

Outcomes evaluation of early transurethral enucleation of the prostate after transrectal ultrasound-guided prostate biopsy

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Abstract

Objective: This study aims to assess the safety and efficacy of transurethral enucleation of the prostate (TUEP) performed early after transrectal ultrasound-guided prostate biopsy.

Methods: A prospective study consisted of 78 BPH/BPO patients with prostate volume > 40ml, divided into two groups: Group 1 (36 patients with prostate biopsy within 3 weeks), and Group 2 (42 patients without prostate biopsy). Perioperative and postoperative parameters were compared between the groups.

Results: No significant differences were observed in patient distribution, energy modality, or preoperative characteristics between the two groups. The enucleation time was significantly longer in the biopsy group (65.69 ± 21.02 minutes vs. 55.83 ± 17.56 minutes, $p=0.027$). However, there were no significant differences in hemoglobin reduction, catheterization duration, or complication rates between the groups. At 1-month follow-up, both groups demonstrated significant improvements, with no statistically significant differences in lower urinary tract symptoms (IPSS, QoL), maximum urinary flow rate (Qmax), or postoperative prostate volume. Correlation analysis indicated that prostate volume, prior biopsy status, and the use of morcellator influenced operative time. Linear regression analysis revealed that prior biopsy increased operative time by an average of 10 minutes, while the use of a morcellator reduced it by 29 minutes.

Conclusion: Early transurethral enucleation of the prostate after transrectal prostate biopsy is a feasible, safe, and effective procedure. A predictive regression model may help estimate surgical time based on prostate volume, biopsy history, and tissue processing techniques.

Keywords: Benign prostatic hyperplasia, transurethral enucleation of the prostate, prostate biopsy, TUEP, Holmium laser enucleation of the prostate, BiTUEP.

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1. INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common condition in older men, causing lower urinary tract symptoms and potentially leading to severe urinary obstruction. When conservative and pharmacological treatment

is ineffective or complications arise, surgical intervention becomes the optimal choice[1, 2]. Monopolar transurethral resection of the prostate (M - TURP) has long been considered as the gold standard for surgical treatment of BPH. However,

this method has limitations, especially when facing prostates with large volume. In recent years, the technique of transurethral enucleation of the prostate (TUEP) has been developed based on the principles of open surgery, allowing for complete removal of the prostate adenoma with less invasiveness and higher treatment efficacy[3].

Personalized treatment for BPH patients is based on a comprehensive evaluation process, including digital rectal examination (DRE), PSA testing, MRI, and prostate biopsy when cancer is suspected[1, 3]. Currently, transrectal ultrasound-guided prostate biopsy (TRUS) with 12-core sampling is the standard for diagnosing prostate cancer[1]. However, biopsy can cause histological changes, inflammation, or bleeding within the prostate tissue, potentially affecting the enucleation process. Some authors suggest that early TUEP may increase the risk of bleeding, prolong surgical time, and make the enucleation process more difficult due to post-biopsy adhesions, potentially increasing surgical complications[4, 5]. However, recent studies have also shown that if performed technically correct, TUEP can be safe and effective even in the early post-biopsy period [6-8].

Patients presenting at late stages with lower urinary tract symptoms causing complications or those who have undergone procedures such as prolonged catheterization may have altered, mostly increased, PSA levels, increasing the need for prostate biopsy before surgery [9, 10]. Delaying surgery after biopsy may require patients to continue with long-term catheterization, increasing the risk of infection and affecting their quality of life. In Vietnam, there is currently no systematic study evaluating the outcomes of TUEP in patients who have undergone prior prostate biopsy or

determining the optimal timing for surgery after biopsy. Therefore, a study is needed to provide scientific evidence on the safety and efficacy of this method, helping clinicians make more accurate decisions.

Based on this practical need, we conducted the study: “***Outcome evaluation of early transurethral enucleation of the prostate after transrectal ultrasound-guided prostate biopsy,***” conducted at the Department of Urology, Binh Duong General Hospital. The study aimed to assess the safety and efficacy of TUEP performed shortly after a 12-core transrectal ultrasound-guided prostate biopsy. The results will help answer an important clinical question: Does TUEP performed early after prostate biopsy negatively affect treatment outcomes?

2. SUBJECTS AND METHODS

Study Population:

From June 2023 to February 2025, 78 patients with BPH/BPO and prostate volume > 40ml underwent en-bloc TUEP and were divided into two groups: Group 1 included patients with a prior prostate biopsy (n=36); Group 2 included patients without a prior biopsy (n=42).

