Orginal Article

Outcome of Monopolar versus Bipolar Transurethral Resection of Prostate

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Abstract

Introduction: Transurethral resection of the prostate is the gold standard surgical treatment for benign prostatic hyperplasia with the lower urinary tract symptoms. Bipolar system is a new in technology to lower the adverse effects of monopolar system. This study was designed to find out clinic-demographic data and peri-operative outcomes of the monopolar versus bipolar transurethral resection of prostate.

Methods: This prospective comparative study was conducted from June 2022 to March 2023, in the Department of Urology of Bir Hospital, National Academy of Medical Sciences, Nepal. Ethical approval of research was taken from Institutional Review Board, NAMS: Ref No. 735/2079/80. Microsoft Excel was used for descriptive analysis for clinic-demographic and outcome variable data, were presented in frequencies and percentages and their relation were analyzed by chi-square test/fisher's exact test.

A p-value of <0.05 statistically significant.

Results: A total 80 patients were compared, bipolar(40 cases) and monopolar(40 cases). There were no differences in the incidence of hyponatremia, clot retention and evacuation rate, re-catheterization rate, mean hemoglobin loss, and mean length of hospital stay. The longer duration of operation time (>60 min) was observed in bipolar transurethral resection (p=0.001). The transurethral resection syndrome was found only in M-TURP.

Conclusion: Both monopolar and bipolar transurethral resection of prostate showed no statistical differences in the amount of resected prostatic tissue, the incidence of hyponatremia, length of hospital stays, blood transfusion rate, re-catheterization rate, clot retention and evacuation rate. The shorter duration of surgery and the trans-urethral resection syndrome was observed in M-TURP.

Keywords: *Bipolar transurethral resection of prostate, monopolar transurethral resection of prostate, peri-operative outcome of transurethral resection of prostate*

Introduction

Despite the development of various new technologies for the treatment of benign prostatic hyperplasia with lower urinary tract symptoms (LUTS) in recent years, transurethral resection of the prostate (TURP) is still the gold standard surgical procedure.[1] In monopolar (M)-TURP, there was more tissue charring effect, tissue sticking on the loop, adjacent area damage, nerve excitement, hyponatremia, transurethral resection syndrome and

possible grounding pad injury.[2] Bipolar (B)-TURP has the cut and seal mechanism, therefore has less adverse effects during resection of prostatic tissue.[2, 3]

The studies reported inconsistency and controversies in terms of patient outcome comparing M&B-TURP, due to discordant prostate size, differences in equipment, magnitude of energy, different techniques, and expertise of surgeons.[4,5] National data on the comparative study of bipolar and monopolarar is scarce.

Our prospective comparative study was intended to find out the clinico-demographic characteristics and peri-operative outcome in M&B TURP.

Methods

This prospective observational comparative study (two surgical techniques) was conducted from June, 2022 to March 2023, in the Department of Urology of Bir Hospital, National Academy of Medical Sciences (NAMS). A total of 80 patients were enrolled as per the inclusion and exclusion criteria mentioned below.

Ethical approval of research was taken from Institutional Review Board, NAMS: Ref No. 735/2079/80. Written informed consent was taken from all the participants.

Inclusion criteria: All cases with a diagnosis of benign hyperplasia of the prostate with lower urinary tract symptoms having a prostatic size from 30 to 100 gm, who underwent M-TURP or B-TURP in Bir hospital from the period of 1st June 2022 to the end of March 2023 were included.

Exclusion Criteria:

1 History of prostate surgery, prostate cancer, urinary bladder cancer, urinary bladder stone, urethral stone, urethral stricture, and neurogenic bladder.

2 Known case of hyponatremia (serum Sodium=<135mmol/l).

3 Known cases of bleeding disorder and patients on anti-coagulation medicines.

On average, there are 6-10 TURP /month in Bir hospital.

Sample size: Sample size was taken as 80 cases, 40 cases for monopolar and 40 cases for bipolar treatment. This was based on intention to detect 0.44 difference in mean change in serum Hb level among M-TURP and B-TURP group, as well as 2.55 difference in mean change in serum Na level among treatment group as per El Saied[6] findings. This was also the findings of Yousef[7] for cardiovascular changes in the groups. The study power of 95% and type I error probability of 0.05 and type 11 error 0.22 were used for sample size estimation.

