

Research Article

Evaluation of Postoperative Urinary Tract Infection and Sepsis Rates After Adding Cystolitholapaxy to HoLEP: A Retrospective Analysis

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Abstract

Holmium laser enucleation of the prostate (HoLEP) is an established treatment for benign prostatic hyperplasia (BPH). In patients with concurrent bladder stones, cystolitholapaxy can be performed during the same procedure, but its impact on postoperative infections is unclear. We retrospectively analysed 278 patients who underwent HoLEP alone ($n = 205$) or HoLEP with cystolitholapaxy ($n = 73$) between 2017 and 2024. Baseline characteristics including age, prostate size, body mass index (BMI), diabetes mellitus (DM), and postoperative infectious outcomes were compared. Urinary tract infection (UTI) was defined by abnormal urinalysis within 30 days, and sepsis was defined clinically. Independent t-tests and Fisher's exact test were used, with $p < 0.05$ considered significant. Baseline demographics were similar between groups (mean age: 73.46 vs. 73.41 years, $p = 0.956$; prostate size: 106.97 vs. 117.92 mL, $p = 0.104$; BMI: 27.64 vs. 28.50 kg/m², $p = 0.281$). The HoLEP + cystolitholapaxy group had more DM patients than HoLEP only (37.7% vs. 22.5%; Odds ratio (OR) = 2.08, 95% CI 1.16–3.74; $p = 0.018$). Postoperative UTI occurred in 22/205 (10.7%) HoLEP-only and 12/73 (16.4%) combined patients (OR = 0.85, 95% CI 0.43–1.64; $p = 0.643$). Sepsis was rare (1/205 in HoLEP-only; 0/73 in combined; OR = 0.93; $p = 1.000$). Despite higher DM prevalence in the HoLEP + cystolitholapaxy group, no significant differences in postoperative UTI or sepsis were observed. Combining HoLEP with cystolitholapaxy appears safe, allowing comprehensive management of BPH and bladder stones in a single session without increasing infectious risk.

Keywords

HoLEP, Cystolitholapaxy, Benign Prostatic Hyperplasia, Urinary Tract Infection, Sepsis, Postoperative Complication

1. Introduction

BPH is one of the most prevalent urological conditions in aging men, often resulting in lower urinary tract symptoms (LUTS) that negatively impact quality of life [1, 2]. While transurethral resection of the prostate (TURP) has long been

considered the gold standard surgical treatment, holmium laser enucleation of the prostate (HoLEP) is now widely accepted as an effective alternative, especially for larger glands, due to its superior haemostasis, shorter catheterization times,

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and durable outcomes [3-6].

Bladder stones frequently coexist with BPH, arising from chronic urinary stasis secondary to outlet obstruction [7, 8]. In such cases, cystolitholapaxy is commonly performed concurrently with HoLEP [9, 10]. However, simultaneous procedures may theoretically increase the risk of postoperative infection due to prolonged operative time and additional instrumentation.

Although perioperative infection after HoLEP is generally uncommon, infectious complications such as UTI and sepsis remain clinically significant [11]. Evidence on whether combined HoLEP and cystolitholapaxy increases infectious risk is limited. This study aims to compare postoperative UTI and sepsis rates in patients undergoing HoLEP alone versus HoLEP with cystolitholapaxy.

2. Materials and Methods

After obtaining approval for an audit, we performed a retrospective study and analysed data from patients who underwent HoLEP between 2017 and 2024. Patients were divided into two groups: HoLEP only, n=205 and HoLEP + cystolitholapaxy, n=73, totalling 278 patients.

Baseline variables included age, prostate size, diabetes mellitus (DM) and body mass index (BMI). We also included in the analysis length of hospital stay (LOS), presence of long-term catheter (LTC), size of stones, number of stones, preoperative and postoperative urinalysis, rate of sepsis and if patients were given antibiotics postoperatively.

We included all consecutive patients undergoing HoLEP and HoLEP + cystolitholapaxy at Colchester Hospital between January 2017 and December 2024. We excluded patients undergoing concomitant procedures other than cystolitholapaxy (e.g., ureteral surgery), incomplete medical records preventing ascertainment of postoperative infectious outcomes, or follow-up <30 days. Patients with active systemic infection at time of surgery were deferred and not included. Patients presenting with a positive urinalysis received a course of targeted antibiotic therapy prior to undergoing the procedure.

