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Corresponding Author
B.C. Range Gowda,
Department of General Surgery, Siddaganga Medical College and Research Institute, Tumkur, Karnataka, India

Author Designation
[1]Assistant Professor
[2]Professor and Head

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Comparison of Clinical Outcome and Safety of Bipolar Versus Monopolar Transurethral Resection of Prostate for Benign Prostatic Hyperplasia

[1]B.C. Range Gowda and [2]N. Chandrashekar
[1,2]Department of General Surgery, Siddaganga Medical College and Research Institute, Tumkur, Karnataka, India

ABSTRACT
LUTS represent a cluster of chronic urinary disorders that occurs among 15-60% of men older than 40 years of age. Specific symptoms associated with the LUTS complex include frequency, urgency, nocturia, difficulty initiating urination, sense of incomplete bladder emptying, decreased force of stream and interruption of stream. The most common etiology of male LUTS is BPH. This was a prospective study to compare the clinical outcomes in terms of symptom improvement and early postoperative results after monopolar or bipolar transurethral resection of prostate for benign prostatic hyperplasia. This was a prospective study to compare the clinical outcomes in terms of symptom improvement and early postoperative results after monopolar or bipolar transurethral resection of prostate for benign prostatic hyperplasia. Improvement in IPSS score was 15.88±3.66 in monopolar and was 15.42±3.74 in bipolar group with p value of 0.810 there was no statistically significant different difference between two groups. Improvement in QOL score was 2.07±0.79in monopolar and was 2.07±0.87 in bipolar group with p value of 0.929 there was no statistically significant different difference between two groups. Improvement in QMAX was 9.05±2.35 in monopolar and was 8.95±2.31 in bipolar group with p value of 0.790 there was no statistically significant different difference between two groups.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is an extremely common pathological finding in men and exhibits an age-related increase in incidence. The exact prevalence and incidence of BPH cannot be quantified as BPH is an age dependent illness. The development of BPH starts as early as 40 years of age. BPH prevalence is greater than 50% by the age of 60 years and by the age of 85years BPH prevalence is as high as 90%[1]. Histologically, there is an increase in both the cellular and stromal components of the prostate gland that may result in the reduction in the caliber of the urethral lumen. BPH may cause physical compression of the urethra and result in anatomic bladder outlet obstruction (BOO) through two distinct mechanisms: First, an increase in prostate volume, termed the static component., second, an increase in stromal smooth muscle tone, termed the dynamic component. LUTS represent a cluster of chronic urinary disorders that occurs among 15-60% of men older than 40 years of age. Specific symptoms associated with the LUTS complex include frequency, urgency, nocturia, difficulty initiating urination, sense of incomplete bladder emptying, decreased force of stream and interruption of stream. The most common etiology of male LUTS is BPH[2]. Medical management is largely established in terms of alpha-blocker and 5-alpha reductase inhibitor. Large numbers of surgical treatment options are also available. For most of the 20th century, from 1909 until the late 1990s, the premier treatment for symptomatic benign prostatic hypertrophy (BPH) was transurethral resection of the prostate (TURP)[3]. Monopolar transurethral resection of the prostate (TURP) remains the gold standard treatment for the surgical management of BPH and bladder outflow obstruction (BOO). TURP rates have declined over the past two decades due to the significant benefits of medical therapy and, to a lesser extent, the proliferation of alternative surgical techniques. Technical modifications have enabled the safer and more efficient performance of the procedure, however complications remain[4]. Indications and treatment methods for enlarged prostate are well established. TURP can be done by using monopolar cautery or bipolar current. Monopolar is already established and gold standard procedure against which all other modalities are compared. Concerns over dilutional hyponatremia and TUR syndrome with the use of hypotonic irrigant, however, generally limit safe resection times. The bipolar resectoscope has become increasingly popular because it utilizes saline irrigant, which avoids the potential for delusional hyponatremic and the associated constraints on resection time. Bipolar resection allows electric current to return to the machine via an electrode in the resectoscope itself. Hence no current passes through the patient and no separate earthing electrode is required. It has been established in the last decade as an excellent alternative for trans-urethral resection of the prostate (TURP). The hemostatic properties of this system have been claimed to be superior to the traditional monopolar cautery[5]. Most of the available studies found no overall difference between M-TURP and B-TURP in terms of clinical effectiveness. B-TURP was found to be associated with fewer adverse events, including TUR syndrome, clot retention and need for blood transfusion. No statistically significant difference in urethral strictures was noticed between monopolar and bipolar resections. However bipolar TURP does have Potential disadvantages like Higher risk of conductive trauma if current is deviated (i.e. via sheath) due to higher energy levels for ignition of plasma (i.e. insufficient lubrication), fluid absorption still possible and risk of recurrent bleeding due to smaller coagulation zone[6]. With this in mind we decided to compare efficacy and outcomes bipolar system when compared to the traditional monopolar TURP.

