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Evaluation of intra-operative trans-urethral endoscopic management of possible open transvesical prostatectomy complications

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Abstract

Objective To evaluate the benefits of using transurethral cystoscope and resectoscope for managing possible complications that may occur during open transvesical prostatectomy operation.

Background Open transvesical or retropubic prostatectomy remains, in less technologically developed countries, the standard option for treatment of complicated large benign prostatic hyperplasia. Complications rate with open prostatectomy procedures, especially post-operative bleeding and urinary incontinence, represent a real challenge facing urologists. Hopefully, recent advances in endourology section helped greatly in management of complicated benign prostatic hyperplasia and also offered a tool to deal with possible open prostatectomy complications.

Patients and methods In a prospective study, fifty (50) male patients with complicated large benign prostatic enlargement associated with large single or multiple bladder stones with stone burden ≥ $3cm^3$ planned to undergo transvesical prostatectomy divided randomly into two groups. Group (A) included 25 patients who underwent standard T.V.P. and group (B) included 25 patients in whom diagnostic urethro-cystoscopy and a mono-polar resectoscope were used pre- and post-prostatic adenoma enucleation. Patients had follow-up evaluation visits at 1, 3 and 6 months postoperatively to evaluate IPSS, post-void urine estimation, Q_{max}, and quality of life.

Results A total of 50 patients were divided equally into two groups. Group (A) included 25 patients who underwent standard transvesical prostatectomy, while group (B) included 25 patients who underwent initial diagnostic urethro-cystoscopy, then bilateral ureteric catheter insertion, followed by prostatic apical demarcation using a monopolar resectoscope. Finally, transurethral hemostasis of the prostatic bed is done after standard transvesical adenoma enucleation. Mean operative time in group (A): 48.3 ± 12.4 min. while in group (B): 68.9 ± 14.1 min ($p < 0.001$), Hemoglobin deficit in group (A): 2.8 ± 1.1 g/dl. while in group (B): 1.1 ± 0.39 g/dl. ($p < 0.001$). Enucleated prostate volume in group (A): 89.2 ± 16.1g, while in group (B): 91.2 ± 17.2g ($p = 0.673$). Post-operative IPSS, Post-void residual urine and Q_{max} showed insignificant differences between the two groups.

Conclusion Trans-urethral endoscopically assisted transvesical prostatectomy provides more safety and fewer morbidities and complications rate compared to standard T.V.P.

Keywords Benign prostatic hyperplasia, Transvesical prostatectomy, Endoscopy

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1 Background

Benign prostatic hyperplasia (BPH) is a significant health issue that affects the quality of life of aging men [1]. BPH is usually associated with lower urinary tract symptoms that may worsen and become complicated by secondary bladder stone formation, recurrent urinary tract infection, refractory urine retention, hematuria, and upper urinary tract deterioration [2].

In earlier years, open prostatectomy was considered the treatment of choice for large prostatic adenomas more than 100 g, as it provided complete prostatic adenoma removal in a short operative time with obvious improvement in post-operative IPSS. However, recent advances in minimally invasive resection procedures have featured alternatives to open prostatectomy [3–5].

TURP replaced open prostatectomy as a treatment of first choice for resection of small and medium-sized prostatic adenomas [6]. However, TURP in large prostates is associated with high complication rates such as long operative time, low resection efficacy, and high incidence of trans-urethral resection syndrome. Also, intraoperative and postoperative bleeding is a troublesome complication [7]. However, bipolar TURP is considered a new minimally invasive intervention for the treatment of large prostates avoiding trans-urethral resection syndrome with good hemostasis and precise adenoma resection [8, 9]. Recently, holmium laser enucleation of the prostate (HoLEP) appeared to put both O.P. and TURP in a real challenge in treating men with complicated, huge prostates. Despite its efficacy in treating large prostate adenomas, its high cost and non-availability limited its wide spread acceptance [10, 11].

2 Patients and methods

Fifty (50) male patients suffering from B.P.H. complicated mainly by secondary bladder stone formation, hematuria, and recurrent urinary retention and prepared for transvesical prostatectomy procedure presented to the urology outpatient clinic in the period from December 2021 till May 2022 were randomly divided equally into groups (group (A) and group (B). The closed-envelop technique was used for the randomization of patients in the two groups.

