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Original Research Article

An Observational Study Determining Incidence and Perioperative Factors Associated with the Development of Urethral Stricture Following B-TURP

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Abstract

Aim: The aim of the present study was to evaluate the incidence and perioperative factors associated with the development of urethral stricture following B-TURP.

Methods: This was a prospective observational study of patients with symptomatic BPO who underwent B-TURP at Department of Urology from September 2019 to November 2022. A total of 200 patients underwent B-TURP during the study period. Informed consent was obtained from all the patients before the surgical intervention.

Results: The mean preoperative IPSS score and Q-max were 21 ± 4 and 8 ± 3 mL/min, respectively. The mean total prostate volume was 56.4±31.6 cm^3. The mean meatal caliber was 28 ± 2 Fr. In all the patients with a prostate volume of ≤40 cm3, a 24 Fr resectoscope was used. For the 200 patients with a prostate volume ≥40 cm3, a 26-Fr resectoscope sheath was used in 80 patients and in the remaining 120 patients, a 24-Fr resectoscope sheath was used as the meatal caliber was <26 Fr. The mean prostate volumes resected with a 24Fr sheath was 44.3 ± 22 cm3 and that with a 26Fr sheath was 80.2 ± 32 cm3. Perioperative complications were classified using the CCS. The most common intraoperative complication was capsular perforation. Most postoperative complications were classified as Grade 1.The present study included 200 patients who underwent B-TURP and were followed up for at least 6 months. A significant correlation between the development of urethral stricture following B-TURP and diabetes mellitus, prostate volume, resectoscope sheath, resection time, capsular perforation, postoperative haematuria, catheter block-manged with flush/exchange, catheter traction, duration of catheter removal.

Conclusion: We found that small meatal caliber was associated with an increased risk of urethral stricture following B-TURP.

Keywords: TURP, urethral stricture, B-TURP.

Introduction

Transurethral resection of the prostate (TURP) is the gold standard surgical treatment for benign prostatic hyperplasia. [1-4] It remains the surgery of choice because of its proven long-term efficacy and durable outcomes. [2,5] TURP has traditionally been performed with the monopolar (M-TURP) system. In the past decade, the bipolar system(B-TURP) has gained popularity because of its better safety profile compared with M-TURP. [2,6,7] Conventional monopolar transurethral resection of the prostate(M-TURP) is one of the major surgical options for benign prostatic obstruction(BPO). Numerous studies support its long-term efficacy and relatively low incidence of complications. [8,9] Nevertheless, there still exist potential complications such as intraoperative bleeding, clot retention, and transurethral resection syndrome, and M-TURP has an overall morbidity rate of 11.1%. [10]

Recently, the midterm (up to 36 months of follow-up) treatment results for multicenter randomized controlled trials (RCTs) using the AUTOCON® II 400 ESU were published. [11] However, cumulative data from RCTs with follow-up of >24 months is still insufficient to make a decision about whether B-TURP remains efficacious and safe in the long term. Indeed, according to the European

Association of Urology, the lack of sufficient long-term data precludes definite conclusions on the duration of improvements or the advantages of B-TURP over M-TURP. [12] There has been only 1 trial which compared the efficacy of TURP is with conventional M-TURP, with follow up results recorded over only a 24 month period. [13]

Many randomized controlled trials were conducted to evaluate perioperative and postoperative morbidity as well as the final outcome of bipolar resections in saline (TURIS) systems. They all lead to the conclusion that bipolar technology has similar clinical efficacy as monopolar TURP. Furthermore, in all randomized controlled trials, neither life-threatening hyponatremia nor TUR syndrome was observed, which leads to the conclusion that bipolar resections are safer. [14] Other concerns arise about the incidence of urethral injuries.

The aim of the present study was to evaluate the incidence and perioperative factors associated with the development of urethral stricture following B-TURP.

