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HoLEP- For Management of Benign Enlargement Prostate

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Abstract **Original Research Article**

Background: Holmium Laser Enucleation of the Prostate (HoLEP) is a modern surgical approach for treating benign prostatic hyperplasia (BPH), known for its minimal invasiveness, reduced complication rates, and faster recovery times compared to traditional methods. It is particularly advantageous for patients with large prostate volumes, providing effective symptom relief and enhancing quality of life. This study aims to evaluate the safety, efficacy, and clinical outcomes of HoLEP in male patients with BPH. ***Objectives:*** To assess the safety, effectiveness, and clinical outcomes of HoLEP in male patients with BPH. *Methods:* The prospective observational study was conducted at Square Hospital, Dhaka, Bangladesh, involving 106 male patients diagnosed with BPH who underwent HoLEP between July 2014 and October 2018. Data were collected on demographic characteristics, surgical outcomes, and postoperative recovery. Statistical analysis was performed using SPSS, with descriptive statistics applied to continuous variables and categorical data. Ethical approval was obtained, and informed consent was provided by all participants in accordance with ethical guidelines. ***Results:*** The study included 106 male patients (mean age 65 ± 5.6 years), with the majority (60%) being retired and 30% employed as professionals. The mean operation time was 90 minutes, with an average enucleated tissue weight of 45 grams. Postoperative catheterization was required for 25-48 hours in 50% of patients, and the average hospital stay was 2–4 days. Dysuria was reported in 5% of patients, while 95% were symptom-free at the one-month follow-up. International Prostate Symptom Score (IPSS) improvements of more than 10 points were observed in 75% of patients. ***Conclusion:*** HoLEP is a safe and effective surgical treatment for BPH, offering minimal complications, short recovery times, and significant improvement in symptoms. This study confirms HoLEP as a promising option for patients with BPH, especially those with larger prostate volumes.

Keywords: Holmium Laser Enucleation of the Prostate (HoLEP), Benign Prostatic Hyperplasia (BPH), Lower Urinary Tract Symptoms (LUTS).

INTRODUCTION

Holmium Laser Enucleation of the Prostate (HoLEP) has emerged as a gold-standard surgical technique for managing benign prostatic hyperplasia (BPH), particularly in cases of moderate to severe lower urinary tract symptoms (LUTS) unresponsive to medical therapy. First introduced in the early 1990s, HoLEP utilizes a high-powered laser to precisely excise prostatic adenomas, achieving complete removal similar to open prostatectomy but with minimal invasiveness. The procedure is applicable across a wide range of prostate sizes and is associated with reduced morbidity compared to traditional approaches such as transurethral resection of the prostate (TURP) [1-3]. The efficacy of HoLEP lies in its ability to significantly improve urinary flow rates, reduce post-void residual volumes, and alleviate LUTS. Its advantages include shorter hospital stays, lower rates of perioperative bleeding, and faster recovery times, making it a preferred choice for patients with bleeding disorders or those on anticoagulant therapy [4-6]. The precision of the holmium laser minimizes thermal damage, reducing the likelihood of complications such as urethral stricture and bladder injury [7-9]. Despite its proven benefits, the adoption of HoLEP is often limited by its steep learning curve, which can initially contribute to higher rates of intraoperative complications, such as capsular perforation or incomplete adenoma removal. However, these challenges diminish with experience, as evidenced by long-term data from high-volume centers

[10-12]. Moreover, recent advancements in surgical techniques and laser technology have further streamlined the procedure, enhancing its safety and efficiency [13]. Clinical studies have demonstrated HoLEP's superiority over other surgical modalities, particularly in patients with large prostate volumes exceeding 80 grams. It has also shown comparable outcomes to TURP in smaller prostates but with lower complication rates [13-15]. As an effective, durable, and versatile option, HoLEP has become a cornerstone in the surgical management of BPH, offering improved quality of life for patients worldwide.

OBJECTIVES

General Objective: To evaluate the safety, effectiveness, and clinical outcomes of Holmium Laser Enucleation of the Prostate (HoLEP) for managing Benign Prostatic Hyperplasia (BPH) in male patients.

Specific Objectives:

- To assess the demographic profile, including mean age and occupation status, of patients undergoing HoLEP.
- To determine the average operation time and enucleated tissue weight during HoLEP.
- To evaluate the postoperative catheterization duration and length of hospital stay following HoLEP.

METHOD AND MATERIALS

Study Design: This was a prospective observational study conducted at Square Hospital Ltd., Dhaka, Bangladesh, to evaluate the efficacy and safety of Holmium Laser Enucleation of the Prostate (HoLEP) for managing benign prostatic hyperplasia (BPH). The study included 106 male patients diagnosed with BPH who underwent HoLEP between July 2014 and October 2018.

