



Evaluation of the Outcomes of TURP using Uroflowmetry Data and IPSS in Older Patients with Low Prostate Volume

Düşük Prostat Hacmi Olan Yaşlı Hastalarda TURP Sonuçlarının Üroflowmetri Verileri ve IPSS Kullanılarak Değerlendirilmesi

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Abstract

Aim: We aimed to evaluate the efficacy and safety of transurethral resection of prostate (TURP) without urodynamic testing in elderly patients with prostate volume less than 35 cc.

Material and Method: A cohort of 116 patients over 70 years of age with a prostate volume less than 35 cc who underwent TURP were included in the study. International prostate symptom score (IPSS) and maximum flow rate (Qmax) measured by uroflowmetry were evaluated one month before the procedure and compared with the values at three and six months after the procedure. "Obstructive pattern in uroflowmetry" was defined as Qmax <15 mL/sec, measured prior to acute urinary retention (AUR) episodes. 24 patients with intraoperatively detected urethral strictures were excluded, and analyses were conducted on the remaining 92 patients.

Results: The significant p value was p<0.05. The mean age of the patients was 74.4±4.2 years and the mean prostate volume was 31.4±3 cc. Qmax increased from 17.9±4.3 ml/sec in the third postoperative month to 18.8±4.6 ml/sec in the sixth month (p<0.001). IPSS decreased in the third and sixth postoperative months (15.9±3 and 14.1±3.2, respectively).

Conclusion: A total of four (3.5%) patients had minor complications, all of which were managed conservatively. TURP is a safe and effective treatment option for elderly patients with low prostate volume without the need for urodynamic testing. We observed significant improvements in Qmax, Postvoiding residue (PVR) and IPSS scores.

Keywords: elderly male, IPSS, TURP, small prostate volume, uroflowmetry

Öz

Amaç: Prostat hacmi 35 cc'nin altında olan yaşlı hastalarda ürodinamik test yapılmadan uygulanan Transüretal prostat rezeksiyonunun (TURP) etkinliğini ve güvenliğini değerlendirmeyi amaçladık.

Gereç ve Yöntem: 70 yaş üstü, prostat hacmi 35 cc'nin altında olan ve TURP uygulanan 116 hastadan oluşan bir kohort grubu araştırmaya dahil edildi. İşlemden bir ay önce değerlendirilen Uluslararası prostat semptom skoru (IPSS) ve üroflowmetride ölçülen maksimum akış hızı (Qmax), işlem sonrası üç ve altı aylardaki değerlerle karşılaştırıldı. TURP sırasında üretral darlığı saptanan 24 hastanın çıkarılmasının ardından elde edilen 92 hastanın veri seti daha ileri analize tabi tutulmuştur.

Bulgular: Anlamlı p değeri p<0.05 idi. Hastaların ortalama yaşı 74.4±4.2 yıl ve ortalama prostat hacmi 31.4±3 cc olarak hesaplandı. Qmax değeri ameliyat sonrası üçüncü ayda 17.9±4.3 ml/sn iken altıncı ayda 18.8±4.6 ml/sn'ye yükseldi (p<0.001). IPSS ameliyattan sonraki üçüncü ve altıncı aylarda azaldı (sırasıyla 15.9±3, 14.1±3.2).

Sonuç: Toplam dört (%3.5) hastada minör komplikasyon gözlemlendi ve bunların tümü konservatif yaklaşımla tedavi edildi. TURP, düşük prostat hacmine sahip yaşlı hastalar için ürodinamik teste ihtiyaç duymadan güvenli ve etkili bir tedavi seçeneğidir. Qmax, işleme sonrası rezidü idrar (PVR) ve IPSS skorlarında anlamlı iyileşmeler gözlemlendi.

Anahtar Kelimeler: IPSS, küçük prostat hacmi, TURP, üroflowmetri, yaşlı erkek



INTRODUCTION

Benign prostatic hyperplasia (BPH) and lower urinary tract symptoms (LUTS) commonly manifest in elderly males.^[1] The association between BPH and LUTS is not consistently direct; some elderly individuals may experience LUTS without presenting BPH, and vice versa. The International Prostate Symptom Score (IPSS) stands as a reliable and valid method for evaluating the subjective severity of lower urinary tract symptoms in an individual and monitoring the progression of these symptoms over time in an individual and the progression of these symptoms over time.^[2]

