

## Comparison of the Effect of Transurethral and Suprapubic Catheterization on Transurethral Prostatectomy Results in Patients with Acute Urinary Retention Secondary to Benign Prostatic Hyperplasia

*Benign Prostat Hiperplazisine Sekonder Akut İdrar Retansiyonu Olan Hastalarda İntraüretral veya Suprapubik Kateter Kullanımının Transüretral Prostatektomi Sonuçlarına Etkisinin Karşılaştırılması*

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### Abstract

**Background:** We aimed to evaluate the impact of different catheterization methods on transurethral resection of the prostate outcomes in patients with benign prostatic hyperplasia related acute urinary retention.

**Materials and Methods:** Between 2019 and 2023, a retrospective examination was conducted on patients experiencing acute urinary retention secondary to benign prostatic hyperplasia. The study encompassed 89 patients who underwent transurethral resection of the prostate. The patients' demographic data, preoperative uroflowmetry results, pathology reports and the data obtained during their follow-up up to the 12th month were recorded. The patients' data were divided into two groups based on catheterization status: percutaneous cystostomy and Foley catheter, and compared.

**Results:** The study included 76 patients with a transurethral Foley catheter and 13 with a percutaneous suprapubic cystostomy. No significant differences were observed in preoperative parameters or postoperative complications and pathology results between the groups. Uroflowmetry showed a significant decrease in postoperative postvoiding residual urine volume in the suprapubic catheter group but no significant difference in maximum flow rate. In the Foley catheter group both maximum flow rate and postvoiding residual urine volume showed significant changes postoperatively. However, when comparing uroflowmetry results between groups no significant differences were observed.

**Conclusions:** Catheterization methods are utilized in the emergency management of acute urinary retention caused by benign prostate enlargement. Advantages and disadvantages should be carefully considered when selecting the appropriate method. Our study has shed light on this aspect. We believe that conducting more comprehensive prospective studies could yield more reliable results.

**Keywords:** Urinary retention, benign prostatic hyperplasia, urethral catheterization, suprapubic cystostomy

### ÖZ

**Amaç:** Bu çalışmada benign prostat hiperplazisi ile ilişkili akut üriner retansiyonu olan hastalarda farklı kateterizasyon yöntemlerinin transüretral prostat rezeksiyonu sonuçlarına etkisini değerlendirmeyi amaçladık

**Gereç ve Yöntem:** 2019-2023 yılları arasında benign prostat hiperplazisine sekonder akut üriner retansiyonu gelişen hastalar retrospektif olarak değerlendirildi. Çalışmaya transüretral prostat rezeksiyonu uygulanan 89 hasta dahil edildi. Hastaların demografik verileri, preoperatif üroflowmetride post voiding rezidü ve maksimum akış hızı, patoloji raporları ve postoperatif 12. aya kadarki takiplerinde elde edilen verileri kaydedildi. Hastaların verileri kateterizasyon durumuna göre perkütan sistostomi ve foley kateter olmak üzere iki gruba ayırarak karşılaştırıldı.

**Bulgular:** Çalışmaya transüretral Foley kateterli 76 hasta ve perkütan suprapubik sistostomili 13 hasta dahil edildi. Gruplar arasında ameliyat öncesi parametreler açısından anlamlı fark yoktu. Postoperatif komplikasyon ve patoloji sonuçları gruplar arasında anlamlı farklılık göstermedi. Suprapubik kateterizasyon grubunda işeme sonrası rezidüel idrar hacminde anlamlı bir azalma gözlemlendi ancak maksimum akış hızında anlamlı bir fark yoktu. Foley kateter grubunda ise hem maksimum akış hızı hem de işeme sonrası rezidüel idrar hacminde ameliyat sonrası önemli değişiklikler gösterdi. Ancak gruplar arasında üroflowmetri sonuçları karşılaştırıldığında anlamlı bir fark gözlemlenmedi.

**Sonuç:** Benign prostat büyümesinin neden olduğu akut üriner retansiyonun acil tedavisinde transüretral veya suprapubik kateterizasyon yöntemlerinden yararlanılmaktadır. Uygun yöntemi seçerken avantajlar ve dezavantajlar dikkatle değerlendirilmelidir. Çalışmamız bu konuya dikkati çekmektedir. Prospektif ve geniş serili çalışmalar ile daha sağlıklı sonuçların elde edileceğine inanıyoruz.

**Anahtar kelimeler:** İdrar retansiyonu, benign prostatik hiperplazi, üretral kateterizasyon, suprapubik sistostomi

### Highlights

- Patients with acute urinary retention were analyzed
- Preoperative characteristics of acute urinary retention patients with BPH were analyzed.
- The effect of catheterization types on prostate surgery results was evaluated.