All patients with an enlarged prostate of more than 100 g associated with a large single or multiple bladder stones with a stone burden size $\geq 3cm^3$ included in our study. Exclusion criteria were: active urinary tract infection, defective coagulopathy profile, known urethral stricture, fibrotic prostate, patients with previous prostatic operations, and proven prostate cancer.

Approval and written informed consent from all participants were obtained.

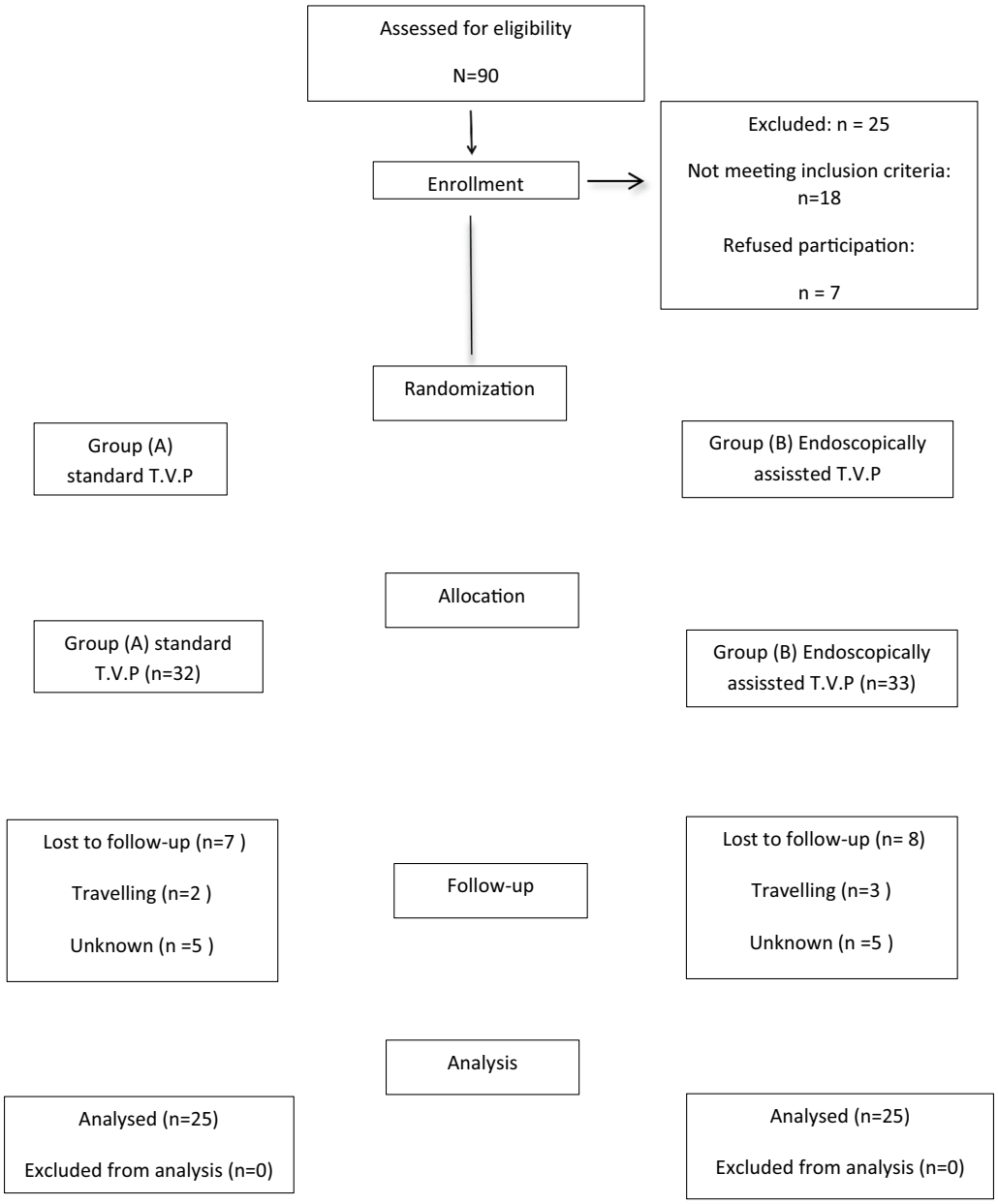
Ethical committee approval from our institution was obtained before the initiation of our study.

