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GENERAL UROLOGY

Original Article

Catheter dwell time and diameter affect the recurrence rates after internal urethrotomy

Kateter süresi ve çapı internal üretrotomi sonrası nüks oranlarını etkilemektedir

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ABSTRACT

Objective: Cold-knife direct vision internal urethrotomy (DVIU) is frequently used as the first-line treatment for urethral stricture disease. Although the steps of the procedure are defined in detail, the duration of catheterization and the diameter of the catheter to be used after the operation are not clearly defined. The aim of this study is to evaluate the effects of catheter dwell time and diameter on recurrence rates of urethral stricture disease after DVIU.

Material and methods: Data of 193 consecutive treatment naïve bulbar urethral stricture patients who underwent DVIU between January 2009 and June 2013 were retrospectively analyzed. Patient demographics and stricture characteristics were noted. Catheter dwell times were grouped as <5 and ≥5 days. The diameters of catheters used were 16, 18 and 22 Fr. The association between recurrence rates, catheter dwell times, and diameter were evaluated with Tukey's test and Pearson's correlation test, respectively.

Results: Overall 193 patients with a mean age of 64.51±12.99 (range: 17 to 85) years were enrolled in the study. Urethral stricture disease recurred in 45 (23.31%) patients within the first year after DVIU. Mean duration of catheterization was 7.47±4.03 and 4.79±1.94 days in patients with and without recurrences, respectively (p=0.0001). Catheter dwell times for ≥5 days were also associated with increased recurrence (p=0.0001). Of the patients with recurrent strictures, 16, 18 and 22Fr catheters were placed in 22.22%, 20% and 57.78% of the patients, respectively. Increased catheter diameter was also associated with higher recurrence rates (p=0.004).

Conclusion: Shortening the postoperative duration of catheterization and decreasing the catheter size may result in improved recurrence rates after DVIU. Further prospective randomized trials are necessary to confirm these findings.

Keywords: Catheter; internal urethrotomy; urethral stricture.

ÖZ

Amaç: Direkt görüş altında internal üretrotomi İÜ üretral darlıkların tedavisinde ilk basamak tedavi olarak sıklıkla uygulanmaktadır. İşlemin basamakları ayrıntılı olarak tanımlanmış olsa da işlem sonrası takılacak üretral kateterin çapı ve kateterizasyon süresi net değildir. Bu çalışmada kateter süresi ve çapının İÜ sonrası nüks oranlarına etkisini değerlendirmek amaçlanmıştır.

Gereç ve yöntemler: Kliniğimizde Ocak 2009 ve Haziran 2013 tarihleri arasında daha önce tedavi edilmemiş bulbar üretral darlıkları için İÜ yapılmış ardışık hastaların dosyaları geriye dönük olarak tarandı. Hastalara ait demografik özellikler ve striktür bulguları not edildi. Kateter süreleri <5 gün ve ≥5 gün olarak ikiye ayrıldı. Kullanılan kateter çapları 16, 18 ve 22 Fr'ydi. Tukey ve Pearson korelasyon testleri kullanılarak kateter süresi ve çapı ile nüks oranları arasındaki ilişki değerlendirildi.

Bulgular: Ortalama yaşları 64,51±12,99 (17 ve 85 arası) yıl olan 193 hasta çalışmaya dahil edildi. DVIU sonrası 1 yıl içerisinde 45 (%23,31) hastada nüks izlendi. Ortalama kateterizasyon süresi tekrarlaya ve tekrarlamayan hastalarda sırası ile 7,47±4,03 ve 4,79±1,94 gündü (p=0,0001). Kateter süresinin ≥5 gün olması da artmış rekürens ile ilişkiliydi (p=0,0001). Rekürens gözlenen hastalarda 16, 18 ve 22Fr üretral kateterler sırası ile hastaların %22,22, %20 ve %57,78'inde takılmıştı. Artmış kateter çapı da nüks ile ilişkili olarak saptandı (p=0,004).

Sonuç: İÜ sonrası kullanılan kateter çapının küçülmesi ve süresinin kısalması nüks oranlarını azaltabilir. Bu bulguları desteklemek için prospektif randomize çalışmalara ihtiyaç vardır.

Anahtar kelimeler: Kateter; internal üretrotomi; üretral striktür darlık.

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Introduction

Urethral stricture disease is the most common cause of obstructed voiding symptoms in younger males and has always been a challenge for urologists.[1] Currently available treatment modalities for urethral strictures are urethral dilation, direct vision internal urethrotomy (DVIU), urethral stent placement and open urethroplasty.[1]

Direct vision internal urethrotomy is the procedure that opens the stricture by incising the scar tissue via transurethral route. If the incision heals by epithelization rather than wound contraction, the procedure is successful. Higher early stage postoperative success rates and the simplicity of this endoscopic approach resulted in rapid acceptance of the procedure.[2] Success rates following DVIU have been shown to vary between 30% and 90%[3-6], depending on the length and location of the stricture.[7,8] Patients are usually left with an indwelling urethral catheter for 3-7 days after DVIU; however there is no consensus on the duration of the catheterization.