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## Introduction

Acute urinary retention is characterized by the sudden inability to pass urine, requiring urgent urological intervention (1). It is often associated with benign prostatic enlargement and can also occur secondary to bladder dysfunction, post-surgical complications, medications and various urogenital infections (2,3). The prevalence of acute urinary retention in men varies with age particularly affecting approximately 10-30% of elderly individuals (4).

In the emergency management of acute urinary retention, drainage is achieved through urethral catheterization. In cases where urethral catheterization is not feasible, bladder drainage is accomplished via percutaneous cystostomy (5). Following catheterization management primarily focuses on treating the underlying cause. In cases of acute urinary retention secondary to benign prostatic enlargement alpha-blockers are initiated and a trial of voiding without a catheter is typically attempted after approximately 3-10 days (6). If these attempts are unsuccessful surgical interventions such as transurethral resection of the prostate (TUR-P) may be necessary to relieve bladder outlet obstruction (BOO) (7).

Uroflowmetry is a used non-invasive urodynamic test to assess urinary flow rate. Voided volume, maximum flow rate (Q<sub>max</sub>), flow pattern and post void residual urine (PVR) are the key parameters for detecting BOO (8). PVR urine assess by transabdominal ultrasound, catheterisation or bladder scan (9). The diagnostic accuracy of this findings for detecting BOO varies and influenced by threshold values. Using a PVR threshold of 50 mL, the diagnostic accuracy of PVR has a positive predictive value (PPV) of 63% and a negative predictive value (NPV) of 52% for the prediction of BOO (10). A threshold Q<sub>max</sub> of 10 mL/s has a specificity of 70%, a PPV of 70% and a sensitivity of 47% for BOO. Using a threshold Q<sub>max</sub> of 15 mL/s the specificity was 38%, the PPV 67% and the sensitivity 82% (11).

This study aims to evaluate the impact of different catheterization methods on the outcomes of transurethral prostate resection in patients with acute urinary retention secondary to benign prostatic enlargement.

## Material and Methods

### Study design

The study commenced after obtaining approval from Uşak University local ethics committee (dated 15.02.2024/decision number 309-309-08). Records of patients presenting with acute urinary retention to our clinic between 2019 and 2023 were retrospectively reviewed. Patients with acute urinary retention secondary to benign prostatic hyperplasia (BPH) who underwent emergency management with either percutaneous cystostomy or transurethral Foley catheterization were included in the study. Patients with acute urinary retention due to factors other than benign prostatic hyperplasia, as well as those with chronic urinary retention, were excluded. The initial amount of urine drained after catheterization was measured as acute urinary retention capacity. Following catheterization, patients who were initiated on alpha-blocker therapy and had their transurethral catheters removed approximately 3 days later as well as those with suprapubic cystostomy catheters whose voiding status was assessed using uroflowmetry were evaluated. A total of 89 patients who continued to exhibit obstructive voiding symptoms and subsequently underwent TUR-P were included in the study.

Patients with acute urinary retention due to causes other than BPH and those who had normal voiding function on follow-up without undergoing TUR-P were excluded from the study. Data on patients' ages, comorbidities, BPH histories, alpha-blocker usage histories, prostate-specific antigen (PSA) values, preoperative uroflowmetry results (PVR and Q<sub>max</sub>), pathology reports, postoperative (3-5 days) uroflowmetry results after catheter removal and follow-up data obtained at 1st, 3rd, 6th and 12th months were recorded.

Patients' data were divided into two groups based on the catheterization method (percutaneous cystostomy and Foley catheter). Comparisons between groups were made regarding age, PSA value, prostate volume, uroflowmetry findings, operative time, length of hospital stay, pathology reports, postoperative uroflowmetry results and complications.

### Statistical Analysis

For statistical analysis sample size was calculated with at least 80% power and a 5% error rate. Normal distribution was assessed using the Shapiro-Wilk and Skewness-Kurtosis tests and non-parametric tests were applied. Descriptive statistics (mean, standard deviation, median, interquartile range, minimum, maximum, n and %) were used for continuous variables. Mann-Whitney U test was used for comparisons between groups and the Wilcoxon test was used for comparisons between preoperative and postoperative measurements. The Chi-

square (Fisher's exact) test was employed to determine relationships between categorical variables. A significance level of  $p < 0.05$  was adopted and SPSS (IBM SPSS for Windows ver.26) statistical software was utilized for analysis.

