

## A Retrospective Study on Prostate Size's Impact on Holmium Laser Enucleation Outcome

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### Abstract:

**Background:** Benign prostatic hyperplasia (BPH) is a usual condition among aging men, characterized by prostate gland enlargement leading to lower urinary tract symptoms (LUTS). Holmium laser enucleation of the prostate (HoLEP) is an effective surgical treatment for BPH, but outcomes can vary. The study's objective was to evaluate the impact of prostate size on the results of HoLEP, a well-established procedure for managing symptomatic BPH.

**Methods:** This retrospective observational study conducted included 135 male participants with bladder outlet obstruction (BOO) who underwent HoLEP. People were categorized based on prostate size, and data on demographics, comorbidities, surgical outcomes, and postoperative follow-up were collected. Statistical analyses were performed to compare outcomes among the three prostate size groups.

**Results:** Refractory urinary retention rates were 18%, 34%, and 67% in groups 1, 2, and 3, with 30% having coagulopathy. Intraoperative complications were similar, except for more superficial mucosal injuries in larger prostates. Capsular perforation occurred in 9.6%, mostly minor. One patient needed a transfusion. Post-HoLEP complications were uniform, except for increased stenosis in group 3. HoLEP led to significant improvements in AUA symptom scores (75% reduction), peak urinary flow rate (225% increase), and postvoid residual volume (86% decrease) after 1 year, consistently across prostate size groups.

**Conclusion:** Prostate size appears to influence certain complications during HoLEP but does not significantly impact overall surgical outcomes or the procedure's efficacy in relieving LUTS. HoLEP remains a valuable treatment option for BPH, irrespective of prostate size.

**Recommendations:** Based on the findings, it is recommended that urologists consider HoLEP as a suitable treatment option for BPH patients, regardless of prostate size. Further research should explore techniques to mitigate complications related to larger prostates during HoLEP and investigate long-term outcomes.

**Keywords:** Benign prostatic hyperplasia, Prostate size, Holmium laser enucleation, Surgical outcomes, Complications.

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### Introduction

Men in their ageing years frequently develop benign prostatic hyperplasia (BPH), a disorder marked by an expanded size of the prostate gland that can cause painful lower urinary tract symptoms (LUTS) and a reduction in quality of life [1]. With a minimal risk of problems, holmium laser enucleation of the prostate (HoLEP) has become a popular surgical treatment option for BPH, providing symptom relief and improved urine flow [2]. Even while HoLEP has shown to be very effective, there is still a significant amount of diversity in the results that patients experience after the treatment. A significant element that could impact the result of a hormone-releasing prostate biopsy is the prostate gland's size.

The size of the prostate is a well-documented factor that can impact surgical outcomes in BPH patients. Larger prostates are often associated with more severe LUTS and may necessitate more extensive surgical procedures [3]. Furthermore, prostate size can affect the technical challenges encountered during HoLEP, such as the time required for enucleation and morcellation, as well as the risk of complications like capsular perforation and postoperative hematuria [4, 5].

Several studies have explored the relationship between prostate size and HoLEP outcomes, but the findings have not always been consistent. Some studies suggest that larger prostates may be associated with longer operative times, increased intraoperative bleeding, and higher rates of

complications [4,5]. However, other research has reported no significant differences in surgical outcomes between different prostate size groups [6,7].

The study's objective was to determine how the size of the prostate affected the outcomes of Holmium laser enucleation of the prostate (HoLEP), a widely used treatment for symptomatic benign prostatic hyperplasia (BPH).

### Methodology

**Study Design:** A retrospective observational design

**Study Setting:** The study was conducted at A.I.I.M.S., Patna, Bihar between 2021 to 2022.

**Participants:** The study included 135 male patients diagnosed with bladder outlet obstruction (BOO). These individuals were selected based on clinical presentation and diagnostic criteria.

### Inclusion Criteria:

- Male patients diagnosed with BOO
- Patients scheduled for HoLEP
- Patients with significant lower urinary tract symptoms (LUTS) and obstructed urinary flow rate

### Exclusion Criteria:

- Individuals who have been diagnosed with prostate cancer before surgery
- Individuals who also have urethral stricture or neurogenic bladder
- Individuals who have low effort tolerance, ischemic cardiomyopathy, and a left ventricular ejection fraction less than 30% are at grade 4 anaesthesia risk according to the American Society of Anesthesiologists.

**Bias:** The study may have introduced bias due to its retrospective nature and the exclusion of certain patient groups based on medical conditions and anesthesia risk.

**Variables:** Variables included prostate size (categorized into three groups based on preoperative weight), surgical outcomes, complications, and postoperative follow-up data.

**Data Collection:** Patient data were collected from medical records, including preoperative assessments, surgical details, and postoperative follow-up visits.

**Procedure:** Patients underwent HoLEP under either regional or general anesthesia, with variations in anesthesia management based on individual patient characteristics and comorbidities. The HoLEP procedure involved laser enucleation of the prostate and morcellation of enucleated tissue. Additional procedures were performed for individuals with related vesical calculi or bladder diverticulum.

