Klinik Çalışma

A pre-pilot study of Evaluation of Changes in Residual Urine Volume, Detrusor Pressure and Bladder Capacity by Three Different Surgeries in Symptom Scores of Prostatic Patients and: Review of the Literature

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Abstract

Objective: To show change in residual urine volume, $P_{detristol}$ Q_{max} and maximum bladder capacity in prostate symptom scores within early period six months after operation in proportion to pre-operation in three group patients that were non-homogeneous in terms of prostate volumes.

Material and Methods: Seventy-five patients with LUSS were included in study, whose bladder outflow fully obstruction had been shown with pressure flow study. Fifty patients as healthy control were included. Of the 50, TVP was applied to 15, TUEP for 15, and TURP for 20. Measurements of symptom scoring, Q_{max}, $P_{det}Q_{max}$, maximum bladder capacity and residual urine volume of all patients were performed pre-operation and post-operation. Paired T-test and Kruskal-Wallis test were used in statistical analysis. P value less than 0.05 was accepted as significant.

Results: The mean age for TVP, TUEP and TURP groups were 68.6, 61.3 and 66.6 years, respectively. Postoperative mean prostate volumes for TVP, TUEP and TURP groups were calculated as 79.1 g, 39.75 g and 54.8 g, respectively. Three groups were evaluated in terms of symptom scores, reduction in residual urine volume, $P_{detrisol}$ Q_{max}, and maximum bladder capacity before and after operation. Significant changes were detected for these parameters of patients in the TVP and TURP. On the other hand, no significant change was monitored only in terms of maximum bladder capacity was monitored in patients in the TUEP group. However, significant change was monitored in symptom scores, reduction in residual urine volume, $P_{detrisol}$ Q_{max}.

Conclusion: While almost similar significant result was monitored in terms of prostate symptom scores, reduction in residual urine volume $P_{detrisol}$ Q_{max}, and maximum bladder capacity in patient groups applied TVP and TURP despite of different prostate volume, positive result was also monitored in other parameters, except maximum bladder capacity in TUEP group, in selected patients.

Key words: Benign prostate hyperplasia, bladder, transrectal ultrasound, surgery.

Introduction

BPH is one of the most frequent causes of lower urinary system symptoms in elder men. BPH is one of the most common diseases affecting elderly men with an increasing incidence and prevalence by aging. Pathological BPH has been reported in 70% of men between the ages of 61 and 70 and in 90% of men between the ages of 81 and 90 (1,2). The goal of treatment in BPH is to reduce LUTS, fully provide the emptying of the bladder and protect the upper urinary system, as a result. In pressure flow studies of the patients with impaired excretion due to BPH, it was demonstrated that 60% of patients had obstruction, 20% had no obstruction and 20% had borderline voiding dysfunction (3,4). Lower urinary system symptomes due to BPH can be improved by medical or surgical treatment. Medical or surgical treatment can be preferred for patients with symptomatic BPH. 5-alpha reductase inhibitors

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and alpha-blockers are first-line medications for BPH. However, patients unable to respond to medical treatment can be performed transvesical prostatectomy (TVP), transurethral electrovaporization (TUEP) and transurethral resection of prostate (TURP). About 10% of the patients have the necessity for surgery as primary treatment (5,6). In this study, we evaluated the effectiveness of transvesical prostatectomy, transurethral resection and transurethral evaporation in BPH patients with confirmed obstruction by pressure-flow study.

Material and Methods

In this prospective study, 75 patients with BPH and complete bladder outlet obstruction diagnosed by pressure flow study were included. All of the patients signed informed consent and hospital ethics committee approval was confirmed. All patients had moderate or severe obstructive symptoms, confirmed by pressure flow study. Patients were performed biochemical, hematological and urine tests. Serum total and free prostate specific antigen (PSA) levels were determined. Serum PSA level of 4.0ng/ml or higher was considered high. Each patient was performed transrectal ultrasonography (TRUS) in order to evaluate prostate morphology, prostate volume and to perform prostate needle biopsy, if necessary. Ellipsoid formula was used to calculate prostatic volume (ellipsoid formula: transverse diameter x anteroposterior diameter x sefalocaudal diameter x 0.52). Patients who were previously performed prostatectomy and had prostate cancer or suspicion, urethral stricture, impaired renal function, neurological deficits (diabetes mellitus etc...) and bladder stones were excluded.

