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Our Initial Experience with Bipolar TURP for Patients with BPH

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Abstract: Background: Despite the development of new minimally invasive methods, transurethral resection of the prostate (TURP) has been considered the cornerstone of surgical management for prostatic enlargement. The most significant technical modification of TURP is the incorporation of bipolar technology permitting resection using saline as the irrigation fluid. **Objective:** To evaluate our initial experience with bipolar transurethral resection of the prostate in cases of BPH. **Patients & Methods:** In the period from July 2011 to October 2012, a total of 16 male patients with a mean age of 65 years (ranges from 50 years to 80 years old) having enlarged prostate were candidates for intervention and had been treated by bipolar transurethral resection of the prostate. Evaluation was made taking in consideration the following parameters: Preoperative and postoperative Hb & S. Na, preoperative and postoperative maximum flow rate tested by uroflowmetry, prostatic size measured preoperatively by abdominal ultrasound, resection time and resection weights, duration of catheterization and hospitalization. **Results:** Statistical comparison was made between preoperative and postoperative hemoglobin, serum sodium, and maximum flow rate. The mean preoperative and postoperative hemoglobin levels were 12.58±1.6 g/dL and 12±1.7g/ dL, respectively, with no significant changes (P-value= 0.348). The mean preoperative and postoperative serum sodium concentrations were 137.25±4.5 mEq/L and 135.84±4.4 mEq/L, respectively, showing no significant changes (P-value= 0.382). No case of TUR syndrome happened in our cases. Uroflowmetry tests were done to all patients that can urinate preoperatively (10 patients) with their mean value of Q max was 10 ml/ sec, and postoperatively for the same ten patients of 17 ml/ sec, with a significant P value of 0.001. Catheter removal and discharge from the hospital were on the 2nd postoperative day. **Conclusion:** Bipolar TURP using saline as an irrigant fluid is an effective and safe technology in treating patients with BPH. Bipolar TURP has an advantage of reducing the decline in postoperative serum Na^+ level and the risk of TUR syndrome. **AIM OF THE STUDY**: This study aims to evaluate our initial experience with bipolar transurethral resection of the prostate in cases of BPH.

Keywords: .

INTRODUCTION

The prostate, a walnut-shaped gland in the male reproductive system, produces semen-forming fluid vital for fertility. It surrounds the urethra, a part of the lower urinary tract. The surgical treatment of benign prostatic hyperplasia has progressed from traditional open suprapubic and perineal prostatectomies to more advanced techniques such as transurethral resection (TURP) and LASER operations. TURP is often regarded as the most reliable and effective method, but LASER enucleation techniques are also highly regarded as equally effective regardless of the size of the prostate. [Finley, D. S. *et al*., 2007; Badraoui, M. *et al*., 2004]

Benign prostatic hyperplasia (BPH) is a prevalent condition that frequently affects elderly men. The progressive aging of the population is steadily raising the percentage of these patients in urology facilities in our country. The prevalence of benign prostatic hyperplasia (BPH) rises significantly from 11.3% in the age group of 40-49 years to 81.4% in those aged 80 years. This condition has a prevalence of 95.5% in men who are above 80 years old [Finley, D. S. *et al*., 2007]. Official figures indicate that the total number of registered patients with prostate illnesses in the Russian Federation has steadily risen by 61.8% from 2002 to 2009 [Badraoui, M. *et al*., 2004]. Transurethral resection (TUR) is still the primary surgical approach for treating benign prostatic hyperplasia (BPH) [Badraoui, M. *et al*., 2004; Lee, D. *et al*., 2005; Ho, H. S. *et al*., 2008; Huang, X. *et al*., 2007].

The key factors that establish this approach of endoscopic surgery as the "gold standard" are its minimal invasiveness compared to open adenomectomy, the short recovery time for patients, and the ability to perform surgical therapy in individuals with concurrent disorders [Finley, D. S. *et al*., 2007]. The aspiration to prevent problems, primarily intraoperative and early postoperative bleeding, has prompted the exploration of novel techniques and enhancement of current surgical approaches for the treatment of benign prostatic hyperplasia[Wang, D. S. *et al*., 2004; Michielsen, D. P. *et al*., 2007; Rassweiler, J. *et al*., 2007; Elzayat, E. *et al*., 2006].

