BANGLADESH JOURNAL OF
UROLOGY
Bangladesh J. Urol. 2024; 27(1): 23-32
www.banglajol.info/index.php/BJU
DOI: https://doi.org/10.3329/bju.v27i1.71206

Original Article

ISSN : 2304 - 8514 (Print)
ISSN : 2304 - 8522 (Online)

Transurethral Resection of Prostate using Bipolar System: A Comparison with Monopolar System

Mohammad Hasibul Islam[1], NI Bhuiyan[2], Mohammad Salahuddin Faruque[3], Md Selim Morshed[4], Md Masud Rana[5], Ashraful Islam[6]

Received: 17 - 09 - 2023
Accepted: 30 - 11 - 2023
Conflicts of interest: None

Abstract

Background: *Benign Enlargement of the Prostate (BEP), common in ageing males, leads to lower urinary tract symptoms (LUTS) due to BEP-related obstruction (BPO). Monopolar Transurethral Resection of the Prostate (M-TURP) is the traditional "gold standard" surgical approach, but it has drawbacks like fluid absorption-related complications. Bipolar Transurethral Resection of the Prostate (B-TURP) emerged as an alternative with advantages, including lower sodium drop and reduced TUR syndrome risk. However, debates persist regarding haemoglobin drop, sodium change, and resection rate differences. This study compares M-TURP and B-TURP, evaluating efficacy through resection rate, postoperative parameters, and safety by monitoring serum sodium, haemoglobin, TUR syndrome, catheterization time, and hospital stay.*

Aim of the study: *The study aimed to evaluate the safety and efficacy of the bipolar with monopolar technique for the endoscopic resection of the prostate.*

Methods: *This is a one-year Randomized Control Trial (RCT) conducted at Square Hospitals Ltd in Dhaka, from December 2020 to November 2021. The study involved 60 patients with BEP who underwent either Monopolar or Bipolar Transurethral Resection of the Prostate (TURP). Group A (control) underwent Monopolar TURP, while Group B (experimental) underwent Bipolar TURP. Inclusion criteria included age e" 50 and symptomatic BEP with surgical indications. Data was collected, and results were analyzed using statistical software. Parameters such as serum haemoglobin, serum sodium, resection rate, catheterization & hospitalization time, maximum flow rate, and complications were compared, with statistical significance set at P d" 0.05.*

Result: *The study compared outcomes of monopolar transurethral resection of the prostate (M-TURP) and bipolar transurethral resection ot the prostate (B-TURP). Baseline variables showed no significant differences between groups. Intraoperatively, resected prostate volume was similar, but B-TURP had a slightly faster resection rate, but not significant. Postoperatively, M-TURP exhibited higher decreases in serum haemoglobin and sodium levels. Clot retention incidence was 10% in M-TURP and 0% in B-TURP, though statistically insignificant. Catheterization and hospital stays were shorter in B-TURP. A six-week follow-up revealed no significant inter-group differences in IPSS and maximum flow rate improvement.*

Conclusion: *Comparing the findings of the present study, it can be concluded that bipolar transurethral resection is safer than monopolar transurethral resection and has similar efficacy in managing benign enlargement of the prostate.*

Keywords: Transurethral Resection of Prostate (TURP), Bipolar and Monopolar.

1. Assistant Professor, Department of Urology, North East Medical College Hospital, Sylhet, Bangladesh
2. Associate Professor, Department of Urology, Bangladesh Medical College Hospital, Dhaka, Bangladesh
3. Associate Professor, Department of Urology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
4. Assistant Register, Department of Urology, Rangpur Medical College Hospital, Rangpur, Bangladesh
5. Assistant Professor, Department of Urology, Bangladesh Medical College Hospital, Dhaka, Bangladesh
6. Assistant Register, Department of Urology, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh

Corresponding author: Dr. Mohammad Hasibul Islam, Assistant Professor, Department of Urology, North East Medical College Hospital, Sylhet, Bangladesh, E-mail: hasibul.uro@gmail.com