All patients in the study were preoperatively performed digital rectal examination (DRE), transrectal ultrasound guided prostatic volume determination, symptom scoring according to American Urological Association (AUA), urinalysis, examination of prostatism and symptoms and serum PSA measurement. Patients were also performed pressure-flow studies and Qmax (maximum flow rate), Pdet Qmax (detrusor pressure at maximum flow rate), maximum bladder capacity and residual urine volumes were detected. Patients with urinary tract infection were included in the study after treatment of infection in accordance with culture antibiogram. All patients were called for the first controls 6 months after the operation. However, only 50 patients applied to our clinic for control. Of these 50 patients, 15 were performed TVP, 15 were performed TUEP and 20 were performed TURP. Seven patients in TVP, four patients in TUEP and five patients in TURP groups had permanent urethral catheters. Therefore, AUA symptom scores of those were regarded as the highest value of 35 points.Before surgery, all patients were given single dose cefotak intravenously.

Surgery technique: TVP patients were operated via standard phanenstien incision. They were discharged at the 7th day of surgery after the removal of urethral catheter. TURP was performed with the conventional Iglesias type of Storz electroresector. TUEP was performed with the same electroresector, but with Storz Spil 5-mm two-system electrode (Karl-Storz GmbH, Tutlingen Germany). Storz and Valleylabs Force 40 AS (Valleylabs inc. Boulder, Colorado, USA) generators were used for both TURP and TUEP. In TUEP and TURP, 1.5% glycine solution was used for irrigation. All operations were performed under general or regional anesthesia. At the end of the operation, 22 F three-way urethral foley catheter were inserted to all patients. In TUEP and TURP patients, urethral catheter was removed when the color of the urine became clear. None of the operated patients' urethral catheter were removed before 24 hours. In control patients, AUA symptom score, Qmax (maximum flow rate), PdetQmax, maximum bladder capacity and residual urine were determined. Statistical analysis was done by paired t-test and Kruskal-Wallis variation analysis and $p < 0.05$ was considered as significant.

Results

The mean age of patients were 68.6 years, 61.3 years and 66.6 years in TVP (15 patients), TUEP (15 patients) and TURP (20 patients) groups, respectively. Average preoperative prostate volumes were calculated to be 79.1 gr, 39.75 gr and 54.8 gr in TVP, TUEP and TURP groups, respectively. Obstructive symptoms of the patients were evaluated after pressure flow study according to Abrams, Grifith (4) Nomogram. There were no statistically significant difference between groups in terms of mean age, while there were significant differences in terms of prostate volumes.

There was no significant difference between groups in terms of blood transfusion during operation (1-2 units) ($p > 0.05$), while statistically significant differences were observed between groups in terms of duration of surgery (TVP: 60-110 minutes, TUEP and TURP: between 30-90 minutes), duration of postoperative catheterization (TVP: 7-8 days, TURP and TUEP: 2-3 days; 4 days for one TUEP patient and 5 days

for two TURP patients) and hospital stay (TVP: 5-7 days, TUEP and TURP: 2-4 days) with p=0.001, p<0.001 and p<0.001, respectively (Table 1).

Statistical difference is present between prostate volumes of TVP, TUEP, and TURP groups. Because, while we approved open surgery prostatectomy in patients whose prostate volume is larger, we approved transurethral TUEP and TURP surgery in patients whose prostate volume is lesser. While significant change was monitored in the TVP group in terms of change rate in symptom scores, reduction in residual urine volume, Pdetrisol Qmax, and maximum bladder capacity before operation and postoperative in the 6th month, the most significant change was monitored at Pdetrisol Qmax in proportion to pre-operation. On the other hand, while significant change is present in symptom scores, residual urine volume, and Pdetrisol Qmax in proportion to pre-operation in the TUEP group, no significant change was monitored in maximum bladder capacity. We observed that the most significant change in the TURP group is in Pdetrisol Qmax in the TURP group as exactly in open prostatectomy group in postoperative period in proportion to pre-operation.

Table 1. Mean ages, prostate volumes, duration of surgery, no. of blood transfusions, duration of catheterization and hospital stay time in three groups

	TVP n=15	*TUEP* n=15	*TURP* n=20	*P value*
Mean age (years)	68.6	61.3	66.6	
Mean prostatic volume (ml)	79.1	39.75	54.8	*
Mean duration of surgery (min.)	72	54	62.5	***
Mean blood transfusions (no.)	0	0	0	
Mean duration of catheterisation (days)	8	3	2.5	***
Mean hospital stay (days)	6	3	2.5	***

*:p<0.05, **:p<0.01, ***:p<0.001

When preoperative and postoperative data were compared, there were statistically significant difference in terms of prostate symptom score reduction, increase in urine flow rate, decrease in residual urine volume, PdetQmax reduction, increase in maximal bladder capacity (*p <0.0001, **p <0.05, ***p <0.001, respectively) (Table 2).