Transurethral resection of the prostate (TURP) is widely recognized as a safe and effective surgical treatment for BPH in accordance with guidelines, particularly for prostate volumes up to 80 cc.^[3]

Urodynamic analysis and pressure-flow studies are widely performed as the most reliable methods for assessing the degree and location of obstruction in urological conditions.^[4] However, it's important to note that these tests are invasive and time-consuming. As an alternative, many urologists prefer to rely on noninvasive objective parameters such as urine flow rate, residual urine volume, and prostate volume to evaluate obstruction.^[5]

Numerous studies in the literature have investigated the correlation between prostate volume and the severity of LUTS. However, the findings of these studies have been inconsistent. Some studies have reported a significant correlation,^[6,7] while others have not demonstrated a significant relationship.^[8,9]

In the course of our investigation, our objective was to assess the outcomes and efficacy of TURP in elderly patients with low prostate volume, employing objective parameters. In addition, we investigated whether TURP could be successful in such patients without the need for urodynamic testing.

MATERIAL AND METHOD

Ethics Approval and Informed Consent

This study was approved by the Izmir Katip Celebi University Non-Interventional Clinical Studies Institutional Review Board (IRB#1077, dated 19 November 2020). All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments. Written informed consent was obtained from all individual participants included in the study.

The hospital charts of male patients who visited the Urology Clinic at our institute January 2015 and December 2020 were subject to a retrospective review. All patients had consent forms and Ethical committee approved the study. We specifically focused on patients aged 70 years or older who had LUTS due to prostatic enlargement, with a prostate volume of 35 cc or lower, and who had undergone monopolar TURP. Prostate volumes were determined using

abdominal ultrasonography. To minimize errors in measuring prostate volume, an experienced uro-radiologist performed the calculation to reduce potential measurement errors due to factors such as an empty bladder or excess abdominal fat. Only patients presenting with obstructive symptoms and an obstructive pattern in uroflowmetry were included in the study (defined as Qmax < 15 ml/sec, measured prior to acute urinary retention episodes)

A total of 126 patients were initially identified for the study. Patients presenting with urge incontinence were excluded, and only those exhibiting obstructive symptoms were included. It is important to note that in our clinic, urodynamic studies are exclusively conducted on patients with storage symptoms. Ten patients were excluded due to factors impacting bladder emptying and associated symptoms.

All patients included in the study had experienced acute urinary retention or failed to see improvement in obstructive voiding symptoms, despite receiving preoperative hormonal or alpha-blocker treatment. Maximum measured rate of flow in uroflowmetry (Qmax) and the IPSS were administered within 30 days before surgery and at 3- and 6-months post-surgery. The patient enrollment process and study inclusion criteria are illustrated in **Figure 1**.

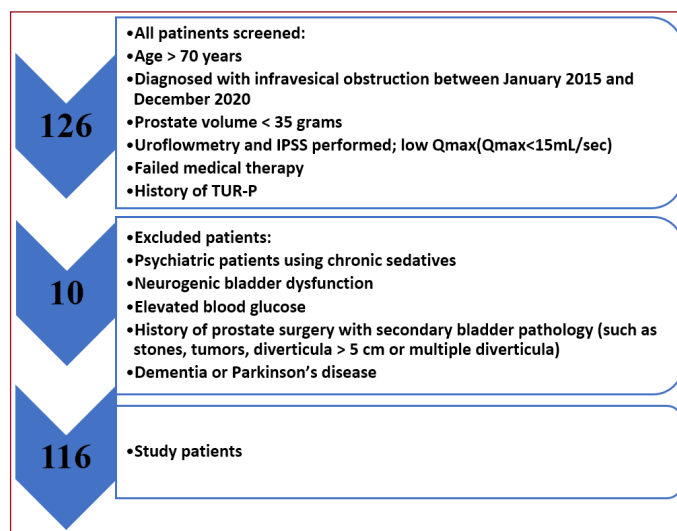


Figure 1. Patient enrollment and study inclusion flow chart.

The post-void residual (PVR) was determined one day before the operation and at the first week following removal of the urethral catheter post-surgery. We accepted poor urination as Qmax below 15 ml/sec in uroflowmetry.

The findings indicate that none of the patients were diagnosed with prostate cancer. Prior to undergoing TURP all patients had a serum prostate-specific antigen (PSA) level below 3 ng/mL or a negative transrectal ultrasound-guided prostate biopsy (TRUSG-Bx). These patients encountered Acute urinary retention (AUR) within one month prior to the operation. Consequently, assessments of IPSS and uroflowmetry were conducted before the occurrence of AUR.

