

BIPOLAR AND UNIPOLAR TRANSURETHRAL RESECTION
OF PROSTATE: A COMPARATIVE STUDY

استئصال البروستات عبر الإحليل باستخدام المنظار ثنائي

القطب أو أحادي القطب: دراسة مقارنة

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ملخص البحث

هدف البحث: يعتبر استئصال البروستات عبر الإحليل TURP التقنية المعيارية في المعالجة الجراحية لحالات فرط تصنع البروستات السليم BPH. تم مؤخراً تطوير المنظار ثنائي القطب والذي يتم فيه الإرواء بالمصل الملحي وذلك لتجنب الحاجة للإرواء بالغلوسين أو الماء المقطر والاختلاطات المرافقة. تم إجراء دراسة مقارنة-مراقبة مستقبلية لمقارنة استخدام المنظار ثنائي القطب في عملية استئصال البروستات عبر الإحليل TURP مع استخدام المنظار التقليدي أحادي القطب من حيث التغيرات الكيميائية الحيوية، التغيرات الحركية الدموية والنتائج الملحوظة.

طرق البحث: تم خلال الفترة بين شباط 2015 وتموز 2017 إدخال 200 مريض من مرضى فرط التصنع البروستاتي السليم العرضي في دراسة مستقبلية للمقارنة بين التقنيتين. تم تقييم جميع المرضى مع الحصول على قصة مرضية شاملة، الفحص السريري وإجراء الاستقصاءات الضرورية. تم تسجيل مدة العملية، وزن النسج المستأصل، فقدان الدم المرافق، الحاجة لنقل الدم، درجة الانخفاض في قيم خضاب الدم، درجة الانخفاض في صوديوم المصل، كما تم تسجيل مدة الحاجة للقطرة البولية بعد العملية، مدة إرواء المثانة، مدة الرقود في المستشفى، الاختلاطات خلال وبعد العملية. تم تقييم درجة التحسن عبر سلم نقاط أعراض البروستات الدولي IPSS، ومعدل الجريان الأعظمي Qmax بعد 3 أشهر من العملية عند جميع مرضى الدراسة.

النتائج: كانت مدة العملية لدى مرضى مجموعة المنظار ثنائي القطب أطول بالمقارنة مع مرضى مجموعة المنظار أحادي القطب (5.5±64.3 دقيقة مقابل 7.8±54.7 دقيقة)، كما احتاجوا لكمية أكبر من سائل الإرواء (1.2±20.6 لتر مقابل 1.4±17.7 لتر). كما أظهرت مجموعة المنظار ثنائي القطب انخفاضاً أقل في نسبة صوديوم المصل (0.0±1.2 ممول/ل مقابل 0.2±5.7 ممول/ل)، انخفاضاً أقل في مستوى خضاب الدم (0.1±0.7 غ/دل مقابل 0.0±2 غ/دل). لم يلاحظ فارق هام في وزن البروستات المستأصلة بين المجموعتين. أظهر مرضى مجموعة المنظار ثنائي القطب مدة إرواء أقل بعد العملية (4.1±23.6 ساعة مقابل 5.8±36.7 ساعة)، مدة أقل للبقاء في المشفى (0.4±2.25 يوماً مقابل 0.5±3.5 يوماً)، والحاجة للقطرة البولية (1±5 يوماً مقابل 1±7.4 يوماً)، مع نسبة اختلاطات أقل بعد العملية. أظهر المرضى في كلتا المجموعتين تحسناً ملحوظاً في قيم نقاط أعراض البروستات الدولي IPSS، معدل الجريان الأعظمي Qmax ونوعية الحياة، حيث كانت الاختلافات بين المجموعتين بالنسبة لهذه البنود غير هامة من الناحية الإحصائية.

الاستنتاجات: أظهرت هذه الدراسة أن استخدام المنظار ثنائي القطب في عملية استئصال البروستات عبر الإحليل TURP يمثل بديلاً واعداً عن المنظار أحادي القطب عند مرضى فرط التصنع البروستاتي السليم، حيث يوفر المنظار ثنائي القطب فعالية مشابهة، مدة أقصر للبقاء في المشفى، شفاء أسرع، خسارة أقل للدم في الفترة المحيطة بالجراحة، تراجع أقل في قيم الصوديوم في المصل ومعدل اختلاطات أقل بعد العملية بالمقارنة مع استخدام المنظار التقليدي أحادي القطب.