All patients underwent the same surgical procedure performed by a single surgeon at the Department of Urology, Binh Duong General Hospital.

Study Design: Prospective study.

Study Variables:

We collected patient data at various time points: preoperatively, intraoperatively, postoperatively and at the 1-month follow-up.

Preoperative data included: time from the 12-core transrectal ultrasound-guided prostate biopsy to surgery, age, serum PSA level, IPSS, QoL, Qmax, complete blood count (CBC), urinalysis, and prostate

volume (under TRUS).

Intraoperative data included: enucleation time, adenoma management time, total operation time, intraoperative complications.

Postoperative data included: CBC, catheterization duration, hospital stay, and postoperative complications.

1-month follow-up data included: IPSS, QoL, Qmax, and residual prostate volume

(under TRUS).

Surgical Technique[11]:

The en-bloc TUEP technique base on the main movement: The “rocking and rotating” movement to sweep the adenoma away from the surgical capsule.

Bipolar energy or Holmium laser was used for hemostasis and cutting the connecting tissue between the adenoma and the prostate capsule.

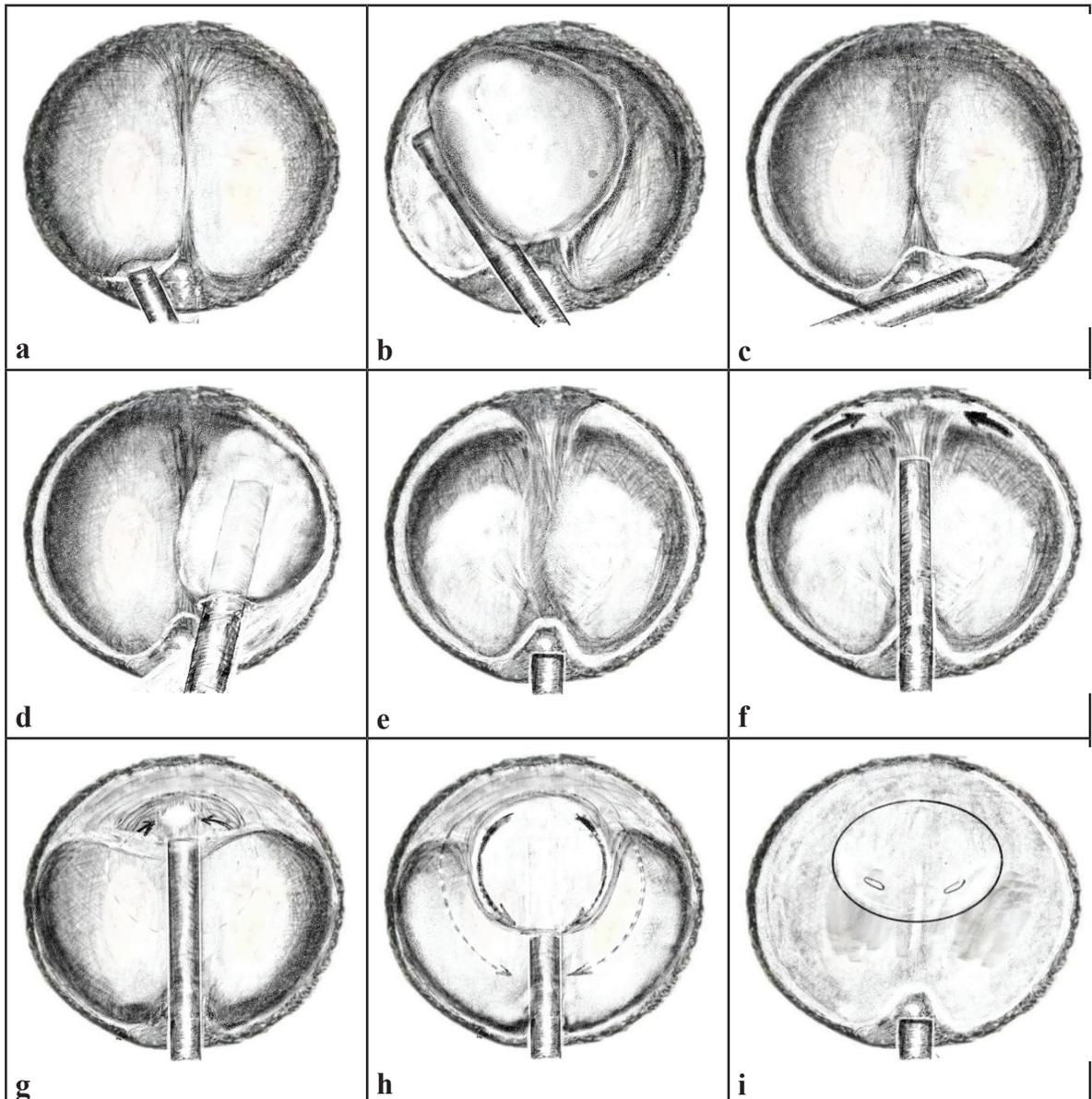


Figure 1: Transurethral enucleation of the prostate technique (a-b-c-d-e-f-g-h-i)