## Results

The average age of the patients was 71, with a mean PSA level of 6.75 and an average length of hospital stay of 4 days. Out of the patients, 76 (85.4%) underwent transurethral Foley catheterization, while 13 (14.6%) received percutaneous cystostomy. Patients without a history of BPH before AUR were more prevalent (80.8%). The distribution of other preoperative variables is presented in **Table 1**. Perioperative continuous measurements were compared between groups based on the catheter type. However, no statistically significant differences were observed in age, PSA or any other parameters. Detailed information on all variables and p-values is provided in **Table 2**.

**Table 1. Preoperative Data of Patients**

Variables, N (%)		Percutaneous Cystostomy (n=13)	Foley Catheter (n=76)
BPH History before AUR		3 (17.7)	14 (82.3)
Alpha blocker usage		3 (17.7)	14 (82.3)
Additional comorbidity	Diabetes Mellitus + Hypertension	2 (28.5)	5 (71.5)
	Chronic Obstructive Pulmoner Disease	0 (0)	2 (100)
	Hypertension	1 (25)	3 (75)
	Diabetes Mellitus	1 (33.3)	2 (66.7)
	Hyperlipidemia	0 (0)	1 (100)
	Laryngeal cancer	0 (0)	1 (100)
Surgical history	Left Nephrectomy	1 (100)	0 (0)
	Thyroidectomy	0 (0)	1 (100)
	Inguinal Hernia Repair	0 (0)	4 (100)
	Coronary Bypass	0 (0)	2 (100)
DRE	Grade-1	2 (20)	8 (80)
	Grade-2	2 (9.5)	19 (90.5)
	Grade-3	1 (33.3)	2 (66.7)
Urine culture	E. Coli	1 (50)	1 (50)
	Klebsiella	0 (0)	1 (100)
	Pseudomonas	0 (0)	1 (100)

**Abbreviations:** AUR; acute urinary retention, BPH; benign prostatic hyperplasia, DRE; digital rectal examination, n; number of patients, USG; ultrasonography

When evaluated for complications during postoperative follow-ups at 1st, 3rd, 6th and 12th months, no statistically significant relationship was observed between the groups. Similarly, pathology results showed that BPH was the most common diagnosis in both groups with no statistically significant difference between them. The data for these variables and their p-values are detailed in **Table 3**. When evaluating uroflowmetry results, a statistically significant difference was observed between preoperative and postoperative PVR values in the percutaneous cystostomy group ( $p=0.009$ ), indicating a significant decrease in PVR postoperatively. However, in this group no statistically significant difference was found in preoperative and postoperative Qmax values ( $p=0.508$ ), indicating similar Qmax values. In the Foley catheter group statistically significant differences were observed between preoperative and postoperative Qmax ( $p=0.003$ ) and PVR ( $p=0.001$ ) values, indicating a significant increase in Qmax and decrease in PVR postoperatively. When comparing uroflowmetry results between the two groups no statistically significant differences were found in preoperative ( $p=0.730$ ) and postoperative ( $p=0.817$ ) Qmax values, as well as preoperative ( $p=0.786$ ) and postoperative ( $p=0.759$ ) PVR values. The uroflowmetry findings are detailed in **Table 4** and depicted in **Figure 1**.

**Table 2. Comparison of Perioperative Continuous Measurements by Catheter Type**

Variables	Percutaneous Cystostomy (n=13)		Foley Catheter (n=76)		*P value
	Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)	
Age/ years	71.69 ± 9.10	70.0 (64.0-78.0)	70.99 ± 6.69	71.0 (66.3-75.0)	0.963
PSA/ ng/ml	6.47 ± 9.12	2.2 (1.04-12.2)	6.78 ± 8.12	3.9 (2.2-7.6)	0.457
Prostate volume/cc	58.15 ± 18.18	63.0 (42.5-75.0)	61.29 ± 4.97	62.0 (50.0-72.3)	0.785
AUR capacity/ml	810.54 ± 367.60	700.0 (575.0-950.0)	811.00±356.91	750.0 (550-1000)	0.963
Preoperative catheterization duration/days	35.08 ± 18.67	34.0 (22.5-46.0)	47.96 ± 32.05	35.5 (25.3-63.8)	0.261
Postoperative hospitalization/days	5.69 ± 5.56	4.0 (2.5-7.0)	3.87 ± 3.75	2.0 (1.0-5.0)	0.123
Postoperative catheterization duration/days	4.00 ± 1.10	4.0 (3.0-5.0)	3.40 ± 0.81	3.0 (3.0-3.0)	0.118

**Abbreviations:** AUR; acute urinary retention. PSA; prostate specific antigen. SD; standard deviation. IQR; Interquartile range \* Significance levels according to Mann-Whitney U test results