This study aims to assess the effects of catheter dwell times and diameter on recurrence rates of bulbar urethral stricture disease after DVIU.

Material and methods

Study design

After obtaining the approval of the institutional review board of Bağcılar Training and Research Hospital Ethical Committee and informed consent of the patients, data of 193 consecutive treatment naïve bulbar urethral stricture patients who underwent DVIU between January 2009 and June 2013 were retrospectively analyzed. Patients' medical history and physical examination findings were recorded along with their urine culture, preoperative uroflowmetry, urethroscopy and antegrade/retrograde urethrography findings.

All cases were performed by the supervision of two senior urologists experienced in reconstructive surgery. Until January 2011, depending on the surgeons' preference, 22Fr urethral catheters were placed for longer durations at the end of DVIUs.

Thereafter small caliber catheters (16 Fr or 18Fr) were preferred for shorter dwell times. Patient demographics, stricture characteristics, size of the urethral catheter placed and the duration of catheterizations were noted. Catheter dwell times were grouped as <5 and ≥5 days.

Patients presenting with recurrent stricture diseases, strictures longer than 3cm and/or multiple strictures together with the patients who experienced post-traumatic or radiation induced strictures, unsuccessful DVIU procedures and/or who necessitated a urethral stent instead of a catheter were excluded from the study. In order to exclude the possible deleterious effects of benign prostatic enlargement on the symptoms and uroflowmetry findings of patients during the follow-up period, patients with documented prostatic enlargement on urethroscopy or who were under medical therapy were not enrolled in the study. Moreover, patients without any detail on catheter removal time, catheter size, postoperative uroflowmetry and a minimum 6 months follow-up were also excluded.

The associations between recurrence rates, catheter dwell times, and size were evaluated.

Operative technique

The procedures were performed under regional or general anesthesia. All patients had sterile urine preoperatively and antibiotic prophylaxis was given with intravenous infusion of cephazoline 1 gr, both prior to the induction of anesthesia and 8 hours after the operation.

A 17 Fr cystourethroscope (Karl Storz GmbH & Co, Tuttlingen, Germany) was inserted through external meatus and a 0.035-inch guide wire (Sensor Guidewire™, Boston-Scientific Corp., Marlborough, MA, USA) was passed carefully through the narrowed stricture area. The stricture site was completely incised at 12 o'clock position using a cold knife urethrotome (Karl Storz GmbH & Co, Tuttlingen, Germany). An indwelling silicone urethral catheter with a diameter of 16, 18 or 22Fr was inserted at the end of each procedure.

Postoperative period

The uneventful patients were discharged on the 1st postoperative day with urethral catheters *in situ*. After removal of the catheters, patients were invited for follow-up visits at 1st, 2nd and 12th postoperative months. Symptoms pertaining to recurrence, including reduced stream of urine, retention of urine, and burning sensation during micturition were noted. The procedure was considered successful if the patient was asymptomatic and had a maximum flow rate of >15 mL/sec. Retrograde urethrography and cystoscopy were performed to confirm recurrence in cases of voiding symptoms or significant decrease in maximal flow rate.

Statistical analysis

Statistical analyses were performed using Number Cruncher Statistical System 2007 statistical software package program (NCSS, LLC, Kaysville, UT, USA). In addition to descriptive statistics (mean, standard deviation, median, interquartile range), Pearson correlation test was used to define the association between the variables and independent t- test was administered to assess the pairwise comparisons of groups with normal distribution. Moreover, data were evaluated by Tukey's range test for subgroup comparison of one-way variance analysis. Statistical significance was set as $p<0.05$.

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Table 1. Patient demographics and stricture characteristics of patients

Characteristics	Total number (%)	Without recurrence (%)	With recurrence (%)	p
Mean age (year)	64.51±12.99	63.94±12.84	66.40±13.46	0.267
Etiology				
Unknown/idiopathic	72 (37.3)	61 (41.22)	11 (24.44)	0.042
Transurethral intervention	121 (62.69)	87 (58.78)	34 (75.56)	
Stricture length				
Pinpoint	87 (45.07)	73 (49.32)	14 (31.11)	0.182
<1 cm	53 (27.46)	38 (25.68)	15 (33.33)	
1-2 cm	21 (10.88)	14 (9.46)	7 (15.56)	
>2 cm, ≤3 cm	32 (16.58)	23 (15.54)	9 (20.00)	
Mean duration of catheterization (days)	5.41±2.81	4.79±1.94	7.47±4.03	0.0001
Catheter dwell times				
<5 days	84 (43.52)	75 (50.68)	9 (20.00)	0.0001
≥5 days	109 (56.48)	73 (49.32)	36 (80.00)	
Catheter diameter				
16Fr	77 (39.90)	67 (45.27)	10 (22.22)	0.004
18Fr	43 (22.28)	34 (22.97)	9 (20.00)	
22Fr	73 (37.82)	47 (31.76)	26 (57.78)	