Pre-operative evaluation included a full history taking, IPSS estimation, and D.R.E. of the prostate.

Abdomino-pelvic and trans-rectal ultrasound for evaluation of prostate size, residual urine volume estimation, degree of hydronephrosis, and the presence of urinary stones.

Laboratory studies included complete blood count (Hb and hematocrit levels), urine analysis, urine culture and sensitivity testing, renal function tests (blood urea and serum creatinine), and P.S.A. levels (total, free, and ratio). Q_{max} was also evaluated. P.S.A. level was repeated after one month of medical treatment if slightly elevated to ensure exclusion of prostate cancer.

Follow-up visits in the outpatient urology clinic until six months postoperatively to evaluate the outcome of the surgical procedure (IPSS, Q_{max}, and PVRU).



Consolidated Standard of reporting trials (CONSORT) flow chart.

2.1 Surgical procedure

The low lithotomy position with a slight Trendelenberg tilt was the preferred position in the second group, while supine position was used in the first group. Spinal anesthesia is mainly used in both groups.

In group (A), a midline or Pfannenstiel incision is done directly without preliminary cystoscopy, followed by an anterior cystostomy and the removal of the bladder stone(s), followed by the standard steps of the transvesical prostatectomy procedure (Figs. 1, 2, 3, 4).

In group (B), a pre-liminary diagnostic cystoscopy was done with identification of the external sphinecteric area, configuration of the prostatic adenoma, length of the prostatic urethra, bladder neck, ureteric orifices, and bladder mucosa all around.

After pre-liminary cystoscopy, two short ureteric catheters (about 35cm in length) were inserted into the two ureteric orifices and left inside the bladder. At the level of the verumontanum, using a continuous irrigation mono-polar resectoscope, apical demarcation of

