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Efficacy and Recovery in BPH Surgery: Insights from Transurethral Bipolar Enucleation

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ABSTRACT

Background: Benign prostatic hyperplasia (BPH) is a prevalent condition among older men, often resulting in bladder obstruction.

Goal: This study focuses on evaluating the efficacy and recovery associated with Transurethral Bipolar Enucleation and Resection of the Prostate (TBERP) for treating BPH in patients with large prostates (>80 g).

Patients and Methods: A randomized prospective clinical trial was conducted on BPH patients over 50 years old with a prostate volume >80 mL, maximum flow rate (Qmax) >15 mL/s, and International Prostate Symptom Score (IPSS) >8, meeting established surgical indications. Patients underwent TBERP, with intraoperative blood loss, operation time, resected prostatic tissue weight, postoperative catheterization, and hospital stay period being recorded. Additionally, patients were assessed for IPSS, post-voiding residual urine, prostate volume, and complications (including urinary retention, urinary tract infection, irritative symptoms, urinary incontinence, urethral stricture, and bladder neck contracture) over a three-month follow-up period.

Results: The study enrolled 32 patients with a mean age of 62.63 years. TBERP demonstrated effective outcomes with minimal complications during the three-month follow-up period. The mean catheterization period was 5.09 days, and the mean hospital stay was 2.13 days. The mean operative time was 121.88 minutes, and the mean weight of resected prostatic tissue was 43.94 g.

Conclusion: TBERP is a safe and effective treatment for BPH in patients with large prostates, offering significant benefits in terms of reduced bleeding and quicker recovery compared to traditional methods. This study underscores the potential of TBERP in enhancing patient outcomes in BPH surgery.

Keywords: BPH, Transurethral Bipolar Enucleation, Prostate Resection, Urology, Surgical Outcomes, Recovery.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common urological condition affecting a significant portion of the aging male population. It is characterized by the nonmalignant enlargement of the prostate gland. BPH can lead to obstructive and irritative lower urinary tract symptoms (LUTS), significantly impacting patients' quality of life. As the prostate enlarges, it can impede the flow of urine from the bladder, leading to symptoms such as urinary frequency, urgency, nocturia, weak stream, and incomplete bladder emptying [(1)].

The management of BPH ranges from conservative medical therapy to various surgical interventions, depending on the severity of symptoms and the size of the prostate. In cases where medical management fails or the prostate is significantly enlarged, surgical options become necessary. Traditionally, open prostatectomy (OP) has been the gold standard for treating large prostatic adenomas. However, it is associated with substantial morbidity, including significant blood loss, prolonged catheterization, and extended hospital stays [(1,2)].

In recent years, advancements in endoscopic surgical techniques have provided less invasive alternatives to open surgery. Among these, Transurethral Bipolar Enucleation and Resection of the Prostate (TBERP) has emerged as a promising technique. TBERP utilizes bipolar energy to enucleate and resect prostate tissue, offering the potential for reduced intraoperative blood loss, shorter catheterization times, and quicker postoperative recovery [(3,4)].

This study aimed to explore the efficacy and recovery outcomes associated with TBERP in the treatment of large BPH. By focusing on key surgical and postoperative parameters, we sought to establish TBERP as a viable and potentially superior alternative to traditional open prostatectomy. The insights gained from this research will contribute to the evolving landscape of BPH management, providing evidence-based guidance for urologists in selecting optimal treatment strategies for their patients.

RATIONALE AND OBJECTIVES

The primary objective of this study was to evaluate the clinical outcomes of TBERP in patients with large prostates (>80 g) undergoing surgery for BPH. By comparing intraoperative and postoperative metrics, including blood loss, operation time, catheterization duration, hospital stay, and complication rates, we aim to demonstrate the benefits and limitations of this technique.

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Additionally, we sought to assess patient-reported outcomes, such as the International Prostate Symptom Score (IPSS) and quality of life measures, to provide a comprehensive understanding of the impact of TBERP on BPH treatment.

