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High Power Diode Laser Prostatectomy versus Transurethral Electroresection of Prostate for symptomatic Benign Prostatic Hyperplasia

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Abstract

Background: Endoscopic urological procedures have become a treatment option for Benign Prostate Hyperplasia. It includes both Laser prostatectomy and Trans Urethral Resection of Prostate.
Aim: To elucidate the benefits and drawbacks of laser system in the treatment of patients with BPH in comparison with TURP procedures.
Methods: Aprospective study enrolled 40 patients, between (50-90 years), diagnosed with lower urinary tract symptoms secondary to BPH, between (November 2014 to June 2015). The techniques used in the study were Electro-cautery resection of prostate (TURP) as Group A, and laser ablation of the prostate (diode laser prostatectomy TULAP) as Group B, and Outcomes were evaluated.
Results: A significant increase in maximum flow rate was observed among BPH patients treated with TULAP compared to TURP ($p<0.001$). There was a significant lower hospital stay for BPH patients treated with TULAP technique ($p<0.001$). The Catheter Time was significantly lower among patients treated with TULAP technique ($p=0.001$). No significant difference was observed in procedure time between both techniques ($p=0.2$). There was a significant increase in prostate specific antigen (PSA) among BPH patients treated with TURP technique ($p=0.01$).
Conclusion: Laser prostatectomyis effective in dealing with lower urinary tract symptoms caused by BPH. Early subjective functional results appeared that lasers are safe and effective as long as the patients are carefully selected for surgery.

Keywords: Prostatectomy, TULAP, TURP.

Introduction

The prostate is a fibromuscular and glandular organ lying just inferior to the bladder. The normal prostate weighs about (20 g) and contains the posterior urethra, which is about 2.5 cm in length (1). More than 30% of men over 65 years-old have either irritative or obstructive urinary problems, as their chief complaints (2).Lower Urinary Tract Symptoms (LUTS) are very common in men (3,4,5). Younger men have also LUTS, but as men are ageing, the prevalence and severity of LUTS increases, although LUTS could also fluctuate to some extent (6,7). As populations grow older, costs for the treatment of LUTS are also likely increases rapidly, which underscore the importance of comparisons of effectiveness and costs of conservative and operative treatments (8). LUTS secondary to BPH remains a highly prevalent problem among men in the USA. 75.1 % of men over 70 years old had at least one BPH related symptom (9).Surgical treatment of BPH was reported in 8.0 % of men 60 to 69 years old and 22.4 % of men over70 years old (10). The optimal

treatment for LUTS must be decided individually based on the clinical findings and the degree of bother that symptoms cause. In complicated cases, such as in urinary retention, renal insufficiency resulting from urinary retention or bladder calculi, surgery is the treatment of choice (11,12,13,14). But still studies have also shown the effectiveness of surgical treatment for LUTS (15,16).The method for the surgical treatment of male lower urinary tract symptoms (LUTS) due to urethral obstruction is TURP for prostates <80 ml in volume and open prostatectomy for prostates >80–100 ml in volume, TUR (Trans-Urethral Resection) syndrome occurs after the absorption of irrigating fluid during surgery (17).Clot retention has been reported to occur in approximately 6% of patients after both monopolar TURP and bipolar TURP (18,19).