Source: Department of Urology, Binh Duong General Hospital

Step 1: Surgical plane exposure

The mucosa was incised just anterior or lateral to the verumontanum (**Figure 1a, 1c**), gentle rocking the beak of the resectoscope sheath allowed easy identification of the plane between the adenoma and the surgical capsule. The optimal location for identifying the surgical plane was at the lobe with mature BPH nodules.

Step 2: Enucleation of the adenoma

From the initial surgical capsule identification, the adenoma was dissected away from the capsule using the rocking and rotating movement. This technique could be used with any energy source (bipolar, laser) capable of cutting the connecting tissue between the capsule and the adenoma and achieving hemostasis on the capsular surface after adenoma detaching.

Left lobe enucleation: The beak of the resectoscope sheath was advanced into the plane between the adenoma and the surgical capsule, and the rocking and rotating movement was repeated to separate the adenoma from the capsule (**Figure 1a, b**). The dissection proceeded in a counterclockwise semicircle from 5 to 12 o'clock, advancing toward the bladder neck.

Right lobe enucleation: **The initial mucosal incision was extended horizontally anterior to the verumontanum, symmetrical to the left lobe.** The dissection continuously proceeded from the previous surgical plane of the left lobe toward the right side, with the same way and direction (**Figure 1c, d**).

For the median lobe, which is adjacent to important structures (the rectum posteriorly, the the median lobe often extends behind the bladder neck and may protrude into the bladder, risking injury to the ureter orifices, bladder neck, seminal vesicles, etc.), the posterior aspect of the median lobe was dissected from the verumontanum

toward the bladder, but complete dissection was avoided to minimize the risk of complications.

Step 3: Mucosal bridges management

Cutting the mucosal bridge between the adenoma and the membranous urethra: **The mucosa and fibrous tissue connecting the adenoma** with the membranous urethra were incised at the 12 o'clock position above the verumontanum (**Figure 1e**), taking care to cut along the external sphincter from 10 to 12 o'clock and from 2 to 12 o'clock. The remaining anterior fibromuscular tissue was then incised (**Figure 1f**) to access the bladder neck at the 12 o'clock position (**Figure 1g**).

Cutting the mucosal bridge between the adenoma and the bladder neck: **The mucosa connecting the adenoma to the bladder neck was incised at the 12 o'clock position to enter the bladder (Figure 1g).** We realize this approach avoid damage to the the major blood vessels supplying the bladder and prostate and minimized the risk of injury to important structures at the bladder neck.

Management of the peri-bladder neck tissue: **The bladder neck consists of circular muscle fibers running along the circumference and a thin layer of longitudinal muscle fibers continuous with the urethral muscle. The dissection followed the circular muscle fibers to define the boundary between the bladder neck muscle and the adenoma, and the mucosa was incised along the entire circumference of the bladder neck in two semicircles, clockwise and counterclockwise, from 12 to 6 o'clock, freeing the adenoma from the bladder neck (Figure 1h).** This approach preserved the anatomical integrity of the bladder neck.

Step 4: Management of the adenoma

The adenoma was gently rotated and pushed into the bladder (Figure 1i). Hemostasis was achieved, with particular attention to bleeding points at the bladder neck mucosa or around the initial dissection plane of the two lateral lobes. A cutting loop or morcellator was used to manage the adenoma after enucleation.

Data Analysis:

Clinical symptoms and quality of life were assessed using the International Prostate Symptom Score (IPSS) and Quality of Life (QoL) questionnaire.

Data were analyzed using SPSS 20.0, with statistic significance set at $p < 0.05$. ANOVA and Chi-square tests were used to compare

differences between the two groups, and multiple linear regression analysis was used to identify correlations between variables and create linear regression model (In SPSS 20.0, Analyze → Regression → Linear).

