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Original research article

COMPARISON OF THE OUTCOME OF MONOPOLAR VERSUS BIPOLAR DIATHERMY USE DURING TRANSURETHRAL RESECTION OF PROSTATE

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Abstract: *Monopolar transurethral resection of the prostate (M-TURP) remains a widely used surgical modality for treating benign prostatic hyperplasia (BPH). However, bipolar TURP (B-TURP), which uses isotonic saline as an irrigant, may reduce the risk of dilutional hyponatremia and transurethral resection (TUR) syndrome associated with M-TURP.* ***Objective:*** *To compare the outcomes of bipolar versus monopolar diathermy during transurethral resection of the prostate.* ***Methods:*** *This randomized controlled trial was conducted at the Department of Urology & Renal Transplantation, Bahawal Victoria Hospital, Bahawalpur, from March 1, 2022, to May 31, 2023. The study included 100 patients, aged 55 to 85 years, scheduled for transurethral resection of the prostate due to BPH. Exclusion criteria were prostatic carcinoma, previous prostate surgery, cirrhosis, chronic renal failure, and bleeding disorders. Patients were randomized into Group A (M-TURP with 5% dextrose water as irrigant) and Group B (B-TURP with normal saline as irrigant). Outcomes, including changes in serum sodium levels, hemoglobin levels, and incidence of TUR syndrome, were assessed 12 hours postoperatively. Statistical analysis was performed using appropriate methods to compare the two groups.* ***Results:*** *The mean drop in hemoglobin (g/dL) was significantly more significant in the bipolar group (51.71 ± 7.28) compared to the monopolar group (47.86 ± 8.26) (p = 0.0001). The mean decrease in serum sodium levels (mEq/L) was significantly less in the monopolar group (143.57 ± 13.85) compared to the bipolar group (75.51 ± 7.98) (p = 0.0001). TUR syndrome occurred in 2 (4.0%) patients in the M-TURP group, whereas no cases were reported in the B-TURP group (p = 0.153).* ***Conclusion:*** *Bipolar transurethral resection of the prostate is associated with a smaller drop in hemoglobin, a lesser decrease in serum sodium levels, and a lower incidence of TUR syndrome than monopolar transurethral resection.*

Keywords: Benign Prostatic Hyperplasia, Hemoglobins, Hyponatremia, Prostate, Transurethral Resection of Prostate.

Introduction

Benign prostatic hyperplasia (BPH) is prevalent in 50% of older males over 60 years, and at least half report moderate to severe lower urinary tract symptoms(LUTS).(1, 2) BPH presents as LUTS with a predominance of voiding symptoms that range from nocturia to acute urinary retention. Long-term or chronic bladder outflow obstruction (BOO) may eventually lead to bladder/detrusor decompensation.(3, 4)

Transurethral resection of the prostate using bipolar electrocautery with normal saline is an advancement in the surgical management of BPH. Despite the introduction of alternative techniques, monopolar transurethral resection of the prostate (TURP) still represents the gold standard in the operative management of benign prostatic hyperplasia (BPH).(2-4) M-TURP remains the most common surgical modality for treating BPH.(5, 6) Bipolar TURP (B-TURP) uses isotonic saline as an irrigant, so dilutional hyponatremia and transurethral resection (TUR) syndrome, which occur in M-TURP, can be avoided.(5, 7) In a study, the mean fall in hemoglobin in the M-TURP group was 1.57 ± 0.71 g/dl, whereas, in the B-TURP group, it was 1.75 ± 0.77 g/dl, which was statistically insignificant (P = 0.28).(8) Giulianelli et al. reported a drop of mean Hb from 14.52 to 10.4 mg/dl in the M-TURP group, while in the B-TURP group, mean Hb dropped from 14.88 to 13.6 mg/dl. However, the authors did not mention whether this was statistically significant.(9) Regarding the decrease in postprocedure sodium concentration, M-TURP had a mean drop of 3.60 ± 2.89 mEq/L, while B-TURP TURP had a mean decline of 0.99 ± 0.76 mEq/L, which was a statistically significant difference (P < 0.001).(8) In a study, TUR syndrome occurred in three patients (2.06%) in the M-TURP group, whereas there was no TUR syndrome in the B-TURP group.(8) The purpose of this study is to compare the outcome of bipolar versus monopolar diathermy use during transurethral resection of the prostate. The results of my research will be a handy addition to the existing literature. Based on these results, the method with better outcomes can be used in our practice for particular patients to reduce the morbidity of the population.