MATERIALS AND METHODS

Study Population: Study population included the patients presenting with LUTS who underwent monopolar or bipolar TURP. It included mixed population from different states of the country and also from across the country.

Sample Size and Sample Technique: Our sample size was 90 patients in each group. In this study the mean amount of prostatic tissue (±SD) resected was 12.27±8.67 g in the TUR-P group and 16.87±6.64 g in the TURIS group (p=0.047). Considering the significant mean difference from the previous study listed above, we calculated the sample size to be 45 with confidence interval of 95%, power of 80%. Expecting an attrition rate of 10% in the sample size, the sample size was rounded minimum 50 per group. But at the end of the study our total sample size was 90 patients in each group.

Study Design: This was a prospective study to compare the clinical outcomes in terms of symptom improvement and early postoperative results after monopolar or bipolar transurethral resection of prostate for benign prostatic hyperplasia.

Inclusion Criteria: Patients presenting with lower urinary tract symptoms due to benign prostatic hypertrophy in whom surgery was strictly indicated were enrolled as were patients with disturbing, drug resistant LUTS, in accordance with European association of urology guidelines.

Exclusion Criteria:

- Prostatic cancer.
- Urethral stricture.
- Neurogenic bladder.

- Active urinary infection.
- Previous Prostate surgery.
- Patients with coagulopathy.
- Patients on anticoagulant therapy which cant be discontinued.
- Associated bladder stones.
- Inability to participate in study sue to dementia.
- If prostatic cancer was found on histopathology or developed during the follow up were excluded.

RESULTS AND DISCUSSIONS

Table 1: Comparison of Post-Operative Findings in Two Groups Studied

Variables	Post-operative		
	Monopolar	Bipolar	P-value
IPSS	7.89±3.33	7.29±3.25	0.223
QOL	1.83±0.67	1.89±0.66	0.578
QMAX	18.56±2.12	18.42±2.22	0.684
HB	11.62±0.88	11.67±1.12	0.713
PCV	34.18±3.00	34.36±2.46	0.665
Na	133.92±3.23	137.98±3.21	<0.001**

There was improvement in symptom score (7.89±3.33 points in monopolar, 7.29±3.25 points in bipolar group) in both groups but difference between two were not significant.

There was a significant improvement in QOL in both groups it was1.83±0.67 in monopolar group and by 1.89±0.66 in bipolar group with p value of 0.578 there was no statistical difference between both groups.

Post-operative Qmax was 18.56±2.12 in monopolar group and 18.42±2.22 in bipolar group. Post-operative values of Qmax were comparable in both groups.

Post-operative hemoglobin were comparable between both groups with p value of 0.713.

Post-operative hematocrit were comparable between both groups with p value of 0.665.

There was a statistically significant difference in post-operative sodium values between both groups.

Table 2: Comparative Pre-Operative and Post-Operative Findings in Monopolar Groups

Variables	Monopolar			
	Pre-operative	Post-operative	Difference	P-value
IPSS	23.18±1.96	7.89±3.33	15.28	<0.001**
QOL	3.90±0.70	1.83±0.67	2.07	<0.001**
QMAX	9.52±1.01	18.56±2.12	9.04	<0.001**
HB	12.23±0.82	11.62±0.88	0.61	<0.001**
PCV	35.91±2.79	34.18±3.00	1.73	<0.001**
Na	139.44±3.58	133.92±3.23	5.52	<0.001**

There was an improvement in IPSS score in monopolar group by 15.28 (p<0.001).

There was an improvement in QOl score in monopolar group by 2.07 (p<0.001).

There was an improvement in Qmax in monopolar group by 9.04 (p<0.001).

There was fall in hemoglobin in monopolar group by 0.61 g/dl (p<0.001).

There was fall in hematocrit in monopolar group by 1.73 (p<0.001).