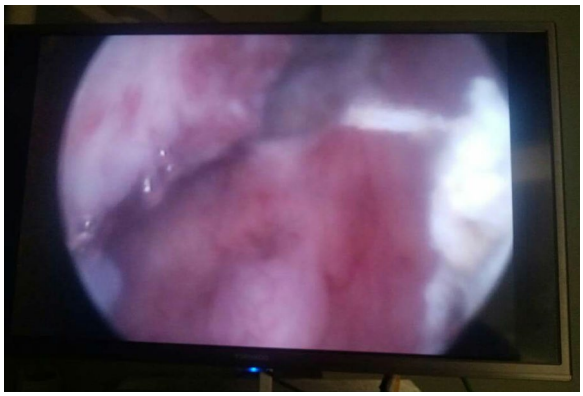


Fig. 1 Initial mucosal demarcation just proximal to verumontanum

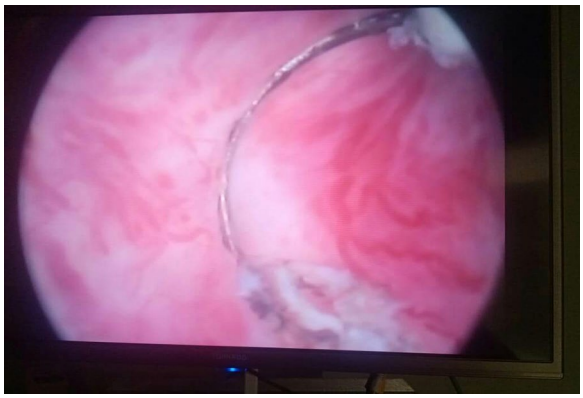


Fig. 3 Right lateral mucosal demarcation

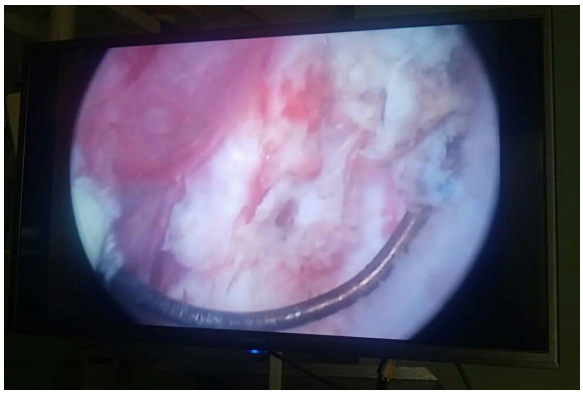


Fig. 2 Left lateral mucosal demarcation

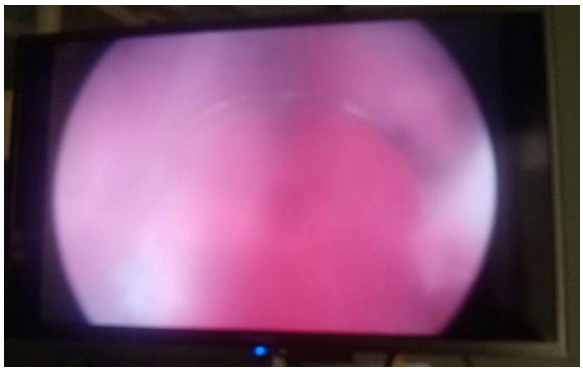


Fig. 4 Apical mucosal demarcation just proximal to verumontanum

the prostatic apex all around using a loop electrode was done.

Midline or Pfannenstiel incision about 5 cm in length, incision of the rectus sheath, then retraction of both recti muscles laterally exposing the peri-vesical space, sweeping of peri-vesical fat and peritoneum superiorly by blunt dissection, stay sutures taken lateral to the proposed site of cystostomy, then anterior bladder wall opened sharply. Removal of bladder stone(s) done first

Table 1 Preoperative patients' baseline characteristics

Characteristics	Group A *N* = 25 standard Mean (SD, range)	Group B *N* = 25 endoscopic assisted	*p* value
Age (years)	52.0 (14.0, 49–71)	51.0 (14.2, 48–73)	0.803
BMI (kg/m^2)	26.5 (4.3, 20–40.1)	27.2 (4.6, 21–41.2)	0.581
IPSS	20.3 (6.8, 11–33)	21.1 (7.1, 2–35)	0.686
Prostate size by TRUS (gm)	105.0 (17.4, 95–155)	107.0 (17.9, 88–170)	0.691
PVRU (ml)	95.5 (27.1, 52–127)	81.9 (26.8, 62–159)	0.081
$Q_{max.}$ (ml/s)	8.8 (3.1, 2–11)	9.1 (4.1, 3–11)	0.771
PSA level (ng/ml	5.1 (2.1, 4.1–6.6)	5.3 (2.4, 4–7.3)	0.755
Hb level (g/dl)	13.2 (3.4, 10.5–15.1)	12.9 (3.2, 11.2–14.3)	0.749
Hct level (g/dl)	40.1 (9.4, 37.2–45.1)	39.7 (8.9, 35.6–44.8)	0.877
Serum creatinine (mg/ dl)	1.32 (0.2, 1.02–1.07)	1.25 (0.1, 0.9–1.42)	0.124

p values are based on independent *t* test

BMI, Body Mass Index; IPSS, International Prostatism Symptom Score; TRUS, transrectal ultrasonography; PVRU, post-void residual urine; Qmax, maximum flow rate; PSA, prostate-specific antigen; SD, standard deviation

then both ureteric stents were loosely sutured to the bladder mucosa using vicryl 3-0 and shorty cut below the ureteric orifices to be later on removed at the end of the procedure before cystostomy closure. Bladder mucosal incision below the ureteric orifices was done using diathermy, then enucleation of the prostatic adenoma by index finger, starting with division of the anterior commissure at 12 o'clock, and continuing enucleation in the correct plane between the adenoma and surgical capsule.

Apical dissection of the adenoma was done bluntly and sometimes sharply, avoiding exerting any traction on the intrinsic component of the external sphincter; this was facilitated in some cases by pushing the prostate apex upward via placing the index finger of the other hand in the rectum.

Inspection of the enucleated prostatic adenoma to ensure complete enucleation, then packing of the prostatic fossa for a few minutes by a gauze pack as a tamponade to facilitate hemostasis.

Figure of (8) hemostatic sutures at 5 and 7 o'clock positions were done when feasible and accessible with plication of the mucosal edge at the bladder neck to ensure adequate hemostasis after removal of the gauze pack.