Methodology

This randomized controlled trial was conducted at the Department of Urology & Renal Transplantation, Bahawal Victoria Hospital, Bahawalpur, from March 1, 2022, to May 31, 2023. The sample size was calculated to be 100 patients, with 50 cases in each group, based on a 95% confidence level, 80% power of the study, and considering the mean decrease in post-procedure sodium concentration after monopolar TURP as 3.60 ± 2.89 mEq/L and bipolar TURP as 0.99 ± 0.76 mEq/L. Non-probability, consecutive sampling was employed to select patients aged 55-85 years, with a disease duration of more than three months, who had failed medical treatment for at least four weeks.

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Patients with hard, nodular prostate on digital rectal examination, a history of prostate surgery, bladder stones, renal failure (serum creatinine >1.5 mg/dl), chronic liver diseases (serum bilirubin >2 mg/dl), and bleeding disorders (INR >1.2) were excluded from the study. After obtaining approval from the ethical review committee and informed consent from each patient, the selected cases were divided into two groups (A and B) by the lottery method. Group A underwent transurethral resection of the prostate using monopolar diathermy with 5% dextrose water as the irrigant solution. In contrast, Group B underwent the procedure using bipolar diathermy with normal saline as the irrigant solution.

All patients were followed up, and the outcomes, including the decrease in serum sodium levels, drop in hemoglobin levels, and incidence of TUR-P syndrome, were assessed at the end of 12 hours post-procedure. Data were analyzed using SPSS version 20.0. Age, disease duration, prostate size, procedure duration, and pre-operative and post-operative levels of hemoglobin and sodium were presented as mean and standard deviation. The occurrence of TUR-P syndrome was presented as frequency and percentage. Stratification was performed based on age, duration of disease, size of the prostate, and duration of the procedure. Post-stratification, an independent t-test was used to assess the effects on the decrease in hemoglobin and sodium levels, while the Chi-square test was employed for TUR-P syndrome. A p-value of ≤ 0.05 was considered statistically significant.

Results

The age range in this study was from 55 to 85 years, with a mean age of 69.55 ± 7.32 years. In group A was 68.94 ± 7.21 years, and in group B was 70.32 ± 7.45 years. Most of the patients, 57 (57.0%), were between 55 and 70 years of age. The mean duration of the disease was 5.67 ± 1.72 months. The mean disease duration in group A was 5.50 ± 1.83 months, and in group B was 5.78 ± 1.68 months. Most of the patients, 71 (71.0%), were ≤6 months in duration. The mean size of the prostate was 61.10 ± 9.03 grams. The mean size of the prostate in group A was 62.12 ± 8.73 grams, and in group B was 61.10 ± 9.19 grams.

The mean duration of the procedure was 33.73 ± 6.89 minutes. The mean duration of the procedure in group A was 32.68 ± 7.11 minutes, and in group B was 34.42 ± 6.79 minutes, as shown in Table I. In my study, the mean drop in hemoglobin (g/dl) was 47.86 ± 8.26 for the monopolar group versus 51.71 ± 7.28 for the bipolar group (p-value = 0.0001).

The mean decrease in serum sodium levels (mEq/L) in the monopolar group was significantly less when compared to the bipolar group (143.57 ± 13.85 versus 75.51 ± 7.98), which was statistically significant (p = 0.0001), as shown in Table. In my study, TUR syndrome occurred in 02 (4.0%) patients in the M-TURP group, whereas there was no TUR syndrome in the B-TURP group (p = 0.153), as shown in Table III. The stratification of the mean drop in hemoglobin, based on age, duration of disease, size of the prostate, and duration of the procedure, is shown in Table IV. Stratification of mean decrease in serum sodium levels concerning age, duration of disease, size of the prostate, and duration of the procedure is shown in Table V. Stratification of Syndrome TUR-P regarding age, duration of disease, size of the prostate, and duration of the procedure is shown in Table VI.

Table I: Distribution of patients according to the duration of the procedure.