Despite the introduction of alternative techniques, (TURP) still represents the gold standard in the operative management of (BPH) (20). TURP is divided into four steps: mid-lobe resection, paracollicular transurethral resection (TUR) (21). Another milestone was video-assisted resection. Electro resection is performed by monopolar, high frequency current with a maximum cutting power of 200 watts (22).Complications and morbidity related to this procedure, such as blood loss, fluid balance disturbances, excessive fluid absorption, incontinence, and erectile dysfunction led to the development and investigation of new techniques. Technological alternatives such as laser treatments may further minimize the risks of this technically difficult procedure (24).Coagulation of prostatic tissues using diode laser through urethra is the most common technique applied, with excellent homeostasis, little morbidity, and decrease in patients complaints due to obstruction of urethra and finally improvement of their quality of life (25,26).Diode lasers use a special diode to generate energy. The operating wavelength of 980 nm is near the infrared electromagnetic spectrum, and is therefore easily absorbed by water and hemoglobin. This results in good hemostatic properties and tissue vaporization performance. Laser techniques include visual laser ablation of the prostate (VLAP) and holmium inoculation of the prostate (HoLEP).Laser technology has also been used to treat lower urinary tract symptoms (LUTS) secondary to BPH for more than 15 years(27,28). Increasingly, laser therapy is being considered for the surgical management of BPH of any size, as an alternative to TURP (29).Diodes are semiconductors with the ability to generate and emit monochromatic light. This light is passed through a crystal, which leads to the final wavelength. Diode lasers are available in various wavelengths and fiber designs (that is, side-firing and end-firing) (31).Techniques consist of coagulation (photoselective vaporization of the prostate [PVP]), vaporization (PVP and diode), resection, and enucleation, depending on the wavelength, power, and type of laser emission (33).

The major disadvantage of these lasers is the near-infrared wavelength, with its physically defined deep optical penetration that causes coagulation necrosis. This necrotic tissue leads to dysuria, sloughing and long-lasting storage symptoms (37).

Aim: The aim of this study is to reportand to elucidate the benefits and drawbacks of laser system in the treatment of patients with BPH in comparison with TURP procedure.

Materials

A prospective study performed from (November 2014 to June 2015).Forty patients diagnosed with bladder outlet obstruction secondary to BPH, (20 cases operated with TURP and 20 cases with TULAP),their ages between (50-90 years), done in Sulaimani city. In all cases, pharmacological treatment had been tried, with minimal or no response. Patients were evaluated by means of anamnesis (the symptoms being evaluated through, physical examination including digital rectal examination (DRE), prostate-specific antigen (PSA), transrectal ultrasonography and uroflowmetry).

Inclusion criteria: Moderate to severe urinary symptoms, as determined by IPSS (score≥8), and Qmax of less than 15 ml/s, with or without significant post-void residual volume (PVR), urine analysis and blood examination also done.

Exclusion criteria: Active urinary tract infection at time of treatment, vesical stone, Urethral conditions that may prevent insertion of a rigid 20F cystoscope, Previous TURP or laser procedure, pelvic surgery or irradiation, Prostate-specific antigen ≥10 ng/l, history of prostate or bladder cancer, Other medical condition or co-morbidity contraindicative for TURP, Urethral stricture, previous prostatic surgery, and obvious manifested neurogenic bladder dysfunction(diagnosed by urodynamic study).

Methods

Spinal anaesthesia was used in all cases, and surgery was performed by different surgeons, patients who underwent TURP; Monopolar TURP was performed with a Storz 25 Charriere resectoscope, using an STORZ ICC 350 generator (Germany) set at 130/50W (cutting/coagulation mode). All resections were carried out with standard loops and factory made irrigating fluid containing glycine. For those who underwent TULAP, Prostate ablation was carried out with a diode laser at 980 nm (CERELAS BIOLITEC GERMANY) delivering 150 W of maximum output power with a 600 nm side-fire and end-fire fiber endowed within a spot of 1 mm in diameter. In all cases, saline solution or glycine solution was used for irrigation through a 22 F cystoscope. Ablation was started at the bladder neck in a clockwise manner, pulling the resectoscope further out and rotating the laser fiber simultaneously with the power set at 140 to 150 W. All prostate tissue causing obstruction was removed until a fine surgical cavity was formed, as in TURP. In all cases, a 24 F three-way catheter was placed despite obtaining clear urine or minimal haematuria. A urethral catheter was placed after the operation and was removed the next day in regard to TULAP, while 3 to 5 day needed for cases who underwent TURP, taking into consideration the degree of haematuria. Postoperative Qmax, PVR, and IPSS with QoL score were obtained 3 months after surgery. Operation time and duration of catheterization were obtained. All patients gave their informed consent prior to their inclusion in the study.