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The dynamic growth of the pharmaceutical industry and the introduction of combination medication therapies are shaping the current approach to treating patients with lower urinary tract symptoms caused by prostatic hyperplasia (PH)[Brunckhorst, O. *et al*., 2015; Hochreiter, W. W. *et al*., 2002]. Nevertheless, in many cases, patients with comorbidities such as cardiovascular disease and diabetes may find the surgical treatment of RPG to be more advantageous and, in some instances, the only viable option due to the concurrent use of medicines from multiple pharmacological classes[Shimizu, Y. *et al*., 2005; Liu, C. *et al*., 2010; Lin, Y. *et al*., 2016]. In this scenario, the doctor's objective is to select the most advantageous surgical approach that minimizes the likelihood of problems and guarantees a lasting clinical outcome. These factors are associated with the active techniques used in the surgical removal of intraurethral adenoma of the prostate. The introduction of various forms of energy for the removal of the prostate gland in urology has become a desirable substitute for transurethral resection of the prostate (TURP) [Lin, Y. *et al*., 2016; Woo, H. H. *et al*., 2011]. The use of bipolar techniques into clinical practice has greatly broadened the range of surgical options available for older patients with comorbidities. The implementation of laser technology in urology has effectively minimized the likelihood of potential consequences. Currently, there is insufficient data comparing contemporary procedures with bipolar transurethral resection of the prostate (TURP) in older patients, who are more susceptible to both intra- and postoperative problems [Hirasawa, Y. *et al*., 2012].

PATIENTS AND METHODS

This study was conducted from July 2011 to October 2012 in the Urology Department of AL-Sader Medical City in Najaf Governorate, Iraq.

Our study included all individuals who were eligible for Transurethral Resection of the Prostate (TURP). These are patients who have not responded to medical treatment with alpha-blockers or 5-alpha reductase inhibitors for at least three months. They have also experienced acute urine retention (AUR) and have been unable to urinate without the use of a urinary catheter.

This study excluded patients who had confirmed or suspected prostate cancer based on abnormal results from a digital rectal examination (DRE), elevated levels of prostate-specific antigen (PSA), neurogenic bladder, renal impairment, or an inability to assume the dorsal lithotomy posture.

Patients that were recruited for the study provided informed consent. The diagnostic evaluation comprised a comprehensive assessment that involved obtaining the patient's medical history, doing a physical examination including a digital rectal examination, analyzing urine samples, measuring serum electrolyte levels and renal function, performing a complete blood count, obtaining a chest X-ray and an electrocardiogram, and measuring prostate-specific antigen levels.

The preoperative size of the prostate was assessed by abdominal ultrasound and estimated using the Ellipsoid formula, which calculates the volume as the product of the length, width, height, and a constant factor of 0.52. All patients who were able to empty underwent preoperative uroflowmetry and were administered a perioperative intravenous antibiotic (ceftriaxone 1 gm). All patients underwent surgery under spinal anesthesia and were positioned in the lithotomy position.

Patients received intravenous Normal Saline infusion during the intraoperative phase. Before the surgery, blood samples of 5 mL were collected to measure the levels of salt and hemoglobin in the serum. After the surgery, blood samples were taken at 6 hours and 24 hours post-operation, and the average of these measurements was calculated.

The patient's vital signs, such as pulse, blood pressure, and oxygen saturation, were continuously monitored using a pulse oximeter. The complete removed specimen was weighed and sent to the pathologist for analysis.

The study collected data on various parameters in patients who received a bipolar resection utilizing the PK Plasma kinetic bipolar resection Martin system. These parameters included the average age of the patients, the duration of the resection procedure, the weight of the tissue that was removed, the changes in levels of haemoglobin and serum sodium, the duration of catheterization, the length of hospital stay, and any complications that occurred during the perioperative period. The surgical instrument employed was a 26 French double sheath continuous irrigation scope. Postoperative bladder irrigation was discontinued on the initial day, catheter extraction was performed on the following day, and patients were discharged once they were able to urinate naturally.

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The data were statistically evaluated using the SPSS program (Statistical Package for the Social Sciences, version 15.0, SPSS, Chicago, IL, USA). The parametric data were analyzed by doing a paired t-test.

