BIPOLAR VERSUS MONOPOLAR TRANSURETHRAL RESECTION OF PROSTATE - A PROSPECTIVE RANDOMISED STUDY

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ABSTRACT

BACKGROUND

Transurethral resection of the prostate has been considered the gold surgical intervention for the patients with BPH.^(1,2) Electrosurgery devices that have traditionally been used during TURP procedures have monopolar design and cannot be used with electrolyte containing irrigation fluid. In recent years, the use of bipolar TURP have challenged conventional monopolar TURP.

Aim of this prospective randomised study is to compare the safety and efficacy of bipolar electrosurgical unit using saline as an irrigant with conventional monopolar electrosurgical unit using glycine as an irrigant.

MATERIALS AND METHODS

A total of 50 patients who underwent monopolar TURP (Group A: 25 patients) or Bipolar TURP (Group B: 25 patients) were analysed in Dept. of Surgery, Muzaffarnagar Medical College and Hospital from May 2015 to January 2016. Variables analysed were haemoglobin drop, serum sodium, serum potassium, IPSS, Q-max, QoL intraoperative resection time, amount of irrigant, resection volume were recorded. Post-operative haemoglobin, Na⁺, K⁺ were assessed within 6 hours of surgery. Patients were followed after 6 weeks to assess the IPSS, Q-max and QoL.

RESULTS

The mean age at presentation, prostate size, mean haemoglobin level and mean serum sodium, potassium level were comparable pre-operatively between both the groups. The mean resection time and resected weight in monopolar TURP was 56.24 mins. and 22.68 gm, while in bipolar TURP was 59.2 mins. and 21.09 gm respectively, which were not statistically significant. The amount of irrigant used for both groups was comparable. The monopolar group showed a statistically significant decline in haemoglobin (1.25 g%, $p < 0.0001$) as compared to the bipolar group (0.64 g%, $p < 0.01$). However, none of the patient required blood transfusion. Patients were followed after 6 weeks, both the groups showed comparable improvement in IPSS, Q-max, QoL.

CONCLUSION

Bipolar TURP is comparable in terms both safety and efficacy to monopolar TURP.

KEYWORDS

TURP, Monopolar, Bipolar, Haemoglobin, IPSS, Q-max, QoL.

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BACKGROUND

Benign Prostatic Hyperplasia (BPH) is a highly prevalent condition in the adult male with more than 50% of the males over 60 years having histologically proven prostatic hyperplasia and at least half reporting moderate-to-severe Lower Urinary Tract Symptoms (LUTS).⁽¹⁾ Transurethral resection of the prostate has been considered the gold surgical intervention for the patients with BPH.⁽²⁾ The development of TURP and the technical modification led to improved haemostasis and outcome with reduced transfusion rates and low perioperative mortality rates.⁽³⁾

Electrosurgery devices that have traditionally been used during TURP procedures have monopolar design and use non-conductive solutions (Glycine). The use of non-electrolyte solutions has been associated with hyponatraemia (TUR Syndrome), variable degree of hypo-osmolality. In recent years other techniques including the use of bipolar TURP (B-TURP) have challenged conventional monopolar TURP (M-TURP). The principal advantage is the possible use of isotonic irrigating fluid, such as normal saline or lactate ringer which eliminates the risk of electrolytic disturbance from systemic uptake such as TUR syndrome.⁽⁴⁾ Bipolar TURP also results in less thermal damage and better visibility and most importantly the ability to use physiologic saline for irrigation.⁽⁵⁾ Therefore, large prostate gland will be resected and can also be used in cardiac patients.

We hereby discuss the safety and efficacy of conventional monopolar as well as new bipolar saline-based TURP systems.

MATERIALS AND METHODS

This study is a Prospective Randomised Study conducted in the Department of General Surgery, Muzaffarnagar Medical College and Hospital, Muzaffarnagar, Uttar Pradesh. Total 50 cases were taken and randomly divided between two groups

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who presented to Surgery OPD and admitted from May 2015 to January 2016 fulfilling the inclusion criteria. The study protocol was approved by the Institutional Ethical Committee before the commencement of the study. A completely well versed written informed consent was taken from each patient.

