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Original Article

Feasibility, complication and long-term follow-up of the newly nelaton based urethral dilation method, retrospective study

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Abstract: *Introduction:* Current methods for Urethral dilatation include filiforms and followers, metal sounds, balloon dilators, catheters of increasing size, introduction of a Council catheter over a guidewire, and coaxial dilators of increasing size. These methods however are effective but expensive and use of them is limited in many third world countries. In this retrospective study, we report the feasibility, complication and long-term follow-up of the newly Nelaton based urethral dilation method following by self calibration plan as a single referral center experience. *Method:* We reviewed the records of 333 men with urethral stricture longer than 1 cm over a 16-year period between March 2001 to December 2018. In this method the straight flexi-tip guide-wire is introduced through the urethra and advanced under cystoscopic vision. This wire then was used to guide the dilatation after withdrawal of the cystoscope. The tip of well-lubricated Nelaton urethral catheters incised and then advanced gently over the guide-wire serially from the smallest to the largest appropriate sizes. The patients were followed up regularly after the dilatation 1, 3, 6, 12 months and then annually postoperatively with taking history, PVR and uroflowmetry and all underwent retrograde urethrography at the 6th and 12th months of follow-up. *Result:* The mean age of patients was 39.19±16.9 years old (10 to 86 years). The mean period of the follow-up was 3.6±1.1 years (range, 3 to 4.3 years). Success rate after first attempted was 58.5% and after two attempted was 77.7% in two years follow up. After one year 51 (15.3%), two years 23 (6.9%) and after three years 11 (3.3%) cases required continued self dilatation once a month. *Conclusion:* Guide wire-assisted urethral dilatation is shown to be acceptable, cost-effective, simple, safe and feasible techniques for urethral dilation. Our technique may be the choice manner in selected patients with short memberanous urethral stricture, because of decrease the risk of incontinency.

Keywords: Urethral stricture, urethral dilatation, internal urethrotomy, clean intermittent catheterization, nelaton

Introduction

Urethral stricture disease (USD) of the posterior urethra in men is one of the challenging is a complicated disease representing a therapeutic challenge [1-3]. The traditional treatment for USD is urethral dilatation(UD); the passage of calibrated instruments; or urethrotomy [4, 5]. The principle of UD is to stretch the urethral stricture up or otherwise, and more commonly, to disrupt it. A graduated series of dilators from smaller to larger size is passed to restore the urethral caliber to normal, or thereabouts [5].

Although minimally invasive treatment is appealing both to urologists and patients, studies have shown a wide variation in success rates for urethral dilatation as primary treatment for urethral stricture ranging from 50 to 80% depending on location, length, cause and but falling to 0-30% for repeated treatment for recurrence, raising concern about long-term outcomes [6, 7] with a risk of the development of a false passage and bleeding [8, 9].

UD is performed during endoscopy or for therapy of urethral or bladder neck strictures. Current methods include filiforms and followers, metal

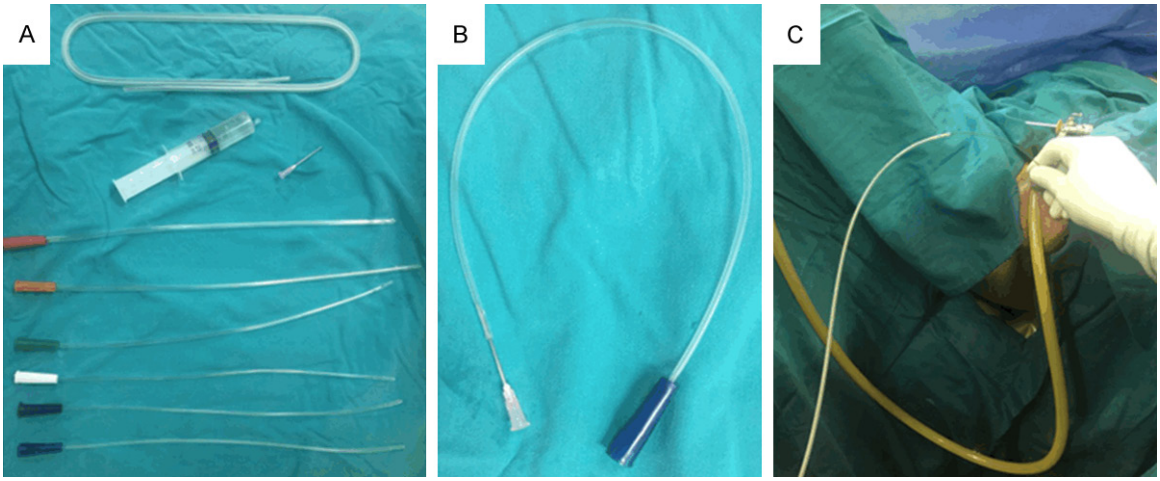

Figure 1. A. Nelaton seires (8-18F) for dilatation. B. Preparation of nelaton befor installation. C. Urethral dilatation under guidewire after lubricant injection.

sounds, balloon dilators, catheters of increasing size, introduction of a Council catheter over a guidewire, and coaxial dilators of increasing size [10]. These methods however are effective but expensive and use of them is limited in many third world countries [11].