PATIENTS AND METHODS

Study Design: This study is a prospective clinical trial conducted at the Urology Department of Helwan University, Egypt, and the Urology Department of MUST University, 6th of October City, Egypt, from October 2020 to October 2022.

Patient Selection: Patients eligible for inclusion in this study were males, aged 50 years or older, with a diagnosis of BPH and a prostate volume greater than 80 mL, confirmed by transrectal ultrasound (TRUS). Additional inclusion criteria included Qmax greater than 15 mL/s and an International Prostate Symptom Score (IPSS) greater than 8, indicating significant urinary symptoms and meeting established surgical indications such as refractory retention, bladder stones, recurrent gross hematuria, recurrent infections, and persistent bothersome symptoms despite medical management. Patients were excluded if they had a history of prostate cancer, prior prostate surgery, uncorrectable coagulopathy, active infection, small prostate (<80 ml), severe comorbid conditions that could increase surgical risk, or if they were on anticoagulant therapy that could not be discontinued.

Preoperative Assessment: All patients underwent a comprehensive preoperative assessment, which included a detailed medical history and physical examination to identify urinary symptoms, previous treatments for BPH, and any other medical conditions. Laboratory tests consisted of a complete blood count, serum creatinine, and prostate-specific antigen (PSA) levels. Imaging studies involved a transrectal ultrasound (TRUS) to assess prostate volume and anatomy, and an abdominal ultrasound to evaluate the upper urinary tract. Uroflowmetry was conducted to measure Qmax, and post-void residual (PVR) urine measurement was performed using ultrasound to assess bladder emptying. Additionally, cystoscopy was performed in selected cases to evaluate the bladder and urethra.

Surgical Procedures:

TBERP was executed using a 26 Fr continuous flow resectoscope, equipped with the plasmakinetic system's enucleation and resection loops (KARL STORZ HF Generator AUTOCON® III 400, Tuttlingen, Germany). The procedure was performed under either general or spinal anesthesia with physiologic saline irrigation to ensure clear visibility and effective tissue removal.

The procedure commenced with the identification of key anatomical landmarks, including the verumontanum, bladder neck, and ureteral orifices (Figure 1). Following this, the middle lobe of the prostate was meticulously resected using the resection loop. A mucosal incision was then made at the 5 and 7 o'clock positions at the apical adenoma, which was deepened to reach the surgical capsule (Figures 2, 3, and 4).

The subsequent steps involved the separation of the left and right lobes from the capsule. This was achieved in a retrograde fashion, moving from the apex to the bladder, using a bipolar enucleation loop. Throughout the procedure, meticulous hemostasis was maintained to minimize bleeding and ensure clear surgical fields (Figure 5).

The bipolar enucleation loop effectively mimicked the surgeon's index finger during an open prostatectomy, providing precision in enucleating the prostatic tissue. The bipolar resection loop was then utilized to fragment the devascularized prostatic lobes into smaller chips. These fragmented chips remained connected to the bladder neck via a narrow pedicle, facilitating their eventual removal.

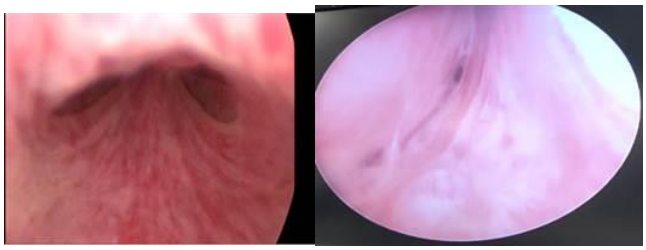

Figure (1): Cystoscopic view of the verumontanum.

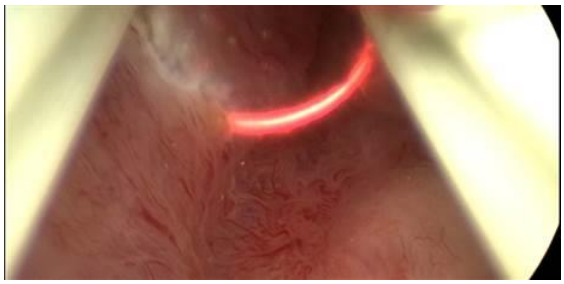

Figure (2): Apical adenoma was incised close to the verumontanum.