Results

A total of 40 male patients with Mean age for those treated with TURP was (76±7 years), 45% of them were (70-79 ears). About two thirds of TURP patients were self employed and their mean weight was (73±8.9Kg). As shown in table 1 and figure 1.

Table -1- shows Sociodemographic characteristics and weight of BPH patients treated with ***TURP.***

Variable	No.	%
Age mean±SD (76±7 years)		
50-59 years	3	15.0
60-69 years	8	40.0
70-79 years	9	45.0
Total	20	100.0
Occupation		
Self-employed	13	65.0
Public servant	2	10.0
Retired	5	25.0
Total	20	100.0
Weight mean±SD (73±8.9Kg)		

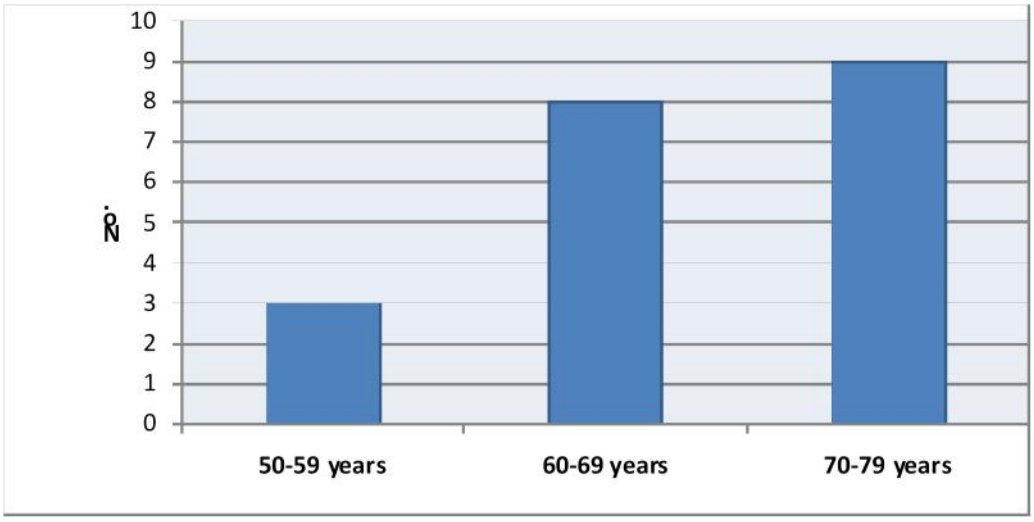

Figure -1- Age distribution of TURP treated patients.

The Mean age of patients treated with TULAP was (81±13 years), 50% of them were aging ≥ 80 years. About two thirds of TULAP patients were retired and their mean weight was (85.3±10.8Kg). As shown in table 2 and figure 2.

Table 2: Sociodemographic characteristics and weight of BPH patients treated with ***TULAP***. Group B=TULAP patients

Variable	No.	%
Age mean±SD (81±13 years)		
60-69 years	5	25.0
70-79 years	5	25.0
≥ 80 years	10	50.0
Total	20	100.0
Occupation		
Self-employed	5	25.0
Public servant	2	10.0
Retired	13	65.0
Total	20	100.0
Weight mean±SD (85.3±10.8Kg)		