Introduction

Benign Enlargement of the Prostate (BEP) is one of the most common diseases of ageing males, develops as a hyperplastic process involving prostatic epithelium and stroma either alone or in combination, which originates in the transition zone, having multifactorial and endocrine-controlled aetiology.[1] The lower urinary tract symptoms (LUTS) caused by BEP–related obstruction (BPO) are a significant problem in the medical care of aged males. The incidence of LUTS and BPO is high and increases linearly with age, and prevalence is 50% by age 60 and 90% by age 85[2,3]. Several therapeutic options based on the symptoms and complications of LUTS and BPO include watchful waiting, pharmacological therapy, transurethral resection of the prostate (TURP) or open prostatectomy.[4] Young introduced endoscopic electrosurgery for the prostate in 1909. In 1926, McCarthy introduced TURP. After improvement over the years, monopolar TURP (M-TURP) is considered the surgical "gold standard" for symptomatic BEP, mainly because of its well-documented efficacy.[5] In M-TURP, the electrical current passes from the loop to the grounding skin pad on the patient's skin.[6] The heat generated from this current facilitates the cutting of tissues.[7] A non-conductive irrigation fluid like non-physiologic hypotonic glycine is mandatory to prevent the dispersion of the electrical current. The potential hazards of this modality include hypotonic fluid absorption [8] with dilutional hyponatremia and resulting Transurethral Resection (TUR) syndrome and bleeding, resulting in high morbidity (11.1%).[9] Several methods have been recommended to decrease fluid absorption, including maintaining low intravesical pressure by using low inflow pressure, continuous flow resectoscopy and limiting the time of resection. Despite these measures, the incidence of transurethral resection (TUR) syndrome remains at 2%.[10] Recently, bipolar energy has been widely used for TURP.[11] In the mid-1990s, a "pseudo-bipolar" transurethral resection in saline system by Olympus and later the first true bipolar Plasma Kinetic (PK) system by Gyrus-ACMI was invented, later adopted by others[12], also known as Transurethral Resection in Saline (TURIS) or Bipolar TURP (B-TURP). The bipolar electrical current flows from one arm & returns directly to the other arm of the loop or from loop to sheath, providing controlled plasma pockets around the loop, generating very little heat, but facilitating the cutting of tissues and sealing of vessels.[13] It can use physiologic isotonic normal saline for irrigation, thus decreasing those morbidities associated with fluid absorption. There was significantly less sodium drop in B-TURP of 10.7 versus 3.2 mmol/L in M-TURP and significantly less TUR syndrome[14]. There was also less surgical bleeding due to the 'cut-and-seal' effect of plasma, with an overall difference of 34%[15]. However, in some studies, there was no significant difference in a drop in haemoglobin and serum sodium change and a slower resection rate in B-TURP of 0.45 versus 0.56 gm/min[16]. So, some dilemmas persisted. This study aimed to compare the advantages and disadvantages of each technique regarding efficacy and early postoperative safety. Safety was measured by the drop in serum sodium (Na+) level, haemoglobin (Hb) level, clot retention, TUR syndrome incidence, catheterization time and hospital stay. Efficacy was quantified by resection rate, postoperative maximum flow rate (Qmax) improvement and International Prostate Symptom Score (IPSS) reduction.

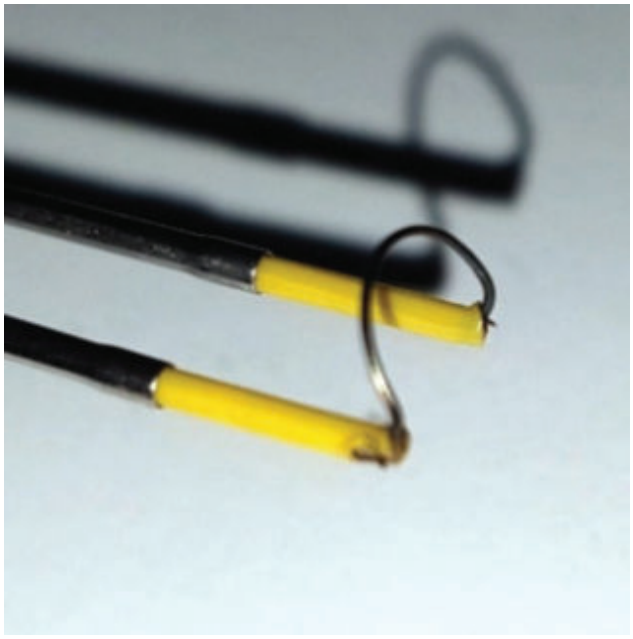
Methodology & Materials

This is a Randomized Control Trial (RCT) study, conducted at the Department of Urology at Square Hospitals Ltd, Dhaka, Bangladesh. The study duration was one year, from December 2020 to November 2021. A total 60 patients diagnosed as BEP who underwent TURP were selected considering Inclusion criteria of age ≥50 years, prostate size 40-80 grams, IPSS >19, symptomatic BEP indicated for surgery (refractory urinary retention, renal insufficiency due to BEP, significant PVR >100 mL, Qmax <10 mL/sec, failed pharmacological management and complications including recurrent urinary infection, hematuria, upper urinary tract change & stone formation) and Exclusion criteria of consent refusal, documented or suspected prostate cancer & neurogenic bladder, active urinary infection, previous prostate surgery, concomitant bladder outlet obstruction due to other causes, chronic urinary retention or very high PVR (>250 mL), long-standing uncontrolled Diabetes Mellitus (HbA1C >8%), coagulopathy, unfit for anesthesia. There were two groups of study subjects, each consisting of 30 subjects. One group was Group A (Control group: Patients who underwent Monopolar TURP), and another was Group B (Experimental group: Patients who underwent Bipolar TURP). Detailed history was taken for each patient, and preoperative IPSS was evaluated and recorded in a predesigned data entry form. Preoperative anesthetic fitness was checked and informed written consent was

obtained. Before collecting data, consent forms were taken from every participant and kept very confidential. Institution's ethical committee approved the study. TURP done in both arms with standard protocol & same postoperative management.