Figure (3): Deepening the incision to the level of the surgical capsule.

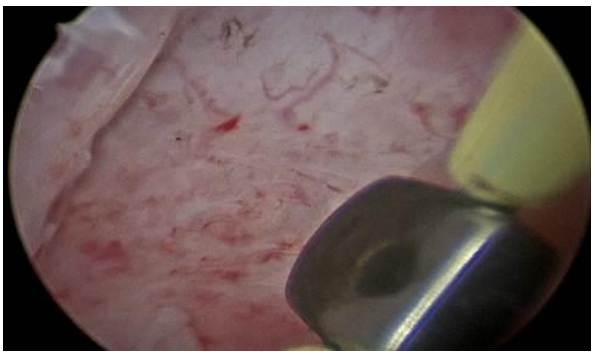

Figure (4): Inner surface of the surgical capsule.

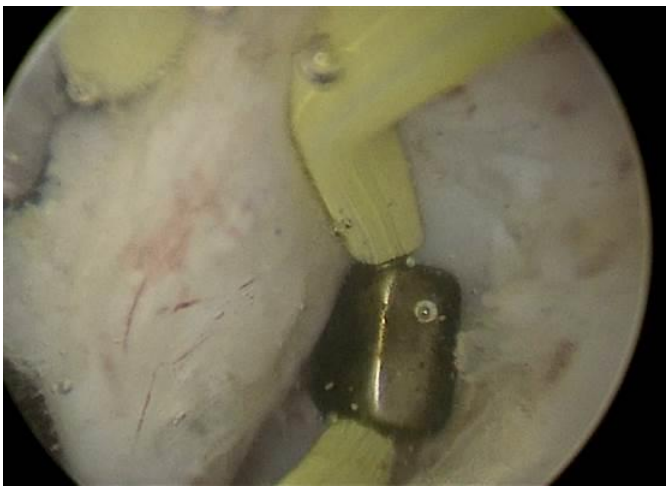

Figure (5): Left lobe was dissected off the surgical capsule in a retrograde fashion from the apex toward the bladder.

Postoperative Management: Postoperative care included the use of a 22 Fr triple-lumen catheter with continuous irrigation for 2-3 days to ensure clear urine output and prevent clot formation. Intraoperative and postoperative data collected included bleeding estimates, operative time, tissue weight, and postoperative hemoglobin levels.

Regular follow-up assessments at specified intervals measured the International Prostate Symptom Score (IPSS), post-void residual urine volume, and monitored for complications such as re-catheterization, urinary retention, irritative symptoms, infections, incontinence, urethral strictures, and bladder neck contracture. Mean hospital stay duration was also recorded.

Ethical Approval: The study was approved by the Institutional Review Board of Helwan University (approval number: HU-IRB-2022-001). All patients provided written informed consent before participating in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical Analysis

Statistical analysis was performed using SPSS software version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were presented as frequencies and percentages.

RESULTS

Patient Characteristics

A total of 32 male participants were enrolled in the TBERP group. The mean age of the patients was 62.63 years. Baseline characteristics of the group are shown in table 1.

Primary Outcomes

The primary outcome measures focused on the catheterization period, hospital stay, operative time, and resected prostatic tissue weight. Patients experienced a mean catheterization period of 5.09 days. The mean hospital stay was 2.13 days. The mean operative time was 121.88 minutes. The weight of the resected prostatic tissue averaged 43.94 g. The mean hemoglobin drop postoperatively was 1.10 g/dl (Table 1).