### Outcome Measures:

- Immediate surgical complications
- Postoperative follow-up data, including AUA symptom scores, uroflowmetry, and postvoid residual urine measurements at 1, 3, 6, and 12 months, as well as yearly thereafter

**Follow-up:** Patients were scheduled for regular follow-up visits at specified intervals to assess postoperative outcomes and monitor their progress.

**Statistical Analysis:** Statistical analyses were conducted to compare outcomes among patients in the three subgroups based on prostate size. A significance level of  $P < 0.05$  was considered statistically significant.

**Ethical Considerations:** The study adhered to ethical guidelines and patient confidentiality. Informed consent was obtained from patients when applicable, and institutional ethical approval was obtained to conduct the retrospective analysis.

### Result

**Table 1: Demographics of the study participants**

Variable	Mean (Range) or n (%)
Age, years	62.8 (49–103)
Associated Medical Comorbidities	100 (74.1)
- Hypertension	48
- Chronic Renal Failure	3
- Diabetes Mellitus	18
- Rheumatic Heart Disease	1
- Ischaemic Heart Disease	26
- COPD/Bronchial Asthma	13
- Cardiac Pacemakers	13
- Hypothyroidism	1
- Liver Cirrhosis	1
Cerebrovascular Accident	2

<i>Abdominoperineal Resection for Rectal Cancer</i>	0
- Bladder Tumour	0
- Inguinal Hernia	5
- Upper Tract Urolithiasis	5
<i>Recurrent BPH</i>	
- After Open Prostatectomy	1
- After TURP	8
<i>Associated Coagulopathy</i>	29 (21.5)
- Anti-platelet Medication (Low-Dose Aspirin/Clopidogrel)	26
- Thrombocytopenia	1
- Warfarin	2
- Autoimmune Dermatitis with Idiopathic Coagulopathy	0
<i>Indication for Surgery</i>	
- Recurrent UTI, Including Epididymitis	2 (1.5)
- Failure of Medical Management	64 (47.4)
- Recurrent Urinary Retention	37 (27.4)
- Bladder Calculi	17 (12.6)
- Obstructive Uropathy	3 (2.2)
- Bladder Diverticulum	2 (1.5)
- Refusal of Medical Management	10 (7.4)

The following are the demographic details for the 135 patients that were part in the study: In groups 1, 2, and 3, refractory urinary retention was noted in 24 (17%), 18 (33%), and 13 (66%) of the participants, respectively. Thirty percent of these participants also had concomitant coagulopathy, and the three groups had an equal distribution of this comorbidity. The three groups did not differ in terms of intraoperative complications, with the exception of a greater incidence of superficial mucosal injury among individuals with larger prostates. At 9.6% of patients, capsular perforation was the most frequent consequence during HoLEP. The majority of these perforations were either "covered" or "threatened," and this had little bearing on how the patients were treated going forward. During HoLEP, just one patient needed a blood transfusion. The patient was on a urethral catheter for five months before to the treatment, and their preoperative hemoglobin level was 7.2 g/dL. Before surgery, they received 2 units of packed cells, and during the procedure, they received one unit of whole blood.

All three groups had post-HoLEP problems equally, with the exception of group 3 having a higher prevalence of stenotic complications. Following surgery, four patients needed blood transfusions; one of them had preoperative hemoglobin levels of 8.9 g/dL and was given 2 units of packed cells after the procedure. Following surgery, the remaining 3 participants who required a blood transfusion either had coagulopathy or were receiving anti-platelet medication. Following HoLEP, 2 of these 3 participants developed secondary haemorrhage, necessitating the removal of a cystoscopic clot.

The mean American Urological Association (AUA) symptom score reduced by 75% with HoLEP, from 19.35 to 4.77, after a 1-year follow-up. The mean peak urine flow rate (Q<sub>max</sub>) rose from 7.76 to 17.60 mL/s, a 225% increase. Furthermore, the mean postvoid residual urine (PVR) dropped from 142.7 to 19.5 mL, an 86% decrease. Crucially, all three patient groups experienced the same gains.

### Discussion

In this study involving 135 patients, refractory urinary retention was more prevalent in those with larger prostates, with 18%, 34%, and 67% of individuals in groups 1, 2, and 3, respectively, experiencing this condition. Associated coagulopathy was present in approximately 30% of patients, evenly distributed across prostate size groups. Intraoperative complications were generally evenly distributed, except for a slightly greater frequency of superficial mucosal injury in patients with larger prostates. Capsular perforation during HoLEP was common (9.6%) but often minor, with minimal clinical impact. Only one participant required a blood transfusion during surgery. Post-HoLEP complications were evenly distributed, except for a higher occurrence of stenotic complications in group 3. HoLEP was found to be effective in improving lower urinary tract symptoms and urine flow regardless of prostate size, as evidenced by a significant 74% reduction in the mean AUA symptom score, a 225% rise in the mean peak urinary flow rate, and an 85% decrease in the mean postvoid residual urine volume after a year.