Materials and Methods

This was a prospective observational study of patients with symptomatic BPO who underwent B-TURP at Department of Urology, Narayan Medical College and Hospital, Sasaram, Bihar, India from September 2019 to November 2022. A total of 200 patients underwent B-TURP during the study period. Informed consent was obtained from all the patients before the surgical intervention.

Patients with symptomatic BPO were included in the study and those with vesical calculus, penile lichen sclerosus, previous history of endoscopic intervention, history of urethral stricture, and patients on catheter prior to B-TURP were excluded. Patient demographics, clinical examination findings and the International Prostate Symptom Score (IPSS) were recorded. Laboratory investigations were performed to measure the hemoglobin, serum creatinine, serum electrolytes, urinalysis, urine culture, and prostate-specific antigen. All the patients underwent uroflowmetry (peak flow rate; Q-max) and ultrasonographic measurement of the post-void residual (PVR) urine volume. To measure the prostate volume, trans-rectal ultrasonography was performed by experienced radiologist using the ellipsoidal formula. [15]

Technique and equipment

The procedure was performed in the lithotomy position under regional anesthesia. All the procedures were performed by a group of seasoned urologists with vast experience in minimally invasive urological procedures. Cysto-urethroscopy was performed to assess the urethra, prostate lobe configuration, and the bladder. The meatal caliber was assessed using a lubricated meatal calibrating instrument. The appropriate size of the resectoscope sheath to perform the bipolar TURP was determined based on the meatal caliber and the prostate size. For prostate glands <40 cm3 in volume, a 24-Fr resectoscope sheath was used; for glands larger and equal to 40 cm3, a 26-Fr sheath was used, provided the meatus was of adequate caliber. Patients in whom a 24-Fr scope was not negotiable due to the small size of the meatus (<24 Fr) were excluded from the study, as they required a meatotomy. In patients with a prostate ≥40 cm3 in volume, if the meatal caliber was <26 Fr, there section was performed with a 24-Fr resectoscope. The TUR is bipolar system (Shalya TURO Seal) was used in all the patients. Intraoperative parameters, such as the resection time and the complications, were assessed. Resection time was measured starting from the resection of the first chip to the end of the coagulation. Perioperative complications were assessed using the modified Clavien classification system (CCS). [16] Following the completion of the procedure, a 20-Fr, 3-way urethral catheter was placed in all the patients. Bladder irrigation was instituted until the haematuria resolved. Traction was placed when deemed necessary and was documented. Prostatic tissue was sent for histopathological examination. All the patients, in whom the histopathological report showed prostatic adenocarcinoma, were excluded from the study. The duration of the catheter placement and the hospital stay were recorded. Patients who required auxiliary procedures such as endoscopic clot evacuation were also excluded from the study.

Follow-up

Patients with a minimum follow-up period of 6 months were included in the study. Patients were followed up at 3 months, 6 months, and 1 year. Postoperative outcome measures, including IPSS, Q-max, and PVR, were recorded at each follow-up visit. Patients with obstructive voiding symptoms (IPSS >19) and poor flow rate (Q-max <12 mL/sec) underwent retrograde urethrography (RGU) and/or cystourethroscopy to diagnose the urethral stricture. Urethral stricture was defined as narrowing of the urethral lumen requiring instrumentation to improve the urinary flow rate.

Statistical Analysis

Data that followed a normal distribution are presented as mean and standard deviation, while those that did not are presented as median; some categorical data are presented as percentages. The Chi-square and student t-tests were used to

compare the categorical data and group means. Statistical significance was set at a $P < 0.05$. All calculations were performed using IBM SPSS Statistics (IBM Co., Armonk, NY, USA).