3. RESULTS

We conducted a study on 78 BPH/BPO patients who underwent en-bloc transurethral enucleation of the prostate (TUEP) at the Department of Urology, Binh Duong General Hospital. Group 1 included 36 patients who had undergone a 12-core transrectal ultrasound-guided prostate biopsy prior to TUEP, and Group 2 included 42 patients without a prior biopsy. We compared the study parameters between the two groups.

Energy Modality Characteristics

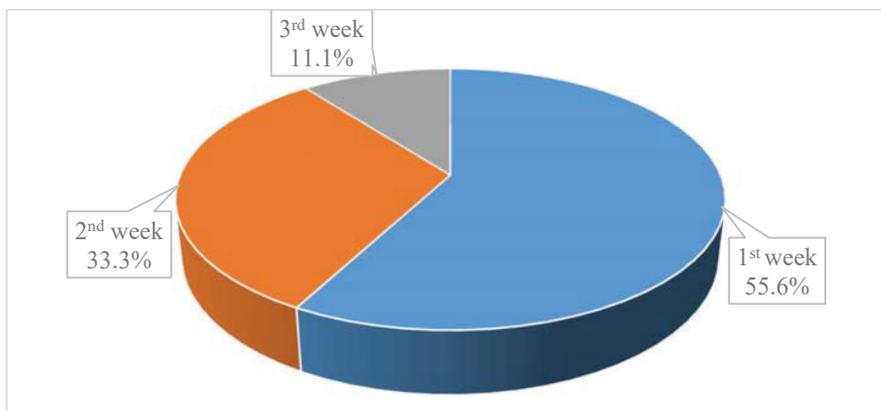
Biopsy group		Biopsy	Non - biopsy	Total	p = 0.495
Surgery group					
HoLEP		18	25	43	
BiTUEP		18	17	35	
Total		36	42	78	

Table 1. Distribution of patients between groups

There were no significant differences in patient distribution between the HoLEP (18 with biopsy vs. 25 without biopsy) and BiTUEP (18 with biopsy vs. 17 without biopsy) groups, or between the biopsy (18 HoLEP vs. 18 BiTUEP) and non-biopsy (25 HoLEP vs. 17 BiTUEP) groups ($p = 0.495$).

Preoperative Biopsy Characteristics

Chart 1. Time from biopsy to surgery



The average time from biopsy to surgery was 8.67 ± 4.66 days (range: 3–21 days). The median time was 7 days. Most cases underwent TUEP within the first week after biopsy (55.6%), 33.3% underwent surgery in the second week, and a few cases were operated on in the third week after biopsy.

Preoperative General Patient Characteristics

Parameter	Biopsy (n=36)	Non - biopsy (n =42)	p
Age	69.75 ± 7.76	72.88 ± 9.40	p=0.117
Serum PSA (ng/ml)	13.15 ± 8.23	2.65 ± 1.36	p=0.000
Preoperative IPSS	31.94 ± 2.14	31.50 ± 2.89	p=0.450
Preoperative QoL	5.08 ± 0.69	5.12 ± 0.71	p=0.823
Preoperative prostate volume (ml)	83.89 ± 34.37	73.64 ± 28.96	p=0.157
Preoperative Qmax	3.13 ± 3.97	2.41 ± 3.77	p=0.422

Table 2. Preoperative Patient Characteristics

Preoperative patient characteristics are summarized in Table 3. There were no significant differences between the two groups in terms of age (69.75 ± 7.76 vs. 72.88 ± 9.40 ; p=0.117), IPSS (31.94 ± 2.14 vs. 31.50 ± 2.89 ; p=0.450), QoL (5.08 ± 0.69 vs. 5.12 ± 0.71 ; p=0.823), prostate volume (83.89 ± 34.37 vs. 73.64 ± 28.96 ; p=0.157), or Qmax (3.13 ± 3.97 vs. 2.41 ± 3.77 ; p=0.422). The PSA level was significantly higher in the biopsy group (**p=0.000**).

Perioperative Outcomes

Parameter	HoLEP (n=43)	BiTUEP (n = 35)	p
Enucleation time (mins)	59.77 ± 17.38	61.14 ± 22.53	p=0.762
Hemoglobin drop (g/dL)	1.15 ± 1.02	0.81 ± 1.17	p=0.170
Catherization time (days)	1.85 ± 1.30	1.83 ± 1.36	p=0.916
Hospital stay (days)	3.88 ± 1.43	4.37 ± 2.05	p=0.221

Table 3. Impact of energy modality on perioperative outcomes

Patients in the study underwent surgery using two different energy sources (holmium laser and bipolar). The perioperative outcomes showed no statistically significant differences between the two energy sources.