Table 1: Pre- and Intraoperative Data

Characteristic	Mean (TBERP)	SD (TBERP)
Age	62.63	5.56
IPSS score (preoperative)	21.75	7.12
Hemoglobin (preoperative) (g/dl)	12.46	0.97
INR (preoperative)	1.05	0.07
Serum creatinine (preoperative) (mg/dl)	0.97	0.19
Total PSA (preoperative) (ng/ml)	2.97	1.49
Prostate volume (preoperative) (g)	102.66	15.14
PVR (preoperative) (ml)	204.69	196.07
Catheterization period (days)	5.09	0.59
Hospital stay (days)	2.13	0.34
Operative time (minutes)	121.88	21.54
Weight of resected prostatic tissue (g)	43.94	10.30
Hemoglobin drop	1.10	0.50

Secondary Outcomes and Adverse Events (Table 2)

Following catheter removal, a small number of patients experienced postoperative complications. One patient (3.1%) required recatheterization due to acute urine retention. Another patient (3.1%) experienced acute urine retention post-catheter removal. The incidence of irritative symptoms was 15.6% (5 patients), and the incidence of urinary tract infections (UTIs) was 9.4% (3 patients) at one week postoperatively.

At one month postoperatively, all patients (100%) showed no need for recatheterization or experienced acute urine retention. The incidence of irritative symptoms was 9.4% (3 patients), and the incidence of UTIs was 3.1% (1 patient).

At three months postoperatively, all patients (100%) continued to show no need for recatheterization or experienced acute urine retention. The incidence of irritative symptoms was 6.3% (2 patients), and the incidence of UTIs was 3.1% (1 patient). Additionally, there were no significant occurrences of urinary incontinence, urethral stricture, or bladder neck contracture.

The majority of participants (93.8%) did not require blood transfusions.

Table 2: Postoperative Data

Outcome	Count (TBERP)	% (TBERP)
Blood transfusion (ml)		
0	30	93.8%
500	2	6.3%
One week post catheter removal		
Recatheterization positive	1	3.1%
Recatheterization negative	31	96.9%
Acute urine retention positive	1	3.1%
Acute urine retention negative	31	96.9%
Irritative symptoms positive	5	15.6%
Irritative symptoms negative	27	84.4%
Urinary tract infection positive	3	9.4%
Urinary tract infection negative	29	90.6%
One month post-operative		
Recatheterization negative	32	100.0%
Acute urine retention negative	32	100.0%
Irritative symptoms positive	3	9.4%
Irritative symptoms negative	29	90.6%
Urinary tract infection positive	1	3.1%
Urinary tract infection negative	31	96.9%
Three months post operative		
Recatheterization negative	32	100.0%
Acute urine retention negative	32	100.0%
Irritative symptoms positive	2	6.3%
Irritative symptoms negative	30	93.8%
Urinary tract infection positive	1	3.1%
Urinary tract infection negative	31	96.9%
Urinary incontinence positive	2	6.3%
Urinary incontinence negative	30	93.8%
Urethral stricture negative	32	100.0%
Bladder neck contracture negative	32	100.0%

Patients demonstrated significant improvements in the International Prostate Symptom Score (IPSS) and PVR urine volume at all follow-up time points. At one week, the mean IPSS score was 13.00, and the mean PVR was 33.31 ml. These improvements persisted at one month (IPSS: 9.41, PVR: 17.19 mL) and three months (IPSS: 7.22, PVR: 12.91 mL) postoperatively (Table 3).

Table 3: Postoperative IPSS and PVR

Outcome	Mean (TBERP)	SD (TBERP)
One week post catheter removal		
IPSS score	13.00	4.35
PVR	33.31	43.78
One month postoperative		
IPSS score	9.41	3.43
PVR	17.19	10.77
Three months postoperative		
IPSS score	7.22	1.95
PVR	12.91	7.19

DISCUSSION

This study provides a comprehensive analysis of the efficacy and recovery outcomes associated with TBERP for treating BPH with prostate adenomas larger than 80 ml. The findings underscore TBERP as a highly effective surgical technique, offering significant benefits in terms of short catheterization periods and hospital stays, thereby enhancing postoperative recovery.The results demonstrate that patients experienced a mean catheterization period of 5.09 days and a mean hospital stay of 2.13 days. These findings are significant as they indicate a relatively quick recovery. These outcomes align with existing literature, such as the studies by Giulianelli et al. and Geavlete et al., which emphasize the advantages of minimally invasive procedures in reducing hospital stays and improving postoperative recovery [5,6].