Sampling Formula: Non-randomized convenience sampling was used, with the sample size (n = 106) determined based on the feasibility of performing HoLEP procedures during the study period and the capacity of the study center. The sampling formula used is:

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Where:
Z = 1.96 (95% confidence interval)
p = estimated proportion of the population requiring HoLEP (assumed 0.5 for maximum variability) d = margin of error (assumed 0.2 due to sample size constraints)

Study procedure: The study procedure involved the recruitment of 106 male patients aged 55 to 75 years, diagnosed with benign prostatic hyperplasia (BPH), who were scheduled for Holmium Laser Enucleation of the Prostate (HoLEP) at Square Hospital Ltd. between July 2014 and October 2018. After obtaining written informed consent, demographic and clinical data were collected from each patient. The HoLEP procedure was performed under general or spinal anesthesia, and operative details such as operation time, enucleated tissue weight, and intraoperative complications were documented. Postoperatively, patients were monitored for catheterization duration, hospital stay, and any immediate complications. Follow-up evaluations were conducted one-month post-surgery to assess recovery, symptom improvement, and any long-term outcomes. Ethical approval was obtained from the hospital's ethical review committee, and all patient data were anonymized to maintain confidentiality.

Inclusion Criteria:

- Male patients aged 55 to 75 years.
- Diagnosed with benign prostate enlargement based on clinical and radiological findings.
- Patients medically fit for surgery under general or spinal anesthesia.
- Patients who provided written informed consent for participation and follow-up.

Exclusion Criteria:

- Patients with a history of prostate cancer or other malignancies.
- Patients with significant comorbidities that contraindicate surgery.
- Patients who had undergone prior surgical interventions for prostate conditions.
- Patients who declined to participate or could not comply with the follow-up protocol.

Statistical Analysis: Data were analyzed using SPSS (Statistical Package for the Social Sciences). Descriptive statistics, including mean and standard deviation (Mean ± SD), were used for continuous variables such as age, operation time, and enucleated tissue weight, while frequencies and percentages were calculated for categorical variables like complications, catheterization duration, and hospital stay. Where applicable, statistical tests, such as Chi-square tests for categorical data and t-tests for continuous data, were applied to determine significant differences or associations, providing a comprehensive understanding of the study's outcomes.

Ethical Consideration: Ethical approval was obtained from the Ethical Review Committee of Square Hospital Ltd. The purpose, procedure, risks, and benefits of the study were explained to all participants. Informed consent was obtained in writing. Participants' confidentiality was maintained by anonymizing the data, and all procedures followed ethical principles outlined in the Declaration of Helsinki.

RESULT

Table 1: Demographic Characteristics of Study Participants (n = 106)

Parameter	Frequency (n)	Percentage (%)
Age (years)		
55–59	26	24.5
60–64	32	30.2
65–69	27	25.5
70–75	21	19.8
Mean ± SD	65 ± 5.6	
Occupation		
Retired	64	60.4
Professional	32	30.2
Others	10	9.4

Table 1 summarizes the demographic characteristics of the 106 male participants undergoing HoLEP. The mean age of the patients was 65 years (±5.6 SD), with the highest representation in the 60–64 age group (32 participants, 30.2%). The majority of patients were retired (64 participants, 60.4%), followed by professionals (32 participants, 30.2%), and others (10 participants, 9.4%). The study exclusively included male participants, as the condition affects only men.

Table 2: Distribution of Operation Time (n = 106)

Operation Time (minutes)	Frequency (n)	Percentage (%)
≤ 80	27	25.5
81–90	42	39.6
> 90	37	34.9

Table 2 shows the operation times for HoLEP procedures among the 106 participants. The mean operation time was approximately 90 minutes, with the most common duration being 81–90 minutes (42 participants, 39.6%). Operations lasting less than or equal to 80 minutes accounted for 25.5% (27 participants), while 34.9% (37 participants) had procedures exceeding 90 minutes. This data underscores the efficiency and consistency of surgical performance in HoLEP.