Parameter	Biopsy (n=36)	Non - biopsy (n =42)	p	
Enucleation time (mins)	65.69 ± 21.02	55.83 ± 17.56	p=0.027	
Adenoma management time (mins)	<i>Average</i>	25.64 ± 23.07	16.48 ± 14.59	p=0.037
	Cutting loop	44.72 ± 17.78	31.76 ± 10.60	p=0.002
	Morcellator	6.56 ± 2.94	6.08 ± 3.28	p=0.501
	p	p < 0.05	p < 0.05	
Hemoglobin drop (g/dL)	0.92 ± 0.80	1.08 ± 1.30	p=0.538	
Catheterization time (days)	1.75 ± 1.23	1.93 ± 1.40	p=0.555	
Hospital stay (days)	3.97 ± 1.81	4.21 ± 1.69	p=0.544	

Table 4. Perioperative outcomes comparison between biopsy and non-biopsy groups

Perioperative outcomes are summarized in Table 4. There were significant differences between the biopsy and non-biopsy groups in terms of enucleation time and tissue management time. Notably, tissue management time was shorter in the morcellator group compared to the cutting loop group; in the cutting loop group, the biopsy group also had longer tissue management times. There were no significant differences between the two groups in terms of hemoglobin drop, catheterization time, or postoperative stay.

Complication Characteristics

Symptoms/Complications	Biopsy (n=36)	Non - biopsy (n =42)	p
Postoperative Bleeding	2	4	p=0.965
Urinary retention	2	2	
Capsular perforation	2	1	
Seminal vesicles injury	1	0	
Urinary incontinence	0	1	
Total	7	8	

Table 5. Complication characteristics of the two groups

There is no significant difference in complications between the biopsy and non-biopsy groups (p=0.965).

1-Month Postoperative Outcomes

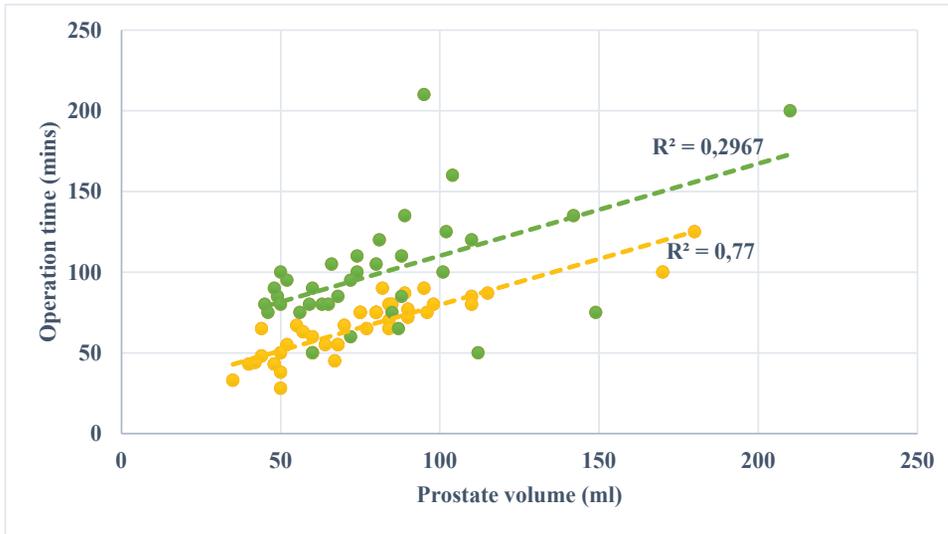
Parameter		Preoperative	1 - month follow-up	p
IPSS	Biopsy (n=36)	31.94 ± 2.14	4.67 ± 1.62	p=0.000
	Non - biopsy (n=42)	31.50 ± 2.89	5.19 ± 1.51	p=0.000
	p	p=0.450	p=0.124	
QoL	Biopsy (n=36)	5.08 ± 0.69	1.47 ± 0.51	p=0.000
	Non - biopsy (n=42)	5.12 ± 0.71	1.57 ± 0.55	p=0.000
	p	p=0.823	p=0.411	
PV	Biopsy (n=36)	83.89 ± 34.37	28.58 ± 10.82	p=0.000
	Non - biopsy (n=42)	73.64 ± 28.96	24.88 ± 8.34	p=0.000
	p	p=0.157	p=0.092	
Qmax	Biopsy (n=36)	3.13 ± 3.97	22.36 ± 6.43	p=0.000
	Non - biopsy (n=42)	2.41 ± 3.77	20.28 ± 4.39	p=0.000
	p	p=0.422	p=0.094	