In terms of operative efficiency, the mean operative time was 121.88 minutes, and the mean weight of resected prostatic tissue was 43.94 grams. These values highlight the procedure's capability to efficiently remove substantial prostate tissue while maintaining a high safety profile. The mean hemoglobin drop of 1.10 g/dl and the minimal requirement for blood transfusions (93.8% of patients did not need transfusions) underscore the procedure's safety, particularly in terms of reduced perioperative bleeding. These findings are consistent with the existing literature on endoscopic enucleation techniques, such as those by Xiong et al. and Rao et al., which also reported minimal blood loss and low transfusion rates [7,8].

The study's outcomes also underscore the safety profile of TBERP. The absence of significant long-term complications, including urethral strictures, urinary incontinence, and bladder neck contracture, indicates that TBERP is a durable and safe procedure over extended follow-up periods. These results align with previous research by Geavlete et al. and Rao et al., which also reported low rates of long-term complications for endoscopic enucleation techniques [6,8].Functional outcomes also improved significantly following TBERP. The International Prostate Symptom Score (IPSS) and PVR urine volume demonstrated substantial reductions at

all follow-up points. The mean IPSS scores were 13.00 at one week, 9.41 at one month, and 7.22 at three months postoperatively, while the mean PVR volumes were 33.31 mL at one week, 17.19 mL at one month, and 12.91 mL at three months. These improvements indicate that TBERP effectively alleviates LUTS and enhances urinary function, corroborating findings from similar studies [5,6,9].

Comparisons with existing literature reveal consistent outcomes, with a significant difference in favor of TBERP regarding catheterization period and hospital stay, as reported by Geavlete et al. (6). This study adds to the collective evidence supporting the role of TBERP in the surgical armamentarium for large prostates, emphasizing its potential for a favorable balance between safety, efficacy, and recovery. The findings align with studies assessing bipolar transurethral enucleation of the prostate (B-TUEP) and Holmium Laser Enucleation of the Prostate (HoLEP), contributing to a comprehensive understanding of the available surgical options [6,9].

The study highlights the advantageous bleeding profile of TBERP, aligning with existing literature that praises the benefits of bipolar vaporization. This is corroborated by findings from studies on plasma kinetic vaporization of the prostate, which emphasize TBERP's potential in reducing peri-operative bleeding risks. These findings contribute significantly to the ongoing discussion about the safety and efficacy of endoscopic procedures, underscoring TBERP's bleeding-related advantages [10,11].

The study acknowledges the learning curve associated with TBERP, consistent with findings by Xiong et al. and Hirasawa et al. The procedure requires precise identification of the avascular plane and careful dissection techniques to preserve critical anatomical structures. Surgeon experience plays a vital role in achieving optimal outcomes, and this study underscores the importance of training and proficiency in performing TBERP [7,12].

While the study presents promising results, it is important to acknowledge its limitations. The relatively small sample size and single-center design may limit the generalizability of the findings. Additionally, the absence of long-term follow-up data restricts the ability to assess sustained treatment effects. Future research should aim to validate these outcomes in larger, multicenter cohorts with extended follow-up periods to better understand the long-term benefits and potential complications associated with TBERP.

CONCLUSION

TBERP demonstrates significant advantages in terms of efficacy and recovery for patients with BPH and large prostate adenomas. The procedure offers a favorable balance between safety, effectiveness, and recovery, making it a valuable addition to the surgical options available for treating BPH. Continued research and refinement of the technique will further enhance its application and outcomes in clinical practice. The insights gained from this study contribute to the growing body of evidence supporting minimally invasive techniques for large prostates, reinforcing the role of TBERP as a viable and effective surgical approach.

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Conflicting interests: The authors declare no competing interests associated with the publication of this manuscript.

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