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Original Research Article

COMPARATIVE STUDY OF BIPOLAR VERSUS MONOPOLAR TURP IN THE MANAGEMENT OF BENIGN PROSTATIC HYPERPLASIA

Nishant Konnur[1], Kailash Banale[2]

[1]Assistant Professor, Department of Urology, Mahadevappa Rampure Medical College, Kalaburagi
[2]Assistant Professor, Department of Urology, Mahadevappa Rampure Medical College, Kalaburagi

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Corresponding Author: Dr. Nishant Konnur
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Abstract

Background: Transurethral resection of the prostate (TURP) remains the gold standard surgical treatment for benign prostatic hyperplasia (BPH). Bipolar TURP has been introduced as an alternative to conventional Monopolar TURP with the potential advantages of improved safety and reduced perioperative complications.

Objectives: To compare the perioperative outcomes, complications, and functional efficacy of Bipolar TURP and Monopolar TURP in the management of benign prostatic hyperplasia.

Materials and Methods: This comparative study was conducted in the Department of Urology, Mahadevappa Rampure Medical College, Kalaburagi, from March 2019 to December 2019. A total of 300 patients diagnosed with symptomatic BPH were enrolled and allocated into two groups: Bipolar TURP (n=150) and Monopolar TURP (n=150). Preoperative evaluation included complete blood count, serum electrolytes, renal function tests, urine routine examination and culture, serum prostate-specific antigen, ultrasonography of the kidney, ureter, bladder and prostate, uroflowmetry, post-void residual urine measurement, International Prostate Symptom Score (IPSS), and quality-of-life assessment. Perioperative outcomes, postoperative complications, and functional outcomes were compared between the groups.

Results: Baseline demographic and clinical characteristics were comparable between the two groups. Bipolar TURP was associated with significantly lower intraoperative blood loss, reduced postoperative haemoglobin decline, fewer electrolyte disturbances, lower transfusion requirements, and absence of TUR syndrome compared with Monopolar TURP. Patients undergoing Bipolar TURP also had shorter catheterisation duration and hospital stay. Both groups showed significant improvement in IPSS, peak urinary flow rate, post-void residual urine volume, and quality-of-life scores, with comparable functional outcomes at follow-up.

Conclusion: Both Bipolar TURP and Monopolar TURP are effective surgical treatments for benign prostatic hyperplasia. However, Bipolar TURP offers superior perioperative safety with reduced blood loss, fewer complications, and shorter hospitalization while maintaining comparable functional efficacy. Therefore, Bipolar TURP may be considered a preferable alternative to conventional Monopolar TURP in the surgical management of BPH.

Keywords: Benign prostatic hyperplasia, Bipolar TURP, Monopolar TURP, Transurethral resection of prostate, Lower urinary tract symptoms, TUR syndrome.

Introduction

Benign prostatic hyperplasia (BPH) is a progressive, nonmalignant enlargement of the prostate gland and represents one of the most common urological disorders affecting elderly men worldwide. Histological evidence of BPH is present in approximately 50% of men by the age of 60 years and increases to nearly 80% in men older than 80 years [1]. The condition is characterized by hyperplasia of both stromal and epithelial elements within the transition zone of the prostate, resulting in bladder outlet obstruction and lower urinary tract symptoms (LUTS). Lower urinary tract symptoms associated with BPH include urinary frequency, urgency, nocturia, hesitancy, weak urinary stream, intermittency, and incomplete bladder emptying. These symptoms significantly affect the quality of life and may lead to complications such as recurrent urinary tract infections, bladder calculi, acute urinary retention, hematuria, and renal insufficiency if left untreated [2]. Management options for BPH include watchful waiting, pharmacological therapy, minimally invasive procedures, and surgical intervention. Surgery remains the treatment of choice for patients with moderate-to-severe symptoms refractory to medical management or in those who develop

complications secondary to bladder outlet obstruction. Transurethral resection of the prostate (TURP) continues to be regarded as the gold standard surgical treatment for symptomatic BPH owing to its proven efficacy and long-term durability [3].