Statistical Analysis

All statistical analyses were performed using SPSS version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were utilized to summarize the dataset, with means \pm standard deviations (SD), medians, and ranges reported for continuous variables, and frequencies and percentages for categorical variables.

Normality of distribution for continuous variables was assessed using the Shapiro-Wilk test. Comparisons of preoperative and postoperative measurements (Qmax, PVR, voided volume, IPSS) at different time points were performed using the paired-samples Student's t-test for normally distributed variables, while the Wilcoxon signed-rank test was applied for non-normally distributed data.

For subgroup comparisons (patients with and without internal urethrotomy), independent-samples t-tests or Mann-Whitney U tests were utilized according to the distribution pattern. Categorical variables were analyzed using the Chi-square test or Fisher's exact test where appropriate.

All statistical tests were two-tailed, and a p-value of <0.05 was considered statistically significant. The analyses aimed to determine the effectiveness of TURP on objective (Qmax, PVR, voided volume) and subjective (IPSS) parameters across different follow-up periods, ensuring rigorous evaluation of treatment efficacy.

RESULTS

A total of 116 male patients aged 70 years and older with lower urinary tract symptoms and low prostate volume underwent TURP. The mean age of the cohort was 74.3 \pm 4.2 years. Comorbid conditions were frequently observed, including hypertension in 53.4%, diabetes mellitus in 50.9%, and coronary artery disease in 57.8% of patients, while 32.8% had additional comorbidities such as chronic obstructive pulmonary disease or prior cerebrovascular events.

Preoperatively, 12.9% of patients had undergone transrectal ultrasound-guided prostate biopsy due to elevated PSA levels, with all cases confirming benign pathology. Additionally, acute urinary retention requiring catheterization was noted in 12.1% of patients within one month prior to surgery. The mean prostate volume measured via ultrasonography was 31.3 \pm 3 cc. Intraoperatively, internal urethrotomy was performed in 20.4% of patients due to previously undiagnosed urethral strictures or narrow segments that impeded resectoscope passage. The mean weight of the resected prostate specimen was 11.7 \pm 2.6 g, with benign histopathology confirmed in all cases.

Perioperative complications were infrequent and managed conservatively. One patient (0.9%) required blood transfusion, and two patients (1.7%) developed TUR syndrome, which resolved with conservative management. A single case (0.9%) of bladder perforation was also managed conservatively, with catheter removal on postoperative day 10. The mean hospital stay was 2.8 \pm 1.2 days (**Table 1**).

Table 1. Demographic characteristics and perioperative surgical data of the patients are summarized

Variable	N (%)	Mean \pm SD
Age (years)	116	74.3 \pm 4.2
Preoperative Prostate Volume (cc)		31.3 \pm 3
Comorbidities		
Hypertension	62 (53.4)	
Diabetes mellitus	59 (50.9)	
Coronary artery disease	67 (57.8)	
Other (COPD, CVA)	38 (32.8)	
Previous Urologic History		
TRUSG-guided prostate biopsy	15 (12.9)	
Acute urinary retention	14 (12.1)	
Intraoperative Findings		
Internal urethrotomy	24 (20.4)	
Perioperative Complications		
Required blood transfusion	1 (0.9)	
TUR syndrome (hyponatremia)	2 (1.7)	
Bladder perforation	1 (0.9)	
Prostate Specimen Weight (g)		11.7 \pm 2.6
Length of Hospital Stay (days)		2.8 \pm 1.2

(TUR-P: Transurethral resection of the prostate, COPD: Chronic obstructive pulmonary disease, CVA: Cerebrovascular accident, TRUSG: Transrectal ultrasound, SD: Standard deviation)

Functional outcomes

- Qmax: Increased significantly from 8.2 \pm 1.9 mL/sec preoperatively to 17.9 \pm 4.3 mL/sec at 3 months and 18.8 \pm 4.6 mL/sec at 6 months (p<0.001).
- IPSS: Decreased from 25.3 \pm 4.5 to 15.9 \pm 3.0 (3 months) and 14.1 \pm 3.2 (6 months) (p<0.001).
- PVR: Reduced from 84.6 \pm 47.5 mL to 37.8 \pm 21.0 mL postoperatively (p<0.001).

Similar trends were observed in the subgroup without internal urethrotomy. Full numeric details are presented in **Table 2** and **Table 3**.