**Table 3. Data on Postoperative Follow-up and Pathology Results**

Variables. N (%)		Percutaneous Cystostomy (n=13)	Foley Catheter (n=76)	*P value
Pathology	BPH	11 (15.7)	59 (84.3)	0.894
	BPH. Chronic Prostatitis	2 (18.1)	11 (81.9)	
	Prostate Adenocarcinoma	0 (0)	6 (100)	
Postoperative 1st Month Follow-up	Hematuria	1 (25)	3 (75)	0.651
	Urge incontinence	1 (25)	3 (75)	
	Stress incontinence	0 (0)	3 (100)	
	Dysuria	0 (0)	4 (100)	
	Straining during urination	1 (33.3)	2 (66.7)	
Postoperative 3rd Month Follow-up	Urge incontinence	0 (0)	2 (100)	0.395
	Dysuria	0 (0)	2 (100)	
	Straining during urination	2 (50)	2 (50)	
	Orchitis	1 (33.3)	2 (66.7)	
	Edema in penis and scrotum	1 (100)	0 (0)	
Postoperative 6th Month Follow-up	Urge incontinence	1 (100)	0 (0)	0.290
	Dysuria	0 (0)	2 (100)	
	Straining during urination	1 (100)	1 (100)	
	Orchitis	0 (0)	1 (100)	
Postoperative 12th Month Follow-up	Hematuria	1 (100)	0 (0)	0.223
	Urge incontinence	1 (100)	0 (0)	
	Dysuria	0 (0)	3 (100)	
	Straining during urination	1 (50)	1 (50)	

	Orchitis	0 (0)	1 (100)
	Acute urinary retention	1 (100)	0 (0)

Abbreviations: BPH; benign prostatic hyperplasia. \* Significance level according to chi-square (Fisher's exact) test results

Table 4: Two-way comparison results of uroflowmetry findings by Groups and Preop-Postop periods

Variables	Percutaneous Cystostomy (n=13)		Foley Catheter (n=76)		*P value
	Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)	
Qmax Preop	4.00 ± 3.34	5.0 (0.0-5.5)	3.67± 3.13	4.0 (0.0-6.0)	0.730
Qmax Postop	5.80 ± 7.78	0.1 (0.0-13.8)	6.33± 7.54	0.1 (0.0-14.6)	0.817
<b>**P value</b>	0.508		0.003		
PVR Preop	202.92±221.03	153.0 (0.0-295.0)	187.83 ± 177.74	178.0 (0.0-267.0)	0.786
PVR Postop	16.15± 23.73	0.1 (0.0-35.0)	14.28± 19.68	0.2 (0.0-25.0)	0.759
<b>**P value</b>	0.009		0.001		

Abbreviations: n; number of patients. PVR; post voiding residue. Qmax; maximum flow rate. SD; standard deviation. IQR; Interquartile range. \*Significance level according to Mann-Whitney-U Test; \*\*Significance level between "Preop-Postop" according to Wilcoxon test

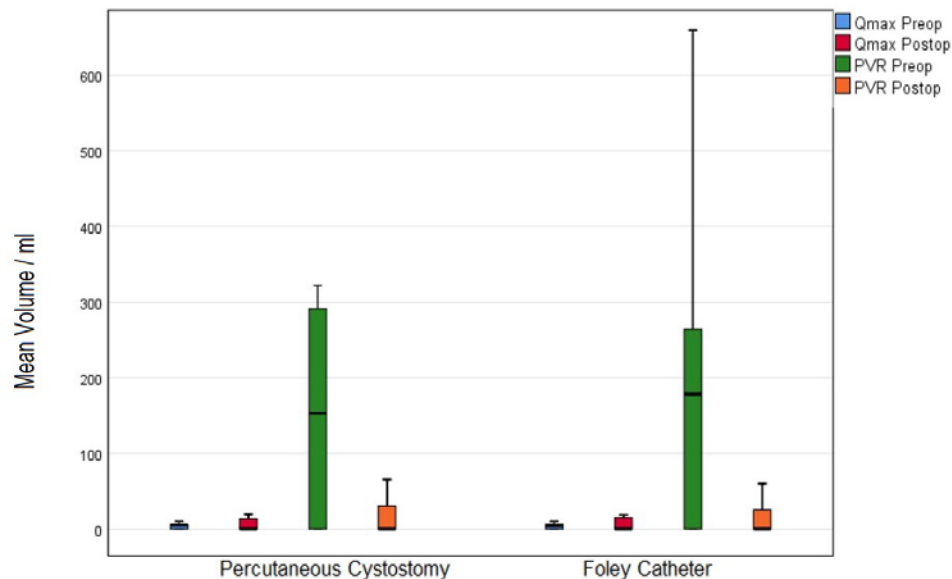


Figure 1: Comparison of uroflowmetry findings by Catheter Type

## Discussion

BPH occurs in men and is common, with the incidence increasing with age affecting approximately 75% of men aged 80 and above (12). About 40% of patients with BPH may require treatment due to the progression of prostate enlargement (13). AUR is a distressing condition often associated with BPH requiring urgent treatment (14). AUR is the most common indication for TUR-P with approximately 70% of patients undergoing TUR-P following AUR.

especially in elderly patients (15).