Inclusion Criteria

Age 50 to 80 years. All patients of Lower Urinary Tract Symptoms (LUTS) not responding to medical treatment. Prostate size: 30 to 80 grams.

Exclusion Criteria: Patients with history of prior TURP, Carcinoma Prostate. BPH with associated conditions (Bladder calculus, bladder diverticula, bladder tumour, urethral stricture), patients with comorbidities (Cardiac patients, bleeding diathesis), BPH with renal insufficiency.

Preoperatively

Clinical history of all the patients were taken in detail. International Prostate Symptom Score (IPSS) and QoL were evaluated, physical examination with digital rectal examination was done. Haematological and Biochemical investigation was done: (Haemoglobin, serum PSA, sodium, potassium, creatinine). A preoperative ultrasonography was done by a radiologist to assess prostate size. Uroflowmetry was done. Informed and written consent was taken from the patient for surgery.

Materials

Uroflowmeter - Based on weight transducer or load cell method, voided weight is measured and then differentiated with respect to time to determine the flow rate.

Irrigant Fluids - Glycine used for Monopolar TURP and Normal Saline used for Bipolar TURP.

Endoscopes - Karl-Storz bipolar resection system: Resectoscope, bipolar TUR loop and Karl-Storz monopolar resection system: Resectoscope, monopolar TUR loops.

Electrosurgical Unit - Erbe Electrosurgical Unit (VIO 300 D) for both monopolar and bipolar TURP.

Intraoperative - Resection Time: Calculated from first cut on prostate to catheterisation, amount of irrigation used, resected weight of gland.

Postoperative - Haematological investigation was done (Haemoglobin, sodium, potassium): Within 6 hours of surgery, catheter is removed once the urine becomes clear in both the groups. After six weeks of surgery, patients were assessed by IPPS, QoL and Uroflowmetry.

Statistical Analysis

The statistical inference was obtained by computing Z test, MW test, Wilcoxon test, T test for difference between any two values and considered statistically significant if the P value was < 0.05.

RESULTS

This study is a Prospective Randomised Study conducted in the Department of General Surgery, Muzaffarnagar Medical College and Hospital, Muzaffarnagar, Uttar Pradesh. Total 50

cases were taken and randomly divided between two groups who presented to Surgery OPD and admitted from May 2015 to January 2016 fulfilling the inclusion criteria. Table 1 represents age wise distribution of monopolar and bipolar TURP patients. The maximum number of patients in both groups is found to be between the age group 66 to 70 years.

Age (Years)	Monopolar	Bipolar	Total
61 – 65	3	5	8
66 – 70	16	12	28
> 70	6	8	14
Total	25	25	50

Table 1. Age Wise Distribution of Cases in Monopolar and Bipolar Study Groups

Parameter	Monopolar		Bipolar		Z Value	P Value
	Mean	SD	Mean	SD		
Age (yrs.)	69.08	3.97	68.92	2.87	0.16	> 0.05

Table 2. Comparison of Age in Monopolar and Bipolar Study Groups

Parameter	Monopolar		Bipolar		Z Value	P Value
	Mean	SD	Mean	SD		
Prostate size (gm)	52.12	4.45	50.2	2.94	1.85	> 0.05

Table 3a. Comparison of Prostate Size in Monopolar and Bipolar Study Groups

Prostate Size	Monopolar	Bipolar	Total
30 - 40	0	0	0
41 - 50	9	14	23
51 - 60	16	11	27
61 - 70	0	0	0
71 - 80	0	0	0
Total	25	25	50

Table 3b. Distribution of Cases in Monopolar and Bipolar Study Groups as per Prostate Size

The average size of the prostate in our study ranged between 45 gms (monopolar and bipolar) up to 55 gms in bipolar and 58 gms in monopolar as shown in Table 3a and Table 3b.