Table 2. Preoperative and postoperative findings of all patients undergoing TUR-P, including 24 that also underwent internal urethrotomy

	N	Mean \pm SD	p
Qmax, ml/sec (Preoperative)	116	8.2 \pm 1.9	
Qmax, ml/sec (Postoperative 3 months)	116	17.9 \pm 4.3	<0.001
Qmax, ml/sec (Postoperative 6 months)	116	18.8 \pm 4.6	
PVR, ml (Preoperative)	116	84.6 \pm 47.5	
PVR, ml (Postoperative)	116	37.8 \pm 21	<0.001
Preoperative Void, ml	116	233 \pm 53.4	
Postoperative Void, ml	116	242 \pm 55.9	0.97
IPSS (Preoperative)	116	25.3 \pm 4.5	
IPSS (Postoperative 3 months)	116	15.9 \pm 3	<0.001
IPSS (Postoperative 6 months)	116	14.1 \pm 3.2	

Qmax: Maximum flow rate, PVR: Post voidal residue, IPSS: International Prostate Symptom Score, TUR-P: Transurethral resection of the prostate, SD: Standard deviation

Table 3. Pre- and Postoperative Outcomes in 92 Patients Undergoing TUR-P Without Internal Urethrotomy

	N	Mean±SD	p
Qmax, ml/sec (Preoperative)	92	8.6±1.8	
Qmax, ml/sec (Postoperative 3 months)	92	18.7±4.3	<0.001
Qmax, ml/sec (Postoperative 6 months)	92	19.6±4.5	
PVR, ml (Preoperative)	92	80.9±46.8	
PVR, ml (Postoperative)	92	36.1±20.5	<0.001
Preoperative Void, ml	92	235±48.8	
Postoperative Void, ml	92	236±50.8	0.97
IPSS (Preoperative)	92	24.3±4.4	
IPSS (Postoperative 3 months)	92	15.3±2.9	<0.001
IPSS (Postoperative 6 months)	92	13.4±3.1	

Qmax: Maximum flow rate, PVR: Post voidal residue, IPSS: International Prostate Symptom Score, TUR-P: Transurethral resection of the prostate, SD: Standard deviation

Repeated measures ANOVA with post hoc Tukey and Bonferroni corrections confirmed the significance of temporal improvements in Qmax, PVR, and IPSS (all $p < 0.001$; **Table 4**). For Qmax, the difference between preoperative and postoperative values was more pronounced at 6 months (-10.6 ± 0.28 ml/sec) than at 3 months (-9.8 ± 0.25 ml/sec), with a minor but significant further improvement between 3 and 6 months (-0.8 ± 0.05 ml/sec, $p < 0.001$). Similarly, IPSS improvements were progressive, with a greater reduction between preoperative and 6-month scores (-11.2 ± 0.15) compared to 3-month scores (-9.4 ± 0.15), and a significant interim decline (-1.9 ± 0.05 , $p < 0.001$; **Table 4**).

DISCUSSION

In the course of our study, we assessed patients presenting with LUTS characterized by low prostate volume and reduced Qmax. Notably, existing literature does not definitively establish a linear correlation between prostate volume and LUTS. As a result, it is imperative to recognize that prostate size should not be singularly regarded as a pivotal parameter in the evaluation of BPH patients.^[8]

TURP is a topic of debate among healthcare professionals when it comes to elderly patients, primarily due to concerns regarding bladder function. According to a study conducted

by Kojima et al., which analyzed data from 436 patients, it was found that elderly patients exhibited similar levels of satisfaction as their younger counterparts following TURP.^[10]

In a separate study examining the impact of aging on the efficacy of transurethral vaporization resection of the prostate, Li et al. observed that prostate surgery is safe and effective for patients across different age groups. The study found that advancing age did not act as a deterrent to surgery and did not escalate the complexity of the procedure.^[11]

In the present study we aimed to provide clarity regarding the decision to perform TURP on elderly patients with a small prostate volume. The results of our study indicate that individuals aged over 70 with a prostate volume of less than 35 cc can derive significant benefits from the TURP procedure.

In their recent research, the team demonstrated that aging contributes to fibrotic changes in tissues. They have indicated that independent of prostate volume, chronic inflammation in prostate tissue is associated with the development of hard tissue in the posterior urethra, which may lead to a decrease in urethral flexibility.^[12] Despite the absence of detrusor function recovery, it is noteworthy that a substantial enhancement in voiding function among patients with comparably low prostate volumes can be attained through the reduction of urethral resistance subsequent to TUR-P.