Results

Table 1: Demographics and preoperative parameters of patients

Demographics	Values
Age(years), mean±SD	64±8.8
IPSS, mean±SD	22±6
Total prostate volume(cm3), mean±SD	56.4±31.6
PVR (mL), mean±SD	64.6±48.8
Q-max(mL/s), mean±SD	8±3
Physical status:(ASA-classification), n(%)	
ASAI (no-comorbidities)	70(35)
ASAII (diabetes/hypertension/others)	110(55)
ASAIII(CVA/CAD/others)	20(10)
Anti-platelets, n(%)	56(28)
Serum creatinine, mean±SD	1±0.5
Haemoglobin (g/dL), mean±SD	13±1.6
Packed cell volume, mean±SD	38.2±3.7

The mean preoperative IPSS score and Q‑max were 21 ± 4 and 8 ± 3 mL/min, respectively. The mean total prostate volume was 56.4±31.6 cm^3.

Table 2: Perioperative parameters and complications following bipolar transurethral resection of the prostate

Parameters	Values
Meatal caliber(Fr), mean±SD	28±2
Resectoscope sheath (Fr),*n*(%)	
24-Fr	120(60)
26-Fr	80(40)
Mean resection time with resectoscope sheaths(min), mean±SD	
Resection time with 24-Frsheath	37.3±19.8
Resection time with 26-Frsheath	64.6±30
Cathetertraction, n(%)	92(46)
Duration of catheter placement(days), mean±SD	2.8±0.5Complications,*n*(%)
Grade1	
Haematuria (managed with saline irrigation)	8(4)
Catheter block-required bedside catheter change/flush	6 (3)
Failure to void after catheter removal	4(2)
Grade2	
Urinary tract infection	8(4)
Blood transfusion	4(2)

The mean meatal caliber was 28 ± 2 Fr. In all the patients with a prostate volume of ≤40 cm3, a 24 Fr resectoscope was used. For the 200 patients with a prostate volume ≥40 cm3, a 26‑Fr resectoscope sheath was used in 80 patients and in the remaining 120 patients, a 24‑Fr resectoscopesheath was used as the meatal caliber was <26 Fr. The mean prostate volumes resected with a 24Fr sheath was 44.3 ± 22 cm3 and that with a 26Fr sheath was 80.2 ± 32 cm3. Perioperative complications were classified using the CCS. The most common intraoperative complication was capsular perforation. Most postoperative complications were classified as Grade 1.

Table 3: Correlation of various parameters with stricture after 6 months

Stricture			
Yes (N=10)		**No (N=190)**	
Total volume of prostate(cm^3), *n* (%)			
<40	3(30)	60(31.57)	0.72
>40	7(70)	135(71.05)	
Diabetes mellitus, *n* (%)	3(10)	85(44.73)	0.32
Meatal caliber, mean±SD	26±2	28±2	0.001
Resectoscope sheath, *n* (%)			
24-Fr	7(70)	130(68.42)	1.24
26-Fr	3(30)	60(31.57)	
Resection time(min), mean±SD	46.4±20.8	48.2±24	0.72
Capsular perforation, *n*(%)	1(10)	8(4.21)	0.14
Post operative haematuria, *n*(%)	1(10)	12(6.31)	0.52
Catheter block-flush/changed, *n* (%)	1(10)	6(3.15)	0.36
Cathetertraction, *n* (%)	6(60)	90(47.36)	0.34
Duration of catheter removal,	2.7±0.8	2.6±0.5	0.48
mean±SD			
Post operative urinary tract infections, *n* (%)	1(10)	8(4.21)	0.42

The present study included 200 patients who underwent B‑TURP and were followed up after 6 months. A significant correlation between the development of urethral stricture following B‑TURP and diabetes mellitus, prostate volume, resectoscope sheath, resection time, capsular perforation, postoperative haematuria, catheter block‑managed with flush/exchange, catheter traction, duration of catheter removal.