Table 6. 1-month follow-up outcomes (PV: Prostate volume)

The 1-month follow-up results are summarized in Table 6. There were no significant differences between the two groups in terms of IPSS (4.66 ± 1.56 vs. 5.23 ± 1.45; p=0.124), QoL (1.45 ± 0.5 vs. 1.51 ± 0.55; p=0.823), prostate volume (28.79 ± 10.57 vs. 27.21 ± 8.92; p=0.092), or Qmax (22.46 ± 6.27 vs. 21.25 ± 4.84; p=0.094). Additionally, the results showed significant improvements in IPSS, QoL, prostate volume, and Qmax at 1 month postoperatively compared to preoperative values (**p=0.000**).

Correlation Between Operative Time and Prostate Volume

Chart 2: Correlation between prostate volume and total operative time (Blue: biopsy group, yellow: non-biopsy group)



The analysis showed a positive correlation between prostate volume and operative time in both the biopsy and non-biopsy groups. Additionally, the operative time was significantly longer in the biopsy group ($p < 0.05$).

Correlation Between Preoperative Factors and Operative Time

Factors	R ²	p
Age	0.004	p=0.582
Prostate volume	0.361	p=0.000
IPSS	0.007	p=0.469
QoL	0.045	p=0.063
Qmax	0.019	p=0.226
Prior prostate biopsy	0.087	p=0.009
Use of morcellator/cutting loop	0.269	p=0.000

Table 7. Perioperative factors and their correlation with operative time

The correlation analysis showed that operative time was correlated with prostate volume, prior biopsy status, and the use of a morcellator/cutting loop.

Linear Regression Model for Predicting Operative Time.

Factor	Coefficient (mins)	95% CI	p
Prostate volume (ml)	0.544	0.393 – 0.694	p=0.000
Prior biopsy	10.649	1.105 – 20.192	p=0.029
Use of morcellator	- 29.434	- 38.911 – -19.957	p=0.000
Constant	49.782	35.470 – 64.093	p=0.000

Table 8. Multiple linear regression analysis of preoperative factors on operative time

Based on the multiple linear regression analysis of the correlation between prostate volume, prior biopsy, and the use of a morcellator with operative time, we found that operative time could be predicted using the linear regression model.

In this model, prior biopsy within 3 weeks increased operative time by an average of 10 minutes, while the use of a morcellator reduced operative time by an average of 29 minutes.

For example, a patient with a prostate volume of 60ml, prior biopsy, and use of a morcellator would have a predicted operative time of: $60 \times 0.544 + 10.649 - 29.434 + 49.782 = 63.637$ minutes.

4. DISCUSSION

In Vietnam, prostate cancer is the 10th most common cancer, with an estimated 1,275 new cases and 872 deaths annually in men[12]. However, the gold standard procedure for diagnosing prostate cancer, prostate biopsy, is currently only available at major centers with specialized urology departments and experienced urologists. This leads to patients require BPH/BPO surgery, that need prostate biopsy to rule out cancer, sometimes have to live with indwelling catheters for months before definitive treatment, increasing the risk of complications and severely affecting their quality of life.

We conducted a study on 78 cases of en-bloc transurethral enucleation of the prostate (TUEP). The use of different energy sources (Bipolar and Holmium laser) to perform the same en-bloc TUEP technique did not result in significant differences in patient distribution or surgical outcomes between the two groups (*Tables 1 and 3*). The study groups were divided based on whether patients had undergone

a systematic transrectal ultrasound-guided prostate biopsy, with Group 1 consisting of 36 patients who had a biopsy within 3 weeks before surgery, and Group 2 consisting of 42 patients without a prior biopsy. We analyzed the results between these two groups and found no significant differences in clinical parameters such as age, IPSS, QoL, prostate volume, or Qmax. However, the PSA level was significantly higher in the biopsy group compared to the non-biopsy group (13.15 ± 8.23 ng/mL vs. 2.65 ± 1.36 ng/mL, $p=0.000$). This reflects the clinical reality that patients with elevated PSA levels are often recommended to undergo biopsy to rule out prostate cancer before deciding on surgical treatment[13].

