3.1)	
Median	6.0	6.0	6.0	
Range	(0.0–13.0)	(3.0–14.0)	(0.0–14.0)	

[a]Kruskal Wallis

[b]Fisher exact

Table 4 Comparison of intra- and post-operative characteristics between patients who were readmitted versus patients who were not readmitted

	No ($N = 42$)	Yes ($N = 5$)	Total ($N = 47$)	p value
Total operative time (min)				0.7693[a]
Mean (SD)	101.7 (33.0)	98.8 (57.1)	101.4 (35.4)	
Median	98.5	94.0	98.0	
Range	(41.0–190.0)	(39.0–173.0)	(39.0–190.0)	
Enucleation time (min)				1.0000[a]
Mean (SD)	44.9 (26.8)	48.8 (34.5)	45.3 (27.3)	
Median	36.0	34.0	35.5	
Range	(16.0–126.0)	(17.0–98.0)	(16.0–126.0)	
Intraoperative fluid volume				0.2490[a]
Mean (SD)	771.4 (412.0)	620.0 (356.4)	755.3 (405.7)	
Median	700.0	500.0	700.0	
Range	(100.0–2200.0)	(300.0–1200.0)	(100.0–2200.0)	
Morphine equivalence in PACU				0.9141[a]
Mean (SD)	14.8 (8.1)	14.5 (8.0)	14.8 (8.0)	
Median	10.0	20.0	10.0	
Range	(0.0–40.0)	(2.5–20.0)	(0.0–40.0)	
Time of arrival to PACU				1.0000[b]
Before 11 am	15 (35.7%)	2 (40.0%)	17 (36.2%)	
After 11 am	27 (64.3%)	3 (60.0%)	30 (63.8%)	
Timing of surgery during the day				0.5694[b]
Before noon	32 (76.2%)	5 (100.0%)	37 (78.7%)	
Afternoon	10 (23.8%)	0 (0.0%)	10 (21.3%)	
Time in PACU (minutes)				0.4075[a]
Mean (SD)	300.3 (89.1)	278.2 (66.6)	297.9 (86.6)	
Median	300.5	274.0	296.0	
Range	(82.0–633.0)	(202.0–379.0)	(82.0–633.0)	
Urine color at 4h in PACU				1.0000[b]
Missing				
0–4	18 (58.1%)	3 (60.0%)	21 (58.3%)	
5–6	8 (25.8%)	1 (20.0%)	9 (25.0%)	
7–8	5 (16.1%)	1 (20.0%)	6 (16.7%)	

[a]Kruskal Wallis

[b]Fisher exact

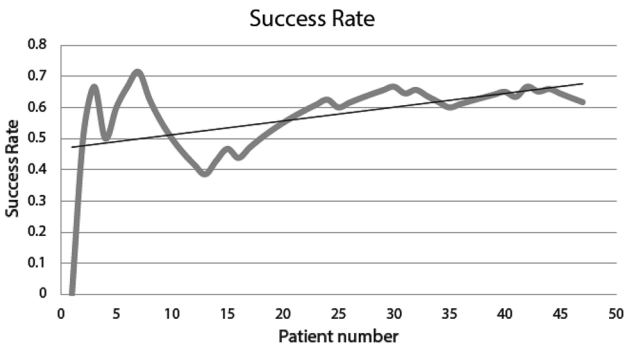

Fig. 2 Success of same-day discharge by case number among patients who fulfilled the selection criteria

Length of stay is variable following different transurethral procedures for BPH. However, Cornu et al. conducted a meta-analyses of 15 randomized clinical trials comparing HoLEP to various alternative interventions including open simple prostatectomy (OSP), monopolar and bipolar transurethral resection of the prostate (TURP), and photoselective vaporization of the prostate (PVP). When lengths of stay were specifically examined, HoLEP demonstrated favorable hospitalization outcomes compared to other procedures. The mean hospital stay difference was 1.4 additional days and 4.3 additional days for monopolar TURP and OSP, respectively [17]. No differences in length of stay were identified when HoLEP was compared to Bipolar TURP, PVP or plasmakinetic enucleation of the prostate [6, 18, 19]. The hospital stay ranged between 1 and 2 days in these trials. Of note, several studies discharged

patients < 24 h following the end of the procedure but this included an overnight stay.