One patient in TUEP group and two patients in TURP group required re-insertion of urinary catheter after removal because of temporary urinary retention and problem has been recovered after the catheter was removed 24 hours later. No additional minor and major complications happened.

Table 2. The changes in the parameters (residual urine volume, $P_{detristol}$ Q_{max} and maximum bladder capacity in prostate symptom scores) postoperative 6^{th} month in each group

	Symptom score		Residual urine (ml)		PdetQmax (mmH_20)		Max. bladder capacity (ml)	
	Preop.	Postop. 6^{th} month	Preop.	Postop. 6^{th} month	Preop.	Postop. 6^{th} month	Preop.	Postop. 6^{th} month
TVP	28.46	6	26.46	7.08	26.45	5.75	129.92	310.31
	± 7.05	±2.85***	± 7.42	±4.52***	± 6.33	±3.0***	±144.8	±83.65*
TUEP	139.31	22.46	167.62	61.15	124.95	40.15	287.62	313.9
	±115.72	±20.41*	±141.7	±124.75*	±128.05	±113.39*	±97.58	±115.0
TURP	110.85	40.07	64.9	43.92	81.46	51.47	125.95	310.47
	± 45.07	±22.2***	±32.99	±19.76*	±37.86	±37.86***	±104.69	±92.5*

*:p<0,05, **:p<,01 ,***:p<0,001

Discussion

Lower urinary tract symptoms (LUTS) are common in aging men and women. A growing body of knowledge showed that male LUTS result from several pathophysiological conditions, but benign prostatic hyperplasia (BPH) has been

recognized as a major contributing factor for LUTS in aging men. It is also known that LUTS affect quality of life in the majority of those who reach average life expectancy (7). In addition, longitudinal population-based studies which best analyse natural history of the disease have shown that BPH is a progressive disease. Progression includes increase of symptoms, acute urinary retention and the need for BPH-related surgery. Therefore, it becomes evident that BPH-LUTS has significant economical implications, since an increasing number of elderly men will eventually seek help for this condition. In daily practice, therapeutic approach is usually initiated with medical treatment and, if drugs fail, minimally invasive interventions or other surgical procedures will follow (7,8). We will be able to distinguish BPH patients with obstruction, detrusor instability or detrusor failure with pressure-flow studies. We evaluated the effectiveness of transvesical prostatectomy, transurethral resection and transurethral evaporation in BPH patients with confirmed obstruction by pressure-flow study.

Surgical treatment may be very effective and successful for patients with obstruction, while those with primary unstable bladder may benefit from medical treatment suppressing detrusor contractions (9). According to Abrams, Griffith, it has been observed more significant improvement by surgical treatment in patients with obstruction than those without obstruction (4). In our study, of the 50 patients with pressure-flow study confirmed obstruction due to BPH, 15 were performed TVP, 15 were performed TUEP and 20 were performed TURP. There was statistical difference between prostate volumes of TVP, TUEP, and TURP groups, but there was no statistical significant difference between mean ages of the patients. Our aim was not to evaluate the direct relationship between the prostate size and severity of obstruction. Because, while we approved open surgery prostatectomy in patients whose prostate volume is larger, we approved transurethral TUEP and TURP surgery in patients whose prostate volume is lesser.

Although the patients in TUEP group had partially lesser prostatic volumes, they had obstructive symptoms. All patients were performed diagnostic cystoscopy before the operation in order to evaluate urethra, length of the prostatic region and bladder. Patients who underwent TVP had larger prostatic volumes and prostatic urethras long enough not to allow TURP and TUEP. Patients had no pathological findings in cystoscopy, such as tumor or stone. TURP is generally suitable for prostates up to 80-100 ml, while open surgery is recommended for prostates larger than 100 ml. (10-12) In a 5-year study on the efficacy and safety of TURP and open prostatectomy, Emberton et al. (13) reported no difference between two surgical methods. In another study Meyhoff et al. (14) reported that in patients who underwent TVP, detrusor pressure at maximum flow rate declined from 75 cm H_20 to 30 cm H_2O and maximum urinary flow rate increased from 8 ml/sec to 23 ml/sec; six months after surgery. Castro et al. (15) evaluated TVP patients before and after the operation and concluded that detrusor pressure at maximum flow rate declined from 92 cm H_20 to 39 cm H_2O and, while maximum urinary flow rate increased from 6.9 ml/sec to 23.5 ml/sec. In TVP group of our study, preoperative detrusor pressure at maximum flow rate has declined from 110.8 cm H_20 to 40.1 cm H_20 and maximum urinary flow rate has increased from 7.63 ml/sec to 21.9 ml/sec; when controlled six months after surgery. These results were statistically significant.