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ABSTRACT

Objective: *Transurethral resection of the prostate (TURP) is the standard procedure for the surgical treatment of benign prostatic hyperplasia (BPH). Monopolar TURP was recently challenged by bipolar TURP, which uses normal saline as an irrigant, thus avoiding the need for glycine or distilled water irrigation and its associated complications. A prospective comparative observational study to compare the use of bipolar TURP with the conventional monopolar TURP regarding biochemical, hemodynamic changes and clinical results.*

Methods: *From February 2015 to July 2017, two hundred patients with symptomatic BPH were randomized into a prospective study comparing the two modalities. All patients were fully assessed with detailed history, thorough physical examination and necessary investigations. Resection time, weight of resected tissue, blood loss, the need for blood transfusion, decline of hemoglobin and serum sodium values were assessed. Postoperative catheter time, irrigation time, hospital stay, intra-operative and postoperative complications were also recorded. The improvements in International prostate symptoms score (IPSS), and Qmax (maximum flow rate) after 3 months were also recorded for all patients.*

Results: *The bipolar group showed significantly longer operative time (64.3±5.5 minutes versus 54.7±7.8 minutes), and required significantly more irrigant volume (20.6±1.2 liters versus 17.7±1.4 liters). It also showed less reduction in serum sodium level (1.2±0.0 mmol/l versus 5.7±0.2 mmol/l), and less reduction in hemoglobin level (0.7±0.1 g/dl versus 2±0.0 g/dl). The weight of the resected tissue was not significantly different between the two groups. The bipolar group showed less postoperative irrigation time (23.6±4.1 versus 36.7±5.8 hours), hospital stay time (2.25±0.4 versus 3.5±0.5 days), catheterization time (5±1 days versus 7.4±1 days), and postoperative complications. Both groups showed significant improvement in IPSS, Qmax, and quality of life; however, the difference between the two groups was not statistically significant.*

Conclusions: *Bipolar TURP seems to be a promising alternative for the treatment of patients with BPH, with*

comparable efficacy, shorter hospital stay, and faster recovery as compared to the conventional monopolar TURP, with less perioperative bleeding, serum sodium reduction and postoperative complications.

INTRODUCTION

The most common benign tumor in men is benign prostatic hyperplasia (BPH), which is an age-dependent disease.¹ It is accompanied by lower urinary tract symptoms (LUTS) with a progressive behavior.^{2,3} After the age of 40, the disease starts to develop. By age of 60, the prevalence is greater than 50%, and by age of 85 it is as high as 90%.⁴ It was observed that the prostate size increases with age at a rate of 0.6 ml per year.⁵ About 75% of men older than 50 years had symptoms arising from BPH and 20-30% of men reaching 80 year-old required surgery.^{2,6}

Although LUTS secondary to BPH is not a life threatening condition, their impact on quality of life can be significant and should not be underestimated.

McNeal demonstrated that all BPH nodules develop either in the transition zone or in the periurethral region.⁷ The nodule enlargement is androgen dependent and involves increase in the number of fibro muscular stromal and epithelial cells, so it is actually a hyperplasia, not a hypertrophy.^{4,8}

The etiology of BPH still remains uncertain in some aspects.⁹ Several mechanisms appear to be involved including age-related tissue remodeling, metabolic syndrome, hormonal alteration and inflammation.¹⁰⁻¹² Aging is the most significant risk factor in the development of BPH and the occurrence of LUTS.^{10,12}

Although medical treatment represents the first line treatment of BPH, a significant percentage of patients with BPH requires surgical intervention.¹³ Transurethral resection of the prostate is the gold corner-stone procedure in the treatment of BPH.¹⁴ The electrosurgical TURP was first described by Stern in 1926 and modified by McCarty in 1931.¹⁵

Although excellent short and long term results were obtained by TURP, it is still associated with significant morbidity.¹⁶ Morbidity occurs in up to 20% of TURP procedures and includes: bleeding requiring transfusion 5-11%,¹⁷ TUR-syndrome 2%,¹⁸ bladder neck contracture 4%, urethral stricture 3.8%, incontinence 2.2%, erectile dysfunction 6.5%, retrograde ejaculation 65-70% and UTIs.^{19,20} Modifications such as incorporation of bipolar technology have been made to minimize the morbidity of TURP.²¹

