Original Article

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 30-35

Comparative Study of Efficacy and Safety Between Monopolar and Bipolar Transurethral Resection of Prostate (TURP)

Md Nazamul Hoque[1*] Md Tanvir Rahman[1] Badiul Alam[2] Md Hasan Ullah[3]

ABSTRACT

Background: *Monopolar Transurethral Resection of Prostate (TURP) is the conventional technique for enlarge prostate. In recent years, bipolar TURP has been increasingly being used by the urologist instead of conventional monopolar TURP. This study was aimed to compare the clinical efficacy and safety profile between monopolar TURP and bipolar Transurethral Resection In Saline (TURIS) system for the treatment of symptomatic Benign Enlargement of Prostate (BEP).*

Materials and methods: *This Quasi Experimental Study was conducted in the Department of Urology, Chattogram Medical College Hospital over 110 consecutive patients from 2nd March 2021 to 1st March 2022. Patients were randomly divided in two groups: Monopolar group and bipolar group. Resection time, Bladder irrigation time, six hours postoperative change in Hemoglobin and Serum Sodium and change in International Prostate Symptom Score (IPSS) Quality of life (QoL) and Maximum flow rate (Qmax) after six weeks of surgery were compared in between two groups.*

Results: *Out of 110 enrolled patients, 100 were available in the final follow-up (50 in each group) and included in the final analysis. Both the groups were similar at baseline in terms of their demographic, clinical and laboratory parameters. Duration of prostate resection in bipolar group was longer (68.28±10.62 versus 55.80±6.36 minutes, p<0.001) than the monopolar group. The mean drop in postoperative hemoglobin and serum sodium concentration were significantly lower in monopolar group than the bipolar group. No TUR syndrome occurred in the study patients. Blood transfusions were required in 2% and 16% of the cases respectively in the bipolar and monopolar group (p=0.031). Post operative Hospital stay was significantly shorter in bipolar group (2.08±0.74 versus 3.08±0.39 days) than the monopolar group. Both groups had significantly improved IPSS values, QoL values and maximum urinary flow rate values after six weeks reflected significantly higher improvement in the bipolar group compared to monopolar group.*

Conclusions: *Bipolar TURP seems to be a promising alternative for the treatment of patients with BEP, with better efficacy and shorter hospital stay with conventional monopolar TURP, with less perioperative bleeding, serum sodium reduction and requirement of postoperative blood transfusion.*

Key words: Benign Enlargement of Prostate, IPSS, Transurethral resection of prostate, Monopolar, Bipolar, Quality of life, Qmax.

Introduction

Benign Enlargement of Prostate (BEP) is the most common disease of Lower Urinary Tract Symptoms (LUTS) in men. The prevalence of BEP increases substantially with age, reaching 90% in men aging 81-90 years.[1] The number of elderly people is expected to increase in the coming decades; hence the prevalence of BEP will also be increased. Though BEP is not usually life-threatening, the LUTS due to BEP are leading to a significant deterioration in patients Quality of Life (QoL).[2] Despite the fact that medical therapy is the first line treatment for BEP, a large number of patients require surgical interference. Recommended surgical procedures include Transurethral Incision of the Prostate (TUIP) Transurethral Resection of the Prostate (TURP) in addition to newer techniques such as laser vaporization and holmium laser enucleation, which has completely replaced open prostatectomy. The European Association of Urology (EAU) Guidelines state that TURP is the current standard surgical procedure for men with prostate sizes of 30 to 80 mL and bothersome to severe LUTS secondary to BEP (EAU Guideline

1. Assistant Professor of Urology
Institute of Applied Health Sciences (IAHS) Chattogram.
2. Professor of Surgery
Institute of Applied Health Sciences (IAHS) Chattogram.
3. Assistant Professor of Paediatric Surgery
Institute of Applied Health Sciences (IAHS) Chattogram.