In this retrospective study, we report the feasibility, complication and long-term follow-up of the newly Nelaton based urethral dilation method following by self calibration plan as a single referral center experience.

Materials and methods

Patients

In this retrospective study we reviewed the records of 384 patients with urethral stricture longer than 1 cm over a 16-year period between March 2001 to December 2018, at the reconstructive urology department of Shohada-e-Tajrish Hospital, Tehran, Iran (main referral center of reconstructive urology). Fifty-one patients were excluded from the study due to lack of clinical and surgical data. Patients that included to our study had penile, bulbar and membranous urethral stricture.

All subjects were assessed by medical history and physical examination, urine culture test, coagulative status test, PVR and uroflowmetery. Stricture length was determined by retrograde urethrography simultaneously with cystogram. Patients were examined by 17 F rigid or 14 F flexible cystoscopes to determine the stricture zone and to observe urethral mucosa.

Surgical technique

A single dose prophylactic intravenous antibiotic was administered before surgery. Patients were secured at lithotomy position after intravenous sedation anaesthesia.

The straight flexi-tip guide-wire is introduced through the urethra and advanced under cystoscopic vision. This wire then was used to guide the dilatation after withdrawal of the cystoscope. The tip of well-lubricated Nelaton urethral catheters incised and then advanced gently over the guide-wire serially from the smallest to the largest appropriate sizes (8 F to 18 F) (**Figure 1**). This method previously presented by same team [11].

Then the cystoscope was reintroduced to ensure sufficient urethral dilatation had been achieved and to allow assessment of the degree of trauma. A 18 F Foley urethral catheter which tip was incised was left in situ for 10 to 14 days to stabilize the dilatation. Following catheter removal patients underwent our arbitrary protocol of clean intermittent catheterization (CIC) by an 16-F Nelaton catheter [12] (**Table 1**). Our technique was the same in all patients.

Follow-up

The patients were followed up regularly after the dilatation 1, 3, 6, 12 months and then annually postoperatively with taking history, PVR and uroflowmetry and all underwent retrograde urethrography at the 6th and 12th months of follow-up. Urethrocystoscopy had been per-

Table 1. Clean Intermittent Catheterization Regimen Following Internal Urethrotomy

Postoperative time	Catheterization
1st week	Daily
2nd week	Every other day
3rd week	Twice a week
4th week	Once a week
2nd month	Every 2 weeks
3rd to 6th month	Once a month
After 6 months	Cessation of regimen

formed in patients who had any history of decreased force and caliber of urine, any difficulty in CIC performing and Q max decreasing (Qmax <12) to rule out any urethral structure.

Outcomes

Demographic characteristics, stricture length based on retrograde urethrography simultaneously with cystogram, etiology of urethral stricture, success rate, and complications were assessed.

We considered the operation successful if we would not notice any urethral stricture during the 24-month follow-up period by performing at most two dilatations.

Ethic

Ethical approval for the study was attained from the ethical committee of Shohada-e-Tajrish Hospital and permitted us to review patients' medical data. Owing to the retrospective nature of the study, the ethical waived the necessity to have patients provide consent to review their medical records.

Statistical analysis

Statistical analysis was performed using Chi square and Fisher's exact tests as appropriate with significance considered at *P* values less than 0.05; using the SPSS software (Statistical Package for the Social Sciences, version 20.0, SPSS Inc, Chicago, Ill, USA). Missing data are completely at random, and then we ignore it.

Results

The mean age of patients was 39.19±16.9 years old (10 to 86 years). The mean period of the follow-up was 3.6±1.1 years (range, 3 to 4.3 years). Their characteristics are listed in the **Table 2**.

138 subjects needed a repeat procedure after the first attempted. Clinical presentations included a decreased stream in 98 patients, difficulty in CIC performing in 36 patients, dysuria in 19 patient, and urinary retention in 5 patient.

Success rate after first attempted was 58.5% and after two attempted was 77.7% in two years follow up. After one year 51 (15.3%), two years 23 (6.9%) and after three years 11 (3.3%) cases required continued self dilatation once a month.

Discussion

Treatment of USD includes numerous reconstructive surgical techniques [13, 14]. The urologist must be familiar with all of these different techniques to be able to deal with any type of urethral stricture [15, 16]. The choice of reconstructive technique depends on the stricture length, degree of spongiofibrosis, and surgeon's preference and experience [2].