Conventional Monopolar TURP (M-TURP) has been widely practiced for several decades and has demonstrated excellent outcomes in relieving bladder outlet obstruction and improving urinary symptoms. However, it is associated with several perioperative complications including bleeding, clot retention, electrolyte disturbances, dilutional hyponatremia, and transurethral resection (TUR) syndrome due to the use of non-conductive irrigation fluids such as glycine [4,5]. The introduction of Bipolar TURP (B-TURP) has represented a significant advancement in endourological surgery. Bipolar systems permit the use of isotonic saline irrigation, thereby minimizing electrolyte disturbances and reducing the risk of TUR syndrome. Furthermore, bipolar technology provides improved hemostasis and reduced thermal injury by confining the electrical circuit between two electrodes on the resection loop [6].

Several randomized controlled trials and meta-analyses have compared Bipolar TURP and Monopolar TURP. These studies have demonstrated comparable efficacy in terms of symptom improvement and urinary flow rates. However, Bipolar TURP has been associated with lower blood loss, reduced transfusion rates, fewer electrolyte disturbances, shorter catheterization duration, and reduced hospital stay [7–9]. Although Bipolar TURP has gained increasing acceptance, Monopolar TURP continues to be widely performed because of its availability and lower equipment cost. Therefore, comparative evaluation of these two techniques remains important in determining the optimal surgical approach for the management of BPH. The present study was undertaken to compare the perioperative outcomes, complications, and functional efficacy of Bipolar TURP and Monopolar TURP in patients with benign prostatic hyperplasia treated at a tertiary care teaching hospital.

Materials and Methods

Study Design and Setting: This prospective comparative study was conducted in the Department of Urology, Mahadevappa Rampure Medical College and Teaching Hospital, Kalaburagi, Karnataka, India, from March 2019 to December 2019. The study was undertaken to compare the efficacy, safety, and perioperative outcomes of Bipolar Transurethral Resection of the Prostate (B-TURP) and Monopolar Transurethral Resection of the Prostate (M-TURP) in the management of Benign Prostatic Hyperplasia (BPH).

Study Population: A total of 300 patients diagnosed with symptomatic benign prostatic hyperplasia requiring surgical intervention were enrolled in the study. Patients were allocated into two groups:

- Group A (Monopolar TURP): 150 patients
- Group B (Bipolar TURP): 150 patients

Inclusion Criteria

- Male patients aged ≥50 years.
- Clinical diagnosis of benign prostatic hyperplasia with moderate to severe lower urinary tract symptoms (LUTS).
- International Prostate Symptom Score (IPSS) >7.
- Prostate volume between 30 and 100 mL as assessed by ultrasonography.
- Peak urinary flow rate (Qmax) <15 mL/s.
- Patients fit for spinal or general anesthesia and willing to provide informed consent.

Exclusion Criteria

- Histologically proven or suspected carcinoma prostate.
- Previous prostate or urethral surgery.
- Neurogenic bladder dysfunction.
- Active urinary tract infection.
- Urethral stricture disease.
- Patients with severe coagulopathy or unfit for surgery.

Preoperative Evaluation: All patients underwent detailed clinical evaluation including history taking, physical examination, and digital rectal examination (DRE). The following investigations were performed:

- Complete blood count
- Serum electrolytes
- Renal function tests
- Urine routine examination and culture
- Serum prostate-specific antigen (PSA)
- Ultrasonography of the kidney, ureter, bladder, and prostate (KUBP)
- Uroflowmetry for assessment of peak urinary flow rate (Qmax)
- Post-void residual urine (PVR) measurement
- International Prostate Symptom Score (IPSS) and Quality of Life (QoL) assessment

Surgical Procedure: All procedures were performed under spinal anaesthesia by experienced urologists.

Monopolar TURP (Group A): Resection was carried out using a standard monopolar resectoscope with 1.5% glycine irrigation. Prostatic

tissue was resected until adequate channel creation was achieved.

Bipolar TURP (Group B): Resection was performed using a bipolar resectoscope employing normal saline irrigation. The resection technique was similar to that used in monopolar TURP.

Resected prostatic chips from both groups were sent for histopathological examination.