Preoperative and postoperative urinalysis was obtained for

all patients; urine culture was obtained if urinalysis was abnormal or the patient was symptomatic. Patients presenting with a positive urinalysis received a course of targeted antibiotic therapy prior to undergoing the procedure.

Perioperative prophylaxis typically consisted of a single dose of intravenous (IV) Gentamicin (3 mg/kg) at induction, with alternatives used for allergy or renal impairment. Patients with an indwelling catheter or positive preoperative urinalysis/culture commonly received a 7 days postoperative antibiotic course at the discretion of the treating surgeon.

3. Results

Patient demographics and baseline characteristics were comparable between groups. Mean age was 73.46 ± 7.8 years in the HoLEP-only group and 73.41 ± 7.5 years in the HoLEP + cystolitholapaxy group ($p = 0.956$). Mean prostate volume was 106.97 ± 36.4 mL versus 117.92 ± 42.1 mL, respectively ($p = 0.104$), and mean BMI did not differ significantly ($p = 0.281$) (Table 1).

The proportion of patients with diabetes mellitus (DM) was significantly higher in the HoLEP + cystolitholapaxy group than in the HoLEP-only group (37.7% vs. 22.5%; OR = 2.08, 95% CI 1.16–3.74; $p = 0.018$). No significant differences were observed in patients with long-term catheter between the two groups (LTC; 30.7% vs. 23.7%; OR = 1.42, 95% CI 0.79–2.54; $p = 0.206$) or abnormal preoperative urinalysis results (23.9% vs. 27.3%; OR = 0.85, 95% CI 0.43–1.64; $p = 0.643$). LOS was similar in both groups (1.5 vs 1.4 days, $p = 0.86$). Mean size of stone was 1.9 cm and 22 patients had one stone, while 51 had multiple stones. (Table 1).

Postoperative urinary tract infections occurred in 22 patients (10.7%) in the HoLEP-only group and 12 patients (16.4%) in the combined group, but this difference was not statistically significant (OR = 1.64, 95% CI 0.76–3.50; $p = 0.215$). Only one patient (0.5%) in the HoLEP-only group developed sepsis; no cases occurred in the combined group ($p = 1.000$) (Table 2).

Overall, these results indicate that combining cystolitholapaxy with HoLEP does not increase infectious complications despite a higher prevalence of DM in the combined group.

Table 1. Baseline Characteristics and Comorbidities.

Variable	HoLEP-only (n=205)	HoLEP + cystolitholapaxy (n=73)	OR (95% CI)	p-value
Age, years (mean $\pm$ SD)	73.46 ± 7.8	73.41 ± 7.5	—	0.956
Prostate volume, mL (mean $\pm$ SD)	106.97 ± 36.4	117.92 ± 42.1	—	0.104
BMI, kg/m ² (mean $\pm$ SD)	27.6 ± 3.7	28.5 ± 4.1	—	0.281
Diabetes mellitus, n (%)	46 (22.5)	27 (37.7)	2.08 (1.16–3.74)	0.018
Long-term catheter, n (%)	49 (23.7)	22 (30.7)	1.42 (0.79–2.54)	0.206
Abnormal preoperative urinalysis, n (%)	56 (27.3)	17 (23.9)	0.85 (0.43–1.64)	0.643

Variable	HoLEP-only (n=205)	HoLEP + cystolitholapaxy (n=73)	OR (95% CI)	p-value
LOS, mean days (range)	1.4 (1- 5)	1.5 (1 – 5)	—	0.86
Size of stones, mean cm (range)	-	1.9 (1 – 5)	—	
Number of stones, n (%)	-		—	
One		22 (32.8)		
Multiple		51 (67.2)		

Note: OR = odds ratio; CI = confidence interval; BMI = body mass index.

Table 2. Postoperative Infectious Complications.

Complication	HoLEP-only (n=205)	HoLEP + Cystolitholapaxy (n=73)	OR (95% CI)	p-value
Urinary tract infection, n (%)	22 (10.7)	12 (16.4)	1.64 (0.76–3.50)	0.215
Sepsis, n (%)	1 (0.5)	0 (0)	—	1.000

Note: OR = odds ratio; CI = confidence interval; UTI = urinary tract infection.