*Correspondence : **Dr. Md. Nazamul Hoque**
Cell : +88 01819 94 25 02
Email : nazamulhoque1@gmail.com

Date of Submission : 14th December 2024
Date of Acceptance : 30th December 2024

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 30-35

2018). TURP via a monopolar electrosurgery unit (ESU) also known as monopolar TURP (Monopolar Trans Urethral Resection of Prostate (MTURP)) is a well established surgical management option for BEP and is widely considered to be the gold standard because of its well documented favorable long term outcomes.[3] Monopolar Trans Urethral Resection of Prostate (MTURP) employs non-conductive 3 hypo-osmolar irrigation medium, such as mannitol, sorbitol or glycine solution. Excessive absorption of such irrigation fluid into the systemic circulation through the prostatic venous sinuses and the peri prostatic tissues may rarely lead to life threatening dilutional hyponatraemia, known as Transurethral Resection (TUR) syndrome, which is associated with longer resection times and larger prostates.[4] The distance between electrodes and the need for electrical current to pass through body tissue as seen with Monopolar Trans Urethral Resection of Prostate (MTURP) also require use of higher voltages. Monopolar Trans Urethral Resection of Prostate (MTURP) therefore occurs at higher temperatures, leading to thermal damage of surrounding tissues and associated complications, including bleeding and clot retention, erectile dysfunction, urinary incontinence, urethral stricture, and bladder neck contracture.[5] Although Monopolar Trans Urethral Resection of Prostate (MTURP) carries a low risk of mortality (0.1%), such complications mean that it continues to be associated with a high level of patient morbidity (11.1%).[3] In light of this, researchers have sought to develop a surgical intervention that can offer effective management of BEP with reduced risk of complications. This has involved incorporation of bipolar technology or bipolar transurethral resection of the prostate (Bipolar Trans Urethral Resection of Prostate (BTURP)) which represents a technical modification of standard Monopolar Trans Urethral Resection of Prostate (MTURP). In contrast to Monopolar Trans Urethral Resection of Prostate (MTURP), the bipolar circuit is completed locally with energy confined between an active electrode (Resection loop) and a return electrode situated on the resectoscope tip (True bipolar) or the sheath (Quasi systems).[6] During Bipolar Trans Urethral Resection of Prostate (BTURP) energy is transmitted from the active electrode to the surrounding conductive solution. This results in water evaporation, which creates an interface gas layer surrounding the loop that poses resistance to the energy flow. By adding voltage to the gas layer, a highly energized state of matter (The plasma) is formed around the electrode. Whilst this requires high current initially, maintenance of the plasma requires minimal energy, allowing tissue resection to be performed with a lower voltage. Coagulation is achieved by the 4 dissipation of energy as heat within vessel walls, which creates sealing coagulum from blood and tissue and collagen shrinkage.[5] The bipolar circuit allows for use of a conductive and physiological irrigation medium, such as normal saline (TURIS) and because less tissue resistance is encountered, lower voltages are required. This has the theoretical advantages of removing the risk of TUR syndrome and allowing TURP to be performed at lower temperatures with reduced thermal damage to surrounding tissues. The subsequent potential for Bipolar Trans Urethral Resection of Prostate (BTURP) to reduce the risk of adverse events, such as bleeding, erectile dysfunction and urinary incontinence, has been assessed in a large number of Randomized Controlled Trials (RCTs).[7] Moreover, Bipolar Trans Urethral Resection of Prostate (BTURP) appeared more advantageous in terms of efficacy, safety and cost-effectiveness than Monopolar Trans Urethral Resection of Prostate (MTURP).[8] In spite of the accumulation of evidence comparing Monopolar Trans Urethral Resection of Prostate (MTURP) and Bipolar Trans Urethral Resection of Prostate (Bipolar Trans Urethral Resection of Prostate (BTURP)) over the last decade, there has been ongoing uncertainty regarding the differences between these two surgical methods in terms of patient outcomes. Therefore, it was necessary to perform a prospective randomized study comparing the efficacy and safety of conventional Monopolar Trans Urethral Resection of Prostate (MTURP) with the new bipolar saline-based TURP systems.