Outcome Measures

The primary outcome measures included:

- Operative time
- Resected prostate weight
- Change in haemoglobin level
- Change in serum sodium level
- Catheterisation duration
- Length of hospital stay

Secondary outcome measures included

- Improvement in IPSS
- Improvement in Qmax
- Reduction in post-void residual urine volume
- Perioperative and postoperative complications such as bleeding, clot retention, TUR syndrome, urinary tract infection, urethral stricture, and need for blood transfusion.

Follow-up: Patients were followed at 1 month, 3 months, and 6 months postoperatively. At each visit, IPSS, QoL score, Qmax, PVR, and postoperative complications were recorded.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 22.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Comparisons between the two groups were performed using the Student's t-test for continuous variables and Chi-square test or Fisher's exact test for categorical variables. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study protocol was approved by the Institutional Ethics Committee of Mahadevappa Rampure Medical College, Kalaburagi. Written informed consent was obtained from all participants prior to enrollment, and the study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Results and Observations: A total of 300 patients diagnosed with benign prostatic hyperplasia (BPH) were enrolled in the study conducted in the Department of Urology, Mahadevappa Rampure Medical College, Kalaburagi, from March 2019 to December 2019. Patients were equally divided into Monopolar TURP (n=150) and Bipolar TURP (n=150) groups. Baseline demographic, clinical, laboratory, and radiological characteristics were comparable between the two groups.

Table 1: Age Distribution of Patients

Age Group (Years)	Monopolar TURP (n=150)	Bipolar TURP (n=150)	Total (n=300)
50–59	28 (18.7%)	25 (16.7%)	53 (17.7%)
60–69	68 (45.3%)	70 (46.7%)	138 (46.0%)
70–79	42 (28.0%)	44 (29.3%)	86 (28.7%)
≥80	12 (8.0%)	11 (7.3%)	23 (7.6%)
Mean Age (Years)	67.2 ± 7.8	66.9 ± 8.1	67.1 ± 7.9

Observation: The majority of patients were between 60 and 69 years of age.

Table 2: Baseline Clinical and Laboratory Characteristics

Parameter	Monopolar TURP	Bipolar TURP	p-value
Hemoglobin (g/dL)	12.8 ± 1.4	12.9 ± 1.5	0.62
Total Leukocyte Count (/mm³)	7840 ± 1240	7710 ± 1190	0.41
Serum Creatinine (mg/dL)	1.08 ± 0.28	1.11 ± 0.31	0.48
Blood Urea (mg/dL)	34.2 ± 8.6	33.7 ± 7.9	0.66
Serum Sodium (mEq/L)	138.6 ± 3.2	138.9 ± 3.1	0.45
Serum Potassium (mEq/L)	4.3 ± 0.4	4.2 ± 0.5	0.31
PSA (ng/mL)	3.8 ± 1.6	3.9 ± 1.8	0.72
Prostate Volume (mL)	62.4 ± 14.2	63.1 ± 15.1	0.68
Qmax (mL/sec)	8.2 ± 2.1	8.4 ± 2.3	0.47
PVR (mL)	118.4 ± 34.5	121.6 ± 36.2	0.41
IPSS Score	23.1 ± 4.3	22.8 ± 4.6	0.54
QoL Score	5.1 ± 0.8	5.0 ± 0.7	0.37

Observation: No statistically significant difference was observed between the two groups at baseline.

Table 3: Preoperative Urine Culture Findings

Finding	Monopolar TURP (n=150)	Bipolar TURP (n=150)	p-value
Sterile Culture	138 (92.0%)	140 (93.3%)	0.67
Positive Culture	12 (8.0%)	10 (6.7%)	

Observation: Preoperative urinary tract infection rates were comparable between the groups.

Table 4: Comparison of Intraoperative Parameters

Parameter	Monopolar TURP	Bipolar TURP	p-value
Operative Time (minutes)	61.8 ± 12.5	64.2 ± 13.1	0.08
Resected Tissue Weight (g)	32.8 ± 9.4	33.7 ± 10.2	0.44
Irrigation Fluid Used (L)	18.6 ± 4.8	19.1 ± 5.2	0.39
Estimated Blood Loss (mL)	285 ± 84	188 ± 67	<0.001

Observation: Bipolar TURP was associated with significantly lower blood loss.