Monopolar TURP: Monopolar electrocautery and 1.5% glycine as irrigant was used for TURP. It was performed using the Olympus ESG-400 energy platform with monopolar setting connected to a U-shaped monopolar cutting loop electrode assembled with the 26 Fr continuous flow resectscope. Standard power settings were 120 W for cutting and 80 W for coagulation. (Figure 1).

Bipolar TURP: Bipolar electrocautery and normal saline (0.9% sodium chloride solution) as irrigant were used for TURP. It was performed using the Olympus ESG-400 energy platform wuth bipolar resection setting connected to a U-shaped bipolar cutting loop electrode assembled with the 26 Fr continuous flow resectscope. Standard power settings were 200 W for cutting and 120 W for coagulation (Figure 2).



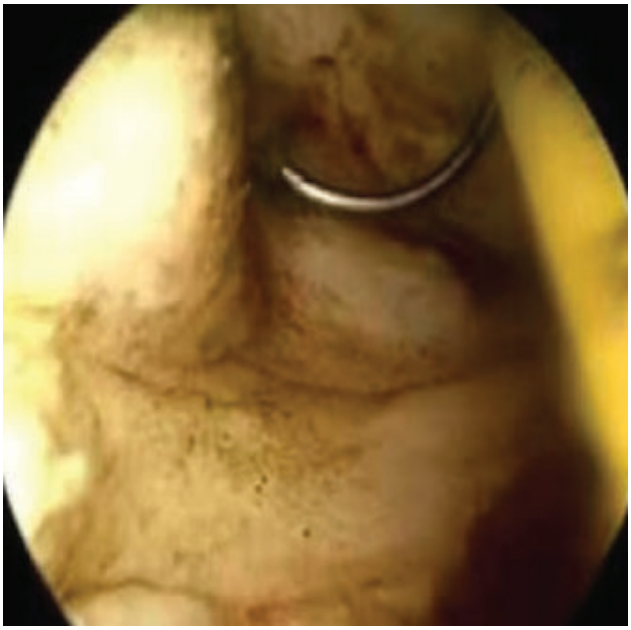
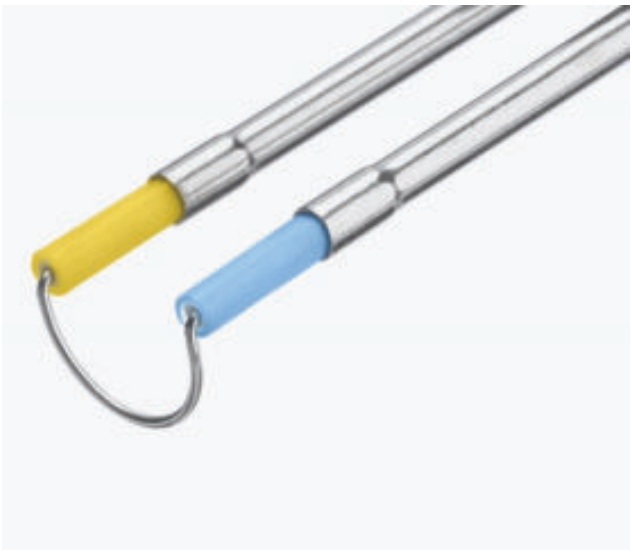


Figure 1: (A) Monopolar cutting loop. (B) TURP with monopolar cutting loop



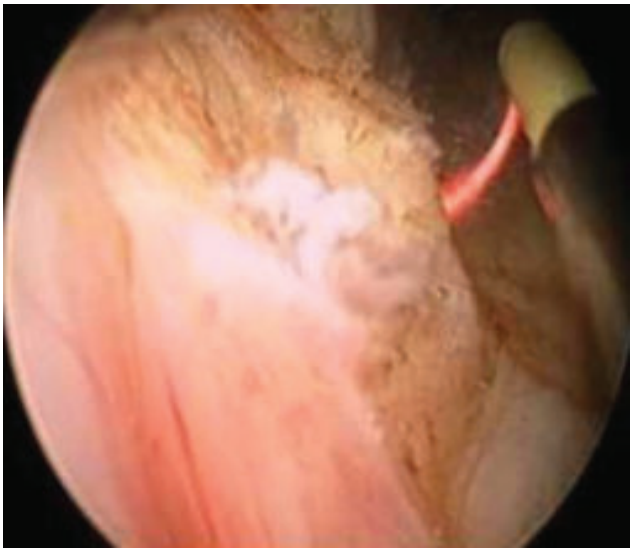


Figure 2: (A) Bipolar cutting loop. (B) TURP with bipolar cutting loop.

Data analysis:

After compilation, the data was presented as text and tables, as necessary. The results were analyzed using computer-based statistical software, Excel free software. Results from the comparison between B-TURP & M-TURP were analyzed; quantitative variables (serum haemoglobin decrease, serum sodium decrease, resection rate, catheterization time, hospitalization time, maximum flow rate increase) were analyzed by Student's t-test, and qualitative variables (TUR syndrome, clot retention & IPSS decrease) were analyzed by Chi-square test. A 'P' value of ≤0.05 was considered statistically significant.