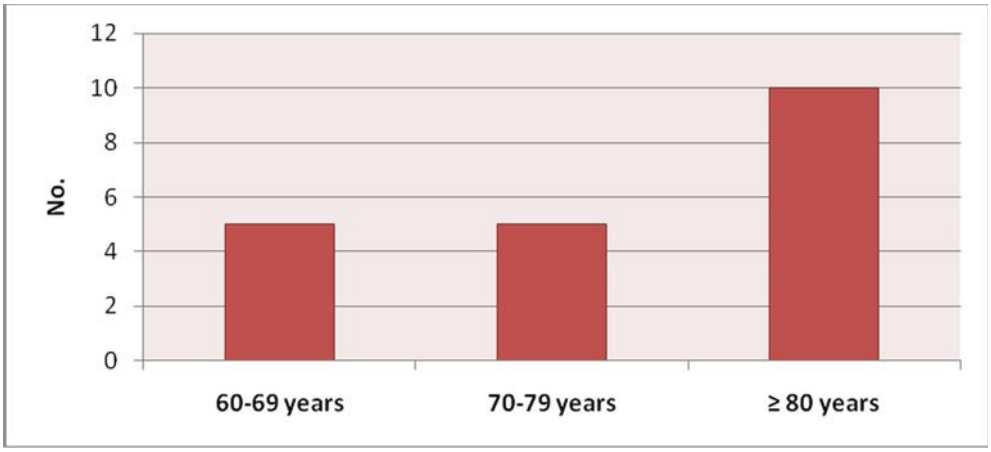

Figure -2- Age distribution of TULAP treated patients.

There was a significant correlation between elderly age of BPH patients and treating with TULAP technique (p=0.002). A significant association was observed between retired BPH patients and treating with TULAP patients (p=0.02). As shown in table 3 and figures 3, 4.

Table 3: Distribution of sociodemographic characteristics of BPH patients according to TURP and TULAP techniques.

Variable	A or TURP		B or TULAP		χ^2	P
	No.	%	No.	%		
Age						
50-59 years	3	15.0	0	-		
60-69 years	8	40.0	5	25.0	14.8*	**0.002**
70-79 years	9	45.0	5	25.0		
≥ 80 years	0	-	10	50.0		
Occupation						
Self-employed	13	65.0	5	25.0		
Public servant	2	10.0	2	10.0	7.1*	**0.02**
Retired	5	25.0	13	65.0		

**Fishers exact test.*

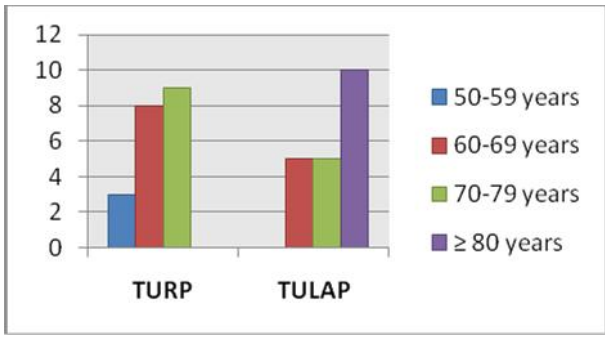

Figure -3- Age distribution according to TURP & TULAP techniques.

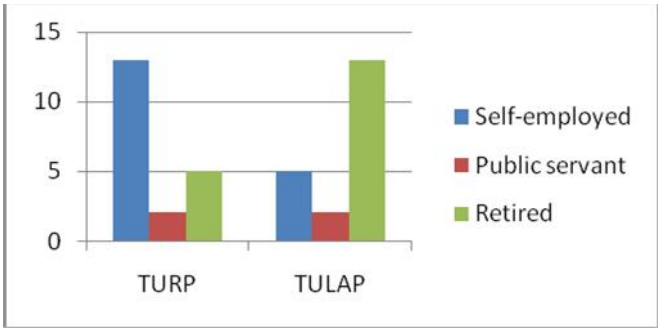

Figure 4: Occupation distribution according to TURP & TULAP techniques.

The weight of BPH patients treated with TULAP was significantly higher than those treated with TURP ($p<0.001$). There was significantly higher prostate size among patients treated with TULAP technique ($p<0.001$). A significant increased in maximum flow rate was observed among BPH patients treated with TULAP ($p<0.001$). There was a significant lower hospital stay for BPH patients treated with TULAP technique ($p<0.001$). The Catheter Time was significantly lower among patients treated with TULAP technique ($p=0.001$). No significant difference was observed in procedure time between TURP & TULAP techniques ($p=0.2$). As shown in Table 4 and Figure 5, 6.

Table -4- shows Distribution of weight, PS, Max. Flow Rate, HS, Cath. Time, procedure time and PSA according to TURP & TULAP techniques.