We here observed statistically significant improvements in Qmax, PVR, and IPSS scores ($p < 0.001$). These improvements exhibited a gradual, sustained trend over the subsequent months of follow-up. These findings underscore the efficacy of TURP as a treatment modality for patients experiencing obstructive voiding symptoms in advanced age. Notably, a retrospective multicenter study by Lotterstätter et al. examined 168 patients aged 85 years and older who underwent TURP, revealing that the procedure demonstrated favorable safety and efficacy outcomes. Specifically, twelve months post-TURP, 85% of patients achieved spontaneous voiding with post-void residual volumes of less than 100 ml, while perioperative mortality remained under 1% and morbidity rates were low.^[13] Additionally, a separate study evaluated the safety and efficacy of endourological surgical interventions in managing BPH in elderly and high-risk patients with concurrent comorbid conditions.^[14]

Table 4. Post Hoc Pairwise Comparisons of Qmax, PVR, and IPSS Across Time Points Following TUR-P

	Time	Mean Difference	SE	df	t	P _{tukey}	P _{bonferroni}
Qmax Comparison							
Preoperative	Postoperative 3 rd month	-9.754	0.2493	115	-39.1	<.001	<.001
	Postoperative 6 th month	-10.595	0.2755	115	-38.5	<.001	<.001
Postoperative 3 rd month	Postoperative 6 th month	-0.841	0.0539	115	-15.6	<.001	<.001
PVR Comparison							
Preoperative	Postoperative	46.7	3.84	115	12.2	<.001	<.001
IPSS Comparison							
Preoperative	Postoperative 3 rd month	9.37	0.1549	115	60.5	<.001	<.001
	Postoperative 6 th month	11.24	0.1510	115	74.5	<.001	<.001
Postoperative 3 rd month	Postoperative 6 th month	1.87	0.0483	115	38.8	<.001	<.001

Following the study, statistically significant improvements in Qmax, IPSS, and PVR values were observed in the postoperative period. The findings indicate that endourological surgical methods offer low complication rates and high efficacy for elderly, high-risk BPH patients.

Notably, no mortality was observed within our patient group, with a calculated morbidity rate of 3.5%. Postoperative Clavien Dindo I-II complications were limited to four patients, all of whom were successfully managed conservatively, resulting in the elimination of complications.

The Olmsted County population-based study has confirmed that the risk of AUR increases with the size of the prostate, as measured by TRUSG (with a three-fold increased risk for prostates larger than 30 cc).^[15] We believe that we have mitigated the risk of AUR in patients with a small prostate volume (less than 35 cc) and obstructive symptoms by performing TURP. According to our data, only one patient (0.86%) experienced AUR after the surgery. This patient was effectively treated with additional alpha-blocker medical therapy. None of the other patients in our study required additional medical therapy. This approach may contribute to the prevention of polypharmacy in the geriatric patient population.

These findings suggest that TURP is a viable and safe treatment option even in elderly patients with small prostate volumes, especially when urodynamic evaluation is not feasible.

However, it is important to acknowledge several limitations of this study. The retrospective design is susceptible to data loss due to inadequate documentation at the time of treatment, although no missing data occurred in the patients we evaluated. It should be noted that the patients seen at our single institution may not be fully representative of all elderly, low-volume BPH patients. Additionally, the limited number of patients treated restricted the scope of subgroup analyses that could be performed. Moreover, the absence of urodynamic studies in these patients prevented the determination of the role and effect of TURP on detrusor function in this patient population.

CONCLUSION

In conclusion, our study demonstrates that TURP is an effective and safe treatment option for elderly patients with small prostate volumes, showing significant improvements in Qmax, PVR, and IPSS scores. These results highlight the sustained benefits of TURP in managing obstructive voiding symptoms in advanced age, with low complication rates. However, the study's retrospective design, limited patient population, and absence of urodynamic studies are notable limitations. Future prospective studies with larger cohorts and comprehensive urodynamic evaluations are needed to further assess TURP's impact, particularly on detrusor function.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of the Izmir Katip Celebi University Non-Interventional Clinical Studies Ethics Committee (Date: 19.11.2020, Decision No: 1077).

Informed Consent: Written informed consent was obtained from all participants prior to enrollment in the study.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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