Working Definition:

A. TUR syndrome was diagnosed according to our departmental definition criteria, as mentioned in the chart. At least one clinical feature from all three must be met- cardiovascular, neurological findings and hyponatremia

   i. Cardiovascular features (anyone): hypertension {Blood pressure (BP) of >160/90 or > 10% baseline increase}, hypotension BP <90/60, bradycardia (pulse rate of <60/min), tachycardia (pulse rate of >100/min), dysrhythmia, shock, sudden cardiac arrest, pulmonary oedema, cerebral and cardiac infarctions.

   ii. Neurological features (anyone): blurred or temporary loss of vision, tingling sensation, muscle twitches, confusion, seizure, coma.

   iii. hyponatremia (<135mmol/l).

B. The time of surgery was taken from the start of the resection of prostatic tissue to the removal of the resectoscope from the urethra.

C. Clot retention means the requirement to evacuate the clots of the urinary bladder (diagnosed by ultrasonography of the abdomen and pelvis) in the operation theatre

D. Re-catheterization means the need to re-insert the foley catheter at the hospital at the time of discharge or after clot retention.

Intervention details: Sampling method Patients were categorized into two groups, where BPH/LUTS cases were managed with M-TURP or B-TURP alternately. The first case was decided by lottery. Demographic parameter of the patients: age and address were recorded. The patients had routine preoperative investigations laboratory tests and radiological investigation as per hospital protocol: urine routine/microscopic with culture and sensitivity, white blood cell count (WBC), hemoglobin (Hb), platelets, coagulation profile (bleeding time, clotting time, and prothrombin time), renal function test (urea, creatinine, sodium, and potassium), prostate-specific antigen(PSA) and the radiological investigations (the chest x-ray including ultrasound of abdomen and pelvis), uroflowmetry and a pre-anesthetic checkup. Patients were counseled and consent was obtained for the surgery.

The data was filled in structured proforma.

Surgical technique: As per hospital routine practice, patients with a pre-operative negative urine culture, a single prophylactic dose of antibiotic inj. Ceftriaxone 1gm I.v. was given 30 minutes to 1 hour before surgery. Surgery was performed under spinal anesthesia in the lithotomy

position. The height of the irrigation fluid was standardized.

M-TURP was performed using 26 French continuous flow monopolar resectoscope from with standard monopolar loop (Karl Storz Germany) with generator set at 130 W cutting and 80 W coagulation mode. Irrigation fluid of 1.5% Glycine was used for M-TURP.

The B-TURP (Karl Storz Germany) 26 French continuous flow bipolar resectoscope with generator ESG 400 is a pure bipolar system with its active and return electrode into a dual-loop distal tip design. The bipolar system was used at 160-180W for resection. Normal saline of 0.9% was used for irrigation in B-TURP.

The adenoma was resected according to the technique of Mauermayer or Barnes. Tissue resected was weighed in the operation theater immediately after the completion of TURP and was submitted to the pathologist for analysis. A 20-22 French three-way Foley catheter was inserted and the bulb inflated with a volume Correspondence to the amount of tissue resected plus 10 ml. The time of surgery was recorded. Bladder irrigation was continued till the next morning. The laboratory investigations for WBC, Hb, Urea, Creatinine, Sodium, and Potassium were sent within 2 hours after the completion of surgery of all patients and the next day after morning rounds. The catheter was removed on the second postoperative day decided by the urine colour (if clear). Patients were discharged on the same day after two voids. If the patient fails to void, he was sent home with an indwelling catheter and asked to return to the OPD a week later.

Data Analysis: Data analysis was done using the statistical package for social sciences, SPSS Windows version 23 (SPSS Inc, Chicago, I.L.). Demographic parameters such as age, prostate volume, resection time, and weight of resected tissue were analyzed in number and frequencies and outcome variables such as incidence of hyponatremia, transurethral resection syndrome, clot retention and evacuation, need of blood transfusion and re-catheterization rate and their relation were analyzed by chi-square test/fisher's exact test.

p-value <0.05 was considered statistically significant.

Results

The clinic-demographics parameters of total 80 patients (monopolar 40 and bipolap 40 cases) were comparable in both groups. The mean age group of patients in M-TURP and B-TURP were 68.88 and 70.37 years respectively, which showed no statistically significant (p=0.95).

The mean prostate volume was 56.44gm in B-TURP and 51.74gm in M-TURP respectively (p=0.58). The difference was not statistically significant.

The mean resected weight of prostatic tissue was 16.55 gm in B-TURP and 15.31 gm in M-TURP respectively. The differences were statistically not significant (p=0.58).

The mean duration of operation time was ≤ 60 min in 21/40(52.5%)cases in M-TURP and 7/40(17.5%) in B-TURP respectively. The difference was statistically significant (p=0.001).

Table 1: Clinic-demographic parameters of patients (n=80) who underwent M/B TURP.