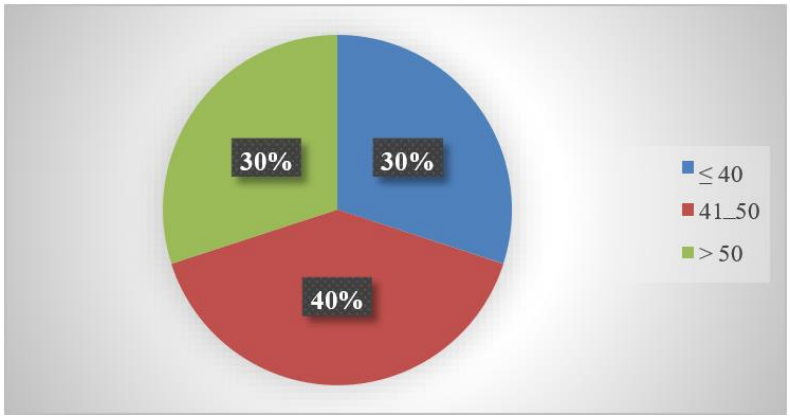

Figure 1: Distribution of Enucleated Tissue Weight

Figure 1 illustrates the enucleated tissue weight distribution for 106 participants, ranging from ≤40 gm to >50 gm, with a mean weight of 45 gm. The highest proportion of participants (40.6%, 43 patients) had tissue weights in the 41–50 gm range. Equal proportions of participants (29.2% each, 31 patients) had weights ≤40 gm and >50 gm. These values highlight the typical tissue removal during the HoLEP procedure.

Table 3: Catheterization Time Distribution (n = 106)

Catheterization Time (hours)	Frequency (n)	Percentage (%)
≤ 24	37	34.9
25–48	53	50.0
49–72	16	15.1

Table 3 presets postoperative catheterization times varied between 24 and 72 hours, with most participants (50.0%, 53 patients) requiring catheterization for 25–48 hours. Thirty-seven participants (34.9%) had catheterization removed within 24 hours, while 15.1% (16 participants) required catheterization for 49–72 hours. The data indicate that catheterization needs were brief for most participants, reflecting a quick recovery phase.

Table 4: Duration of Hospital Stay (n = 106)

Hospital Stay (days)	Frequency (n)	Percentage (%)
2	42	39.6
3	37	34.9
4	27	25.5

Table 4 highlights the length of hospital stays following HoLEP among the 106 participants. A total of 42 participants (39.6%) stayed for 2 days, 37 participants (34.9%) stayed for 3 days, and 27 participants (25.5%) stayed for 4 days. The average hospital stay ranged from 2 to 4 days, indicating an efficient postoperative discharge process and positive recovery outcomes.

Table 5: Complications and Postoperative Issues (n = 106)

Complication	Frequency (n)	Percentage (%)
Dysuria	5	4.7
Bleeding (requiring transfusion)	0	0.0
No Complication	101	95.3

Table 5 shows that only five participants (4.7%) experienced dysuria post-surgery, which was managed conservatively. No major complications, such as bleeding requiring transfusion, were reported, with 95.3% (101 participants) experiencing no complications. These results demonstrate the safety and low complication rate associated with HoLEP.

Table 6: Follow-Up Outcomes at One Month (n = 106)

Follow-Up Outcome	Frequency (n)	Percentage (%)
Symptom-Free	101	95.3
Dysuria	5	4.7

Table 6 shows that at one-month follow-up, 101 participants (95.3%) reported being symptom-free, while 5 participants (4.7%) continued to experience mild dysuria. The high rate of symptom resolution underscores the effectiveness of the HoLEP procedure in relieving urinary symptoms caused by benign prostate enlargement.

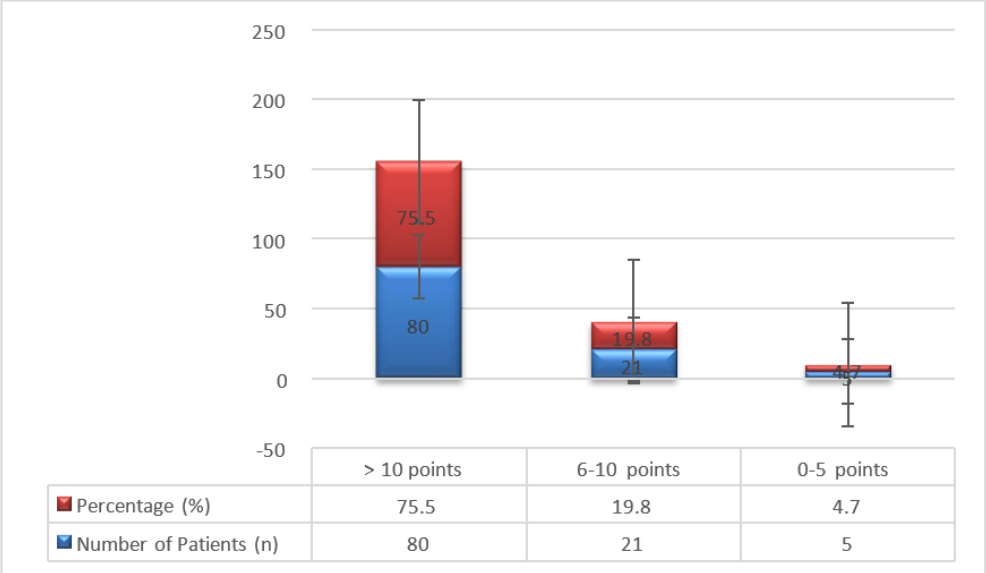

Figure 2: Improvement in Symptoms (IPSS Score Reduction)