Result

Data of age, preoperative Qmax, prostate size, serum haemoglobin, and sodium level were analyzed using the student's t-test and data of IPSS were analyzed using the Chi-square test, and the significance level was 0.05. Table I compares baseline variables between the control and experimental groups; no statistically significant differences were found between patient age, preoperative IPSS, Qmax, prostate size. Preoperative mean heamoglobin & sodium levels in both groups were statistically similar. Table II compares the resected prostate volume, resection time, and resection rate between monopolar (control) and bipolar (experimental) TURPs. There was no difference in resected volume in both groups (P=0.274). For M-TURP, the mean required time for resection was lower in the bipolar group than in the monopolar group but failed to achieve the significance level (P=0.06). The resection rate was calculated by dividing the resected volume by the resection time in each individual. The resection rate was 0.59±0.14 gm/min during B-TURP, slightly faster than M-TURP, 0.54±0.12 gm/min. However, this difference is statistically insignificant (P=0.157). In Table III, Postoperative mean serum haemoglobin decrease was higher in the monopolar group (0.99±0.26) than in the bipolar group (0.80±0.33), which had a statistically significant level (P=0.024). Table IV shows that the mean postoperative serum sodium decrease was significantly higher in the monopolar group (1.42±0.58) than in the bipolar group (0.32±0.17), P<0.001. In Table V, three patients (30%) out of 30 in the monopolar group had an incidence of clot retention after TURP, whereas none (0%) in the bipolar group developed clot retention but could not produce a statistically significant difference (P=0.078). None of the patients from either the monopolar group or bipolar group developed TUR syndrome. Table VI shows that the mean catheterization time after B-TURP significantly less than M-TURP (P<0.001). A total of 15 of 30 patients (50%) in the monopolar group required catheterization for three days, eight patients (26.67%) required it for four days, and two patients (6.66%) required it for five days. Only five patients (16.67%) had catheters removed on the second postoperative day in the monopolar group, while 22 patients (73.33%) in the bipolar group required catheterization for two days. In the rest of the patients of the bipolar group, the catheter was removed after three days in seven patients (23.33%) and four days in only one patient (3.33%). Table VIII shows that the mean hospital stay time after B-TURP was significantly shorter than M-TURP (P<0.001). A total of 15 of 30 patients (50%) in the monopolar group stayed in the hospital after TURP for three days, seven patients (23.33%) required four days, two patients (6.66%) for five days, and one patient (3.33%) for highest six days. Only five patients (16.67%) had a hospital stay of two days, while 22 patients (73.33%) of the bipolar group stayed in hospital for two days. The rest of the patients in the bipolar group were discharged after three days in 6 patients (20.0%) and the highest four days in only two patients (6.66%). On the six-week follow-up, the mean IPSS decrease in the monopolar arm was similar to bipolar arm, P=0.959 (Table IX). Maximum flow rate (Qmax) on uroflowmetry in both arms were increased sufficiently at six-week follow-up, which does not have any statistically significant difference, P=0.377 (Table X).

Table I: Comparison of preoperative baseline variables in both groups (N=60).

Outcome	Group A (n=30)	Group B (n=30)	P-value
Age (year)	64.27±8.45	66.97±7.95	0.208
(Range)	(52- 81)	(53- 84)	
Preoperative IPSS	25.77±3.47	25.73±2.82	0.268
(Range)	(20- 32)	(21- 34)	
Preoperative Q max (mL/sec)	7.54±3.78	7.09±4.11	0.658
(Range)	(0- 16.1)	(0- 15.7)	
Preoperative prostate size (gram)	57.0±8.17	56.4±8.03	0.775
(Range)	(41-73)	(40- 71)	
Preoperative haemoglobin level (gm/dL)	12.39±1.12	12.86±1.12	0.11
(Range)	(10.8-14.3)	(11.1- 14.8)	
Preoperative sodium level (gm/dL)	139.41±2.64	138.89±2.39	0.425
(Range)	(136.2-144.9)	(135.3-143.6)	

Table II: Comparison of resected volume, resection time & resection rate in both groups (N=60).

Variables	Group A (n=30)	Group B (n=30)	P- value
Resected volume (gram)	28.50±5.66	26.67±7.11	0.274
(Range)	(17-36)	(15-38)	
Resection time (minute)	54.47±13.47	47.27 ±15.47	0.06
(Range)	(32-82)	(23-76)	
Resection rate (gm/min)	0.54±0.12	0.59±0.14	0.157
(Range)	(0.38-0.76)	(0.30-0.88)	

Table III: *Comparison of serum haemoglobin decrease in both groups (N=60).*

Variables	Group A (n=30)	Group B (n=30)	P- value
Serum haemoglobin decrease (gm/dL)	0.99±0.26	0.80±0.33	0.024
(Range)	(0.5-1.4)	(0.2-1.3)	

Table IV: *Comparison of serum sodium decrease in both groups (N=60).*

Variables	Group A (n=30)	Group B (n=30)	P- value
Serum sodium decrease (mmol/L)	1.42±0.58	0.32±0.17	<0.001
(Range)	(0.1-3.4)	(0.1-0.8)	

Table V: Comparison of incidence of clot retention in both groups (N=60).