Variables	M-TURP N (%) 40(50%)	B-TURP N (%) 40(50%)	p-value
Age (years)			
60 or less	5(12.5)	3(7.5)	0.45
>60	35(87.5)	37(92.5)	
Pre-operative prostate volume (gm)			1.00
50 or less	17(36)	17(36)	
>50	23(64)	23(64)	
Resection weight(gr)			
20 or less	32(80)	29(72.5)	0.43
>20	8(20)	11(27.5)	
Operation time(min)			
60 or less	21(52.5)	7(17.5)	
>60	19(47.5)	33(82.5)	0.001

The fall in sodium(hyponatremia) was observed in 12/40(30%) cases in M-TURP and 5/40(12%) cases in B-TURP, which showed no statistical significance (p=0.05).

The transurethral resection syndrome was observed in 1/40(2.5%) cases of M-TURP only.

There was no need for blood transfusion in all cases.

Clot retention and evacuation were needed in 1/40(2.5%) cases in M-TURP and 1/40(2.5.%) cases in B-TURP.

Re-catheterization was done in 1/40(2.5%) cases in M-TURP and 3/40(7.5%) cases in B-TURP; the result was not statistically significant (p=0.3).

Table 2: Outcome variables of patients (n=82) who underwent M/B TURP.

Variables	M-TURP N (%) 40(50%)	B-TURP N (%) 40(50%)	P value
Sodium loss(hyponatremia) Yes	12(30)	5(12)	0.05
no	28(70)	35(77.5)	
Transurethral resection syndrome Yes	1(2.5)	0	-
no	39(97.5)	40(100)	
Blood transfusion Yes	0	0	-
no	40(100)	40(100)	
Clot retention and evacuation Yes	1(2.5)	1(2.5)	1
no	39(97.5)	39(97.5)	
Re-catheterization Yes	1(2.5)	3(7.5)	0.3
no	39(97.5)	37(92.5)	

The mean Hb loss in B-TURP and M-TURP was 1.14mg/dl and 1.24gm/dl respectively. The result was not statistically significant (p=1.00)

The mean length of hospital stay was 3.20 days in M-TURP and 3.24 days in B-TURP. The differences were statistically not significant (p=0.6); Table 3.

Table 3: Parameters of patients (n=80) who underwent M- or B- TURP.

Variables	M-TURP N (%) 40(50%)	B-TURP N (%) 40(50%)	p-value
Hb loss (mean) gm/dl	1.16	1.08	1.00
Hospital Stay (mean) days	3.20	3.28	1.00

Discussion

Our comparative prospective study showed the equivalent outcome in the incidence of hyponatremia, blood transfusion rate, clot retention and evacuation rate, re-catheterization rate, mean Hb loss, and mean length of hospital stay in M-TURP and B-TURP groups. The shorter operation time (≤ 60 min) was observed in 21/40 (52.5%) cases in M-TURP and 7(17.5%) cases in B- TURP, which was statistically significant (p=0.001).

In our study, the basic clinic-demographic parameter of patients was similar in both groups: the age of the patient, mean prostate volume and mean resected weight of prostatic tissue. Outcome after TURP depends on several factors such as age, operation time, amount of removed prostate tissue, duration of catheterization, history of preoperative prostatitis, type of anesthesia (regional or general), and history of pre-operative urinary retention. [8 9]

In the present study, the mean duration of operation time ≤ 60 min was found in 21(52.5%) cases in M-TURP and 7/40 (17.5%) cases in B-TURP, which was found to be statistically significant (p=0.001). Similar to our study, the longer operation time in B-TURP was found in various other studies.[10, 11] The reason behind this was supposed to be the less familiarity with the bipolar system, smaller loop size, and more frequent interaction with residents during bipolar resection.

In the present study, the low value of sodium (hyponatremia) was observed in 12/40 (30%) cases in M-TURP and 5/40(12%) cases in B-TURP. Though the incidence of hyponatremia was found to be higher in number in M-TURP than in B-TURP, the difference was not statistically significant (p=0.05). Various studies reported the incidence of hyponatremia ranges from 10 to 40% in M-TURP. [12,13] Their findings are similar to our study.