Our study showed that the enucleation time was significantly longer in the biopsy group compared to the non-biopsy group (65.69 ± 21.02 minutes vs. 55.83 ± 17.56 minutes, $p=0.027$). This may be due to post-biopsy inflammation and bleeding altering the plane between the adenoma and the prostate capsule, making dissection more difficult. Additionally, adenoma management time was longer in the biopsy group, especially when using a cutting loop instead of a morcellator. Similarly, Pizza et al. (2020)[5] reported that patients who underwent biopsy ≤ 6 months before surgery had lower treatment efficacy and longer enucleation times compared to those who underwent biopsy > 6 months before TUEP. Choi et al. (2024)[13], in a study of 556 patients (biopsy group < 4 months: 139; control group: 417), also concluded that enucleation time and catheterization duration were significantly longer in the biopsy group. In our study, although operative time was longer in the biopsy group, there were no significant differences in hemoglobin drop, catheterization time,

or hospital stay. This is similar to previous studies, such as Yıldız et al. (2021)[7], who also did not observe a significant increase in complication rates or blood loss when performing HoLEP shortly after prostate biopsy.

We did not observe any significant differences in complication rates between the two groups ($p=0.965$), which is consistent with the findings of Choi (2024) [13], who reported no significant differences

in postoperative complications between the biopsy and non-biopsy groups. The most common complication in our study was postoperative bleeding (2 cases in the biopsy group and 4 cases in the non-biopsy group). Some rare complications, such as capsular perforation (2 cases in the biopsy group, 1 case in the non-biopsy group) and seminal vesicle injury (1 case in the biopsy group), were also observed.



Figure 2. Seminal vesicles injury

Source: Department of Urology, Binh Duong General Hospital

These differences may be due to post-biopsy changes in the prostate structure, including inflammatory adhesions, bleeding of the capsule and adenoma, making the plane between the adenoma and capsule less clear. The seminal vesicles may also show bleeding and adhesions, similar to tumor invasion. The prostate undergoes structural changes after systematic transrectal ultrasound-guided biopsy, as demonstrated by MRI studies. These structural changes persist until the end of the third week post-biopsy and may last longer in some cases[4], making TUEP performed before this time more challenging and associated with higher risks. Piazza et al[5] reported that a time interval of ≤ 6 months between biopsy

and TUEP was associated with a higher risk of surgical complications. However, in our study, all complications were effectively managed without serious sequelae.

At 1-month follow-up, both groups showed significant improvements in lower urinary tract symptoms (IPSS, QoL), maximum urinary flow rate (Q_{max}), and residual prostate volume, with $p < 0.05$ when comparing preoperative and postoperative values. Notably, there were no significant differences in the degree of improvement between the two groups, indicating that early TUEP after biopsy does not affect treatment efficacy. This is consistent with the studies by Etafy et al. (2021)[6] and Bell et al. (2019)[8], where both biopsy and

non-biopsy groups showed similar clinical improvements after TUEP. Ali Yıldız et al. (2021)[7], in a study of 66 patients who underwent TUEP within 1–3 weeks after transrectal prostate biopsy, concluded that it is a feasible procedure with high efficacy, low complication rates, and excellent functional outcomes at 3, 6, and 12 months compared to a control group of 114 patients who underwent TUEP without prior biopsy. Etafy et al[6] also reported similar findings when performing TUEP in patients who underwent biopsy within 6 weeks.

We developed a linear regression model to predict operative time based on prostate volume, prior biopsy status, and the use of a morcellator. The results showed that prior biopsy increased operative time by an average of 10 minutes, while the use of a morcellator reduced operative time by an average of 29 minutes. Larger prostate volumes were associated with longer operative times. This model may be a useful tool in clinical practice, helping to predict and optimize surgical planning for patients. However, larger-scale studies are needed to confirm the accuracy of this model. Lin et al[14], in a study of 135 BPH patients treated with en-bloc HoLEP using the “no-touch” technique, found that the volume of enucleated tissue, a history of recurrent urinary tract infections (positive urine culture > 3 times in the last 3 months), and the use of antiplatelet agents (with aspirin not discontinued before surgery) increased operative time. Their regression model also showed that recurrent urinary tract infections and the use of antiplatelet agents increased operative time by approximately 24 minutes and 20 minutes, respectively. Monn et al[15] reported similar findings, with enucleated tissue volume, preoperative catheterization, recurrent urinary tract

infections, antiplatelet use, and surgeon experience affecting both enucleation and tissue management times. In our study, we identified similar correlating factors, and the linear regression model could be expanded with a larger sample size and more variables to build a more accurate predictive model.