Recent studies have extensively explored the outcomes of HoLEP in individuals with varying prostate sizes. A significant study found that HoLEP outcomes, including improvements in PSA,

AUA symptom score, and max. urinary flow rate, are independent of prostate size [8]. Another research focused on whether the size of the resectoscope sheath influences the outcomes of HoLEP, finding no clear advantage of scope size on intra-operative or post-operative outcomes [9]. The efficacy and safety of the 'Inverted Omega En-bloc' HoLEP technique were also assessed, emphasizing its effectiveness irrespective of prostate size [10]. Additionally, a comparison between HoLEP and robotic-assisted simple prostatectomy highlighted HoLEP as a size-independent surgery with potential advantages for minimally invasive procedures [11]. Lastly, a randomized controlled trial comparing traditional HoLEP with a top-down approach focused on urinary functional outcomes and postoperative results, demonstrating the procedure's effectiveness [12]. These studies collectively underscore the versatility and efficacy of HoLEP in treating benign prostatic hyperplasia across different prostate sizes and surgical approaches.

### Conclusion

The study suggests that HoLEP is an effective treatment for individuals with LUTS due to BPH. While there may be some differences in complications and outcomes related to prostate size, overall, HoLEP led to significant improvements in symptoms, urinary flow, and postvoid residual urine volume for all patients included in the study. It also highlighted the relatively low incidence of severe complications during and after the procedure.

**Limitations:** The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

**Recommendations:** Based on the findings, it is recommended that urologists consider HoLEP as a suitable treatment option for BPH patients, regardless of prostate size. Further research should explore techniques to mitigate complications related to larger prostates during HoLEP and investigate long-term outcomes.

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### List of Abbreviations:

1. BPH - Benign Prostatic Hyperplasia
2. LUTS - Lower Urinary Tract Symptoms
3. HoLEP - Holmium Laser Enucleation of the Prostate

4. PSA - Prostate-Specific Antigen
5. AUA - American Urological Association
6. BOO - Bladder Outlet Obstruction

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**Conflict of Interest:** The authors have no competing interests to declare.

### References

1. Roehrborn CG. Benign prostatic hyperplasia: an overview. *Rev Urol.* 2008;10(Suppl 2):S3-S14.
2. Malaeb BS, Yu X. HoLEP: A review of the development and advantages of the holmium laser enucleation of the prostate. *Rev Urol.* 2018;20(3):152-157.
3. Elzayat EA, Habib EI, Elhilali MM, Elzayat EA. Holmium laser enucleation of the prostate in patients on anticoagulant therapy or with bleeding disorders. *J Urol.* 2006;175(4):1428-1432.
4. Elzayat EA, Habib EI, Elhilali MM, Elzayat EA. Holmium laser enucleation of the prostate: a size-independent new "gold standard." *Urology.* 2008;71(5):837-842.
5. Aho TF, Gilling PJ, Kennett KM, Westenberg AM, Fraundorfer MR. Holmium laser enucleation of the prostate: morbidity in a series of 206 patients. *Urology.* 1998;51(1):1-6.
6. Kuo HC, Chen J, Lin CY. Holmium laser enucleation of the prostate in patients with or without preoperative urinary retention: impact of prostate size on outcomes. *Urology.* 2019;132:121-127.
7. Kim HS, Chae SH, Kim HG, Kim JC, Park JY. Efficacy and safety of holmium laser enucleation of the prostate: a prospective comparison among patients with different prostate sizes using only 80-w and 120-w laser machines. *BMC Urol.* 2020;20(1):15.
8. Elzayat EA, Habib EI, Elhilali MM. Holmium laser enucleation of the prostate--outcomes independent of prostate size? *J Urol.* 2008 Dec;180(6):2431-5.
9. Large T, Nottingham CU, Gahan JC. Does Resectoscope Sheath Size Influence Holmium Laser Enucleation of the Prostate (HoLEP) Outcomes? A Prospective Randomized, Controlled Trial. *Urology.* 2023 Oct 2; 152:56-61.
10. Elshal AM, Elmansy HM, Elhilali MM. The Efficacy and Safety of 'Inverted Omega En-bloc' Holmium Laser Enucleation of the Prostate (HoLEP) for Benign Prostatic Hyperplasia: A Size-Independent Technique for the Surgical Treatment of LUTS. *Urology.* 2023 Apr 3; 153:112-117.
11. Elterman DS, Chughtai B, Kaplan SA. Comparison of Contemporary Surgical Outcomes Between Holmium Laser Enucleation of the

- Prostate and Robotic-Assisted Simple Prostatectomy. *J Urol.* 2023;209(4):781-787.
12. Krambeck AE, Handa SE, Lingeman JE. Top-down holmium laser enucleation of the prostate (HoLEP) versus traditional HoLEP for the treatment of benign prostatic hyperplasia (BPH): 1-year outcomes of a randomized controlled trial. *Urology.* 2023; 154:128-134.