Parameter	Monopolar		Bipolar		Z Value	P Value
	Mean	SD	Mean	SD		
Resection Time (minutes)	57.24	4.75	59.2	3.34	1.69	> 0.05

Table 4. Comparison of Resection Time in Monopolar and Bipolar Study Groups

The mean resection time between monopolar and bipolar TURP group is shown in above table, which is not statistically significant.

Parameter	Monopolar		Bipolar		Z Value	P Value
	Mean	SD	Mean	SD		
Resected Weight (gm)	22.68	4.06	21.09	1.19	1.88	> 0.05

Table 5. Comparison of Resected Weight in Monopolar and Bipolar Study Groups

The average resection volume of patients undergoing monopolar and bipolar TURP is shown in Table 5. The resection volume in our study is comparable in both groups.

Parameter	Monopolar		Bipolar		Z Value	P Value
	Mean	SD	Mean	SD		
Amount of irrigant (Litre)	18.78	1.28	18.50	1.34	0.75	> 0.05

Table 6. Comparison of Amount of Irrigant in Monopolar and Bipolar Study Groups

Amount of irrigant used in both the groups does not show any statistically difference as shown in Table 6.

Haemoglobin (gm%)	Monopolar		Bipolar		Z Value	P Value
	Mean	SD	Mean	SD		
Pre-operative	12.48	1.19	12.99	0.95	1.68	> 0.05
Post-operative	11.23	0.88	12.35	0.86	4.54	< 0.0001
Haemoglobin Drop	1.25 gm%		0.64 gm%			

Table 7. Comparison of Pre- and Post-Operative Haemoglobin in Monopolar and Bipolar Study Groups

In our study, there is significant drop of haemoglobin in monopolar group as compared to bipolar group, which is statistically significant as shown in Table 7a. The monopolar group showed a statistically significant decline in haemoglobin (1.25 gm%, $p < 0.0001$) as compared to the bipolar group (0.64 gm%, $p < 0.01$). However, none of the patient required blood transfusion.

Sodium (mEq/L)	Monopolar		Bipolar		Z Value	P Value
	Mean	SD	Mean	SD		
Pre-operative	138.46	2.26	137.05	4.89	1.31	> 0.05
Post-operative	138.02	2.04	136.31	4.54	1.77	> 0.05

Table 8. Comparison of Pre- and Post-Operative Sodium in Monopolar and Bipolar Study Groups

Both the groups in our study does not show any serum sodium changes postoperatively as shown in Table 8.

Potassium (mEq/L)	Monopolar		Bipolar		Z Value	P Value
	Mean	SD	Mean	SD		
Pre-operative	4.01	0.19	3.83	0.46	1.86	> 0.05
Post-operative	3.92	0.25	3.75	0.42	1.72	> 0.05

Table 9. Comparison of Pre- and Post-Operative Potassium in Monopolar and Bipolar Study Groups

Both the groups in our study does not show any serum sodium changes postoperatively as shown in Table 9.

IPSS	Monopolar		Bipolar		MW Test Z Value	P Value
	Mean	SD	Mean	SD		
Pre-operative	20.84	3.13	22.08	10.02	0.24	> 0.05
Postoperative (6 weeks)	6.32	1.14	6.80	0.91	0.59	> 0.05

Table 10. Comparison of Pre- and Post IPSS in Monopolar and Bipolar Study Groups

In our study both the groups shown significant improvement in IPSS after 6 weeks of surgery, which is comparable as shown in Table 10.

QoL at	Monopolar		Bipolar		MW Test Z Value	P Value
	Mean	SD	Mean	SD		
Pre-operative	3.52	0.71	3.52	0.65	0	> 0.05
Postoperative (6 weeks)	1.24	0.52	1.24	0.44	0	> 0.05

Table 11. Comparison of Pre- and Post-Quality of Life (QoL) in Monopolar and Bipolar Study Groups

In our study both the groups showed significant improvement in QoL after 6 weeks of surgery, which is comparable as shown in Table 11.