A P-value less than 0.05 was deemed significant, while a value less than 0.005 was regarded as extremely significant. The R number represents the Pearson correlation coefficient, which has a significant value of less than 0.4.

RESULTS

In the period from July 2011 to October 2012, sixteen male patients with their ages range from 50 to 80 years (mean= of 65 years) underwent bipolar TURP in the Urology Department of Al- Sader Medical City in Najaf.

Their preoperative prostate size measured by abdominal Ultrasound was 35.8 to 90 ml (mean=58.16±20.44 ml).

The resection time was 13 to 30 min (mean=19.14 minutes). The mean weight of resected prostatic tissue was 12.33 gm (range 3.7 to 34.5gm).

There was a significant linear regression correlation between resection time and prostatic size (R=0.4), as show in Figure (7).

All patients had their histopathology reports of BPH.

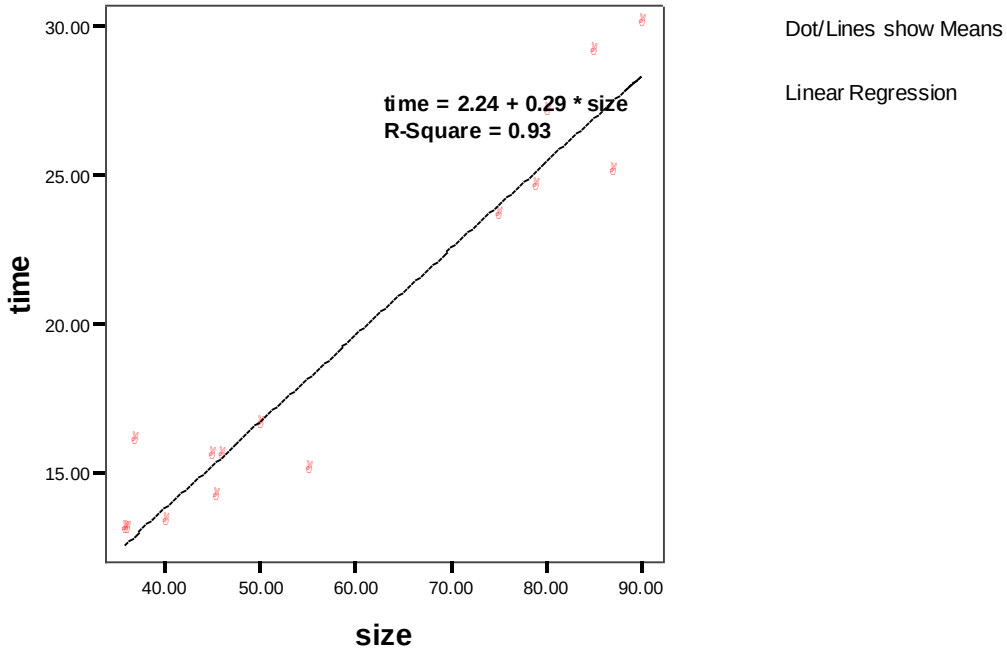

Figure 1: Shows the linear regression correlation between prostatic size and resection time.

The mean preoperative and postoperative hemoglobin levels were 12.58±1.6 g/dL and 12±1.7g/dL, respectively, with no significant changes (P-value= 0.348), as show in Table (1).

The mean preoperative and postoperative serum sodium concentrations were 137.25±4.5 mEq/L and 135.84±4.4 mEq/L, respectively, showing no significant changes (P-value= 0.382), as shown in table (1).

Table (1): Shows the changes in pre and postoperative Hb and S. Sodium.

Parameter	Mean	SD	Minimum	Maximum	P-value
Hb (g/dL): preop.	12.58	1.6	10.10	15	0.348
Hb (g/dL): postop.	12	1.7	9.30	14.9	
Na (mEq/L): preop.	137.25	4.5	132	150	0.382
Na (mEq/L): postop.	135.84	4.4	131	148	

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There was no clinical diagnosis of TUR syndrome (confusion, hypertension, and bradycardia) in any of our patients and no perioperative morbidity or mortality.

Uroflowmetry test was done to all patients who can urinate preoperatively (10 patients) with their mean value of Q max of 10 ml/ sec, and postoperatively for the same ten patients of 17 ml/ sec, with highly significant changes (P-value of 0.001), as show in Table (2).