There was fall in serum sodium in monopolar group by 5.52 mEq/l (p<0.001).

Table 3: Comparative Pre-Operative and Post-Operative Parameters in Bipolar Groups

Variables	Bipolar			
	Pre-operative	Post-operative	Difference	P-value
IPSS	22.71±1.81	7.29±3.25	15.42	<0.001**
QOL	3.97±0.74	1.89±0.66	2.07	<0.001**
QMAX	9.47±1.14	18.42±2.22	8.94	<0.001**
HB	12.27±1.08	11.67±1.12	0.59	<0.001**
PCV	35.80±2.45	34.36±2.46	1.44	<0.001**
Na	139.52±3.10	137.98±3.21	1.53	<0.001**

There was an improvement in IPSS scpre in bipolar group by a mean of 15.42 (p<0.001**).

There was an improvement in QOL score in bipolar group by a mean of 2.07 (p<0.001**).

There was an improvement in Qmax score in bipolar group by a mean of 8.94ml/s (p<0.001**).

There was a fall in hemoglobin in bipolar group by a mean of 0.59g/dl (p<0.001**).

There was a fall in hematocrit in bipolar group by a mean of 1.44 (p<0.001**).

There was a fall serum sodium in bipolar group by a mean of 1.53 (p<0.001**).

Table 4: Comparison of Outcome in Two Groups Studied

Variables	Difference of pre-op and Post op		
	Monopolar	Bipolar	P-value
IPSS	15.88±3.66	15.42±3.74	0.810
QOL	2.07±0.79	2.07±0.87	0.929
QMAX	9.05±2.35	8.95±2.31	0.790
HB	0.61±0.32	0.59±0.17	0.662
PCV	1.73±1.01	1.44±1.16	0.076+
Na	5.52±3.46	1.53	<0.001**

Improvement in IPSS score was 15.88±3.66 in monopolar and was 15.42±3.74 in bipolar group with p value of 0.810 there was no statistically significant different difference between two groups.

Improvement in QOL score was 2.07±0.79in monopolar and was 2.07±0.87 in bipolar group with p value of 0.929 there was no statistically significant different difference between two groups.

Improvement in QMAX was 9.05±2.35 in monopolar and was 8.95±2.31 in bipolar group with p value of 0.790 there was no statistically significant different difference between two groups.

Drop in blood hemoglobin was 0.61±0.32 in monopolar and was 0.59±0.17 in bipolar group. Although there is slightly higher drop in monopolar group, with p value of 0.662 there was no statistically significant different difference between two groups.

Drop in blood hematocrit was 1.73±1.01 in monopolar and was 1.44±1.16 in bipolar group. Although there is slightly higher dilution in monopolar group, with p value of 0.076+ there was no statistically significant difference between two groups.

Drop in serum sodium was 5.52±3.46 mEq/l in monopolar and was 1.53 in bipolar group. There is statistically significant higher drop in sodium level in monopolar group, with p value of <0.001**.

Table 5: PERI Operative Findings

PERI Op	Monopolar	Bipolar	P-value
Op time	43.59±5.28	44.58±4.30	0.163
RES WT	23.83±6.16	25.07±6.28	0.185
CAT REM	2.46±0.67	2.41±0.54	0.625

Here was no statistically significant significant difference between two groups with regards to operative time (43.59±5.28 minutes in monopolar group and 44.58±4.30 minutes in bipolar) with P value of 0.163.

Mean resection weight was slightly lower (23.83±6.16g) in monopolar compared bipolar group (25.07±6.28) but with p value of 0.185, there was no statistically significant difference between both the groups.

Mean catheterization time was slightly longer in monopolar group (2.46±0.67) compared to bipolar (2.41±0.54) but difference noted was not statistically significant (p value-0.625).

Table 6: Complications in Two Groups Studied

Complications	Monopolar (n=90)		Bipolar (n=90)		
	No	%	No	%	P-value
1.BT	1	1.1	0	0.0	1.000
2.CLOT Retention	4	4.4	2	2.2	0.682
3.TURS	2	2.2	0	0.0	0.497
4.F T V	3	3.3	3	3.3	1.000
5.UTI	2	2.2	2	2.2	1.000
6. Bladder Neck Cont/Urethral Strcture	2	2.2	2	2.2	1.000
7.Hematuria	3	3.3	2	2.2	1.000

Two cases of TUR syndrome were noted in monopolar group while none occurred in monopolar group but it was not statistically significant with p value of 0.497.