There is not a common concept recognized all over the world for the surgical treatment of BPH with TUEP. There are also some differences related to the implementation of this procedure. For example, Kaplan and Alexis declared that they first started the vaporization from bladder neck or median lobe up to verumontanum, and then vaporized the area between the levels of 1-5 o'clock and 7-11 o'clock up to verumontanum (16). However, Tewari and Narayan recommend that bladder neck should only be vaporized at the levels of 5-7 o'clock, and the remaining tissue should not be vaporized in order to protect ejaculation and provide early epithelialization of 1-11 o'clock line (17). In TUEP, there becomes less bleeding until it reaches the capsule, but bleeding increases when closer to the capsule (18). In TUEP study of Porru et al. (19) it was reported that preoperative detrusor pressure at maximum flow rate has declined from 80 cm H_20 to 37 cm H_20 and maximum urinary flow rate has increased from 7.2ml/sec to 17 ml/sec; when controlled two months after surgery. In our TUEP group, preoperative detrusor pressure at maximum flow rate has declined from 64.9 cm H_20 to 43.9 cm H_20 and maximum urinary flow rate has increased from 6.5 ml/sec to 15.7 ml/sec; when controlled six months after surgery. These results were statistically significant. Today, TURP is more popular than open surgery due to lower mortality and shorter hospitalization time. At the same time, development of high-quality resectoscope, fiber optic and lens systems has increased the ratio in TURP in prostate surgery (20). Transurethral surgery to resolve bladder

outlet obstruction was done by Pare for the first time in 16th century (21). After Steams developed Tungsten loop in 1926, the TURP procedure has become widespread (22). Meyhoff et al. (14) reported that in 34 patients who underwent TURP, detrusor pressure at maximum flow rate declined from 75 cm H_20 to 40 cm H_2O and maximum urinary flow rate increased from 8.3 ml/sec to 16 ml/sec; six months after surgery. Jung et al. (23) reported that in 43 patients who underwent TURP, detrusor pressure at maximum flow rate declined from 60 cm H_20 to 35 cm H_2O and maximum urinary flow rate increased from 9.2 ml/sec to 21 ml/sec; after 9-month follow-up . In another study, as demonstrated by Jensen et al. (24) detrusor pressure at maximum flow rate declined from 60 cm H_20 to 27 cm H_2O and maximum urinary flow rate increased from 9.5 ml/sec to 16.3 ml/sec; six months after TURP in134 patients. In another TURP study of 29 patients, it was declared that mean maximum urinary flow rate increased from 3.8 ml/s to 20.9 ml/sn, AUA score decreased from 26.4 to 6.3 and PVR decreased from 229 ml to 43.4 three months after surgery. In the same study, one year after the operation, maximum urinary flow rate, AUA score and PVR were 20.9 ml/s, 4.7 and 31.3 ml, respectively (25). In our TURP group, preoperative mean Pdet Qmax was 81.4 cm H_20 and maximum urinary flow rate was 5 ml/sec, while postoperative values were 51.4 cm H_20 and 24.4 ml/sec, respectively. This result was statistically significant.

TURP is generally preferred more often than open surgery because of low morbidity and invasiveness. TURP, the gold standard for the treatment of symptomatic BPH, is an effective technique with low mortality rates (26,27). However, serious conditions such as retrograde ejaculation, urethral stricture and incontinence may also develop following TURP (28). In our study, improvements in bladder capacities of the patients in each group were statistically significant ($p < 0.05$). However, increase in the bladder capacity was a little more prominent in TUEP group. Kaplan et al. (29) reported that 9% of their TUEP patients and 6% of TURP patients required recatheterization, while in another study 3.3% of the patients after TURP were recatheterized (30). In our TUEP and TURP groups, 5.5% and 10% of the patients required re-catheterization, respectively. Differences in healing of infravesical obstruction after TVP, TURP and TUEP depends on the residual tissue in the prostatic apex (14). Therefore, we took care not to leave residual tissue at the apex of prostate, especially after TURP and TUEP.