Table (2): Shows the pre and postoperative Q max levels.

Parameter	Mean	SD	P value
Q max (ml/sec): preop.	10	2.8	0.001
Q max (ml/sec): postop.	17	2.1	

There is a significant linear regression relationship between the resected prostatic tissue and postoperative Q max, with R-Square =0.41, as shown in Figure (8).

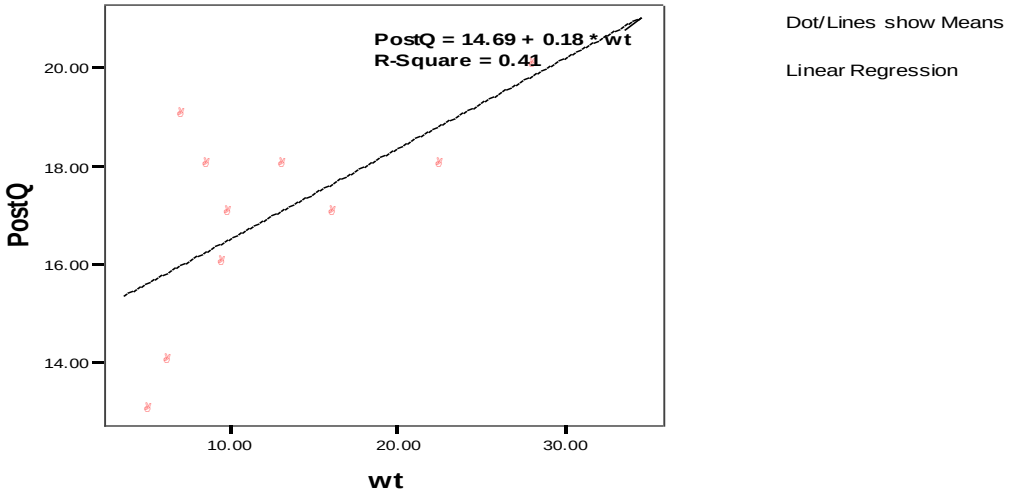

Figure (2): Shows the relation between the resected prostatic tissue and postoperative Q max.

Catheter removal was done on 2nd postoperative day in all patients, and they were discharged from the hospital upon spontaneous voiding on 2nd postoperative day, too.

Table (3): Shows all variables taken in this study.

Parameter	Minimum	Maximum	Mean	SD
Age (yr)	50	80	65	7.9
Prostatic size (ml)	35.81	90	58.16	20.44
Hb (g/dL): preop.	10.1	15	12.58	1.6
Hb (g/dL): postop.	9.3	14.9	12	1.7
Na (mEq/L): preop.	132	150	137.25	4.5
Na (mEq/L): postop.	131	148.5	135.84	4.4
Q max (ml/sec): preop.	5.8	14	10	2.86
Q max (ml/sec): postop.	13	20	17	2.16
Resection Weight (gm)	3.7	34.5	12.33	8.8
Resection Time (min)	13	30	19.41	6.1
Time of catheter removal (day)	2	2	2	0
Day of discharge from the hospital	2	2	2	0

DISCUSSION

Currently, a multitude of transurethral operations are conducted to alleviate urinary issues caused by prostatic blockage.

Despite the introduction of several alternative treatment technologies in the past twenty years, transurethral resection of the prostate (TURP)

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continues to be considered the most effective surgical treatment for benign prostatic enlargement.

A novel resection device utilizing bipolar electrocautery and 0.9% sodium chloride solution as irrigation fluid has been created as an alternative to the traditional monopolar electrocautery. The clinical effectiveness of this device has been extensively assessed.

Recent trials have assessed the safety and effectiveness of bipolar resectoscopes and have reported advantages compared to normal monopolar resection. By utilizing physiologic saline (0.9% NaCl) as the irrigation solution, the risk of TUR syndrome is eliminated, allowing for the removal of tissue without the need for a specific time constraint.

The bipolar technique can be utilized with equal safety and efficacy in the excision of large glands (> 60 g), as demonstrated in previous studies on the resection of smaller and medium-sized glands.

In a multicentre study on bipolar transurethral resection of the prostate (TURP), operators showed a preference for bipolar TURP over monopolar TURP due to the cleaner resection surfaces (64%) and the higher accuracy achieved when resecting the apex of the prostate glands (93%).