The proposed advantages of bipolar resection are improved hemostasis, better intra-operative visualization and reduced risk of TUR syndrome (bipolar technique allows resection in normal saline which is the most physiologic irrigant as it is an isotonic electrolytes medium).^{22,23}

Some studies also reported shorter catheterization time, reduced hospital stay²⁴ and smaller degree of cautery artifacts in the TURP chips.²⁵ In the monopolar electro-cautery system, the current pass through the patient's body from the active electrode placed on the resectoscope to the return plate on the patient's leg, this can cause nerve or muscle stimulation, deep tissue heating and malfunction of cardiac pacemaker.²⁶ In the bipolar electrocautery system, the active and return electrodes are placed on the same axis on the resectoscope using high current locally with reduced distant side effects.²⁷

Aim of the study: The aim of this prospective comparative observational study was to compare the use of bipolar TURP using saline as an irrigant with the conventional monopolar TURP regarding biochemical, hemodynamic changes and clinical results.

METHODS

This study was conducted in the urology department of Al-Basra General Hospital and Al-Mawani General Hospital, from February 2015 till July 2017, after appropriate approval by the management of both hospitals.

A total number of 200 patients with symptoms of

bladder outlet obstruction (BOO) due to prostatic enlargement requiring surgery (because of failure of medical therapy or refractory urine retention) were enrolled in the study and divided into two groups: Group I: managed by monopolar TURP (120 patients), and Group II: managed by bipolar TURP (80 patients).

Exclusion criteria included documented or suspected prostate cancer (elevated PSA level and/or abnormal DRE), and patients who refusing participation in the study.

Informed consent was taken from all patients, and they were all evaluated before the surgery by detailed medical history, thorough physical examination including DRE, laboratory investigations including urinalysis, serum PSA, complete blood count, renal function tests, serum sodium level and assessment of bleeding tendency. Imaging studies including ultrasound was done to evaluate urinary tract, to estimate preoperative prostate size, and to measure the post-voiding residual urine volume (PVR).

Maximum urine flow rate (Qmax) was determined by uroflowmetry. International prostate symptom score (IPSS) and quality of life (Qol) score were determined in all participants.

Depending on the cardiopulmonary status of the patient, surgical procedure was done under general or spinal anesthesia in the lithotomy position.

Patients with urinary tract infections were treated before the procedure, single intravenous dose of third generation cephalosporine was given to all patients at the induction of the anesthesia as a prophylactic antibiotic.

The monopolar TURP was performed with a 26 French continuous flow Karl-Storz resectoscope, an active Karl-Storz monopolar single stem working element and a standard thin loop element. Glycin was used for irrigation.

The bipolar TURP was performed with a 24 French continuous flow Karl-Storz resectoscope, an active

Karl-Storz bipolar double-stem working element and Karl-Storz bipolar cutting loop electrode, normal saline 0.9% was used for irrigation.

The height of the irrigation fluid was about 60 cm in all patients. At the end of the procedure, a three ways 22 French silicone Foley's catheter was inserted, and continuous saline irrigation was started at a rate enough to maintain a light pinkish return. The irrigation was stopped once the returning fluid turned clear.

The operative time which is the time from the first cut till the insertion of the Foley's catheter, the amount of irrigation fluid,

the weight of the resected prostatic tissue and the immediate postoperative serum sodium level were determined.

Postoperative hemoglobin level was obtained 24 hours after the surgery. Duration of postoperative irrigation, duration of hospitalization, duration of catheterization and any postoperative complication such as clot retention, blood transfusion and re-admission due to any surgery-related cause were recorded.

All the patients were followed for at least three months, and at the end of the three months the IPSS, Qmax and Qol were determined.

Appendix A

Patient's sheet

Name: _____ age: _____ mobile No.: _____

Date of surgery: _____ type of surgery: _____

Preoperative Data:

| | | | |
|---------------|--|--------------|--|
| Prostate size | | Qol score | |
| PSA | | PVR | |
| Q max | | Hb% | |
| IPSS | | Serum sodium | |

Operative Data:

| | |
|---------------------------|--|
| Operative time | |
| Weight of resected tissue | |
| Volume of irrigant used | |

Postoperative Data:

| | | | |
|-----------------------------|--|-------|--|
| Serum sodium (immediate) | | IPSS | |
| Hb% (24 hour later) | | Q max | |
| Duration of irrigation | | Qol | |
| Duration of hospital stay | | | |
| Duration of catheterization | | | |
| Result of histopathology | | | |
| Clot retention | | | |
| Blood transfusion | | | |
| Readmission | | | |
| Any other complication | | | |

Statistics: Data analysis was performed by using statistical package for social science (SPSS) version 18, all values were expressed as mean±standard deviation. Significant difference between the two groups was evaluated using the t test. A p-value less than 0.05 was considered as statistically significant.