Table 5: Comparison of Haematological and Electrolyte Changes

Parameter	Monopolar TURP	Bipolar TURP	p-value
Haemoglobin Drop (g/dL)	1.84 ± 0.61	1.12 ± 0.48	<0.001
Serum Sodium Drop (mEq/L)	5.8 ± 2.4	1.7 ± 1.2	<0.001
Serum Potassium Change (mEq/L)	0.42 ± 0.18	0.21 ± 0.11	<0.001

Observation: Bipolar TURP showed significantly less haemoglobin and electrolyte alteration postoperatively.

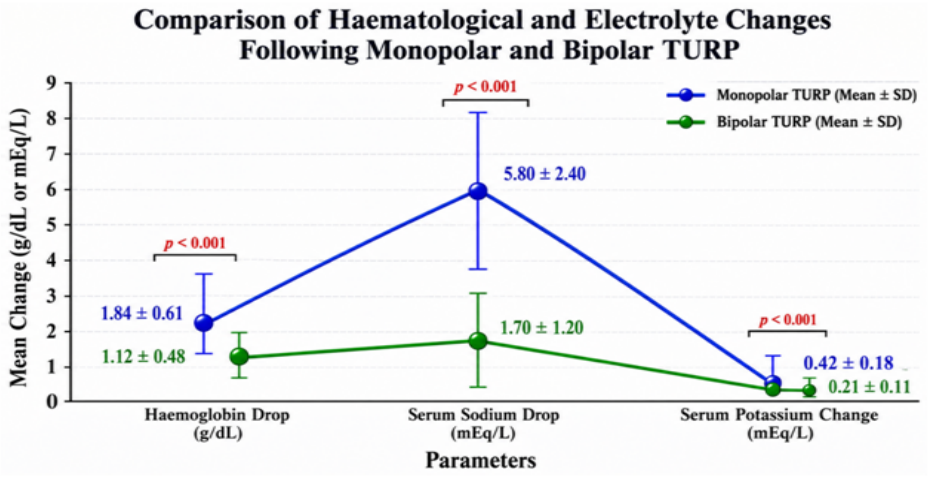

Figure 1: Comparison of Haematological and Electrolyte Changes following monopolar and Bipolat TURP

Table 6: Postoperative Recovery Parameters

Parameter	Monopolar TURP	Bipolar TURP	p-value
Catheterization Duration (Days)	3.9 ± 1.1	2.8 ± 0.8	<0.001
Hospital Stay (Days)	4.8 ± 1.3	3.4 ± 1.0	<0.001

Observation: Bipolar TURP resulted in earlier catheter removal and shorter hospital stay.

Table 7: Early Postoperative Complications

Complication	Monopolar TURP n (%)	Bipolar TURP n (%)	p-value
Clot Retention	12 (8.0%)	4 (2.7%)	0.03
Blood Transfusion	10 (6.7%)	2 (1.3%)	0.01
TUR Syndrome	6 (4.0%)	0 (0%)	0.01
Urinary Tract Infection	11 (7.3%)	8 (5.3%)	0.47
Re-catheterization	8 (5.3%)	5 (3.3%)	0.39

Observation: TUR syndrome and transfusion requirements were significantly more frequent in the Monopolar TURP group.

Table 8: Functional Outcomes at 6-Month Follow-Up

Parameter	Monopolar TURP	Bipolar TURP	p-value
IPSS Score	7.4 ± 2.6	6.9 ± 2.3	0.08
Qmax (mL/sec)	18.2 ± 3.5	19.1 ± 3.8	0.04
PVR (mL)	32.4 ± 14.2	28.8 ± 12.6	0.03
QoL Score	1.8 ± 0.7	1.6 ± 0.6	0.05

Observation: Both procedures significantly improved urinary symptoms, urinary flow rate, and quality of life, with slightly superior outcomes in the Bipolar TURP group.

Table 9: Late Postoperative Complications During Follow-Up

Complication	Monopolar TURP n (%)	Bipolar TURP n (%)	p-value
Urethral Stricture	6 (4.0%)	4 (2.7%)	0.52
Bladder Neck Contracture	4 (2.7%)	2 (1.3%)	0.41
Stress Incontinence	3 (2.0%)	2 (1.3%)	0.65

Observation: No statistically significant difference was observed in late postoperative complications.