4. Discussion

This study demonstrates that combining cystolitholapaxy with holmium laser enucleation of the prostate (HoLEP) does not significantly increase the risk of postoperative urinary tract infection (UTI) or sepsis compared to HoLEP alone. Despite a higher prevalence of diabetes mellitus (DM) in the combined group (37.7% vs 22.5%), infectious outcomes were comparable, suggesting that concomitant cystolitholapaxy can be safely performed in patients with benign prostatic hyperplasia (BPH) and bladder stones, even among those with comorbidities that predispose to infection.

Postoperative infectious complications following HoLEP are generally uncommon but remain clinically relevant. Early series reported overall infectious complication rates of approximately 7–8%, including cases of prostatitis, pyelonephritis, epididymitis, and urosepsis (Shigemura et al., 2013) [12]. More recent large-scale studies have reported UTI rates ranging from 4% to 13%, with sepsis occurring in fewer than 1% of patients (Elsaqa et al., 2023; Capogrosso et al., 2023; Dörsch et al., 2024) [11, 14, 13]. Factors independently associated with postoperative UTI include positive preoperative urine cultures, higher body-mass index (BMI), frailty, and postoperative incontinence [11]. These findings highlight that, while HoLEP is a clean-contaminated procedure with low infection rates overall, vigilance remains warranted, particularly in high-risk individuals.

Concerns have been raised that prolonged operative time and additional endoscopic manipulation during simultaneous procedures may increase infection risk (Romero-Otero et al., 2019) [15]. However, both the present study and prior investigations

found that adding cystolitholapaxy to HoLEP does not significantly increase overall complications despite longer operative times. Shah et al. [10], Tangpaitoon et al. [9], and Elshal et al. [16] all demonstrated that concomitant management of bladder stones and prostate obstruction using HoLEP is feasible and safe, with no rise in major postoperative complications. Interestingly, bladder stones themselves may serve as a nidus for infection [17], and their removal during HoLEP could theoretically reduce recurrent UTI risk, potentially counterbalancing any increased risk associated with longer surgery.

Antibiotic prophylaxis protocols also influence postoperative infection rates. In a recent multicentre analysis, high-risk HoLEP patients (with preoperative catheters or positive urine cultures) had lower infection rates when given an extended preoperative antibiotic course (1.9%) compared with a standard short regimen (7.6%) [18]. Likewise, Yu et al. [19] found that extended postoperative antibiotic prophylaxis after transurethral prostate surgery, including HoLEP, did not significantly reduce infection risk compared with ≤ 1 day of antibiotics. Large single-centre series confirm that contemporary HoLEP carries very low infectious morbidity, with postoperative UTI around 5% and sepsis under 0.1%, underscoring the procedure's safety in experienced hands [20]. Advances in perioperative care, such as targeted antibiotic therapy, improved irrigation systems, and early catheter removal likely contribute to this reduction.

Taken together, current evidence supports that concomitant cystolitholapaxy can be safely performed with HoLEP without increasing infectious complications, even in higher-risk populations such as those with diabetes mellitus. Nevertheless, given the theoretical risk imposed by longer operative times and additional instrumentation, individualized risk assessment

and meticulous perioperative infection control remain essential.

Our study also confirms that patient characteristics such as age, prostate size, and BMI were similar between groups, reducing confounding effects (Table 1). Although DM was more prevalent in the combined group, this did not translate into higher infection rates, highlighting the safety of the combined procedure in a higher-risk population.

Limitations of this study include its retrospective design and the relatively small size of the cystolitholapaxy subgroup, which may reduce statistical power. Operative time was not stratified, which could influence infection rates. Future prospective multicentre studies with larger cohorts are needed to validate these findings and further clarify risk factors for postoperative infections.

5. Conclusion

The addition of cystolitholapaxy to HoLEP does not significantly increase the risk of postoperative urinary tract infection or sepsis, even in patients with a higher prevalence of diabetes mellitus. These findings support the safety and feasibility of a combined surgical approach, allowing effective management of both benign prostatic hyperplasia and bladder stones in a single session without increasing infectious complications.

Abbreviations

HoLEP	Holmium Laser Enucleation of the Prostate
BMI	Body Mass Index
DM	Diabetes Mellitus
UTI	Urinary Tract Infection
OR	Odds Ratio
LUTS	Lower Urinary Tract Symptoms
BPH	Benign Prostatic Hyperplasia
TURP	Transurethral Resection of the Prostate
IV	Intravenous
LOS	Length of Hospital Stay

Conflicts of Interest

The authors declare no conflict of interests.

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