Variable	TURP	TULAP	t-test	P
	Mean±SD	Mean±SD		
Weight (Kg)	73±8.8	85.3±10.8	3.9	**<0.001**
Prostate size (gm)	71±26.2	118.3±47.3	3.9	**<0.001**
Max. Flow rate (ml/sec.)	11.8±1.9	16.5±2.06	7.3	**<0.001**
Hospital stay (day)	2.2±1.1	0.6±0.5	5.6	**<0.001**
Catheter Time (day)	9.9±1.7	1.7±0.4	3.7	**0.001**
Procedure time (hour)	0.9±0.3	1.07±0.4	1.1	0.2
PSA (ng/ml)	4.9±2.5	3.2±1.2	2.6	**0.01**

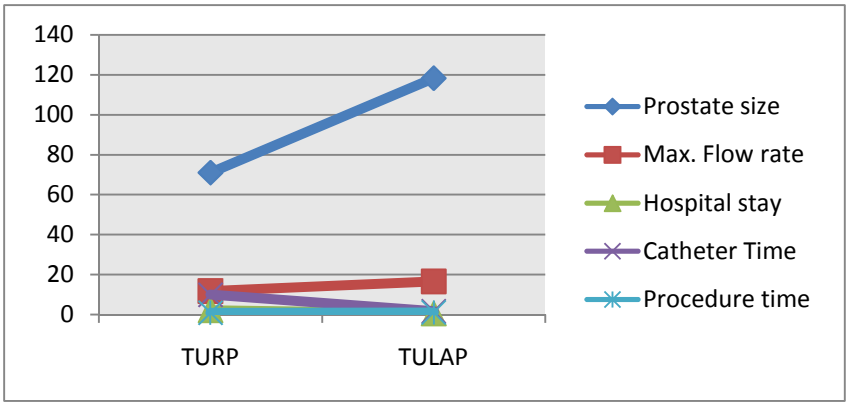

Figure 5: Distribution of prostate size, MFR, HS. Cath. Time and procedure time means according to TURP & TULAP techniques.

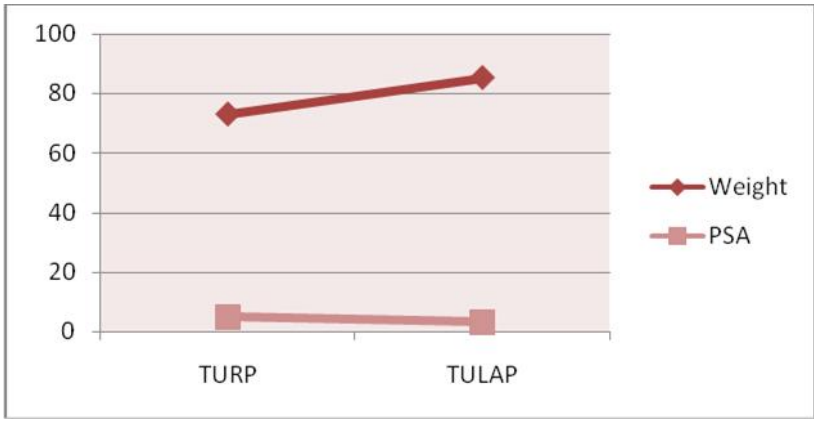

Figure -6- Distribution of weight and PSA means according to TURP & TULAP techniques.

There was no significant difference between TURP & TULAP techniques regarding postoperative complications (p=0.2). About one third of BPH patients treated with TURP had no complications; the common postoperative complications of TURP were urine retention (15%), LUTS (35%), and hematuria (15%). One half of BPH patients treated with TULAP had no postoperative complications, the common postoperative complications of TULAP were urine retention (15%), dysuria (10%), re-insertion of catheter (10%), urge incontinence (10%) and retrograde ejaculation (5%). All these findings were shown in Table 5 and Figures 8, 9.

Table -5- shows Distribution of postoperative complications according to TURP & TULAP techniques.