Values are presented as number (%), level of statistical significance was set at p<0.05

Table 2. Catheter dwell times and diameters classified according to different stricture lengths

	Pinpoint (n=87)	<1 cm (n=53)	1-2 cm (n=21)	2-3 cm (n=32)	p
Catheter dwell times (days)	5.07±2.01	5.51±2.36	5.57±4.56	6.09±3.75	0.347
Catheter diameter					
16Fr	36 (41.38)	22 (41.51)	9 (42.86)	10 (31.25)	
18Fr	22 (25.29)	6 (11.32)	4 (19.05)	11 (34.38)	
22Fr	29 (33.33)	25 (47.17)	8 (38.10)	11 (34.38)	0.244

Values for catheter diameter are presented as numbers (%), level of statistical significance was set at p<0.05

Results

A total of 193 patients with a mean age of 64.51±12.99 (range: 17 to 85) years were enrolled in the study. The mean duration of symptoms before the operation was 5.7±4.2 months. The etiological factors, and length of the strictures are provided in Table 1, Table 2, and 3 summarize the catheter dwell times and diameter among different stricture lengths and etiological factors, respectively.

The mean duration of follow-up period was 36.42±12.32 (range: 8 to 52) months. During the follow- up, 45 (23.31%) patients experienced recurrences. Of these patients, 39 (86.66%) experienced recurrences during the first 3 months and the remaining during the next 6 months.

The mean postoperative duration of catheterization was 7.47±4.03 and 4.79±1.94 days in patients with and without recurrences, respectively (p=0.0001) (Table 1). Of the patients

Table 3. Catheter dwell times and diameters classified according to different etiological factors

	Unknown/ Idiopathic (n=72)	Transurethral intervention (n=121)	p
Catheter dwell times (days)	5.11±2.45	5.6±2.99	0.248
Catheter diameter			
16Fr	30 (41.67%)	47 (38.84%)	
18Fr	17 (23.61%)	26 (21.49%)	
22Fr	25 (34.72%)	48 (39.67%)	0.789

Level of statistical significance was set at p<0.05

Table 4. Logistic regression analysis of risk of recurrence in direct vision internal urethrotomy

	B	SE	p	Exp(B)	CI lower limit	CI upper limit
Etiology	-0.72	0.43	0.095	0.49	0.21	1.13
Catheter duration	0.43	0.10	0.0001	1.54	1.27	1.87
16Fr catheter	-0.98	0.43	0.015	0.40	0.19	0.73
18Fr catheter	-1.27	0.46	0.005	0.28	0.12	0.68
22Fr catheter	-0.84	0.50	0.093	0.43	0.16	1.15

B: partial logistic regression coefficients, SE: standard errors, p: significance level, Exp(B): exponentiation of the B coefficient, CI: 95% confidence interval for the Exp(B)

with catheter dwell times of <5 days; 1.78, 17.85, 64.28 , and 16.07% had remained catheterized for 1, 2, 3 and 4 days, respectively. Recurrences of strictures were seen more commonly in patients who had catheter dwell times of ≥5 days when compared with patients with a duration of <5 days (80% vs. 20%, respectively, p=0.0001) (Table 1). On the other hand, stricture length (p=0.182) was similar among two groups. A logistic regression analysis was conducted to predict the risk of recurrence after DVIU using the etiological factors, duration of catheterization and the diameter of the catheter as predictors (Table 4). Duration of catheterization and diameter of the catheter made a significant contribution to the prediction of recurrences while etiology of the stricture was not a significant predictor.

Discussion

Male urethral stricture is one of the oldest urologic diseases, and it continues to be a challenging condition for urologists.[1,9] In 1974, Sachse[10] introduced DVIU to treat urethral strictures by cold-knife incision. Optical urethrotomy by either incision or ablation has been considered as the standard therapy for anterior urethral strictures.[9] Together with urethral dilation, DVIU is regarded as the initial treatment of choice for most urethral strictures.[9] A recent survey examining the practice patterns among board-certified American urologists demonstrated that 85.6% of them use urethral incision to treat anterior urethral strictures.[11] An indwelling urethral catheter is placed at the end of the procedure, irrespective of the method preferred. Our results revealed that urethral stricture recurrence is more common in patients with prolonged (≥5 days) catheterization and with large (22Fr) catheters.