Q-max mL/sec	Monopolar		Bipolar		MW Test Z Value	P Value
	Mean	SD	Mean	SD		
Pre-operative	7.48	1.36	6.88	0.88	1.85	> 0.05
Postoperative (6 weeks)	19.36	1.73	18.6	1.04	1.84	> 0.05

Table 12. Comparison of Q-max in Monopolar and Bipolar Study Groups

In our study, both the groups showed significant improvement in Q-max after 6 weeks of surgery which is comparable as shown in Table 12.

DISCUSSION

We have conducted prospective randomised study to evaluate and compare the safety and efficacy of monopolar versus bipolar TURP in benign prostatic hyperplasia. We have selected 50 patients in our study who were divided randomly into two groups. Age wise distribution of the BPH patients is shown in Table 1. The mean age of the patients grouped in monopolar and bipolar are 69.08 and 68.92 years respectively (Table 2), which corresponds to the findings noted by various authors.^(6,7,8,9,10)

The mean prostate size of the patients in monopolar group is 52.12 gm and in bipolar group is 50.2 gm (Table 3a). Fagerstrom et al⁽⁹⁾ and Singhania et al⁽⁷⁾ in their study had mean prostate size of 58.2 gm and 55.86 gm respectively in monopolar group and 55.6 gm and 59.23 gm respectively in their bipolar group.

The mean resection time of prostate during monopolar TURP in our study was 57.24 mins., whereas in Bipolar TURP it was 59.2 mins. (Table 4), which was not statistically significant (P value > 0.05). However, Engeler et al⁽⁸⁾ in his

study had mean resection time of 41.8 mins. in monopolar TURP and 50.3 mins. in bipolar TURP.

He explained this slight increase in resection time in bipolar TURP to the small diameter of the resection loop (Gyrus device) and more cutting strokes that were required to resect the same amount of tissue. Neyer et al⁽¹⁰⁾ also had the same findings in his study and explained it due to a small delay (0.8) with each cut until the plasma corona is formed.

The mean resected weight of prostate during monopolar TURP in our study was 22.68 gm, whereas in bipolar TURP it was 21.09 gm (Table 5) which was not statistically significant (P value > 0.05). Neyer et al in his study had mean resected prostate volume of 21.9 gm in bipolar and 23.5 gm in monopolar group.

The mean amount of irrigant used (Glycine) during monopolar TURP in our study was 18.78 litre, whereas (Saline) in bipolar TURP was 18.50 litre (Table 6) which was not statistically significant (P value > 0.05). Singhanian et al⁽⁷⁾ in his study had 19.8 litre mean irrigation used in monopolar group and 18.6 litre in bipolar group. He explained a better coagulation and clearer operative field with bipolar resectoscope. This could explain a slightly less amount of irrigant used during bipolar surgery.

In our study, post-operative haemoglobin during monopolar TURP was 11.23 gm/dL with drop of 1.25 gm%, whereas in bipolar TURP it was 12.35 gm/dL with drop of 0.64 gm% (Table 7a), which was statistically significant (P value < 0.0001). It was taken as an indirect parameter to assess intraoperative blood loss in both groups. However, none of the patient in either group required blood transfusion. Patankar et al⁽¹¹⁾ in his study found significant blood loss among patients undergoing monopolar TURP (282.67 mL) as compared to those undergoing bipolar TURP (140.6 mL). Singhanian et al⁽⁷⁾ in his study showed statistically significant haemoglobin drop (0.97 gm%, p value < 0.005) as compared to bipolar group which showed small drop in haemoglobin (0.55 gm%, p value = 0.014).

On comparison of pre- and post-operative Na⁺, monopolar group showed mean pre-operative Na⁺ 138.46 mEq/L and mean post-operative Na⁺ 138.02 mEq/L. While bipolar group showed mean preoperative Na⁺ 137.05 mEq/L and mean post-operative Na⁺ 136.3 mEq/L, p value in both pre- and post-operative groups was > 0.05 which was not statistically significant (Table 8).