Solitary blood transfusion was done in monopolar group. Clot retention (p value 0.682) and secondary hematuria rates were slightly higher in monopolar group but not statistically significant.

There was no difference noted in regards to other complications like urinary tract infection, post-operative acute urinary retention (FTV), urethral stricture.

Our study revealed that both techniques were equally efficacious in reducing the patients symptoms, improving the quality of life and the Qmax. Mean improvement in IPSS score was 15.88±3.66 (p value<0.001**) in monopolar group while it was 15.42±3.74 ((p value<0.001**)) in bipolar group with p value of 0.810. Mean improvement in QOL score was 2.07±0.79 and 2.07±0.87 in monopolar and bipolar group respectively with p value of 0.929. Improvement in Q max sone at 3 months from surgery showed increase in q max by 9.05±2.35in monopolar group and 8.95±2.31 in bipolar group. With p value of 0.790 there was statistically significant difference between two groups. Mamoulakis C1, Ubbink DT, de la Rosette JJ. *et al.* in their meta-analysis found data on efficacy measured by the impact of each technique on Qmax, IPSSas well as QoL score compared to baseline, was provided at follow-up periods ranging from 1-48 mo in 12 trials. All trials but one concluded that both techniques were equally effective[7]. DS Engeler, C Schwab, M Neyer, T Grün, A Reissigl, H-P Schmid noted mean Q-max improvement postoperatively in both groups by about 12ml s-1(DS Engeler, C Schwab, M Neyer, T Grün, A Reissigl, H-P Schmid). Mean improvement of IPSS score and Qmax respectively were 11.8+/- 3.4 and 8.5+/-3.9 in monopolar group and 12.1+/-4.6 and 8.7+/-4.5 in bipolar group in a study done by Chang-Jun Yoon, Ji-Yoon Kim et al. (Chang-Jun Yoon, Ji-Yoon Kim, Ki-Hak Moon, Hee-Chang Jung)[8,9]. Overall, the improvements that we observed in Q-max, residual urine volume, IPSS and QoL scores agreed with those reported in the literature for both bipolar and monopolar TURP and were similar in statistical terms(Yang S, Lin WC, Chang HK, Hsu JM, Lin WR, Chow YC)()Ho HS, Yip SK, Lim KB, Fook S, Foo KT, Cheng CW) (DS Engeler, C Schwab, M Neyer, T Grün, A Reissigl, H-P Schmid)[10,11]. Although a significant decrease in TUR syndrome incidence has been reported during the past decades, it still represents a serious perioperative complication. One of the most significant recent advancements in transurethral resection of the prostate (TURP) is the incorporation of bipolar technology. Bipolar circuitry allows TURP to be performed in a normal saline environment, which addresses a fundamental concern of conventional monopolar TURP (i.e., the use of hypo-osmolar irrigation). As a result, the risks of dilutional hyponatremia and transurethral resection (TUR) syndrome are eliminated, allowing for longer and safer resection. (Issa MM.) Clinical TUR syndrome was seen in 2 patients in the monopolar group and none in bipolar group. Drop in the serum sodium was 5.52±3.46 in monopolar group while it was only 1. -----3.17±1.22 in bipolar group. There was statistically significant higher drop in serum sodium in monopolar group ((P < 0.001). Kong CH, Ibrahim MF, Zainuddin ZM et al. found a decline in serum sodium in monopolar group of 5.01(1.77)mmlo/l and it was 1.03(2.36) mmol/l in bipolar group it was statistically significant drop in monopolar group compared to bipolar group[12]. Mean decrease in serum sodium in monopolar group was 2.03+/-1.35 in monopolar group while it was 1.62+/-1.31 in bipolar group in a comparative study done by Chang-Ying Xie, Guang-Bin Zhu *et al.* (Xie CY, Zhu GB, Wang XH, Liu XB.) Mamoulakis C *et al.* in there systematic analysis of randomised control trials found that Most trials reporting on the postoperative drop in serum sodium level showed a significantly higher drop after M-TURP and, but data were extremely heterogeneous to be