Discussion

Transurethral resection of the prostate (TURP) is considered the gold standard treatment for benign prostate enlargement (BPE). It is the commonest surgical treatment for BPE, against which all the other modalities are compared. [8] In the last decade, several modifications have been introduced to improve the safety of BPE treatment. Many randomized controlled trials have evaluated the perioperative and postoperative morbidity and the outcomes of bipolar TURP (B‑TURP). [14] All have found that B‑TURP has a clinical efficacy similar to that of monopolar TURP (M‑TURP). However, the incidence of complications such as urethral stricture and other factors associated with B‑TURP are still a matter of debate. [17,18]

The mean preoperative IPSS score and Q‑max were 21 ± 4 and 8 ± 3 mL/min, respectively. The mean total prostate volume was 56.4±31.6 cm^3. The mean meatal caliber was 28 ± 2 Fr. In all the patients with a prostate volume of ≤40 cm3, a 24 Fr resectoscope was used. For the 200 patients with a prostate volume ≥40 cm3, a 26‑Fr resectoscope sheath was used in 80 patients and in the remaining 120 patients, a 24‑Fr resectoscope sheath was used as the meatal caliber was <26 Fr. The mean prostate volumes resected with a 24Fr sheath was 44.3 ± 22 cm3 and that with a 26Fr sheath was 80.2 ± 32 cm3. Perioperative complications were classified using the CCS. The most common intraoperative complication was capsular perforation. Most postoperative complications were classified as Grade 1.Urethral strictures are known to occur following TURP and are most commonly located in the bulb membranous urethra, followed by the fossa navicularis and the penile urethra. Over the past three decades, the risk of urethral stricture has remained stable, mostly because the TURP is performed with a large-caliber sheath which results in pressure ischemia of the bulbomembranous urethra and the narrow fossa navicularis, increasing the risk of stricture in these regions. [19]

The M-TURP system uses high-frequency electrical energy passed from a generator onto a cutting loop, which produces the intense heat needed to cut prostate tissue [3]. The circuit is completed by a return flow of the electrical current back to the generator. The return current flow of the M-TURP is directed via a return plate placed on the patient's skin. The B-TURP design also utilizes high frequency current passed from a generator onto a cutting loop. The interaction of this energy with normal saline produces particles that are charged, known as plasma B that can disintegrate tissue. [3,20] The return current flow of the B-TURP is different because it is channeled back via the resectoscope itself, rather than through a return plate like the M-TURP system. Faul et al [21] elegantly presented the electrical current flow patterns of these different systems in a review of the subject.

The present study included 200 patients who underwent B‑TURP and were followed up after 6 months. A significant correlation between the

development of urethral stricture following B‐TURP and diabetes mellitus, prostate volume, resectoscope sheath, resection time, capsular perforation, postoperative haematuria, catheter block‐manged with flush/exchange, catheter traction, duration of catheter removal. Ho et al. reported a 6.3% urethral stricture rate with the TUR is system. [22] It is interesting to note that Tao et al [23] also recently reported that US is associated with slow resection rate. That study also found mucosal rupture of the urethra and continuous postoperative infection to be risk factors for US occurrence. However, it appeared that they included both PK-TURP and M-TURP in their data, and it was not clear whether slow resection affected both systems equally. Among the patients who underwent B-TURP, Tefekli et al [24] found a higher incidence of urethral stricture if a larger diameter resectoscope sheath was used. Also, a study by Komura et al [25] found that longer operating times and larger prostate volumes were associated with a higher urethral stricture rate in the TUR is group. However, in the present study, the urethral stricture rates did not significantly correlate with the prostate volume, resectoscope sheath size, resection time, catheter traction, or the duration of catheter placement. Several of the possible confounding factors were taken care by the well selected exclusion criteria, such as the preoperative catheterization for acute urinary retention, lichen sclerosis of the glans, prior history of urethral instrumentation, and the requirement for ventral meatotomy.

Conclusion

We found that small meatal caliber was associated with an increased risk of urethral stricture following B‐TURP.However, considering the fact that larger PVs and longer operation times were significantly associated with higher stricture rate, further analysis in well-designed, large-scale multicentre RCTs would be needed to confirm these findings.

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