In an early study, Larner et al. reported the feasibility of same-day discharge; however, the average prostate volume was limited to 30 g which hinders any comparison between the two studies [20]. Comat et al. reported their experience of same-day discharge in 90 patients who underwent HOLEP with comparable pre-operative prostate volumes [21, 22]. They concluded that same-day discharge is safe and feasible with acceptable complication rates. However, no clear pre-operative selection criteria were described. Post-operative discharge criteria were not set prior to the procedure. In their study, all surgeries were performed at 8 am, whereas in our study the cases were performed any time of the morning or early afternoon that would allow discharge the patients at a reasonable time. Last, trainee participation was not included in their study and no readmission data were reported.

In general, post-operative admission is necessary when the patient requires frequent/intensive monitoring, repeated procedures, administration of parenteral medications, when the risk of early complications is high or when the patient is expected to have delayed bowel function or ambulation. The presence of a skilled nursing team augments medical care with monitoring and administration of medications. However, in our opinion the rationale of overnight stay following HoLEP is the need for catheter management and the fact that patients undergoing HoLEP typically have large glands. From our clinical experience, there are many patients who did not require CBI or it was unnecessarily continued at a slow rate on the same day of the procedure. Those patients tend to be very satisfied and ready for early discharge on post-operative day 1. Accordingly, we hypothesized that some patients can be safely discharged home when selected properly and received adequate education.

The most common etiology for unplanned readmission following any type of surgery is complications. Using a very large inpatient sample from American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP), Merkow et al. identified surgical site infection, ileus, and bleeding/thromboembolic event as the main reasons for readmission. This observation persisted when the complications were assessed according to the time of occurrence (< 7 days vs > 7 days) [23]. However, transurethral endoscopic interventions for BPH management are unique and carry potential additional risks associated with urinary tract infection (UTI), sepsis, fluid overload and electrolyte disturbances. Following monopolar TURP, the 30-day readmission rate was found to be 4.4% and is most commonly secondary to hematuria with the most important predictor being age and CCI [24]. Little is known about the exact incidence of immediate post-operative complications following HoLEP as most series report complications within 30 days or later. We have previously reported our experience with hematuria following HoLEP early during our learning curve. The transfusion rate was observed in 6.7%. Transfusion was more common in patients with prostate cancer, history of UTIs, large prostate volumes and in those patients with cardiac risk factors and Hgb less than 10 mg/dL based on cardiology recommendation at that time [25]. In the current study, we tried to avoid these factors by excluding patients with these criteria. While this resulted in no transfusions in this series, the color of urine as a surrogate of the degree of hematuria requiring CBI was still the most common cause of readmission. Five patients in this study had delayed recurrence of hematuria later in the day despite reassuring hematuria score in PACU.

This was a prospective quality improvement initiative aimed at shortening length of stay in appropriately selected patients. Limitations of the study include the strict qualification criteria that reduced the number of eligible patients. Patient satisfaction was not directly assessed during this study. Despite the fact that other studies demonstrated good satisfaction with early discharge, it is difficult to generalize these results due to the differences in complications rates and different post-operative care pathways [26]. The effect of hospitalization vs early discharge on final functional outcomes and peri-operative complications was not assessed during this study. However, the functional outcomes are mainly determined by the intra-operative course and patients' inherent factors, and are not expected to be affected by the length of stay. The selection criteria in this study may have prevented the inclusion of a larger number of HoLEP patients who may be candidates for discharge. However, without any objective criteria in the literature, guidelines were conceived arbitrarily and aimed at patient safety. While this study did not identify specific predictors for readmission/early discharge in our multivariable analysis, we suggest that it will be safer to consider admitting patient with large glands and history of UTI with high hematuria scores until further larger studies are reported. Future directions include larger randomized prospective studies to assess the selection criteria for same-day discharge and to determine the statistical significance of potential predictors whose effect could have been masked by this study limitation and to assess the potential cost-related benefits of same-day procedures.

In conclusion, we believe that same-day HoLEP is feasible and safe in a small number of well-selected patients undergoing HoLEP. This will potentially offer several health- and cost-related benefits. Further work should be done to identify suitable patients and specific selection criteria. This has to proceed with caution to ensure patient safety and best possible outcomes.

Author contributions H A-M: project development, data collection and management, data analysis and manuscript writing. WC: protocol and project development, data collection and manuscript editing. AN: manuscript editing. JG: data collection and project development. KT: data collection and project development. MG: statistical analysis. PA: manuscript editing. SC: manuscript editing. MH: project and protocol design, manuscript editing.

Funding None.

Conflict of interest The authors declare that they have no conflict of interest.

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