Original Article

The use of S-curved coaxial dilator for urethral dilatation: Experience of a tertiary department

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Abstract

Objective: Urethral strictures can be treated by urethral dilation, optical internal urethrotomy, or open surgical reconstruction (urethroplasty). Urethral dilation is done with filiforms and followers, balloons, or coaxial dilators inserted over a guidewire. The S-curved coaxial dilator (SCCD) was designed to facilitate the passage of the dilator through the stricture and the urethra because it imitates the curved anatomy of the male urethra. This study presents our experience with SCCD.

Materials and Methods: We used this kind of dilation in 310 patients. The technique included the insertion of a hydrophilic floppy-tipped guidewire through the urethra directly into the bladder under fluoroscopic control. The SCCDs were then inserted over the guidewire. Dilators of gradually increased size from 8F to 20F were used. The follow-up of the patients includes uroflowmetry and measurement of postvoid residual at 4 weeks, 6 months, or in the case of a recurrence of symptoms.

Results: The age of the patients were 69.08 ± 15.77 years. The causes of urethral stricture were iatrogenic ($n = 114$), traumatic ($n = 35$), infectious ($n = 22$), and of unknown origin ($n = 139$). The stricture length was 1.62 ± 0.85 cm. The mean number of dilations needed per case was 2 (range: 1–15), and the time between the dilations was 212.19 ± 253.9 days. We had seven failures.

Conclusion: We propose the S-curved coaxial dilators for urethral dilation as a safe and effective technique because of their similarity to the shape of the male urethra and because of their hydrophilic coating.

Keywords: Curved, dilation, lower urinary tract symptoms, urethral stricture

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INTRODUCTION

Events such as perineal and pelvic injuries, infectious diseases, and lichen Urethral stricture is a fibrotic narrowing of the lumen of the urethra.[1] The leading cause in the developed countries is iatrogenic injury of the urethra due to instrumentation, prostate cancer treatments, and previous hypospadias surgery. Idiopathic causes, traumatic sclerosis are less common causes of the condition.[2-4]

The main symptomatology belongs to the sphere of bladder outlet obstruction and includes voiding and storage symptoms. Furthermore, they can lead to urinary tract infections (UTI) and to renal function impairment.[3,4]

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The evaluation usually begins with uroflowmetry, which will show an obstructive voiding pattern with sometimes elevated postvoid residual volume (PVR). The most common interventions used to establish the diagnosis are cystoscopy and retrograde or anterograde urethrography. The use of ultrasound, magnetic resonance imaging, or computed tomography is also possible.[1,2,5]

The treatment options for urethral strictures include dilations, optical internal urethrotomy, and open reconstructive urethroplasty. The treatment choice depends on the stricture site, length, and patient's condition. Urethroplasty has a success rate reaching up to 90% compared to optical urethrotomy and dilation, which success rates reaches 25%–60%.[6] Urethroplasty promises a definite treatment, while the two alternatives have a higher recurrent rate.[1,3,4,6] However, the most frequently used methods are dilations and optical urethrotomy, especially as an initial management of the stricture, due to their simplicity and minimal invasive nature.

Urethral dilation is done with filiforms and followers, balloons, or coaxial dilators inserted over a guidewire.[7-9] In our department, we use the S-curved urethral dilator set (Cook Medical., Bloomington, USA) for the performance of urethral dilations. These dilators follow the anatomy of the male urethra, while the hydrophilic coating limits the traumatic passage through the urethra and the stricture.[7,10] We, herein, present a long experience with the use of these dilators for the management of urethral stricture in different

MATERIALS AND METHODS

Patients

Patients with urethral strictures were treated with S-curved urethral dilators in a tertiary department over a period of 6 years. The diagnosis was established by urethrocystoscopy or urethrography. Before the dilation, a retrograde urethrography was always performed to detect the site and the length of the stricture. No exclusion criteria were applied regarding the location and length of the stricture as well as the presence of multiple strictures. Patients on anticoagulants or antiplatelet aggregation medication did not represent an exclusion criterion. The data of the patients were retrospectively collected.