Urethral stricture is a common complication after transurethral procedures, and may require a secondary operation. Kaplan et al. (29) detected urethral stricture incidence as 3-4% after TUEP and TURP (16,29). In another study, the incidence of stenosis after TURP was repoted as 7.5% (31). In a large series, including 1855 patients, urethral stricture rate after TURP was 10.9% (32). In our study, no urethral strictures were detected at 6th month controls after surgery. Except the longer duration of catheterization after TVP, all three surgical procedures had no superiority to each other in terms of postoperative complications. In all three surgical techniques we applied, postoperative data were statistically significant from preoperative data. When preoperative and postoperative mean detrusor pressures at maximal flow rate and maximal flow rates were evaluated according to the Abrams, Grifith (4). Nomograms; patients were carried from obstructed zone to nonobstructed zone by all three surgical procedures. However, the lowest intravesical pressure and the highest peak flow rate were obtained via TVP. In this respect, considering the postoperative effectiveness of treatment, procedures can be ranked as TVP, TURP and TUEP. In theory, over a certain cut-off value of prostatic volume, an operative technique may be superior to another. Yet, in patients with small volumes, efectivity of treatment modalities to reduce urethral resistance may be a little different or not.

Conclusion

In our study, when parameters of symptom scores, reduction in residual urine volume, Pdetrisol Qmax, and maximum bladder capacity before operation and postoperative in the 6th month are considered, significant change at similar level was monitored in TVP and TURP groups. However, when prostate volumes in selection of patients were considered, considering advantages in it self of either surgery is a more true approach instead of talking about superiority each other between open prostate surgery and transurethral prostate surgery due to difference. On the other hand, significant change in the TUEP group which has lesser prostate volume was also monitored in other parameters in proportion to pre-operation in parameters apart from bladder capacity change. However, results of this pilot study continue more significant inference will may make a more comprehensive contribution to literature after multicentric studies to be done as well as long term results.

Üç Farklı Cerrahi ile Prostat Hastalarındaki Semptom Skorlarında, Rezidüel İdrar Volumü, Detrusör Basıncında ve Mesane Kapasitesindeki Değişimin Literatür Eşliğinde Bir Ön Çalışma ile Değerlendirilmesi

Özet

Amaç: Prosatat volumleri açısından homojen olmayan üç grup hastada, prostat ameliyatı öncesine göre, ameliyattan altı ay sonraki erken dönemde prostat semptom skorlarında, rezidüel idrar volumunde, Pdetristol Q max ve mesane maksimal kapasitesindeki değişimi göstermek

Gereç ve yöntem: Basınç akım çalışmasıyla tam mesane çıkım obstruksiyonu gösterilmiş 75 AÜSS (alt üriner sistem semptomlu) hasta çalışmaya alındı. Bu ön çalışmaya, kontrole gelen 50 hasta dahil edilmiştir. 50 hastanın 15'ine TV-P, 15'ine TUE-P ve 20'sine TUR-P uygulandı. Tüm hastaların operasyon öncesi ve sonrasında semptom skorlaması, Qmax, PdetQmax, maksimum mesane kapasitesi ve rezidüel idrar ölçümü yapıldı. İstatistiksel analizde Paired t-test ve Kruskal-Wallis analizi kullanıldı, p<0.05 anlamlı kabul edildi.

Bulgular: TVP, TUEP ve TURP grupları için sırasıyla yaş ortalamaları 68.6, 61.3 ve 66.6, preoperatif ortalama prostat volümleri 79.1 gr, 39.75 gr ve 54.8 gr idi. Gruplar operasyon öncesi ve sonrasında semptom skorlarında, rezidüel idrar volumunde azalma, Pdetristol Q max ve mesane maksimal kapasitesi yönünden değerlendirildi. TVP ve TURP grubundaki hastalarda bu parametrelerde anlamlı değişim saptanmıştır. Öte yandan TUEP grubundaki hastalarda, sadece mesane maksimal kapasitesi yönünden anlamlı değişim izlenmemiştir. Ancak semptom skorlarında, rezidüel idrar volumunde azalma, Pdetristol Q max anlamlı değişim izlenmiştir.

Sonuç: Farklı prostat volumüne rağmen TVP ve TURP uygulanan hasta gruplarında prostat semptom skorlarında, rezidüel idrar volumunde azalma, Pdetristol Q max ve mesane maksimal kapasitesi yönünden hemen hemen benzer anlamlı sonuç izlemişken seçilmiş hasta gruplarında da mesane maksimal kapasitesi dışında, TUEP grubunda diğer parametrelerde olumlu sonuç izlenmiştir.

Anahtar kelimeler: Benign prostate hiperplazisi, cerrahi, mesane, transrektal ultrason.

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