Variables	Clot retention	No clot retention	Mean±SD	P- value
Group A	3	27	0.10±0.35	0.078
Group B	0	30	-	

Table VI: Comparison of incidence of TUR syndrome in both groups (N=60).

Variables	TUR syndrome	No TUR syndrome
Group A	0	30
Group B	0	30

Table VII: *Comparison of catheterization time in both groups (N=60).*

Variables	Group A (n=30)	Group B (n=30)	P- value
Catheterization time (day)	3.23±0.81	2.30±0.53	<0.001
(Range)	(2-5)	(2-4)	

Table VIII: *Comparison of duration of hospital stay in both groups (N=60).*

Variables	Group A (n=30)	Group B (n=30)	P- value
Hospital stay (day)	3.30±0.95	2.33±0.60	<0.001
(Range)	(2-6)	(2-4)	

Table IX: *Comparison of international prostate symptom score (IPSS) decrease in both groups (N=60).*

Variables	Group A (n=30)	Group B (n=30)	P- value
IPSS decrease on follow-up	20.87±3.32	20.77±3.64	0.959
(Range)	(14-28)	(15-28)	

Table X: *Comparison of maximum flow rate (Q max) increase in both groups (N=60).*

Variables	Group A (n=30)	Group B (n=30)	P- value
Qmax increase on follow-up (mL/sec)	15.91±3.63	16.81±4.14	0.377
(Range)	(8.1-25.8)	(7.9-25.8)	

Discussion

This prospective comparative study was designed to observe the complications and to compare the safety efficacy between TURP with monopolar and bipolar techniques. Male patients of age 50 years or more with symptomatic benign enlargement of the prostate requiring surgery were divided into two groups. The results of the treatment of both groups were compiled and compared. In this study, the ages of the patients ranged from 52 years to 84 years. The mean age of both groups were statistically indifferent (P=0.208). The mean age of this study was comparable with the study done by Huang et al. and Erturhan et al., which compared the safety and efficacy of plasma kinetic bipolar versus conventional monopolar energy in transurethral resection of the prostate.[17,18] Similar studies were done by Singh et al. (2005), Autorino et al. (2009), Xie et al. (2012), Stucki et al. (2015) and Madduri et al. (2016), the mean age was almost similar to the present study.[7,19-22]. The participants of both groups were evaluated for IPSS by a self-questionnaire and Qmax by uroflowmetry before operation as baseline parameters. They were found to be similar in both groups. Preoperatively, serum haemoglobin and serum sodium levels were measured on the morning of operation day just before shifting the patient to the operation theatre, and no significant differences were found between groups. All the patients of both groups had either normal preoperative levels of serum haemoglobin and sodium or corrected to normal levels as a criterion for preoperative preparation, followed in our institute. In our study, though insignificant, the mean resection time was longer for monopolar TURP. During our resection, there was a smooth pattern of resection by the bipolar system, along with a less frequent need for separate coagulation of bleeding vessels in between cutting due to the "cut and seal" effect of the bipolar system. Adherence of resected tissues with the cutting loop remained lesser during resection in B-TURP than in M-TURP. These factors led to quicker bipolar resection. In a 2006 study done by Sio et al., the mean resection time in the monopolar TURP group was slower than in the bipolar TURP group (P>0.05).[23] However, Komura et al. in 2014 compared bipolar TURIS with monopolar TURP and found that mean resection time was significantly higher in the bipolar group in comparison to the monopolar group (P<0.05).[24] They explained this finding by the fact that their cutting loop for B-TURP was smaller than that for M-TURP (3.4-5.0 mm for TURIS and 4.1-6.2 mm for M-TURP). The preoperative prostate size was assessed by an abdominal ultra sonogram of KUB+Prostate and prostate size of 40-80 grams were included in this study. Almost similar mean-sized prostates in both groups (P=0.775) were included in the study. After resection, all the prostatic chips were collected by filter and weight was measured. The weight of the resected prostate ranged from 15-38 gm. The mean resected prostatic weight in M-TURP (28.50 gm) was statistically indifferent to that of B-TURP (26.67 gm) (P=0.274). In our study, resection time was strictly kept below 90 minutes; that's why the weight of resected prostatic chips was slightly lower. Ho et al. resected 30.6 grams of the prostate by monopolar and 29.8 grams by the bipolar system.[14] In 2011, Fagerström, Nyman and Hahn included mean volumes of 58.2 mL & 55.6 mL prostate and resected tissue weights were 26.3 gm & 27.3 gm in M-TURP & B-TURP respectively, which was parallel to our study.[25] For much accuracy, the resection rate was calculated in this study by dividing the weight of resected prostate tissue by resection time. The mean resection rate was 0.54 gm/min for M-TURP and 0.59 gm/min for B-TURP (P=0.157), which was comparable