On comparison of pre- and post-operative K⁺ monopolar group had mean pre-operative K⁺ 4.01 mEq/L and mean post-op K⁺ 3.92 mEq/L, bipolar group had mean pre-operative K⁺ 3.83 mEq/L and mean post-op K⁺ 3.75 mEq/L, p value of both pre- and post-operative groups was > 0.05 which was not statistically significant (Table 9).

Neyer et al⁽¹⁰⁾ in his study did not find any significant change in serum sodium and serum potassium level in either of his bipolar and monopolar TURP cases evaluated after one hour of surgery. He explained use of non-haemolytic hypo-osmolar fluid like glycine has entirely reduced the incidence of TUR syndrome in monopolar TURP cases. Singhanian et al⁽⁷⁾ in his study had greater decline in serum sodium (4.12 mEq/L) compared to bipolar saline group (1.3 mEq/L); however, this is not statistically significant. He explained that osmolality of the absorbed irrigant is equally responsible for the development of TUR syndrome and not only serum sodium

level. This explains that none of the individual in our study developed TUR syndrome, as operating time in both the groups are almost similar.

In our study, there is significant improvement in IPSS of patients in both monopolar and bipolar group (Table 10). In our study, monopolar group showed mean post-operative IPSS 6.32, while bipolar group showed mean postop IPSS 6.80, p value > 0.05 which is not statistically significant. Mamoulakis et al⁽⁶⁾ in his study had significant improvement in the IPSS of patients in both monopolar and bipolar group (7.5 and 7.7, respectively) which was not statistically significant. In our patients who were followed for 6 weeks, none of the patients presented with worsening of symptom score. This study might require a longer followup in view of assessing urethral stricture and bladder neck contracture. Mamoulakis et al⁽⁶⁾ explained a number of factors including instrument size, urethral diameter and surgeon's skill that are responsible for the occurrence of urethral stricture. He also explained that both in monopolar and bipolar TURP, electric current leakage can provoke stenosis. This explains no significant difference of urethral stricture and bladder neck contracture in both groups after 36 months of followup in his study.

In our study, there is significant improvement in QoL of patients in both monopolar and bipolar group (Table 11). Monopolar group showed mean post-operative QoL 1.24. Bipolar group also showed mean post-operative QoL 1.24. P value > 0.05, which is not statistically significant. Engeler et al⁽⁸⁾ had significant improvement in QoL score in both monopolar and bipolar TURP patients post-operatively.

In our study, there is significant improvement in Q-max of patients in both monopolar and bipolar group (Table 12). Monopolar group showed mean post-op Q-max 19.36 mL/sec. Bipolar group showed mean post-op Q-max 18.6 mL/sec, P value > 0.05 which is not statistically significant. Patankar et al⁽¹¹⁾ in his study had comparable improvement in Q-max in both groups (19.16 and 20.67 mL/sec) postoperatively. However, late followup of all our patients are required to evaluate a long-term outcome of both our surgical groups.

CONCLUSION

1. In our study the amount of blood loss is more in monopolar group as compared to bipolar group, though none of the patients required blood transfusion.
2. There is no statistically significant change in serum sodium and serum potassium levels in either of our bipolar and monopolar groups.
3. In our study, there is significant improvement in IPSS of patients in both monopolar and bipolar group, but insignificant when compared.
4. There is significant improvement in Q-max of patients in both monopolar and bipolar group, but insignificant when compared with each other.
5. In our study, there is significant improvement in QoL of patients in both monopolar and bipolar group, but insignificant when compared with each other.

In view of above conclusions, the safety and efficacy of Bipolar TURP is similar to Monopolar TURP. However, in our study there was small number of patients with gland size up to 80 gm and limited followup. Hence, we recommend a well-designed randomised trial study involving more number of

patients with larger prostate gland size extended followup is needed.

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