The role of etiology as the predictor of the outcome of DVIU has long been investigated.[12,13] Kumar et al.[12] reported higher success rates with iatrogenic strictures when compared with post-traumatic and post-inflammatory etiology. However, Desmond et al.[13] could not find any association between the etiology of the stricture and the outcome of urethrotomy. In our study, the etiologic factors were similar in patients with catheter dwell times of <5 days or ≥5 days (p=0.48).

Desmond et al.[13] recommended keeping the urethral catheter for at least 3 days in patients with minimal previous treatments and extended the duration up to 4 weeks in patients with impaired detrusor function. Lipsky and Hubmer[14] reported their series of 32 patients who underwent DVIU. They left a silicon catheter for approximately 7 days and recommended a hydraulic self-dilatation protocol for 6 months. Of these patients, 25 (83%) voided satisfactorily after the procedure and needed no further treatment.

Recurrence was reported in patients with long strictures, traumatic strictures with large scarred areas and in patients who failed to carry out regular hydraulic self-dilatation. In another study, Al-Ali and Al-Shukry[15] performed 400 IUs in 154 men with complete urethral occlusions and noted that 35% of them were cured with a single procedure. They placed a 22Fr silicone catheter except for 36 cases, in whom it was possible only to insert a 16Fr catheter. They compared various catheter dwell times including 1, 2 weeks 1, and 3 months. They suggested leaving an indwelling silicone catheter for 3 months for optimal epithelization, depending on the follow-up urethroscopy findings. In their series, Pansadoro and Emiliozzi[3] inserted 18 and 20Fr latex catheters, and left them for 24 to 36 hours. They instructed all patients to perform hydraulic self-dilation for 3 months, beginning from the 15. postoperative days. At a median follow-up of 98 months, overall success rate after 1st DVIU was 32 percent. The findings of another retrospective analysis compared the recurrence rates with respect to the postoperative catheter drainage in 798 strictures.[16] A silicone catheter was used in 89.7% of the cases with a mean duration of 5.5 days. Recurrence was experienced in 34%, 43% and 65% of the patients with 1-3,

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4-7 and more than 7 days of catheterization, respectively. The authors concluded that postoperative catheter drainage for less than 3 days seems to result in a decreased recurrence rate. However, they did not mention how they decided the duration of catheterization and the size of the silicone catheter used. On the other hand, Holm-Nielsen et al.[17], reported an overall cure rate of 77% in the management of 369 strictures in 225 patients and concluded that although an active follow-up with periodic urethroscopic examinations affected the outcome of DVIU; postoperative period of catheterization and positive urine culture at the time of follow-up had no significant influence on the results. As we do not routinely initiate a urethral dilation program after removal of the urethral catheter, we have not enough data to evaluate the effects of post-DVIU dilation on the recurrence rates. However, it is clear from our data that leaving the catheter more than 4 days will eventually increase the failure rates of IU when compared with the shorter catheter dwell times (33.02% vs. 10.71%, p=0.0001).

Data regarding the effects of catheter size on the outcome of IU is lacking. However, it is known that, ischemia is involved in the process of stricture formation in most of the recurrent urethral stricture cases.[18] Due to the pressure that they apply on the wall of the urethra, larger bore catheters may decrease the blood flow and hinder the re-epithelization process that will eventually end with the healing of the incised urethra with fibrosis.[19,20] Decreasing the catheter size from 22Fr to 18Fr significantly decreased the risk of fossa navicularis strictures (6.9% vs. 0.9%, p=0.02) without increasing the complications after robotic assisted laparoscopic radical prostatectomy.[19] The role of catheter size on the outcome of hypospadias repair was also evaluated.[20] Karakus et al.[20] compared the meatal stenosis rates in patients who underwent tubularized incised plate urethroplasty and concluded that tubularization of urethral plate over a small-sized (6Fr) catheter, regardless of the age of the patients, prevents meatal stenosis. According to our findings, decreasing the catheter diameter from 22Fr to 18Fr (p=0.005) or 16Fr (p=0.015) significantly decreases the recurrence rates.

This study has several limitations. First of all the data of the patients were collected retrospectively. The follow-up duration is an important issue when assessing the success and recurrence rates of IU. Although the mean follow-up period (34.12±11.41 months) of the patients was shorter in the present study, it has been showed that first three months is the most important period and the recurrence within the first 3 months is a poor prognostic factor.[6] Naude and Heyns[21] concluded that if recurrence occurs, it is most likely to do so within 3 to 12 months. In this study, 94.98% of the patients completed the 12th month follow-up control. Another limitation is that the caliber of the strictures was not documented. Also, routine urethral ultrasound to assess the degree of spongiofibrosis has not been performed.

In conclusion, prolonged durations of the postoperative catheterization may increase the recurrence rates of the disease. Decreasing the catheter size may also result in improvement of the outcome.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Bağcılar Training an Research Hospital.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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