Temporary insertion of a 22 or 24fr. triple-way urethral catheter with inflation of its balloon in the prostatic fossa or at the bladder neck was done; after that, a suprapubic catheter was inserted to ensure adequate drainage, closure of the cystostomy in two layers using vicryl 2/0. After that, the triple-way urethral catheter was removed, followed by the introduction of a 24Fr continuous irrigation resectoscope via the urethra and the coagulation of any bleeding vessels at the bladder neck, and in the prostatic fossa, paying attention to controlling the bleeding vessels at 5 and 7 o'clock. Electrocautery should be used in spray mode to avoid ureteric orifice injury and bladder neck ischemia that may lead to bladder neck contracture later on. What should be taken into consideration is that visualization and coagulation of the prostatic fossa after adenoma enucleation is not an easy task and requires an expert endourologist using excellent endoscopic equipment.

Re-insertion of the triple-way urethral catheter (24 or 26Fr.) on a guide wire inserted via the resectoscope sheath to ensure entering the bladder cavity was done, followed by inflation of its balloon by normal saline.

A retropubic drain is inserted followed by anatomical closure of the wound. Continuous bladder irrigation with slight catheter traction was done, ensuring good drainage. All surgical procedures were done by the same surgical team to standardize the surgical skills required.

2.2 Statistical analysis

The collected data were coded, tabulated, and statistically analyzed using the Statistical Package for Social Sciences (SPSS) software version 25. Data distribution was evaluated using the Kolmogorov–Smirnov test.

Descriptive statistics were calculated for parametric (normally distributed) quantitative data, including the mean, standard deviation (SD), and minimum and maximum ranges. For qualitative data, the frequency and percentage were calculated.

For parametric quantitative data, the groups were compared using independent sample *t* tests. Using qualitative data, the two groups were compared using a Chi-squared test (if up to 20% of the cells had an expected count of less than five) or a Fisher's exact test (if more than 20% of the cells had an expected count of more than five). The significance level for all statistical analyses was $p < 0.05$.

2.3 Sample size calculation

The sample size was calculated based on previous studies, with the mean difference in the primary outcome between both groups being 2.58 with a power of 80% and a level of significance of 5%.

The calculated sample size is 52 participants: about 26 participants in each group. Additionally, a 10% dropout rate to compensate for non-response was considered, and the sample size was recalculated as n/(1- 0.1), so a total of 58 participants will be needed: 29 participants in each group. Epi-calc 2000 (version 1.01) was used to calculate the sample size for this study. Unfortunately, the actual dropout rate in our study during follow-up period increased, resulting in 25 patients being finally included and completed untill the end of the study.

Sample size for comparing two means

Input Data	
Confidence Interval (2-sided)	99%
Power	80%
Ratio of sample size (Group 2/Group 1)	1

	Group 1	Group 2	Difference*
Mean	4	6.8	− 2.8
Standard deviation	1.7	4.7	
Variance	2.89	22.09	
Sample size of Group 1	26		
Sample size of Group 2	26		
Total sample size	52		

*Difference between the means

Results from Open Epi, Version 3, open source calculator–

Table 2 Frequency of associated benign prostatic hyperplasia (BPH) pre-operative complications

Associated BPH complications	Group A *N* = 25 *N* (%)	Group B *N* = 25 *N* (%)	*p* value
Recurrent urine retention	8 (32)	5 (20)	0.333[a]
2ry single large bladder stone	10 (40)	16 (64)	0.667[b]
2ry multiple bladder stones	15 (59)	8 (32)	0.741[b]
Recurrent hematuria	2 (8)	3 (12)	1[b]
Recurrent UTI	7 (28)	9 (36)	0.544[a]
Upper tract dilatation	2 (8)	1 (4)	1[b]

p values are based on [a]Chi-square test for difference in proportions

[b] The test applied is Fisher exact test

3 Results

The mean (range) age of the included patients in our study was 52 years (49–71) in group (A), while the mean (range) age in group (B) was 51years (48–73).

The mean pre-operative serum P.S.A. level was (5.1 ± 2.1) ng/ml in group (A) while it was (5.3 ± 2.4) ng/ml in group (B), However, it decreased significantly after one month postoperatively to reach (1.1 ± 0.06) ng/ ml in group (A) and (2.1 ± 0.9) ng/ml in group (B), indicating the removal of more than 85% of the total prostate gland.