Figure 2 reflects significant improvement in symptoms using the International Prostate Symptom Score (IPSS) among 106 participants. A total of 80 participants (75.5%) experienced a score reduction of more than 10 points, indicating substantial symptom relief. Moderate improvements (6–10 points) were observed in 21 participants (19.8%), while only 5 participants (4.7%) experienced mild improvement (0–5 points). These results emphasize the considerable clinical benefit of HoLEP in enhancing the quality of life for patients.

DISCUSSION

The results from this study underscore the effectiveness of Holmium Laser Enucleation of the Prostate (HoLEP) in managing benign prostatic hyperplasia (BPH). The study, which included 106 male participants with a mean age of 65 years, primarily consisted of retired individuals (60%), which aligns with the established pattern of BPH affecting older men, particularly those in their later years when symptoms of BPH are most prevalent. Similar trends have been observed in previous studies, which reported a significant proportion of BPH patients being retired or in the age group most commonly affected by this condition [16, 17]. The average operation time for HoLEP in this study was approximately 90 minutes, with the majority of procedures (39.6%) falling within the 81–90-minute range. These results are consistent with other studies that report operation times for HoLEP ranging from 80 to 100 minutes, with variations depending on factors such as prostate size and surgeon experience. As surgical experience increases, operation times tend to decrease, reflecting the growing efficiency of the HoLEP procedure [18, 19].

The mean enucleated tissue weight in this study was 45 grams, with the highest proportion of participants (40.6%) having tissue weights in the 41–50 gm range. This finding is consistent with other studies, showing that HoLEP is effective in managing both small and large prostates. Notably, HoLEP is particularly beneficial for patients with larger prostates (≥80 gm), as it has been found to offer comparable outcomes to traditional open prostatectomy, but with fewer complications and shorter recovery times [20, 21].

Regarding postoperative catheterization, the majority of participants (50%) required catheterization for 25– 48 hours, which is in line with existing literature. The short catheterization times observed reflect the precision and minimal invasiveness of the HoLEP procedure, which results in less tissue damage and a quicker recovery. This finding supports the benefits of HoLEP in promoting rapid postoperative recovery [22, 23].

The duration of hospital stays was also brief, with 39.6% of patients being discharged after 2 days, and 34.9% after 3 days. These results are consistent with studies that highlight the shorter hospital stays associated with HoLEP when compared to traditional surgeries such as transurethral resection of the prostate (TURP) or open prostatectomy. Shorter hospital stays not only reduce healthcare costs but also contribute to faster recovery and improved patient satisfaction [24, 25].

In terms of safety, the complication rate in this study was notably low, with 95.3% of patients experiencing no complications. Only 4.7% of patients experienced mild dysuria, which was managed conservatively. This aligns with other studies showing that HoLEP has a significantly lower complication rate compared to TURP, including a reduced incidence of bleeding, transfusions, and erectile dysfunction [19, 22].

Finally, the results of this study highlight the substantial symptom relief provided by HoLEP. At the one month follow-up, 95.3% of patients reported being symptom-free, with significant reductions in their International Prostate Symptom Scores (IPSS). These findings are consistent with other studies that have demonstrated the effectiveness of HoLEP in improving the quality of life for patients suffering from BPH. Overall, the study reinforces the benefits of HoLEP as a safe, efficient, and effective treatment option for BPH18, 22, 25.

CONCLUSION

This study demonstrates that HoLEP is a safe and effective surgical option for managing BPH, particularly in older male patients. The procedure resulted in minimal complications, a short postoperative catheterization period, and a brief hospital stay. Additionally, significant improvements in urinary symptoms were observed in the majority of patients, reflecting the procedure's efficacy in improving quality of life. The low complication rates and rapid recovery time further highlight the benefits of HoLEP as a preferred treatment modality for BPH compared to other traditional methods such as TURP or open prostatectomy. This supports its growing popularity in clinical practice for treating patients with benign prostate enlargement.

Limitations of the study: Firstly, the sample size of 106 participants may not be representative of the wider population with Benign Prostatic Hyperplasia (BPH), limiting the generalizability of the findings. Additionally, the research was conducted at a single medical center, which could introduce bias due to variability in patient demographics and surgical practices.

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