RESULTS

The preoperative characteristics of the patients of both groups are shown in Table 1. There was no significant difference in the preoperative parameters in both groups of the study.

Appendix B

| | Not at all | Less than 1 time in 5 | Less than half the time | About half the time | More than half the time | Almost always | Score |
|---|------------|-----------------------|-------------------------|---------------------|-------------------------|---------------|-------|
| Incomplete emptying. Over the last month, how often have you had a sensation of not emptying your bladder completely after you finish urinating? | 0 | 1 | 2 | 3 | 4 | 5 | |
| Frequency. Over the last month, how often have you had to urinate again less than 2 hours after you finished urinating? | 0 | 1 | 2 | 3 | 4 | 5 | |
| Intermittency. Over the past month, how often have you found you stopped and started again several times when you urinated? | 0 | 1 | 2 | 3 | 4 | 5 | |
| Urgency. Over the past month, how often have you found it difficult to postpone urination? | 0 | 1 | 2 | 3 | 4 | 5 | |
| Weak stream. Over the past month, how often have you had a weak urinary stream? | 0 | 1 | 2 | 3 | 4 | 5 | |
| Straining. Over the past month, how often have you had to push or strain to begin urination | 0 | 1 | 2 | 3 | 4 | 5 | |
| Nocturia. Over the past month, how many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning? | 0 | 1 | 2 | 3 | 4 | 5 | |
| Total IPSS score | | | | | | | |

| Quality of life due to symptoms | Delighted | Pleased | Mostly satisfied | Mixed—about equally satisfied and dissatisfied | Mostly dissatisfied | Unhappy | Terrible |
|--|-----------|---------|------------------|--|---------------------|---------|----------|
| If you were to spend the rest of your life with your urinary condition just the way it is now, how would you feel about? | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

The International Prostate Symptom Score (IPSS). This figure was published in Barry MJ, Fowler FJ Jr, O’Leary MP, et al. (1992). The American Urological Association symptom index for benign prostatic hyperplasia. J Urol 148(5):1549-57. Copyright Elsevier 1992.

The difference between the two groups was significant regarding the operative time; the mean operative time in group I was 54.7 ± 7.8 minutes versus 64.3 ± 5.5 minutes in the group II. Greater amount of irrigant was used in the group II than in the group I. The mean volume of irrigant used in the group I was 17.7 ± 1.4 liter versus $20.61.2 \pm$ liter in the group II. However the difference in the weight of resected prostatic tissue was not significant. The mean resected prostatic tissue volume in the group I was 54.7 ± 1.5 g versus 64.3 ± 2.2 g in the group II.

Serum sodium level dropped in the group I from 140.7 ± 1.4 to 135.9 ± 1.6 mmol/l (the mean reduction was 5.7 ± 0.2 mmol/l), and this was significantly higher

than the drop in the group II (serum sodium level dropped from 140.3 ± 1.4 to 138.8 ± 1.4 mmol/l, the mean reduction was 1.2 ± 0.0 mmol/l), as shown in Figure 1.

The hemoglobin level dropped in the group I from 13.9 ± 0.9 g/dl to 11.9 ± 0.9 g/dl (the mean reduction level was 2 ± 0.0 g/dl), and this was significantly higher than the drop in the group II in which the hemoglobin level dropped from 13.7 ± 0.9 to 13 ± 0.5 g/dl (the mean reduction level was 0.7 ± 0.1 g/dl), as shown in Figure 2.