Regarding mean operative time in group (A), from skin incision till finishing enucleation of the prostate, it was 48.3 ± 12.4 min, while in group (B), operative time including preliminary endoscopic steps and post-enucleation endoscopic hemostasis was 68.9 ± 14.1 min. There was a significant difference (p value = 0.001) in operative time in favor of group A.

The mean endoscopic hemostasis time was 17.8 ± 3.2 min in group B (Tables 1, 2, 3).

The mean hemoglobin and hematocrit levels postoperatively showed a significant difference in group B compared to group A (p value = 0.001) from the base line values.

Regarding post-operative complications, we used the modified Clavien- Dindo score in order to grade possible complications, as shown in Table 4.

Grade 1 included mild fever, catheter malfunction, clot retention, prolonged drainage and urinary retention after catheter removal, while Grade 2 included patients with hematuria requiring blood transfusion. Intra-peritoneal extravasation was graded (3).

Regarding grade 4 myocardial infarction or grade 5 death, no patients were categorized in these grades (Tables 5, 6, 7).

Prolonged drainage managed by continued catheter drainage occurred in three patients in group (A) compared to only one patient in group (B).

Bleeding requiring blood transfusion occurred in 7 patients in group (A), with one unit of packed RBCs in 5 patients and two units in 2 patients. However, only one patient required transfusion of one unit of packed RBCs in group B.

Intra-peritoneal extravasation due to inadvertent peritoneal entry during the procedure occurred in two patients in group (A) and one patient in group (B).

Q_{max} and P.V.R. were statistically significantly improved in the follow-up visits; no patient had acute urinary retention after the removal of the catheter in group B, while two patients experienced one attack of urine retention after catheter removal in group A, which improved after a few days of re-catheterization and medical treatment.

Post-operative mild urge urinary incontinence was observed in 2 patients in group (A) that improved gradually on conservative medical treatment.

Histo-pathological examination of the resected prostatic adenoma revealed glandular and stromal hyperplasia in all patients.

The results of our study showed significant improvement in IPSS in early and later follow-up visits.

Table 3 A comparison of operative variables according to the approach used for prostatectomy

Operative variables Mean (SD, range)	Group A standard *N* = 25	Group B endoscopic *N* = 25	*p* value
Operative time (min.)	48.3 (12.4, 40–72)	68.9 (14.1, 58.1–82.6)	< 0.001*
Endoscopic homeostasis time (min.)	0 (0)	17.8 (3.2, 13.4–25.2)	< 0.001*
Hb loss (g/dl)	2.8 (1, 1.1–3.2)	1.1 (0.3, 0.8–1.4)	< 0.001*
Hct deficit (%)	4.9 (1.8, 3.7–5.2)	2.1 (0.7, 1.1–2.8)	< 0.001*
Enucleated prostate volume	89.2 (16.1, 71–135)	91.2 (17.2, 83–158)	0.673
Bleeding requiring blood transfusion *n* (%)	7 (28)	1 (4)	0.024*[a]

*Statistically significant at 95% level of confidence. *p* values are based on independent *t* test

[a] The test applied is Fisher exact test

Table 4 A comparison of peri-operative variables according to the approach used for prostatectomy

Peri-operative variables	Group A *N* = 25 *N* (%)	Group B *N* = 25 *N* (%)	*p* value
Post-operative fever (> 38.5 °C)	4 (16)	2 (8)	0.667[b]
Postoperative hematuria	8 (32)	1 (4)	0.023[b]*
Clot retention	7 (28)	1 (4)	0.024[b]*
Catheter malfunction	8 (32)	2 (8)	0.037[b]*
intra- or extraperitoneal extravasations	2 (8)	1 (4)	1[b]
Retention after catheter removal	2 (8)	0 (0)	0.490[b]
Need for 2nd look cystoscopy hemostasis	4 (16)	0 (0)	0.110[b]
Prolonged drainage	3 (12)	1 (4)	0.609[b]
Early rehabilitation	23 (92)	25 (100)	0.490[b]
Readmission rate (for 2ry hemorrhage	4 (16)	0 (0)	0.110[b]
Incidental finding of bladder tumors	1 (4)	0 (0)	1[b]
Incidental iatrogenic injury of ureteric orifices	2 (8)	0 (0)	0.490[b]
Residents faults during apical dissection	3 (12)	0 (0)	0.235[b]
Amount of bladder wash (Liters /1st 24 h) Mean (SD, range)	13 (2.2,11–15)	6 (1.3, 5–7)	< 0.001[a]*
Period of catheterization (days) Mean (SD, range)	10(2, 8–12)	5 (1,4–6)	< 0.001[a]*
Hospital stay (days) Mean (SD, range)	8 (2, 6–10)	4 (1, 3–5)	< 0.001[a]*