Variable	TURP		TULAP		χ^2	P
	No.	%	No.	%		
Complications					12.7*	0.2
No	7	35.0	10	50.0		
Urine retention	3	15.0	3	15.0		
LUTS	7	35.0	0	-		
Hematuria	3	15.0	0	-		
Re-insertion of catheter	0	-	2	10.0		
Retrograde ejaculation	0	-	1	5.0		
Urge incontinence	0	-	2	10.0		

**Fishers exact test*.

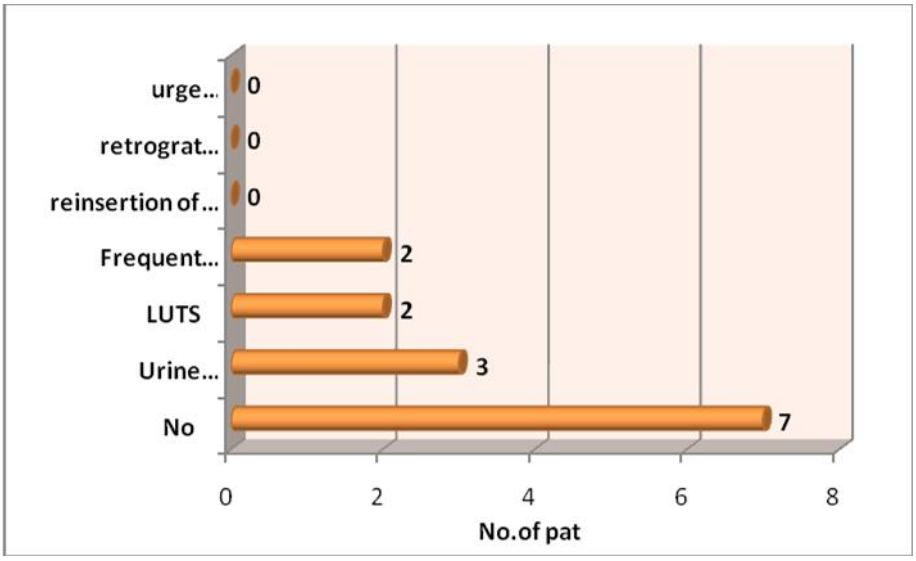

Figure -8- TURP postoperative complications.

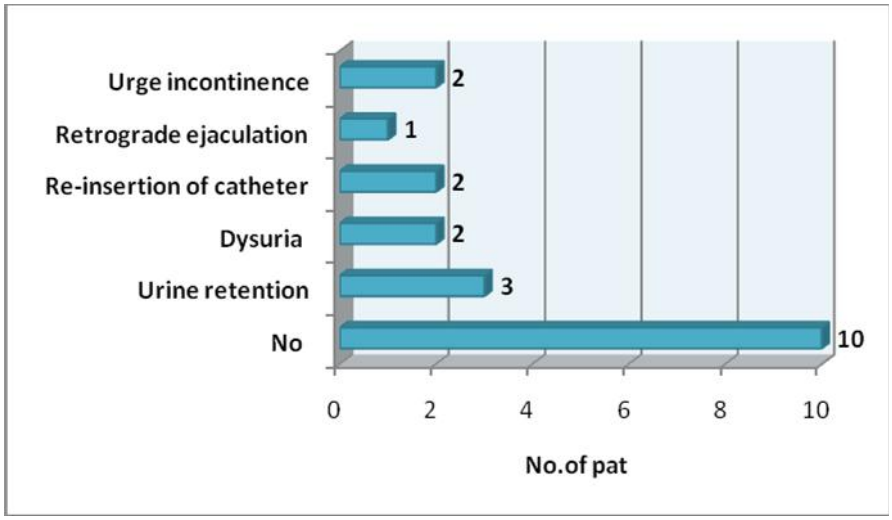

Figure -9- TULAP postoperative complications

Discussion

Laser prostatectomy for the treatment of LUTS provides outcomes and lower complication rates at least equal to those obtained with TURP (32). However, the idea that TURP should be replaced by laser therapy as the gold standard is still not widely accepted due to the lack of studies on a large number of cases (32).Mortality after TURP has decreased substantially during the past few decades to<0.25% in contemporary series (33). This might be mainly attributable to the advances in anesthesia and to the technical improvements of TURP (3).