Materials and methods

This Quasi experimental study was conducted in the Urology Department of Chittagong Medical College from 2nd March 2021 to1st March 2022. 110 patients admitted in the Department for surgical treatment were included in the study, as group A which included 55 patients who underwent monopolar TURP (MTURP) and group B which also included 55 patients who underwent bipolar TURP (BTURP).

Table I Baseline clinical characteristics of the study groups (n=100)

Variables	Study groups: Bipolar (Bipolar Trans Urethral Resection of Prostate (BTURP) group (n=50)	Monopolar (Monopolar Trans Urethral Resection of Prostate (MTURP) group (n=50)	p value
Prostate size, ml	66.94±8.15	65.28±8.08	0.310
IPSS score	22.40±3.35	22.28±3.02	0.851
QoL score	3.98±0.87	3.92±0.80	0.721
Qmax, ml/sec	7.43±192	7.54±1.69	0.754

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 30-35

The above study shows that preoperative clinical variables including mean prostate volume, IPSS score, QoL score and Qmax level were similar in the monopolar and bipolar groups.

Table II Preoperative laboratory parameters of the patients stratified by study groups (n=100)

Variables	Study groups: Bipolar (Bipolar Trans Urethral Resection of Prostate (BTURP) group (n=50)	Monopolar (Monopolar Trans Urethral Resection of Prostate (MTURP) group (n=50)	p value
Hemoglobin level, mg/dl	14.98±0.94	15.03±0.94	0.774
Serum Na, mmol/L	136.50±1.23	136.86±1.89	0.261

Mean serum sodium levels were 136.50±1.23 mmol/L and 136.86±1.89 mmol/L respectively in BTURP and MTURP group. The difference between two groups were not significant (p=0.774 and p=0.261).

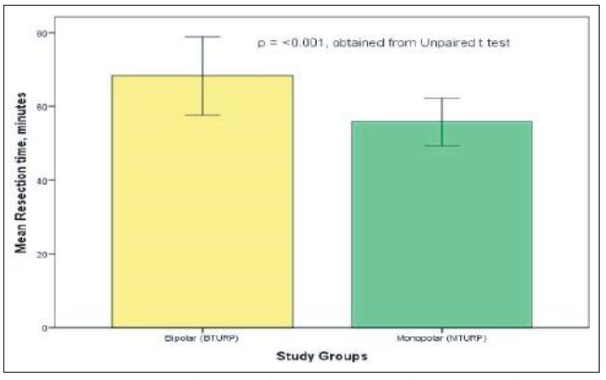

Figure 1 Comparison of mean resection time between two groups

The mean resection time was higher in BTURP group (68.28±10.62) than the MTURP group (55.80±6.36) and the difference was highly significant. (p<0.001)

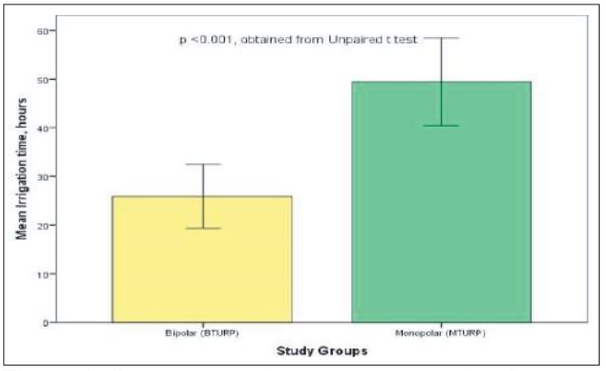

Figure 2 Comparison of mean irrigation time between the groups

The mean irrigation time was lower in BTURP group (25.92±6.58) than the MTURP group (49.44±8.95) and the difference was highly significant (p<0.001)

Table III Comparison of hemoglobin level between the two study groups measured peroperatively and postoperatively (n=100)