The management of AUR lacks a standardized treatment algorithm but typically involves initial transurethral catheterization. If unsuccessful, suprapubic catheterization is performed (16,17). While suprapubic catheterization has disadvantages such as catheter displacement and bowel injury, it offers advantages such as a lower risk of urethral stricture and infection and no need for repeated catheterization after failed voiding (18). To increase the success rate of trial without catheter alpha blockers should be started after catheterization and the first voiding attempt should be made approximately 2-3 days later (19).

In our study, patients with AUR secondary to benign prostatic enlargement were managed with transurethral Foley catheterization followed by the initiation of alpha-blockers immediately after catheterization with a trial of voiding approximately three days later.

In patients with percutaneous cystostomy, the catheter was clamped for voiding trials. Elective surgery was performed on patients with unsuccessful voiding trials. Some patients initially refused surgery and were managed with catheterization until later opting for surgery, resulting in a longer duration between catheterization and surgery. This led to a higher observed duration between catheterization and surgery. In the study by Cathcart et al., the rate of patients undergoing surgery after acute urinary retention was reported to be approximately 20-32% (20). In our study, we also observed a similar rate with 27.6% of patients undergoing surgery.

When evaluating the effectiveness of different catheterization methods on postoperative outcomes of TUR-P, we found that in the transurethral catheterization group postoperative Qmax significantly increased compared to preoperative values, while PVR significantly decreased. In the percutaneous cystostomy group PVR significantly decreased after voiding but there was no significant difference in Qmax values. However, when comparing both groups there was no significant difference in Qmax and PVR values. Despite the lack of significant increase in Qmax values in the percutaneous cystostomy group, the decrease in residual urine and similar rates of voiding difficulty suggest that suprapubic catheterization does not adversely affect voiding.

When evaluating complication rates, early complications (within the first postoperative month) were observed in 4.4% for hematuria, 4.4% for dysuria, 3.3% for voiding difficulty, 6.7% for urinary tract infection and 7.8% for incontinence. Complications observed at 12 months included 1.1% for hematuria, 3.3% for dysuria, 2.2% for voiding difficulty, 1.1% for urinary tract infection, 1.1% for AUR and 1.1% for incontinence. There was no significant difference in complication rates between the groups during the 12-month follow-up period. All patients were followed conservatively. Huang et al. observed similar postoperative complication rates ranging from 1.27% to 31.65% in their studies (21).

In a study by Chen et al. it was found that the risk of complications was elevated in TUR-P procedures performed after acute urinary retention (22). Additionally, another study reported a high incidence of repeat catheterization and risk of urethral stenosis in transurethral catheterization suggesting that suprapubic catheterization should be prioritized (23). In our study one patient in the percutaneous cystostomy group required a repeat catheter at the 12-month follow-up, which was managed by inserting a transurethral Foley catheter.

Our study has several limitations including its retrospective nature and being conducted at a single center, which may have resulted in insufficient or inaccessible data. Voiding status was evaluated intermittently with uroflowmetry tests and symptom evaluation data, such as the International Prostate Symptom Score (IPSS), could have provided a more comprehensive assessment. However, a sufficient number of IPSS scores could not be obtained in our study. Additionally, repeated postoperative uroflowmetry results were not available in sufficient numbers so only the initial results were compared. Access to these data could have significantly contributed to the study.

#### **Study limitations**

Some of the limitations of this study were that it was a single-center and cross-sectional study conducted in a certain time interval. Caregivers may not have responded to the questionnaire accurately enough because of apparent insufficiencies in their care of the patients, unwillingness to share their caregiving situation and show burnout symptoms that might be perceived as weakness. The study should be conducted with larger samples.

#### **Conclusion**

Transurethral or suprapubic catheterization methods are utilized in the emergency management of AUR caused by benign prostate enlargement. When choosing the appropriate method, it is important to carefully weigh the pros and cons. Our study has shed light on this aspect. We believe that conducting more comprehensive prospective studies could yield more reliable results.

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