with a study done by Singh et al. Their resection rate was 0.74 gm/min and 0.61 gm/min, respectively.[7] We also visually found appreciably less charring effects with maintaining tissue architectures during both cutting & coagulation in B-TURP in compare of M-TURP, which is needed to be more confirmed by histopathology. The amount of haemoglobin decrease, measured at 06 hours after operation completion in both groups, was compared and calculated by subtracting postoperative haemoglobin level from preoperative haemoglobin level. In this present study, decreases in haemoglobin were 0.99 gm/dL and 0.80 gm/dL in M-URP and B-TURP, respectively, which was significantly lower in bipolar resection (P=0.024). Although the difference was significant, none of the patients in either group required blood transfusion. Though blood loss with irrigation fluid during the operation was not measured visually, B-TURP had less bleeding. A smaller haemoglobin decrease may be due to the simultaneous cutting and sealing effect and deeper coagulation depth of the bipolar system. Kong, Ibrahim, and Zainuddin (2009) reported a mean decrease in haemoglobin level by 1.8 gm/dL in the M-TURP group while 0.60 gm/dL in the B-TURP group (P=0.01).[26] Postoperative changes in haemoglobin levels were significantly lower in the bipolar group, but the changes were minimal, and none of the patients required blood transfusion. Huang et al. (2012) reported also a greater haemoglobin decrease in monopolar than bipolar TURPs (P=0.01)[17]. In the study done by Komura et al. (2014), the mean haemoglobin decrease was similar in both groups, but perioperative blood transfusion was required in 4 patients during M-TURP & only in 1 patient during B-TURP.[24] The present study assessed postoperative serum sodium levels immediately after sending the patient to the recovery room. The mean serum sodium decrease was 1.42 mmol/L in the monopolar group, significantly higher than in the bipolar group, 0.32 mmol/L (P<0.001). As normal saline was used instead of glycine as an irrigant during B-TURP, which is isotonic and contains sodium, there was less fluid absorption, thereby less chance of dilutional and absolute hyponatremia. In a study by Singh et al. (2005), the mean decrease in serum sodium level was 4.6 mEq/L in a monopolar group as it was 1.2 mEq/L in the bipolar group, which had a significant difference (P<0.001).[7] Poh et al. (2011) found no significant difference in sodium decrease between groups.[16] Operation time was limited to below 90 minutes. Irrigation fluid was placed 60 cm above the patient level; a continuous flow resectoscope was used to keep bladder pressure low. While maintaining all these preparations and precautions, neither group developed TUR syndrome during or after TURP. In almost all previous studies, no patient in the bipolar group developed TUR syndrome, but some in the monopolar. Ho et al. in 2007 found that 2 of his 52 patients who underwent monopolar resection developed TUR syndrome and none in bipolar resection.[14] Only three patients (10%) in the monopolar group after TURP developed clot retention before catheter removal, whereas none in the bipolar group (P=0.078). Clot retention occurred for a single episode in 2 patients and two episodes in 1 patient. All the episodes were immediately managed successfully by flush irrigation of saline followed by a transient increase in irrigation rate. Xie et al. in 2012 found 8 cases (7.3%) developed postoperative clot retention after M-TURP and only 1 case (0.9%) after plasmakinetic B-TURP.[20] An 18F Trichannel Foley catheter was placed without traction immediately at the end of the operation with normal saline irrigation in all patients of both groups. After 24 hours of visually clear urine following discontinued bladder irrigation, the urethral catheter was removed. The present study shows that the catheter was removed significantly earlier in the bipolar group than in the monopolar group. The mean catheterization time was 3.23 days in the monopolar group and 2.30 days in the bipolar group (P<0.001), ranging from 2-5 days. In M-TURP, 15 patients (50%) required three days of catheterization, and two required catheterization up to 5 days. However, in B-TURP, in 22 patients (73.33%), the catheter was removed on the second postoperative day and no patient required catheterization for more than four days. As there was early normalization of urine colour visually, irrigation was stopped earlier, thus facilitating early removal of the catheter. This also correlates with less bleeding and better coagulation during bipolar resection. Therefore, there was also a reduced chance of clot retention after bipolar resection. Early catheter removal facilitates better patient compliance and reduces the chance of catheter-related discomfort and complications. In a randomized clinical trial, Singh et al. (2005) showed a significant reduction of the catheterization time with bipolar TURP for 2.52 days compared with 3.41 days in the monopolar TUR.[7] In a comparative study by Kong, Ibrahim and Zainuddin. (2009) found that the mean duration