Time of measurement	Mean±SD of Hemoglobin level, mg/dl: Bipolar (Bipolar Trans Urethral Resection of Prostate (BTURP) group (n=50)	Monopolar (Monopolar Trans Urethral Resection of Prostate (MTURP) group (n=50)	p value
Preoperative	14.98±0.94	15.03±0.94	0.774
Postoperative	13.14±1.16	12.41±1.01	0.001
Change	1.84±0.45	2.62±0.71	<0.001
p value	<0.001	<0.001	

The mean SD drop in postoperative hemoglobin levels after 6 hours of follow up was 1.84 (0.45) mg/dl in the bipolar group and 2.62 (0.71) mg/dl in the monopolar group. The hemoglobin drop was significant from the preoperative values in both groups (p<0.001). However, mean drop was significantly higher in MTURP group (2.62 gm/dl) than the BTURP group (1.84gm/dl)

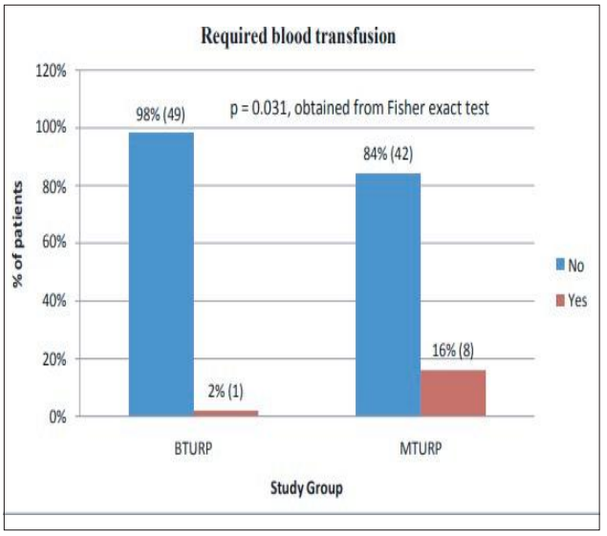

Figure 3 Requirements of blood transfusion in the study groups in postoperative period (n=100)

Blood transfusions were required in one (2.0%) patients in the bipolar group and in eight (16%) patients in the monopolar group and the difference was significant statistically (p=0.031) (5.98>3.841). In monopolar group, more blood transfusion was required in comparison to BTURP.

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 30-35

Table IV Comparison of IPSS score, QoL score and Qmax between the two study groups measured preoperatively and postoperatively(n=100)

Time of Measurement	Mean + SD IPSS, QoL, QMAX score Bipolar (BTURP) (n=50)	Monopolar (MTURP) (n=50)	p value
IPSS Score			
Preoperative	22.40±3.35	22.28±3.02	0.851
Postoperative	8.14+1.70	8.90+1.76	0.031
Change	14.26±2.74	13.38±3.17	0.141
p value	<0.001	<0.001	
QoL Score			
Preoperative	3.98±0.87	3.92±0.80	0.721
Postoperative	1.18±1.70	1.54±1.76	0.019
Change	2.80±0.81	2.38±0.73	0.007
p value	<0.001	<0.001	
Qmax level			
Preoperative	7.34±1.92	7.54±169	0.754
Postoperative	21.78±2.02	20.16±2.57	0.001
Change	14.35±1.90	12.62±2.71	<0.001
p value	<0.001	<0.001	

In both the groups the improvements were statistically significant and the mean change in the IPSS score was significantly higher in Bipolar Trans Urethral Resection of Prostate (BTURP) group compared to Monopolar Trans Urethral Resection of Prostate (MTURP) group. In both the groups the improvements were statistically significant and the mean change in the QoL score was significantly higher in Bipolar Trans Urethral Resection of Prostate (BTURP) group compared to Monopolar Trans Urethral Resection of Prostate (MTURP) group. The improvement in Qmax was significantly higher in Bipolar Trans Urethral Resection of Prostate (BTURP) group than the Monopolar Trans Urethral Resection of Prostate (MTURP) group.