*Statistically significant at 95% level of confidence. *p* values are based on

[a] Independent *t* test

[b] Fisher exact test

Table 5 A comparison of post-operative variables according to the approach used for prostatectomy

Post-operative variables Mean (SD, range)	Group A *N* = 25	Group B *N* = 25	*p* value
Post-operative continence *N* (%)	23 (92)	25 (100)	0.490[a]
Post-operative IPSS	10.1 (2.8, 8–13)	8.7 (3.1, 6–12)	0.100
Post-operative PVRU	28.7 (11.2, 21–65)	32.1 (12.4, 25–68)	0.314
$Q_{max.}$ (ml/s)	18.9 (4.1, 16–23)	19.4 (5.2, 15–25)	0.707
PSA level (ng/ml)	1.5 (0.7, 0.9–1.9)	1.1 (0.9, 1.6–2.8)	0.089

p values are based on independent *t* test

[a] The test applied is Fisher exact test

Table 6 A comparison of pre- and post-operative variables in the open prostatectomy resection group (Group A)

Variables Mean (SD, range)	Preoperative	Post-operative	*p* value
IPSS	20.3 (6.8, 11–33)	10.1 (2.8, 8–13)	< 0.001*
PVRU (ml)	95.5 (27.1, 52–127)	28.7 (11.2, 21–65)	< 0.001*
$Q_{max.}$ (ml/s)	8.8 (3.1, 2–11)	18.9 (4.1, 16–23)	< 0.001*
PSA level (ng/ ml)	5.1 (2.1, 4.1–6.6)	1.1 (0.06, 0.9–1.9)	< 0.001*

*Statistically significant at 95% level of confidence. *p* values are based on paired *t* test

4 Discussion

Open prostatectomy is still considered a suitable surgical treatment option in patients with complicated large-volume BPH > 100 g, especially if associated with large bladder stones. Open prostatectomy provides a

Table 7 A comparison of pre- and post-operative variables in the endoscopic prostatectomy (Group B)

Variables Mean (SD, range)	Preoperative	post-operative	*p* value
IPSS	21.1 (7.1, 2–35)	8.7 (3.1, 6–12)	< 0.001*
PVRU	81.9 (26.8, 62–159)	32.1 (12.4, 25–68)	< 0.001*
$Q_{max.}$ (ml/s)	9.1 (4.1, 3–11)	19.4 (5.2, 15–25)	< 0.001*
PSA level (ng/ ml)	5.3 (2.4, 4–7.3)	2.1 (0.9, 1.6–2.8)	< 0.001*

*Statistically significant at 95% level of confidence. *p* values are based on paired *t* test

significant improvement and a less failure rate. However, it has a significant morbidity [12, 13].

The EAU recommends several surgical options for prostates > 80 cc, including Holmium Laser Enucleation of the Prostate (HoLEP), open simple prostatectomy, transurethral resection of the prostate (TURP), or robotic simple prostatectomy [14].

Several procedures tried to benefit from the advantages of open prostatectomy while minimizing its disadvantages. Portogerou et al. [15] performed open prostatectomy enucleation via a 3-cm skin incision. However, perioperative bleeding was significant. They operated on 169 patients by transvesical prostatectomy, with a mean (range) prostate size of about 101 g (85–144). Of these patients, 69 (41.8%) required one unit of blood transfusion, while 19 (11.5%) required three units of blood transfusion. The mean operative time was 24 min. range (15–36 min). The catheter was removed on the third post-operative day in 155 (94%) patients, and the hospital stay was about 3–10 days.