The mean postoperative irrigation time was less

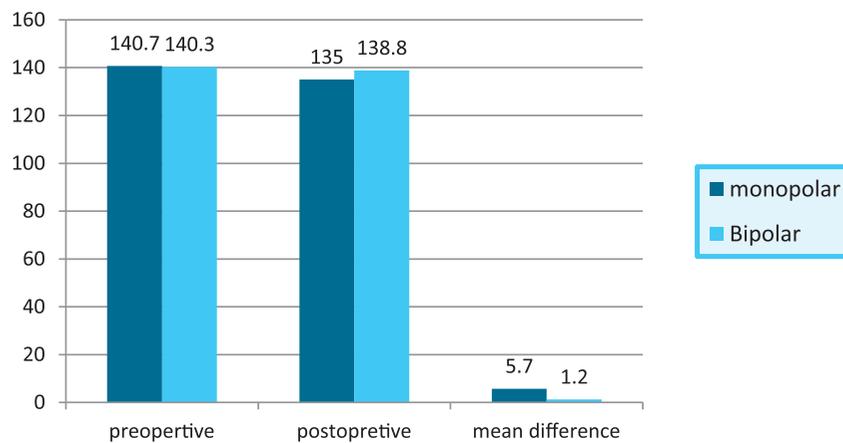


Figure 1. The mean difference of serum sodium in preoperative and postoperative in mono and bipolar TURP.

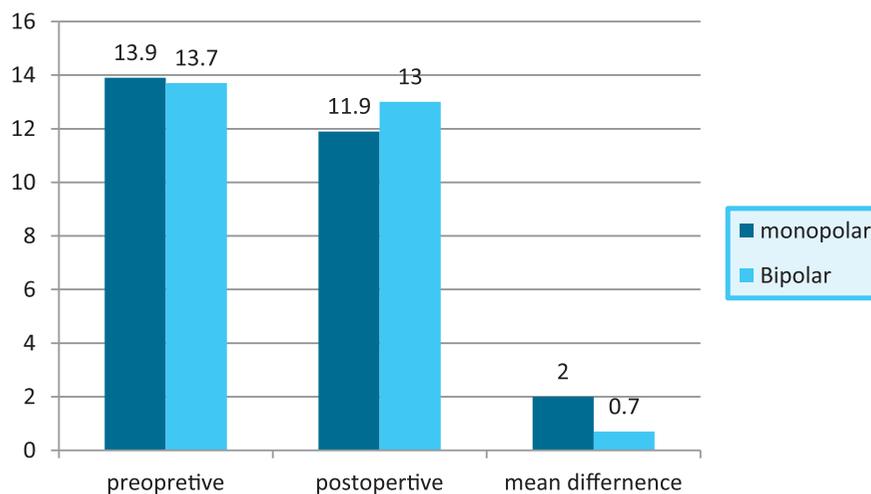


Figure 2. The mean difference of hemoglobin level in preoperative and postoperative in mono and bipolar TURP.

in the group II (23.6±4.1 hours) than in the group I (36.7±5.8 hours), and the difference was highly significant. The difference was also significant regarding catheter time and hospital stay, the mean catheter time was 5±1 day for the group II versus 7.4±1 day for the group I, and the mean hospital stay

was 2.25±0.4 day in the group II versus 3.5±0.5 day in the group I.

There was a significant improvement in the IPSS, Qol, and Qmax after three months in both groups in the study, but the difference between the two groups was

| Character | Monopolar | | Bipolar | | p-value | |
|--------------|---------------|-------|---------|-------|---------|------|
| | Mean | ±SD | Mean | ±SD | | |
| Age | 64 | 7 | 65 | 3 | | |
| Preoperative | Prostate size | 63.8 | 5.3 | 62.1 | 5 | 0.3 |
| | PSA | 2.1 | 0.6 | 1.9 | 0.5 | 0.3 |
| | Q max | 7.1 | 1.1 | 7.4 | 1.3 | 0.48 |
| | IPSS | 21.9 | 2.3 | 21.8 | 2.1 | 0.8 |
| | Qol score | 3.7 | 0.8 | 3.6 | 0.8 | 0.7 |
| | PVR | 143.7 | 25 | 131 | 32.6 | 0.2 |
| | Hb% | 13.9 | 0.9 | 13.7 | 0.9 | 0.5 |
| | Serum sodium | 140.7 | 1.4 | 140.3 | 1.4 | 0.4 |

Table 1. Preoperative characteristics of the patients.

| Character | Monopolar | | Bipolar | | p-value |
|-------------------------------|-----------|-----|---------|-----|---------|
| | Mean | ±SD | Mean | ±SD | |
| Operative time (minutes) | 54.7 | 7.8 | 64.3 | 5.5 | 0.000 |
| Weight of resected tissue (g) | 45 | 1.5 | 50 | 2.2 | 0.2 |
| Volume of irrigant (liters) | 17.7 | 1.4 | 20.6 | 1.2 | 0.002 |