Conventional "blind" dilatation techniques with followers and bougies for urethral stricture commonly traumatize the urothelium, leaving a bleeding raw area that will heal by scarring and lead to further stricture formation [14]. Other complications associated with conventional dilatation techniques are creation of a false passage, incontinence, impotence, and rupture of the rectum and other neighboring organs [17]. These complications are common when a narrow tunnel is located eccentrically in the urethral cross section, and the urethra does not taper gradually onto the stricture [18]. In contrast, if a guide wire is placed through the stricture endoscopically the dilatation is subsequently directed appropriately, allowing precise and safe dilation [8].

This paper reported a safe and minimally invasive procedure that offered 58.5% of the patients with recurrence-free outcome after one dilation. We did experience just 2 (0.6) false passage and any significant sepsis in all urethral dilations that we performed. Bleeding from the urethra during dilation means that the scar is torn and further mucosal and spongy injury has occurred. The stricture will soon

Table 2. Patients clinical data

Characteristics	N	Percent
Mean ureteral stricture length, cm	2.1±0.6 cm	Min: 1 cm max: 5 cm
Site of urethral stricture		
Penile	45	13.5
Distal bulbar	48	14.4
Mid bulbar	168	50.5
Proximal bulbar	54	16.2
Memberanous	18	5.4
Cause of urethral stricture		
Straddle injury	39	11.7
Urethral instrumentation	33	9.9
Prostate surgery	50	15
Sexual transmitted disease	54	16.2
Other	157	47.1
Previous intervention		
IU	42	12.6
Dilatation	63	18.9
Urethroplasty	66	19.8
CIC	63	18.9
No Intervention	99	29.7
Success rate		
First session	195	58.5
Second session	64	19.2
Complication		
UTI	15	4.5
Urethral haemorrhage	12	3.6
False passages	2	0.6
Priapism	1	0.3
Incontinency, meatal Stenosis, perineal haematoma, scrotal oedema	0	0
Mean Qmax		
Before intervention	7±1.3	*p*.value <0.05
3 years after intervention	17.8±4.9	
Mean PVR		
Before intervention	90.9±19.6	*p*.value <0.05
3 years after intervention	34.9±15.4	

recur and result in worsened stricture length and density.

Since external urinary sphincter is close to membranous urethra, it may be injured in patients with Membranous urethral stricture that treated by DVIU. Our study revealed that nelaton series dilatation vs DVIU (18 patients had membranous urethral stricture) decrease the risk of urinary incontinence. In other hand there is no risk of urinary incontinence by series dilatation of membranous urethra.

In 1996 Freid [19] passed a "Glidewire" into the bladder as an alternative to filiforms. They then inserted a urethral catheter over the wire and dilated the urethra with various instruments. In 2003 Dewan et al. [8] described a similar procedure in children. Last, Rubenstein et al. [20] reported decreased axial force of a novel urethral access sheath compared with a standard cystoscope and urethral dilator in an experimental model. The sheath dispenses a protective fluorocarbon film during introduction.

Dilation is rarely a cure and needs to be repeated periodically. If the stricture recurs too rapidly, the patient may be instructed on how to insert a catheter into the urethra periodically to prevent early closure. This procedure may need

to be repeated from time to time, as strictures may recur [21]. Intermittent weekly self catheterization for the prevention of stricture formation was proposed by the Nottingham group in 1986 [22]. This technique has been successful in terms of patient acceptability and prevention of restricturing [23]. This may be because of the regeneration of urethral mucosa that takes place in about 3 to 5 weeks [24]. The stricture may recur if synechiae form during this period. The idea of self calibration was introduced by Lapides et al. [25]. The results of previous trials have suggested that men who adhere to protocols of ISD following urethral dilatation or DVIU have longer stricture-free intervals than those who do not although overall recurrence rates are similar [26].

Based upon our data, our results in 333 patients are encouraging, because no major complication during the peri-postoperatively. One of the reasons for high success rate during follow up is the proper self-catheterization program. Proper catheterization training to patients and emphasis on adherence to standard catheterization protocol and continuous follow-up are the main reasons for the success of this study.

We realize that the study could have some weaknesses. Our investigation was a retrospective study therefore we had some missing data especially in patients' follow up, and the main bias is lack of control group.

Conclusion

Guide wire-assisted UD is shown to be acceptable, cost-effective, simple, safe and feasible techniques for urethral dilation. The results of treatment have no clear relationship with surgical history and the length of stricture. The mentioned techniques have no effect on patients' potency. Because filiforms and followers and balloons are expensive and not available easily, this cost-effective technique can be used in every urology department.

Our technique may be the choice manner in selected patients with short memberanous urethral stricture, because of decrease the risk of incontinency.

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Disclosure of conflict of interest

None.

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