In our study, the transurethral resection(TUR) syndrome was recorded in 1/40(2.5%) cases after M-TURP and it was not recorded in B-TURP. One of the severe forms of complications associated with M-TURP is TUR syndrome. TUR syndrome may occur after absorption of a larger amount of hypo-osmolar non-sodium irrigation fluid e.g., Glycine (230 mos) commonly at the end of the resection of prostatic adenoma. Iso-osmolar non-conductive solutions are not suitable for TURP because of increased turbidity and low visibility.[14] The pathophysiology of TUR syndrome is the dilutional hyponatremia, hypervolemia, and toxic effects of glycine and its metabolites. Studies showed a higher incidence of transurethral syndrome in older age, larger pre-operative prostate gland, longer duration of resection time, and larger volume of prostatic tissue resection.[15] The irrigation solution of normal saline used during the resection of prostatic tissue virtually eliminates the risk of hyponatremia and TUR syndrome in B-TURP.[16] Our national studies reported the incidence of TURP syndrome from 3% to 10% in M-TURP [17] and it was not observed in B-TURP. [18] These findings are similar to our study.

Perioperative hemorrhage is one of the major complications in TURP requiring blood transfusion and the need for an ancillary procedure for evacuation of clot or re-fulguration. The larger size of the prostate gland, longer duration of surgery, use of anticoagulation medication, and older age are associated with peri-operative hemorrhage.[19] The B-TURP showed a less charring effect, more clear field, and better coagulation during surgery. [10] Various studies reported significant benefits from B-TURP regarding bleeding complications and lower incidences of blood transfusion and clot retention.[5, 20] However, the present study did not report any major bleeding episode in either group that needed a blood transfusion.

In our study, after sub-analysis, the mean Hb loss in B-TURP and M-TURP was 1.14mg/dl and 1.24gm/dl respectively. The result was not statistically significant (p=1.00). Various comparative studies showed inconsistent findings on post-operative hemoglobin loss; some had shown statistically insignificant,[17,21] while others reported statistically significant reduction of hemoglobin in M-TURP compared to B-TURP.[22] Cochrane Database of Systematic Reviews by Alexander[5] reported a lower rate of blood transfusion in B-TURP compared to M-TURP. The advantage of B-TURP in coagulation was found to be statistically significant in the meta-analysis by Tang.[23]

In our study, clot retention and evacuation were done in 1/40(2.5%) cases and 1/40(2.5%) cases in M-TURP and B-TURP respectively. Various studies revealed the incidence of clot retention is 2-10%, which is similar to our results.[20, 24, 25] The study reported the re-intervention to fulgurate the bleeding site in 3-5% for the management of clot retention. [20, 24, 26] In our study, fulguration was required in 1/40(2.5%) cases in M-TURP.

In present study re-catheterization was done in 1/40(2.5%) cases in M-TURP and 3/40(7.5%) cases in B-TURP, the result was not statistically significant (p=0.86). This finding was similar to another study.[22] In the present study, re-catheterization was required due to clot retention in 1/40(2.5%) cases of M-TURP and 1/40(2.5%) cases of B-TURP. Our 2/40(5%) cases of B-TURP needed re-catheterization due to urinary retention at the time of discharge. Nepalese studies reported overall 11-13% of the re-catheterization rate due to clot retention and urinary retention in TURP, [18, 27] which is similar to our study.

The surgical and anesthetic advancements had led the strategy to reduce the days of hospital stay which is beneficial for patients as well as the hospital. One Nepalese study showed the strong co-relation of early removal of the catheter (less than two days) and the duration of hospitalization in M-TURP. They recommended to remove the foley catheter early, in the patient having no co-morbidities, no intra-operative complication, and short resection time with limited amount of resected prostatic tissue.[28] Study reported the shorter catheterization time had reduced the infection rate, and cost of surgery for the patient and it was also useful for optimum bed management of the waiting list. [27, 28] Our hospital practice for deciding the removal of a foley catheter after TURP was guided by the urine color at the time of morning round the next day irrespective of the size of the prostate and resected volume.

In present study, the hospital stay of patients in M-TURP and B-TURP varied from 3 to 5 days. The mean length of hospital stay was 3.20 days in M-TURP and 3.28 days in B-TURP, which was not statistically significant(p=1.00). This is similar to other studies compared to the length of hospital stay.[29, 30]

Our study had also limitations: being a retrospective, single institution-based with a short duration of time and a low number of cases. Various aspects of TURP e.g., co-morbidities, medications, the histopathological study of resected prostatic chips and long-term complications were not studied. This study will add some valuable information comparing monopolar and bipolar TURP in our set-up.

Conclusion

Both B-TURP and M-TURP were found to be safe and effective with equivalent outcomes in the amount of resected prostatic tissue, the incidence of hyponatremia, length of hospital stay, blood transfusion rate, re-catheterization rate, clot retention and evacuation rate. The shorter duration of prostatic surgery was found in M-TURP and the transurethral resection syndrome was observed only in M-TURP.

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