Table 2. Intraoperative parameters of the patients.

| Character | Monopolar | | Bipolar | | p-value |
|--|-----------|------|---------|------|---------|
| | Mean | ±SD | Mean | ±SD | |
| Serum sodium | 135.9 | 1.6 | 138.8 | 1.4 | 0.000 |
| Hb (g/dl) | 11.9 | 0.9 | 13 | 0.5 | 0.001 |
| Duration of postoperative irrigation (hours) | 36.7 | 5.8 | 23.6 | 4.1 | 0.000 |
| Duration of hospital stay (days) | 3.5 | 0.5 | 2.25 | 0.4 | 0.000 |
| Duration of catheterization (days) | 5 | 1 | 7.4 | 1 | 0.000 |
| Clot retention | 0.25 | 0.44 | 0 | 0 | 0.03 |
| Blood transfusion | 0.25 | 0.44 | 0.06 | 0.25 | 0.6 |
| IPSS | 6.6 | 1 | 6.5 | 1 | 0.7 |
| Q max | 16.7 | 1 | 17.6 | 1.2 | 0.02 |
| Qol | 3 | 0 | 3 | 0 | 0.00 |

Table 3. Postoperative parameters of the patients.

not significant. The IPSS decreased from 21.9 ± 2.3 to 6.6 ± 1 in the group I and from 21.8 ± 2.1 to 6.5 ± 1 in the group II. The Qmax increased from 7.1 ± 1.1 ml/sec to 16.7 ± 1 ml/sec in the group I, and from 7.4 ± 1.3 ml/sec to 17.6 ± 1.2 ml/sec in the group II.

During the period of follow up, two patients in the bipolar group were readmitted to the hospital, one for high grade fever and heavy pyuria, and one for late hematuria and only one patient in the monopolar group was readmitted for hematuria and clot retention.

The histological examination confirms the diagnosis of BPH in all patients who underwent TURP in both groups.

DISCUSSION

Till this date, TURP has been considered the cornerstone of surgical management for BPH, due to the procedure's outstanding, well-documented, long-term treatment efficacy,¹³ but still is associated with significant morbidity rates. Several technical modifications were used during the last years to reduce the incidence of both intraoperative and postoperative complications.²¹ One of these modifications is the incorporation of bipolar technology, allowing performance of TURP with normal saline to minimize complications.²¹

Bipolar TURP has theoretical advantages that need to be further evaluated; in this study, further exploration of the potential benefits of bipolar TURP was aimed.

It is clear from the results that there were no statistically significant differences between the two groups with respect to the preoperative baseline parameters including prostate size, PSA, IPSS, Qmax, PVR urine volume, hemoglobin concentration, and serum sodium level.

It is clearly observed an increased time of resection in group II (64.3 ± 5.5 minutes) as compared to group I (54.7 ± 7.8 minutes) which was statistically significant. The results in this study were in accordance with those

reported by Michielsen et al²⁹ who found that bipolar TURP required significantly more time than monopolar TURP (56 ± 25 vs. 44 ± 20 minutes), and they attributed these findings to the use of a small-sized resectoscope²⁴ French in bipolar TURP, i.e. the size of the monopolar resectoscope loop is larger so that more cutting strokes are required to resect the same amount of tissue. The availability of larger resection loops could resolve this limitation in bipolar TURP.

Huang et al also found similar results,³⁰ they compare bipolar and monopolar TURP in a randomized controlled study done on 136 patients, and they found that the operative time for bipolar group was (75.77 ± 22.63 minutes), and for monopolar group was (71.22 ± 19.85 minutes).

Also Acun~ a-Lo´pez, et al³¹ analyzed intraoperative and postoperative results in bipolar versus monopolar TURP in a cross-sectional study done on 30 patients, and found that the operative time for bipolar group was 64.3 ± 19.4 minutes and that for monopolar group was 61 ± 13.5 minutes.

In contrast to this study, Fagerstrom et al³² compared monopolar versus bipolar TURP in a randomized controlled study done on 202 patients. They found that the operative time for bipolar group (62 ± 23 minutes) was shorter than monopolar group (66 ± 23 minutes). Also Singhania et al³³ found that, the operative time for bipolar group was 55.1 ± 13.3 minutes and for monopolar group was 56.76 ± 14.51 minutes, (nearly similar).