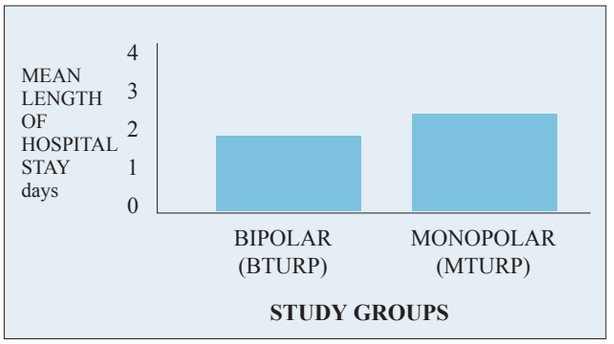

Figure 4 Mean length of hospital stay in study groups(n=100)

The mean length of post operative hospital stay was shorter in Bipolar Trans Urethral Resection of Prostate (BTURP) group (2.08±0.74 days) than the Monopolar Trans Urethral Resection of Prostate (MTURP) group (3.08±0.39 days), and the difference was highly significant statistically (p <0.001).

Discussion

This study was conducted to compare the efficacy and safety of monopolar and bipolar TURP techniques for the management of symptomatic BEP. The mean prostate size of patients of the current study was around 66 ml. According to other studies the mean prostate size varied from 50 to 69 ml for the TURP patients.[9] In the present study there was an increased time of resection in bipolar group (68.28±10.62) more than that in monopolar group (55.80±6.36) which was statistically significant, which is similar with a study by El Saied.[10] The operative time for bipolar group was 64.3 min ± 19.4 and that for monopolar group was 61 min ± 13.5. In contrast to the present study, Fagerstrom found that the operative time for bipolar group (62 min ± 23) was shorter than monopolar group (66 min ± 23).[11]The mean fall in hemoglobin in the Monopolar Trans Urethral Resection of Prostate (MTURP) group was 2.62±0.71 g/dl whereas in the Bipolar Trans Urethral Resection of Prostate (BTURP) group, it was 1.84±0.45g/dl (p < 0.001), which was statistically significant mostly due to better hemostasis. Various studies have reported that the amount of perioperative bleeding is greater in the monopolar groups than in the bipolar groups.[11] The mean irrigation time was lower in Bipolar Trans Urethral Resection of Prostate (BTURP) group (25.92±6.58 hours) than the Monopolar Trans Urethral Resection of Prostate (MTURP) group (49.44±8.95 hours), and the difference was highly significant statistically (p<0.001) which is in consistent with another study by Madduri.[12]

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 30-35

The most important finding in the current study was the significant decrease in Na+ level in monopolar group (5.58± 2.34) than in bipolar group (1.66±0.77). These results are in accordance with the previous works.[11,12] In the present study, the hospital stays were shorter in Bipolar Trans Urethral Resection of Prostate (BTURP) group (2.08±0.74 days) than the Monopolar Trans Urethral 50 Resection of Prostate (MTURP) group (3.08±0.39 days) and the difference was highly significant statistically ($p < 0.001$). This findings corresponds to another study by Bruce.[13] The present results confirm that both the bipolar and monopolar techniques of performing TURP reduce IPSS scores and improve urinary flow. In both the groups the improvements were statistically significant and the mean change in the IPSS score was significantly higher in Bipolar Trans Urethral Resection of Prostate (BTURP). Hossain also reported similar improvement in IPSS score and QoL score in the patients underwent TURP.[14] The study results demonstrated that the use of Bipolar Trans Urethral Resection of Prostate (BTURP) was associated with a significantly less drop of serum hemoglobin and serum sodium, reduced the requirement for a post-operative blood transfusion and reduce length of hospital stay compared to the monopolar approach. Moreover, there was significant difference in the efficacy of TURP (using Qmax as a unit of measurement), IPSS and QoL measured six weeks postoperatively between the monopolar and bipolar groups with a better trend in the Bipolar Trans Urethral Resection of Prostate (BTURP) group.