pooled. All trials but one reported on TUR syndrome occurrence, describing a total of 13 cases versus none after M-TURP and B-TURP, respectively. In a study by piyush *et al.* The monopolar glycine group showed a greater decline in serum sodium (4.12 meq/L) compared to the bipolar saline group (1.3 meq/L). However, this was not statistically significant between the groups (p=0.93 for bipolar and p=0.2 for monopolar group respectively) (Piyush Singhania, Dave Nandini, Fernandes Sarita, Pathak Hemant). Study by Singh H *et al.* showed that bipolar is equally effective as monopolar and monopolar group found to had more sodium drop 4.6 meq/l whereas it fell only 1.2 mEq/L in bipolar group (P<0.001) (Singh H, Desai MR, Shrivastav P, Vani K..), which is similar to results of present study Bipolar technology, however, does not prevent fluid absorption, which can still happen; therefore, it should always be kept in mind (J. Rassweiler, M. Schulze, C. Stock, D. Teber, J. de la Rosette). One of the major complications of M-TURP is intra-or perioperative bleeding, which is clinically significant mainly if it causes clot retention or necessitates blood transfusion or reoperation. Although transfusion rates in M-TURP series have been significantly reduced over time, clot retention incidence ranges between 2% and 5% and bleeding still remains a concern. In a study by Chang-Jun Yoon, Ji-Yoon Kim, Ki-Hak Moon Fall in haemoglobin was 0.62+/-0.78 in monopolar group and it was 0.67+/-0.62 in bipolar group. there was no statistical difference in the mean changes of hemoglobin (Hb) between the two groups (p=0.278). Méndez-Probst CE, Nott L *et al.* found postoperative decrease in the mean hemoglobin level in the bipolar group of 12.57mmol/L was not significantly different when compared to 9.10mmol/L in the monopolar group. No patient required blood transfusion. Piyush et al. found that monopolar glycine group showed a statistically highly significant decline in Hb (0.97gm%, p<0.005) from the preoperative value. In comparison, the bipolar group showed a smaller drop in hemoglobin (0.55gm%, p=0.014). The surgeons reported better coagulation and a clearer operative field with the bipolar resectoscope (Piyush Singhania, Dave Nandini, Fernandes Sarita, Pathak Hemant). Mamoulakis *et al.* in their systematic review and meta-analysis of randomized controlled trials found that data on the postoperative change in Hb level were available from nine trials, all reporting a nonsignificant drop between arms. Due to lack of standard deviations and large heterogeneity, they could not be pooled. Although all individual trials but one reported a nonsignificant difference in clot retention between arms, pooled analysis showed a significantly higher frequency in the M-TURP arm (RD: 5%., 95% CI, 1-10%., p=0.03). Twelve trials reported on the need for blood transfusions. All individual trials reported a nonsignificant difference in blood transfusion rates between arms. Pooled analysis verified this result. Fewer cases required transfusion in the B-TURP arm, but the difference was not significant. In our study there was a single blood transfusion in the monopolar arm which was not statistically significant. Clot retention rate was slightly higher in the monopolar group with 4 cases in monopolar arm and 2 cases in bipolar arm, but it was not statistically significant. Other available studies also found a slightly increased incidence of clot retention in monopolar group. In our study incidence of post-operative Acute Urinary retention was same in both groups. All These patients were re catheterized and foleys removed after 3 days and voided later with improved q max. The major late complications of M-TURP include strictures and BNCs and the incidence has not changed significantly over time, despite improvements in surgical techniques, lubricants, instruments, and electrical technology (J. Rassweiler, D. Teber, R. Kuntz, R. Hofmann). Theoretically, bipolar technology minimizes the risk of USs, but the different electrode arrangements of the various systems should be considered separately. In our study there were 2 cases of stricture urethra in monopolar group and 2 cases of urethral stricture in bipolar group. 1 patient in each group was managed by urethral dilatation for small segment membranous urethral stricture and 1 patient in each group needed internal urethrotomy. Increased numbers of patients and/or longer follow-up, however, may change these results. Higher incidences of urethral complications with bipolar systems have been suggested occasionally. Larger resectoscope diameter, higher ablative energy used and longer procedures have been proposed as risk factors.

CONCLUSION

The present study shows bipolar TURP is as equally effective as monopolar TURP in reducing the IPSS and improving QOL and maximal flow rate. Our study shows no instance of TUR syndrome in the bipolar armand this may be beneficial in allowing complete resection in high-risk patients without the fear of precipitating fluid-electrolyte disturbances. However, our study was underpowered to detect the statistical significance of this outcome. There was lower drop in the serum sodium in the bipolar group which was statistically significant.

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