Table 10: Overall Outcome Comparison

Outcome	Monopolar TURP	Bipolar TURP	p-value
Excellent	112 (74.7%)	128 (85.3%)	0.02
Satisfactory	28 (18.7%)	18 (12.0%)	
Poor	10 (6.6%)	4 (2.7%)	

Observation: Bipolar TURP demonstrated a higher proportion of excellent outcomes and fewer complications than Monopolar TURP.

Discussion

The present study compared the efficacy and safety of Bipolar TURP and Monopolar TURP in the management of benign prostatic hyperplasia. A total of 300 patients were included, with 150 patients undergoing Bipolar TURP and 150 patients undergoing Monopolar TURP. Baseline demographic, clinical, and laboratory parameters were comparable between the two groups, allowing meaningful comparison of outcomes.

The mean age of patients in the present study was 67.1 years, with the majority of patients belonging to the sixth and seventh decades of life. This finding is consistent with the known epidemiology of BPH reported in previous studies [1,2].

Operative time was slightly higher in the Bipolar TURP group; however, the difference was not statistically significant. Similar findings have been reported in systematic reviews comparing the two techniques [7,8]. The slightly increased operative duration may be attributable to technical differences in tissue resection and coagulation characteristics associated with bipolar energy systems.

One of the most significant findings of the present study was the reduced intraoperative blood loss observed in the Bipolar TURP group. The decline in postoperative hemoglobin levels and the need for blood transfusion were also significantly lower among patients undergoing Bipolar TURP. These findings are in agreement with previous studies demonstrating improved hemostatic control with bipolar technology [6–8].

Electrolyte disturbances remain a major concern during conventional Monopolar TURP because of systemic absorption of non-conductive irrigation fluids. In the present study, the reduction in serum sodium concentration was significantly lower in the Bipolar TURP group. Furthermore, no patient undergoing Bipolar TURP developed TUR syndrome, whereas cases of TUR syndrome were observed in the Monopolar TURP group. These findings are consistent with previous reports demonstrating the safety advantage of saline irrigation during bipolar resection [5,7,8].

Postoperative recovery parameters were significantly better among patients treated with Bipolar TURP. The duration of catheterization and length of hospital stay were significantly shorter in comparison with Monopolar TURP. Similar observations have been reported previously and are likely related to superior hemostasis and lower complication rates associated with bipolar technology [8,9].

Postoperative complications such as clot retention and blood transfusion requirement occurred more frequently in the Monopolar TURP group. The lower complication rate observed with Bipolar TURP further supports its improved perioperative safety profile. Comparable findings have been reported in randomised trials and meta-analyses evaluating both procedures [7–9]. Functional outcomes, including International Prostate Symptom Score (IPSS), peak urinary flow rate (Qmax), post-void residual urine (PVR), and quality-of-life scores, improved significantly in both groups following surgery. Although slightly better improvements were observed in the Bipolar TURP group, both techniques provided substantial symptomatic relief. Previous studies have similarly demonstrated comparable efficacy between Bipolar and Monopolar TURP in terms of long-term functional outcomes [7–9].

Late postoperative complications such as urethral stricture, bladder neck contracture, and urinary incontinence were infrequent and showed no significant difference between the two groups. These findings suggest that both procedures have comparable long-term safety profiles [7,8]. The findings of the present study indicate that Bipolar TURP provides significant perioperative advantages over Monopolar TURP, particularly

with respect to blood loss, electrolyte stability, transfusion requirement, catheterisation duration, and hospital stay. At the same time, both procedures offer comparable improvement in urinary symptoms and functional outcomes.

Conclusion

Both Monopolar TURP and Bipolar TURP are effective treatment options for benign prostatic hyperplasia, resulting in significant improvement in urinary symptoms and functional outcomes. However, Bipolar TURP was associated with reduced blood loss, fewer electrolyte disturbances, lower complication rates, shorter catheterization duration, and reduced hospital stay. Therefore, Bipolar TURP appears to be a safer and more effective alternative to Monopolar TURP while providing comparable clinical efficacy.

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