Conclusions

The present study results demonstrate that bipolar transurethral resection of prostate causes less drop in sodium and hemoglobin level and less requirement of blood transfusion in postoperative period with shorter hospital stay than monopolar transurethral resection of prostate. However, it takes longer resection time. Moreover, the efficacy parameters like IPSS score, QoL score and Qmax showed better improvement in Bipolar Trans Urethral Resection of Prostate (BTURP) group compared to Monopolar Trans Urethral Resection of Prostate (MTURP) group at six weeks after prostatectomy.

Disclosure

The authors declared no conflicts of interest.

References

1. Cho A, Chughtai B and Te A.E. Benign Prostatic Hyperplasia and Male Lower Urinary Tract Symptoms: Epidemiology and Risk Factors. Current Bladder Dysfunction Reports. 2020. doi:10.1007/s11884-019-00566-.

2. Pinto J D O, He H-G, Chan S W C & Wang W. Health-related quality of life and psychological well-being in men with benign prostatic hyperplasia: An integrative review. Japan Journal of Nursing Science. 2016;13(3):309–323.

3. Reich O, Gratzke C, Bachmann A, Seitz M, Schlenker B, Hermanek P, Lack N, Stief C G & 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;180(1):246–249.

4. Acuña-López, J A, Hernández-Torres A U, Gómez-Guerra L S R M-M & Lozano- Salinas J F. Bipolar versus monopolar transurethral resection of the prostate: Intraoperative and postoperative result analysis. Revista Mexicana de Urología. 2010;70(3):146–151.

5. Issa M M. Technological advances in transurethral resection of the prostate: Bipolar versus monopolar TURP. Journal of Endourology. 2008;22(8): 1587–159.

6. Alexander CE, Scullion MM, Omar MI, Yuan Y, Mamoulakis C, N'Dow JM, Chen C and Lam TB. Bipolar versus monopolar transurethral resection of the prostate for lower urinary tract symptoms secondary to benign prostatic obstruction. Cochrane Database of Systematic Reviews. 2019. doi:10.1002/14651858.cd009629.pub4.

7. Mamoulakis C, Trompetter M & de la Rosette J. Bipolar transurethral resection of the prostate: The golden standard reclaims its leading position. Current Opinion in Urology. 2009;19(1):26–32.

8. Pirola G M, Maggi M, Castellani D, Sciarra A, Rubilotta E & Gubbiotti M. A Cost–Benefit Analysis of Bipolar TURP for the Treatment of Bladder Outflow Obstruction. Research and Reports in Urology. 2021;13:487.

9. Ahmad M, Khan H, Masood I, Masood W, Malik A. Comparison of bipolar and monopolar cautry use in turp for treatment of enlarged prostate. Journal of Ayub Medical College Abbottabad. 2016;28(4):758-761.

10. Hafez ES, Hamid EDAE, Raouf E, Soaida SA, Marie M.M. Bipolar versus monopolar transurethral prostate resection: Comparison of hemodynamic and biochemical changes. Egyptian Journal of Anaesthesia. 2014; 30(1):47–52.

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 30-35

11. FagerströmT, Nyman C, Hahn R Bipolar transurethral resection of the prostate causes less bleeding than the monopolar technique: A single-centre randomized trial of 202 patients. BJU international. 2010; 105(11):1560-1564.

12. Madduri, VKS, Bera MK, Pal D. K. Monopolar versus bipolar transurethral resection of prostate for benign prostatic hyperplasia: Operative outcomes and surgeon preferences, a real- world scenario. Urology Annals. 2016; 8(3):291–296.

13. Bruce A, Krishan A, Sadiq S, Ehsanullah SA, Khashaba S. Safety and Efficacy of Bipolar Transurethral Resection of the Prostate vs Monopolar Transurethral Resection of Prostate in the Treatment of Moderate-Large Volume Prostatic Hyperplasia: A Systematic Review and Meta- Analysis. Journal of Endourology. 2021; 35(5):663–673.

14. Hossain MA, Alam MA, Naser MF, & Azam MS. Effects of Transurethral Resection of Prostate (TURP) on Quality of Life in Case of Benign 60 Prostatic Hyperplasia. Journal of National Institute of Neurosciences Bangladesh. 2019; 5(2):143-147.