In our study, we employed bipolar transurethral resection of the prostate (TURP) for patients with prostate sizes ranging from 35.81 to 90 g (mean 58.16 g). The highest duration of the resection procedure was 30 minutes. We observed a significant linear regression association (R=0.4) between the size of the prostate and the time required for resection.

The occurrence of collateral and penetrative tissue injury is minimized, resulting in reduced tissue charring, improved identification of the surgical capsule, and decreased formation of granulation tissue. Patients who had bipolar TURP experienced a lower average duration of catheterization (2.3 days vs. 3.2 days) and a shorter hospital stay (3.2 days vs. 3.8 days) compared to those who received monopolar TURP. In our study, we removed the catheter from all patients on the second day after their surgery. Additionally, the patients were discharged from the hospital on the same day once they were able to urinate naturally.

Michielsen *et al*. have documented that bipolar resection leads to significantly longer operating times. Another study by Michielsen *et al*. focused on their experience with large prostate resections and found that the use of a bipolar resectoscope resulted in only a minimal decrease in hematocrit levels. In contrast, our study revealed a decrease in hemoglobin levels of 0.58gm/dL following bipolar TURP. The decrease in hemoglobin levels was not statistically significant (P-value 0.348), and none of the patients needed a blood transfusion.

Our study demonstrated an average decrease of 1.41 milliequivalents per liter (mEq/L) in serum sodium content following bipolar transurethral resection of the prostate (TURP). Nevertheless, the decrease in sodium levels did not reach statistical significance (P-value 0.382).

In a tiny pilot study conducted by Issa *et al*., it was noted that despite an extended duration of surgical removal, the average decrease in serum sodium content was merely 1.6 mEq/L.

The increase in Q max seen in our study was statistically significant, with a notable improvement from an average of 10 ml/sec before the surgery to 17 ml/sec after undergoing bipolar TURP (P-value 0.001).

A linear regression link was observed between the weight of the removed prostatic tissue and the improvement in Q max.

Another study demonstrated that transurethral resection of the prostate (TURP) performed on patients with prostate glands larger than 60 ml yielded outstanding outcomes in terms of perioperative blood loss, alteration in serum sodium levels, and time of catheterization [Faul, F. *et al*., 2007; Assel, M. *et al*., 2019].

Beak *et al*. conducted a study on the perioperative results of bipolar transurethral resection of the prostate (TURP) in patients with prostate glands larger than 80 ml. The study concluded that bipolar TURP had several advantages, including a smaller change in serum sodium levels and a smaller change in hemoglobin levels.

All of our patients experienced no complications during the surgical process, and none of the procedures were halted because of capsular perforation. There were no patients in our care who needed a blood transfusion or had to undergo recatheterization due to clot retention. Furthermore, none of our patients necessitated any form of intervention during the postoperative

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follow-up, such as the need for reoperation. There were no cases of epididymitis or cardiac morbidity observed in any of our patients throughout the postoperative follow-up. The user's text is "[Masumori, N. *et al*., 1996]".

Our results indicate the effectiveness of this method of bipolar prostate surgery. However, it is necessary to note a number of nuances that distinguish and highlight bipolar vaporectomy. We noted that in some cases, this electrode is not always well activated and forms a plasma arc upon contact with pancreatic tissue. This fact, in our opinion, is associated with the lower resistance of the electrode, which contains twice as much metal as a conventional electrode loop. Lower resistance leads to longer heating and, accordingly, longer formation of air bubbles and plasma arc. A solution to this problem was found by constant irrigation of warm saline solution (at a temperature not lower than (380C)

CONCLUSIONS

Our results indicate that bipolar TURP using saline as an irrigant fluid is an effective and safe technology in treating patients with BPH. Bipolar TURP has an advantage of reducing the decline in postoperative serum Na^+ level and the risk of TUR syndrome.

Bipolar resection also allows for a reduction in the use of irrigation volume, catheter, and hospital time.

RECOMMENDATIONS

This study contributes to the growing body of evidence that may herald a new era with bipolar TURP as the standard of surgical care for symptomatic BPH.

However, a larger number of patients and a longer follow-up period are necessary to reinforce the present findings, and a comparative study between monopolar and bipolar TURP is recommended.

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