Technique

After the urethrography, a 0.038 in. hydrophilic floppy-tipped guidewire was inserted through the urethra into the bladder. The insertion was done most of the times under fluoroscopic control or rarely with the help of an endoscope. The endoscopic approach was selected in cases that the fluoroscopic-guided insertion of the guidewire failed. Then, the S-curved coaxial dilators (SCCDs) were immersed into normal saline and they were introduced over the guidewire into the urethra. The set contains six dilators from 8 to 20F, which were introduced serially into the urethra. The insertion technique is done under fluoroscopic guidance, and the S-shape of the dilators could always follow the course of the guidewire by just rotating them. When the last dilator was introduced, it was left in place for a few minutes until the bladder was empty. In some cases, where the dilation was difficult such as cases on anticoagulants or antiplatelet therapy or cases of bleeding or more complex strictures, a catheter was introduced over the guidewire, and it was left in place for 48–72 h.

Follow-up: Patients were reevaluated at 4 weeks with uroflowmetry and measurement of the PVR. Then, the patients were reevaluated at 6 months. In the case of recurrence of symptoms, the patients were evaluated with the above investigations. When these diagnostic investigations led to the clinical suspicion of stricture recurrence, urethrography, or urethrocystoscopy (or both) was performed. An additional dilation was performed if deemed necessary. Technical success was defined as the insertion of the guidewire in the bladder and dilation up to 20Fr. Success of the treatment was defined as the lack of recurrence of the stricture over a period of 12 months from the last dilation. Recurrence was defined as obstructive pattern in uroflowmetry and/or symptoms and/or PVR >100 ml along with the urethrographic or urethroscopic confirmation of the condition. Patients were evaluated during their yearly urological investigation when the stricture was considered as cured.

Data analysis

Mean values with standard deviations and percentages were calculated. The range of the values was also considered. The IBM SPSS version 20 (IBM Corp., Armonk. NY, USA) was used for the calculations.

RESULTS

A total of 310 patients with an average age of 69.08 ± 15.77 years were candidates for urethral dilation with the S-curved dilators. The causes of urethral stricture were iatrogenic (n = 114; 36.8%), traumatic (n = 35; 11.3%), infectious (n = 22; 7.1%), and of unknown etiology (n = 139; 44.8%) [Table 1].

The mean cumulative length of the stricture was 1.62 ± 0.85 cm. The mean number of dilations needed

was 1.62 (range: 1–15) percase, and the time between the dilations was 212.19 ± 253.9 days. A total of 608 dilations in 429 strictures were performed. We had seven technical failures, in which the guidewire could not pass through the stricture. A total of 35 patients (11.5%) had incomplete follow-up data or were lost to follow-up. Successful treatment was observed in 185 (69%) of the patients with complete follow-up data. These patients underwent up to two dilations. The remaining of the patients underwent several dilations or was treated with a surgical approach appropriate for the characteristics of their strictures.

Complications included the development of UTI in 33 patients after the dilation. These cases were all managed conservatively with 12 of them requiring hospitalizations. Persistent hematuria (over 2 days) or hematuria requiring bladder irrigation was observed in 11 patients. In four of these cases, UTI was also diagnosed. About two cases of penile hematoma were observed and resided without the need for any intervention. All cases with hemorrhage did not require interventions for their management.

DISCUSSION

Urethroplasty has without a doubt the highest success rate (81%–92%) in curing urethral strictures compared with internal urethrotomy and dilation (54%–60%), and it is the only method that promises definite treatment.[1,6] Therefore, more and more urologists worldwide have started to favor urethroplasty above the other alternatives.[6,11] Moreover, the American Urological Association guidelines published in 2016 clearly discourage the repeat endoscopic procedure as an alternative to urethroplasty.[2]

Despite that tendency to urethroplasty, it is a demanding reconstructive procedure and there is still a lack of experience in the field among urologists. In addition, not all patients are fit or willing to undergo an urethroplasty. Therefore, internal urethrotomy and dilation are still the most commonly used procedures for urethral strictures due to their simplicity and safety especially when employed for an initial treatment.[6,11]

Wong *et al*. compared the rates of recurrence between internal urethrotomy and dilation and found no significant difference at 3 years.[4] Many ways have been described for urethral dilation such as filiforms and followers, balloons, or coaxial dilators inserted over a guidewire, even the use of Amplatz renal dilators.[7-9]