required for catheterization was about 57.7 hours in the monopolar group and 37.2 hours in the bipolar group.[26] Because of early catheter removal, patients with bipolar arms were also discharged from the hospital earlier in comparison to monopolar arms. All the patients were able to void normally after catheter removal. Then, almost all the patients were discharged on the same day, as catheters were removed in the early morning, followed by ensure voiding within noon. Only two patients following M-TURP and one following B-TURP were discharged the next day after catheter removal, as they voided at the second half of the day after catheter removal, and hospital discharge time was limited to office hours till 2:30 pm. Both groups found significant hospital stay differences (3.30 days for M-TURP and 2.33 days for B-TURP, P<0.001). Due to shorter hospital stays, there would be reduced financial burden to the patient and early return to work. This would also increase the patient turnover in hospitals. Singh et al. (2005) reported that the mean hospital stay in the bipolar group was 3.02 days, which was significantly lower than that of the monopolar group of 3.88 days (P=0.019).[7] In the study done by Xie et al. (2012), hospital stay was 5.19 days after M-TURP and 4.18 days after B-TURP (P<0.001) [20]. All the patients after discharge were followed up six weeks after the operation and were assessed by uroflowmetry for Qmax and also by self-questionnaire to determine IPSS. In this study, there was a sufficient improvement of Qmax at six weeks of follow-up in both groups, and no significant difference was found between mean improvements of follow-up Qmax values. This indicates a similar improvement of urinary flow after TURP using either monopolar or bipolar energy. Singh et al. (2005) also presented similar and static improvement of Q-max in groups in their study: in the monopolar group, 18.6 mL/sec at one month and 17.8 mL/sec at three months and in the bipolar group, 19.8 mL/sec & 19.0 mL/sec respectively.[7] Indifferent finding was also reported by Xie et al. (2012) in 5 years follow up[20] and also by Stucki et al. (2015) & Komura et al. (2015).[21,24] IPSS was sufficiently and indifferently reduced in both the current study groups. However, no significant difference in IPSS was noticed between 2 groups at six weeks of follow-up. IPSS was reduced to 2-9 at follow-up from the preoperative value of 20-34, which also indicates similar efficacy of both methods. This result is also supported by different studies done by Singh et al., (2005), Autorino et al. (2009) and Xie et al. (2012), where patients' symptoms were reduced similarly in groups.[7,19,20]. A long-term study would be helpful to identify any urethral stricture, Bladder neck contracture or any sexual dysfunction. In comparison to other studies, in conclusion, this study found that B-TURP is a safer alternative to M-TURP in terms of postoperative haemoglobin, sodium decrease and early removal of the catheter with short hospital stays which is beneficial to both patients and hospital and as much as effective as M-TURP.

Limitations of the study: Like all hospital-based research endeavours, the current study is not immune to limitations. The study's constraints are explicitly outlined, including its singular focus on a specific centre, a relatively modest sample size, and the absence of prostate size measurements through transrectal ultrasound. The follow-up duration was limited, and there was a lack of comparison with alternative plasma kinetic bipolar electric generators and resected scopes. Furthermore, the study did not address any sexual function status and also did not examine pathological samples for thermal artefacts, highlighting the need for a comprehensive evaluation of these aspects in future research.

Conclusion and Recommendations

Upon reviewing the results of the current study, it is evident that bipolar transurethral resection is a safer option in the form of less haemoglobin & sodium level drop, early catheter removal and shorter hospital stay compared to monopolar transurethral resection, specially in patients of CKD (Chronic Kidney Disease) with electrolyte imbalance, coagulopathy while demonstrating comparable efficacy in treating benign enlargement of the prostate. Based on these findings, it can be asserted that bipolar transurethral resection presents itself as a viable alternative to monopolar transurethral resection in the management of benign prostate enlargement (BEP). However, it is essential to note that a comprehensive, multi-centred comparative study with an extended follow-up period is necessary for more comprehensive insights and conclusive remarks.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethical Committee.