Literature review was done by Jens Rassweiler et al, in regard to complication of TURP, their results show recent complication as follow (34): transfusion rate (0.4%), clot retention (2%), and urinary tract infection (1.7%). Urinary retention (3%) is generally attributed to primary detrusor failure rather than to incomplete resection. Early urge incontinence occurs in up to 30–40% of patients; however, late iatrogenic stress incontinence is rare (<0.5%). Despite an increasing age (55% of patients are older than 70), the associated morbidity of TURP maintained at a low level (<1%) with a mortality rate of 0–0.25%. The major late complications are urethral strictures (2.2–9.8%) and bladder neck contractures(0.3–9.2%).

In our study there were no blood transfusion needed, no TUR syndrome ,no clot retention ,we have 15% urine retention, 10% LUTS ,may be related to catheter blockage ,theater infection control ,no cases reported as early urethral stricture or bladder neck contracture, may be due to short duration study .We also found that laser prostatectomy resulted in relatively low rates of intraoperative and perioperative complications. Patients undergoing diode laser therapy did not require postoperative blood transfusions or withholding anticoagulants. Besides the re-catheterization rate was10% while Patients in other studies in diode laser group had a re-catheterization rate of approximately 17% may be due to small sampling (35, 36).

Rieken et al reported that among patients who underwent diode laser treatment, 9.6% of those with bladder neck obstruction required reoperation, compared with 3.6% among those who underwent TURP, while in our study there are no such complications. In addition, a urethral stricture developed in 5.5% of those undergoing diode laser treatments versus 0% undergoing TURP (35), in our study, during follow up , there was no urethral stricture neither TURP nor TULAP .

In our study for those treated with TURP, there was a significant decrease in post-voiding residual volume post operatively ($p<0.001$). Tim Fagerstrom et al, (37) case study reported that (71%) catheters were removed within 24 hours and additional (12%) patients had their catheters permanently removed within 48 hours. If a second try to get rid of the catheter did not succeed, patients were discharged with an indwelling catheter. While in our study the mean time of catheter removal time in TURP patients is 9.9 days and in TULAP cases is 1.7day (40hrs) for all cases. Akman et al. reported (40) to have monopolar transurethral resection of the prostate (TURP) who were followed up for 12 months. The mean procedure duration was (58.7 minutes) for monopolar TURP. The incidence of TUR syndrome was 1.5% for monopolar TURP. There was statistically significant difference in the length of hospital stay for our TURP group study compared with this monopolar TURP group (2.2 days compared with 2.5 days). There were lower rates of clot retention (0.8% compared with 15%), and mean time to catheter removal (2.4 days compared with 9.9 days).

All complications that occurred during the perioperative period (up to the end of the first month till three month after surgery) were noted. Improvements in the assessed parameters (Qmax, PVR) in each group were calculated by the paired *t*-test. Categorical variables were compared using the Chi square test. A two-sided $P < 0.05$was considered statistically significant.

Conclusions and Recommendations

Transurethral resection of the prostate (TURP) and TULAP are currently the two most commonly performed procedures for the treatment of (BPH). While each procedure has been shown to be efficacious, TURP or TULAP maybe preferred in certain clinical scenarios. A number of factors may influence the choice of which patients undergo TULAP or TURP. This decision may take into account patient characteristics, such as age, co-morbidities, predominance of irritative symptoms, and/or ongoing anticoagulation. Additionally, balancing desired outcomes with possible risks is critical. Laser prostatectomy has become widely accepted by urologists as an alternative to TURP for the treatment of BPH. Laser technology is generally accessible to the practicing urologist and the transurethral endoscopic approach and operative techniques are familiar. Laser prostatectomy has proved to be a safe and efficacious surgical intervention to relieve symptomatic bladder outlet obstruction. Overall morbidity contrasts favorably with standard surgical approaches. There are several advantages of TULAP over traditional TURP. The most important, TULAP can be used on patients with high comorbidity and those taking anticoagulation. Furthermore both techniques may be applied to patients with large prostates.

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