Duration (minutes)	Group A (n=50)		Group B (n=50)		Total (n=100)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
≤30	20	40.0	15	30.0	35	35.0
>30	30	60.0	35	70.0	65	65.0
Mean ± SD	32.68 ± 7.11		34.42 ± 6.79		33.73 ± 6.89	

Table II: Comparison of the outcome of bipolar versus monopolar diathermy use during transurethral resection of the prostate.

Outcome	Group A (n=50)	Group B (n=50)	p-value
	Mean ± SD	Mean ± SD	
Mean drop in hemoglobin (g/dl)	47.86 ± 8.26	51.71 ± 7.28	0.0001
The mean decrease in serum sodium levels (mEq/L)	143.57 ± 13.85	75.51 ± 7.98	0.0001

Table III: Comparison of TUR-P Syndrome between both Groups.

		Group A (n=50)		Group B (n=50)	
		No. of Patients	%age	No. of Patients	%age
TURP Syndrome	Yes	02	4.0	00	0.0
	No	48	96.0	50	100.0
The p value is 0.153, which is statistically significant.					

Table IV: Stratification of mean drop in hemoglobin concerning age, duration of disease, size of the prostate, and duration of the procedure.

Co-morbid conditions	Group A (n=50)		Group B (n=50)		P-value
	Drop in hemoglobin (g/dl)		Drop in hemoglobin (g/dl)		
	Mean	SD	Mean	SD	

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Age (years)	55-70	1.72	0.41	0.64	0.13	0.0001
	71-85	1.63	0.19	0.82	0.19	0.0001
Duration of disease (months)	≤6	1.69	0.28	0.74	0.19	0.0001
	>6	1.69	0.52	0.70	0.19	0.0001
Size of prostate (grams)	≤60	1.78	0.44	0.69	0.18	0.0001
	>60	1.61	0.22	0.78	0.18	0.0001
Duration of procedure (minutes)	≤30	1.58	0.33	0.78	0.16	0.0001
	>30	1.76	0.35	0.71	0.19	0.0001

Table V: Stratification of mean decrease in serum sodium levels concerning age, duration of disease, size of the prostate, and duration of the procedure.

Co-morbid conditions		**Group A (n=50)**		**Group B (n=50)**		**P-value**
		decrease in serum sodium levels (mEq/L)		decrease in serum sodium levels (mEq/L)		
		Mean	SD	Mean	SD	
Age (years)	55-70	3.36	0.77	1.08	0.23	0.0001
	71-85	3.67	0.65	1.04	0.22	0.0001
Duration of disease (months)	≤6	3.40	0.79	1.04	0.21	0.0001
	>6	3.68	0.54	1.10	0.25	0.0001
Size of prostate (grams)	≤60	3.26	0.63	1.06	0.24	0.0001
	>60	3.65	0.79	1.05	0.22	0.0001
Duration of procedure (minutes)	≤30	3.56	0.69	0.95	0.21	0.0001
	>30	3.41	0.78	1.10	0.22	0.0001

Table VI: Stratification of TUR-P syndrome concerning age, duration of disease, size of the prostate, and duration of the procedure.

Co-morbid conditions		**Group A (n=50)**		**Group B (n=50)**		**P-value**
		TUR-P syndrome		TUR-P syndrome		
		Yes	No	Yes	No	
Age (years)	55-70	01	31	00	25	0.373
	71-85	01	17	00	25	0.233
Duration of disease (months)	≤6	01	36	00	34	0.334
	>6	01	12	00	16	0.259
Size of prostate (grams)	≤60	01	22	00	24	0.302
	>60	01	26	00	26	0.322
Duration of procedure (minutes)	≤30	00	20	00	15	∞
	>30	02	28	00	35	0.121

Discussion

For over eight decades, transurethral resection of the prostate (TURP) has been considered the cornerstone of surgical management for benign prostatic obstruction (BPO) due to treatment efficacy.(10) Nevertheless, the morbidity of the procedure, notably TURP syndrome, bleeding, and urethral stricture, remains significant at 11.1%, based on a prospective, multicentre study of 10 654 men.(11)

In recent years, the use of bipolar TURP (B-TURP) has challenged conventional monopolar TURP (M-TURP). With a bipolar generator, the advantage is the possibility of using isotonic irrigating fluid, such as normal saline, eliminating the risk of electrolytic disturbance such as TUR syndrome. Nevertheless, the isotonic irrigants will not prevent severe cardiac/pulmonary failure due to excessive absorption. Accordingly, B-TURP offers the theoretical advantage of providing more time to perform resection and to control hemostasis without compromising safety.