References

1. Smith DR. Smith and Tanagho's general urology. McGraw Hill Professional; 2013.
2. Verhamme KM, Dieleman JP, Bleumink GS, Van der Lei J, Sturkenboom MC, Panel TP. Incidence and prevalence of lower urinary tract symptoms suggestive of benign prostatic hyperplasia in primary care—the Triumph project. European urology. 2002 Oct 1;42(4):323-8.
3. Bhansali M, Patankar S, Dobhada S, Khaladkar S. Management of large (> 60 g) prostate gland: PlasmaKinetic Superpulse (bipolar) versus conventional (monopolar) transurethral resection of the prostate. Journal of endourology. 2009 Jan 1;23(1):141-6.
4. Michielsen DP, Coomans D, Peeters I, Braeckman JG. Conventional monopolar resection or bipolar resection in saline for the management of large (> 60 g) benign prostatic hyperplasia: an evaluation of morbidity. Minimally Invasive Therapy & Allied Technologies. 2010 Aug 1;19(4):207-13.
5. Reich O, Gratzke C, Stief CG. Techniques and long-term results of surgical procedures for BPH. European urology. 2006 Jun 1;49(6):970-8.
6. Stenmark F. Transurethral microwave thermotherapy and transurethral resection of the prostate. Evaluation and development. 2021 Apr 29.
7. Singh H, Desai MR, Shrivastav P, Vani K. Bipolar versus monopolar transurethral resection of prostate: randomized controlled study. Journal of endourology. 2005 Apr 1;19(3):333-8.
8. Balzarro M, Ficarra V, Bartoloni A, Tallarigo C, Malossini G. The pathophysiology, diagnosis and therapy of the transurethral resection of the prostate syndrome. Urologia internationalis. 2001 Apr 1;66(3):121-6.
9. Reich O, Gratzke C, Bachmann A, Seitz M, Schlenker B, Hermanek P, Lack N, Stief CG, Urology Section of the Bavarian Working Group for Quality Assurance†. Morbidity, mortality and early outcome of transurethral resection of the prostate: a prospective multicenter evaluation of 10,654 patients. The Journal of urology. 2008 Jul;180(1):246-9.
10. Mebust WK, Holtgrewe HL, Cockett AT, Peters PC, Bueschen AJ, Carlton Jr CE, Denton SE, Gibbons RP, McKiel CF, Nadig PW, Roth RA. Transurethral prostatectomy: immediate and postoperative complications. A cooperative study of 13 participating institutions evaluating 3,885 patients. The Journal of urology. 1989 Feb 1;141(2):243-7.
11. Eaton AC, Francis RN. The provision of transurethral prostatectomy on a day case basis using bipolar plasma kinetic technology. BJU international. 2002 Apr;89(6):534-7.
12. Issa MM. Technological advances in transurethral resection of the prostate: bipolar versus monopolar TURP. Journal of endourology. 2008 Aug 1;22(8):1587-96.
13. Mashni J, Godoy G, Haarer C, Dalbagni G, Reuter VE, Ahmadie HA, Bochner BH. Prospective evaluation of plasma kinetic bipolar resection of bladder cancer: comparison to monopolar resection and pathologic findings. International urology and nephrology. 2014 Sep;46:1699-705.
14. Ho HS, Yip SK, Lim KB, Fook S, Foo KT, Cheng CW. A prospective randomized study comparing monopolar and bipolar transurethral resection of prostate using transurethral resection in saline (TURIS) system. European urology. 2007 Aug 1;52(2):517-24.
15. Fagerström T, Nyman CR, Hahn RG. Bipolar transurethral resection of the prostate causes less bleeding than the monopolar technique: a single centre randomized trial of 202 patients. BJU international. 2010 Jun;105(11):1560-4.
16. Poh BK, Mancer K, Goh D, Lim T, Ng V, Ng KK, Ng FC. PlasmaKineticTM (bipolar) transurethral resection of prostate: a prospective trial to study pathological artefacts, surgical parameters and clinical outcomes. Singapore Med J. 2011 May 1;52(5):336-9.
17. Huang X, Wang L, Wang XH, Shi HB, Zhang XJ, Yu ZY. Bipolar transurethral resection of the prostate causes deeper coagulation depth and less bleeding than monopolar transurethral prostatectomy. Urology. 2012 Nov 1;80(5):1116-20.
18. Erturhan S, Bayrak Ö, Seçkiner Ý, Demirbað A, Erbaðcý A, Yaðcý F. Comparative outcomes of

plasmakinetic versus monopolar transurethral resection of benign prostatic hyperplasia: 7 years' results. Turkish journal of urology. 2013 Dec;39(4):220.

19. Autorino R, Damiano R, Di Lorenzo G, Quarto G, Perdonà S, D'Armiento M, De Sio M. Four-year outcome of a prospective randomised trial comparing bipolar plasmakinetic and monopolar transurethral resection of the prostate. European urology. 2009 Apr 1;55(4):922-31.

20. Xie, C., Zhu, G., Wang, X. and Liu, X. (2012). Five-Year Follow-Up Results of a Randomized Controlled Trial Comparing Bipolar Plasmakinetic and Monopolar Transurethral Resection of the Prostate. Yonsei Medical Journal, 53(4), pp.734-741.

21. Stucki, P., Marini, L., Mattei, A., Xafis, K., Boldini, M. and Danuser, H. (2015). Bipolar Versus Monopolar Transurethral Resection of the Prostate: A Prospective Randomized Trial Focusing on Bleeding Complications. The Journal of Urology, 193(4), pp.1371-1376.

22. Madduri, V. K. S., Bera, M. K. and Pal, D. K. (2016). Monopolar versus bipolar transurethral resection of prostate for benign prostatic hyperplasia: Operative outcomes and surgeon preferences, a real-world scenario. Urology Annals, 8(3), pp.291-296.

23. de Sio M, Autorino R, Quarto G, Damiano R, Perdonà S, di Lorenzo G, Mordente S, D'Armiento M. Gyrus bipolar versus standard monopolar transurethral resection of the prostate: a randomized prospective trial. Urology. 2006 Jan 1;67(1):69-72.

24. Komura, K., Inamoto, T., Takai, T., Uchimoto, T., Saito, K., Tanda, N., Minami, K., Uehara, H., Takahara, K., Hirano, H., Nomi, H., Kiyama, S., Watsuji, T. and Azuma, H. (2014). Could Transurethral Resection of the Prostate Using the TURis System Take Over Conventional Monopolar Transurethral Resection of the Prostate? A Randomized Controlled Trial and Midterm Results. Urology, 84(2), pp.405-411.

25. Fagerström, T., Nyman, C. and Hahn, R. G. (2011). Complications and Clinical Outcome 18 Months After Bipolar and Monopolar Transurethral Resection of the Prostate. Journal of Endourology, 25(6), pp.1043-1049.

26. Kong, C. C., Ibrahim, M. and Zainuddin, Z. M. (2009). A prospective, randomized clinical trial comparing bipolar plasma kinetic resection of the prostate versus conventional monopolar transurethral resection of the prostate in the treatment of benign prostatic hyperplasia. Annals of Saudi Medicine, 29(6), p.429.