The difference in operative time is most probably operator dependent, related to orientation to the use of the bipolar resectoscope, as most surgeons are well trained to the use of the monopolar one.

A greater volume of irrigant fluid was consumed in bipolar (20.6 ± 1.2 liter) than in monopolar (17.7 ± 1.4 liter), and this is perhaps related to the longer operative time. This was in contrast to Singhania et al,³³ where they found that the mean volume of glycine used in the monopolar group was 19.8 ± 5.4 liter, while the mean volume of saline used in the bipolar group was 18.76 ± 8.1 liter, p-value was >0.05 .

In this study, the decline in serum sodium was significantly lower in the group II (1.2 ± 0.0 mmol/l) than in group I (5.7 ± 0.2 mmol/l), because of the use of normal saline as an irrigant, the result is comparable to that of Singhania et al,³³ who reported a greater decrease in serum sodium in the monopolar TURP (4.12 vs. 1.3 mmol/l). In another study Michielsen et al,²⁹ also reported less decline in serum sodium in the bipolar group (1.44 vs. 2.23 mmol/l), however; none of the patients in either group developed TURP syndrome.

The change in the hemoglobin level showed a significant decrease in the group I (2 ± 0.0 g/dl), while the decrease in the group II was (0.7 ± 0.1 g/dl). This result comes in harmony with that of Huang, et al³⁰ who found that the decrease in hemoglobin level in bipolar group was (0.71 g/dl) and in monopolar group was (1.15 g/dl). Also, Singhania, et al³³ reported a decline in hemoglobin level in bipolar group (0.55 g/dl) and in monopolar group (0.97 g/dl). On the other hand; Fagerstrom, et al³² compared the change in percentage of hemoglobin level between bipolar and monopolar TURP in randomized controlled study on 202 patients, they found that the percentage of decrease in hemoglobin level in bipolar group was 5.5%, and in monopolar group was 9.6% which was highly significant.

In contrast to this study, Ho, et al³⁴ found that there was no significant decrease in hemoglobin level between bipolar group and monopolar group. Also, Michielsen, et al²⁹ found that the decrease in hemoglobin level in bipolar group was (1.21 g/dl) and in monopolar group was (1.3 g/dl).

This study found a significantly shorter duration of postoperative irrigation in the group II (23.6 ± 4.1 hours versus 36.7 ± 5.8 hours), and a significantly shorter catheter time (5 ± 1 days versus 7.4 ± 1 days), and a shorter hospital stay (2.25 ± 0.4 vs. 3.5 ± 0.5 days).

These results are in harmony with the results reported by Giulianelli, et al (1 ± 0.5 vs. 2 ± 2 days for catheter time, and 2 ± 0.25 vs. 3 ± 2 days for hospital stay).³⁵ Patankar, et al³⁶ also reported a significantly shorter catheter time in the bipolar group (18.44 ± 2.7 versus 42.4 ± 15.2 hours), and Tefekli, et al³⁷ have mentioned

a significantly shorter hospital stay after bipolar TURP (2.3 ± 0.7 vs. 3.8 ± 0.7 days; $p < 0.05$).

According to the obtained results in this study, there was a significant improvement in the IPSS, Qmax and Qol score in both groups of the study after three month of the study compared with baseline values, but the difference between the two groups was statistically insignificant.

The improvement observed in this study, in the IPSS, Qmax and Qol score agreed with those reported in the literature for both monopolar and bipolar TURP.^{33,35,36}

In this study, four patients in the group I developed clot retention postoperatively, and three of them required blood transfusion, whereas only one patient in the bipolar group had clot retention and required blood transfusion.

During the follow up period, one patient from the group I was re-admitted for hematuria and clot retention, and two patients from the bipolar group re-admitted one for high grade fever and heavy pyuria and the other one for late hematuria.

Results of this study were similar to that mentioned by Giulianelli, et al³⁵ Starkman, et al and Santucci, et al²² who reported a lower complication rate in the bipolar group compared to the monopolar group.

CONCLUSIONS

Bipolar TURP is a promising alternative for the treatment of patients with BPH, with comparable efficacy, shorter hospital stay, faster recovery than the conventional monopolar TURP, with less perioperative bleeding, serum sodium reduction and postoperative complications.

RECOMMENDATIONS

Because of the small sample in this study and the limited follow-up period our results need to be validated in a larger study with a longer follow-period to perfectly evaluate the safety and effectiveness of the bipolar TURP.

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