Although a few trials have suggested that bipolar resection is adequate and potentially safer for the treatment of benign prostatic hyperplasia, most others are inconclusive and fail to demonstrate superior outcomes for B-TURP.(12, 13)

The age range in my study was from 55 to 85 years, with a mean age of 69.55 ± 7.32 years. The mean age of patients in group A was 68.94 ± 7.21 years, and in group B was 70.32 ± 7.45 years. In my study, the mean drop in hemoglobin (g/dl) was 47.86 ± 8.26 for the monopolar group versus 51.71 ± 7.28 for the bipolar group (p-value = 0.0001). The mean decrease in serum sodium levels (mEq/L) in the monopolar group was significantly less when compared to the bipolar group (143.57 ± 13.85 versus 75.51 ± 7.98), which was statistically significant (p = 0.0001). In my study, TUR syndrome occurred in 02 (4.0%) patients in the M-TURP group, whereas there was no TUR syndrome in the B-TURP group (p = 0.153).

In a study, the mean fall in hemoglobin in the M-TURP group was 1.57 ± 0.71 g/dl, whereas, in the B-TURP group, it was 1.75 ± 0.77 g/dl, which was statistically insignificant (P = 0.28). (8) Regarding the decrease in postprocedure sodium concentration, M-TURP had a mean drop of 3.60 ± 2.89 mEq/L, while B-TURP TURP had a mean drop of 0.99 ± 0.76 mEq/L, which was a statistically significant difference (P < 0.001). (8) In a study, TUR syndrome occurred in three patients (2.06%) in the M-TURP group,

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whereas there was no TUR syndrome in the B-TURP group. (8)

In one study, the mean fall in hemoglobin in the B-TURP group was 0.67 ± 0.62 g/dl, whereas for the M-TURP group, it was 0.62 ± 0.78 g/dl.(14) Although the "cut-and-seal" effect of bipolar technology is supposed to result in better hemostasis during resection, (15) International multicenter randomized controlled trials reported statistically insignificant differences in hemoglobin drop after M-TURP and B-TURP (P = 0.548).(16) However, some studies have noted less blood loss in the B-TURP group than in the M-TURP group (0.6 g/dl vs. 1.8 g/dl, P = 0.01).(17) Giulianelli et al. reported a drop of mean Hb from 14.52 to 10.4 mg/dl in the M-TURP group, while in the B-TURP group, mean Hb dropped from 14.88 to 13.6 mg/dl. However, the authors did not mention whether this was statistically significant.(9) Huang et al.(18) Compared the decrease in serum sodium between bipolar and monopolar transurethral prostatectomy in a randomized controlled study done on 136 patients, they found that the reduction of serum Na+ in the bipolar group was (−2.02 ± 0.53 mmol/l) and in the monopolar group was (−4.57 ± 0.71 mmol/l)—also, Singhania et al.(19) Showed that the decrease in serum sodium in the bipolar group was (−1.25 meq/l) and in the monopolar group was (−4.12 mmol/l); Ho et al(20) Compared the decline in postoperative Na+ and Hb between bipolar and monopolar TURP in a prospective randomized study on 100 patients. They found that the decrease in serum Na+ in the bipolar group was (−3.2 mmol/l), and in the monopolar group was (−10.7 mmol/l), which was highly significant. In another study by Michielsen et al.(21), the decrease in serum sodium in the bipolar group was (−1.5 mmol/l) and in the monopolar group was (−2.5 mmol/l).

Conclusion

This study concluded that the drop in hemoglobin, decrease in serum sodium levels, and TUR-P syndrome are less after bipolar transurethral resection of the prostate than after monopolar transurethral resection. So, we recommend that bipolar diathermy be used for transurethral resection of the prostate to reduce the morbidity of these particular patients.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.
It is approved by the department concerned. (IRB/BVHB-0393)

Consent for publication
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Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

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