Our study has some limitations: The sample size was relatively small and limited to a single surgical center; The follow-up period was only 1 month postoperatively, limiting the assessment of long-term outcomes; We did not analyze the impact of prostate biopsy on inflammatory markers and tissue recovery after surgery. Therefore, further multicenter studies with longer follow-up periods are needed to provide more robust evidence on the safety and efficacy of early TUEP after prostate biopsy.

5. CONCLUSION

Our results support that en-bloc transurethral enucleation of the prostate performed within 1–3 weeks after transrectal ultrasound-guided prostate biopsy is a feasible, safe, and effective procedure that significantly improves lower urinary tract symptoms and urinary function.

A multiple linear regression model can be developed to predict operative time based on prostate volume, prior biopsy status, and the use of a morcellator.

Further large-scale, multicenter studies with long-term follow-up are needed to strengthen the evidence on the safety and efficacy of this procedure and to clarify the initial findings of our predictive model for operative time.

REFERENCES

1. Hội Tiết niệu - Thận học Việt Nam (2019), “Hướng dẫn chẩn đoán và điều trị Tăng sinh lành tính tuyến tiền liệt”.
2. Hội Tiết niệu - Thận học Việt Nam

- (2014), “Hướng dẫn xử trí tăng sinh lành tính tuyến tiền liệt”.
3. J.N. Cornu (Chair), M. Gacci, H. Hashim,, T.R.W. Herrmann, S. Malde, C. Netsch, C. De Nunzio, M. Rieken, V. Sakalis, M. Tutolo, and Guidelines Associates: M. Baboudjian, N. Bhatt, M. Creta, M. Karavitakis, L. Moris Guidelines Office: N. Schouten (2024), “EAU Guidelines on Non-Neurogenic Male Lower Urinary Tract Symptoms (LUTS)”.
 4. Ikonen, S., et al. (2001), “Optimal timing of post-biopsy MR imaging of the prostate”, *Acta Radiol.* 42(1), pp. 70-3.
 5. Piazza, P., et al. (2022), “Short Time Delay Between Previous Prostate Biopsy for Prostate Cancer Assessment and Holmium Laser Enucleation of the Prostate Correlates with Worse Perioperative Outcomes”, *Eur Urol Focus.* 8(2), pp. 563-571.
 6. Etafy, M. H., et al. (2021), “Holmium Laser Enucleation of Prostate Within 6 Weeks of Transrectal Ultrasound Guided Prostate Biopsy is Safe and Effective”, *Urology.* 148, pp. 88-92.
 7. Yildiz, A., et al. (2021), “Safety and Efficacy of High-Powered Holmium Laser Enucleation of the Prostate within 1-3 Weeks Following Prostate Biopsy”, *Urol Int.* 105(9-10), pp. 852-857.
 8. Bell, C., et al. (2019), “Safety and efficacy of Holmium laser enucleation of the prostate (HoLEP) in patients with previous transperineal biopsy (TPB): outcomes from a dual-centre case-control study”, *BMC Urol.* 19(1), p. 97.
 9. Prince Kasongo, M., et al. (2024), “The histological prevalence of prostatitis at Potchefstroom Hospital: a cross-sectional study”, *Pan Afr Med J.* 47, p. 8.
 10. Kawakami, J., Siemens, D. R., and Nickel, J. C. (2004), “Prostatitis and prostate cancer: implications for prostate cancer screening”, *Urology.* 64(6), pp. 1075-80.
 11. Miernik, A. and Schoeb, D. S. (2019), ““Three horse shoe-like incision” holmium laser enucleation of the prostate: first experience with a novel en bloc technique for anatomic transurethral prostatectomy”, *World J Urol.* 37(3), pp. 523-528.
 12. Tế, bộ y (2023), “hướng dẫn chẩn đoán và điều trị triệu chứng đường tiểu dưới do tăng sinh lành tính tuyến tiền liệt”(1531 /QĐ-byt).
 13. Choi, S. M., et al. (2024), “Clinical outcome and safety of holmium laser prostate enucleation after transrectal prostate biopsies for benign prostatic hyperplasia”, *Investig Clin Urol.* 65(2), pp. 148-156.
 14. Lin, C. H., et al. (2020), “Preoperative predictors of enucleation time during en bloc ‘no-touch’ holmium laser enucleation of the prostate”, *BMC Urol.* 20(1), p. 185.
 15. Monn, M. F., et al. (2015), “Predictors of Enucleation and Morcellation Time During Holmium Laser Enucleation of the Prostate”, *Urology.* 86(2), pp. 338-42.