Gratzke et al. performed open prostatectomy on 902 patients with an average prostate volume of 96.3 ± 37.4 ml and concluded that postoperative complications occurred in 17.3% of all patients. 68 patients (7.5%) received blood transfusion, 33 patients (3.7%) had significant bleeding, and 46 patients (5.1%) had urinary tract infection [16].

Regarding our study, in group A, 7 patients (28%) required blood transfusion, while only one patient (4%) in group B required blood transfusion (p value = 0.024), which was statistically significant, highlighting the benefit of transurethral endoscopic hemostasis of the prostatic fossa after adenoma enucleation. The mean operative time in group A was 48.3 ± 12.4 min, which was significantly shorter than that in group B (68.1 ± 14.1 min) due to the longer time needed for endoscopic hemostasis.

Urethral catheterization in group (A) ranged from 8 to 10 days postoperatively; with a higher incidence of catheter malfunction than in group (B), in which the urethral catheter was removed on the fourth to sixth day postoperatively.

The mean hospital stay in group (A) was 8 ± 2.6 days, while in group (B), it was 4 ± 1 days, referring to lesser post-operative co-morbidities in group (B) compared to post-operative stays in operative and HoLEP that were 8 and 3 days, respectively [17, 18].

Endoscopic manipulation and hemostasis of the prostatic fossa after prostatic enucleation needs expert endourologist aiming to control arterial bleeding, while venous bleeding can be controlled by Foley's catheter traction. Sparing mode of electrocautery is preferred, especially at the area of the bladder neck, to avoid injury to the ureteric orifices or bladder neck contracture [19].

The use of endoscopic coagulation and hemostasis during our procedure in group (B) decreased blood loss and the need for blood transfusion. The mean Hb loss was 1.1 ± 0.3g/dl, and the mean Hct deficit was 2.1 ± 0.7%. Compared to group A, it was 2.8 ± 1 and 4.9 ± 1.8, respectively. Bleeding that required blood transfusion occurred in 7 patients (28%) n group A, while only one patient required blood transfusion in group B. The blood transfusion rate during TURP and HoLEP was < 10% and 0.05%, respectively [20, 21].

Regarding the complications of prostatic surgery, a modified Clavien-Dindo score was used, which was simple and easy to use. Mamoulakis et al. stated that in 198 men with BPH treated by TURP, 44 complications occurred in 31 patients (15.6%), mainly grade 1 and grade 2 complications [22], while EL-Shal et al. operated on 163 patients with open transvesical prostatectomy and found that postoperative bleeding that required blood transfusion was the commonest low-grade complication that occurred in 24.5% of their patients [23]. In our study, post-operative complications were mainly grade 1 in the form of clot retention in 7 patients (28%) in group A, while only one patient in group B, which was clinically significant. Also, post-operative hematuria occurred in 8 patients in group (A), while only one patient in group (B) experienced post-operative hematuria, and that was also clinically significant owing to the use of trans-urethral coagulation and fulguration of bleeding points using the resectoscope after adenoma enucleation.

Our results show significant improvement in the patient's IPSS shortly after catheter removal. These results are comparable for those related to HoLEP, laparoscopic, and open prostatic surgery [24].

The limitations of our study were the relatively small number of patients and the short follow-up. However, a larger number of patients with a longer follow-up period will give a more accurate evaluation of early and late post-operative outcomes.

5 Conclusion

Endoscopic assistance to correct possible complications of open transvesical prostatectomy is technically safe and effective.

Abbreviations

BPH	Benign prostatic hyperplasia
Q_{max}	Maximum voiding flow rate
T.V.P	Trans vesical prostatectomy
D.R.E	Digital rectal examination
PVR	Post void residual
Holep	Holmium laser enucleation of prostate

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MF conceived designed and collected data and performed surgery. NF did statistical analysis and interpretation of results. MM shared in final interpretation of data and critically reviewing the work. AI helped in manuscript writing, editing of manuscript and involved in review and final approval of manuscript.

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Availability of data and materials
All data generated or analyzed during the study are available from the corresponding author on reasonable consent.

Declarations

Ethics approval and consent to participate
Ethical approval has been given by our institutional ethical committee and proper informed written consent from participants to have clear knowledge about the indication, risks, and benefits of the surgical procedure.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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