The SCCDs are being used at our department for several years. In 2007, Herschorn and Carrington published to be the first reported the use of the SCCD. The dilators were used in 30 urethral strictures with only one failure and without any specific complications. Despite the limited number of cases included, the method was characterized safe and effective.[10]

In the present study, we showed also that the use of SCCD was effective and safe in most cases of stricture. We studied 310 patients of which we had seven failed attempts. The failed attempts could be attributed to the fact that some patients were referred to us after repeated failed efforts to pass a catheter and consequent significant injury of the urethra with false passages, hematuria, and edema. These cases are difficult to manage in the acute phase and may require a suprapubic catheter. A hydrophilic guidewire with the support of a ureteral catheter could provide under fluoroscopic control access to the bladder even in these cases. When the above maneuver is not successful, the placement of the guidewire under combined endoscopic and fluoroscopic guidance is possible. The current study reflects our experience that failure to dilate the strictures and gain access to the bladder are rare with the presented technique. In fact, it was rarely needed to place a suprapubic catheter in cases of urethral strictures due to the inability to dilate the strictures and gain access to the bladder.

The mean number of dilations needed was 2 (range: 1–15). The patients who needed a high number of dilations or frequent dilations were obviously candidates for urethroplasty; however, either they were unfit for such a procedure or they preferred repetitive dilations over other procedures such as urethroplasty. The hydrophilic coating of the SCCDs allows for an atraumatic dilation of the stricture which is well tolerated by the patients. Furthermore, most of the cases were performed under local anesthesia, while a limited number of cases were treated under sedation. According to our experience, older patients will opt for the dilations despite the need for frequent procedures. Nonetheless, it should be made clear that the most appropriate procedure should be suggested to each patient and the decision to undergo repetitive dilations with SCCSs does not reflect the best possible practice for these patients.

The complications of urethral dilation involve UTIs, false route, and injuries such as urethral perforation, bleeding, or even rectal injuries.[3] The presented experience did not encounter any urethral perforations or rectal injuries, which

Table 1: Summary of the cases included in the current study

Background of patients	Discription
Number of patients/successful dilations	310/303
Age (years)	69.08±15.77
Etiology	Iatrogenic (*n*=114) Traumatic (*n*=35) Infectious/inflammatory (*n*=22) Unknown (*n*=139)
Number of strictures	429
Stricture site	Urethral meatus/fossa navicularis (*n*=48) Penile urethra (*n*=89) Bulbar urethra (*n*=179) Membranous urethra (*n*=55) Prostatic urethra (*n*=39) Bladder neck (*n*=19)
Stricture length (cm)	1.62±0.85
Number of dilations/case	2 (range: 1-15)
Time between dilations (days)	212.19±253.9
Complications	Urinary tract infection (*n*=33; 10.8%) Persistent or significant bleeding (*n*=11; 3.6%) Penile hematoma (*n*=2; 0.6%)

are the most serious complications of the conventional methods.[3] Probably, these two complications were avoided since the dilators were introduced over a guidewire, which was inserted under fluoroscopic cpntrol or, as mentioned above, under combined fluoroscopic and endoscopic control. The shape of the dilators facilitated the insertion of the dilators over the guidewire because it imitates the shape of the male urethra. Furthermore, the hydrophilic coating of the dilators allows for any atraumatic dilation. UTI were encountered in 10.8% of the cases. The incidence of this complication should probably be attributed to high residual volume of urine that these patients have and makes them prone to UTIs, rather than the use of the SCCDs. Similarly, the hemorrhagic complications (3.6%) could be related to the inclusion of all our experience in the current study without selecting any cases. A diverse population with urethral strictures was managed. Patients already bleeding, such as patients with hemorrhage by repetitive attempts to place a urethral catheter or patients prone to bleeding such as those under anticoagulants or antiplatelet therapy, were included. It should be noted that a number of cases were done as emergent cases and consequently, and the interruption of anticoagulants or antiplatelet drugs would not provide any benefit. As a general rule, the procedure was not contraindicated when the aforementioned medication was not interrupted. The two penile hematomas of the current population were not developed during dilation but were already present when we initiated the procedure.

Considering the above, it could be advocated that these dilators could be used for all cases of difficult urethra catheterization due to the presence of significant strictures even in an emergency setting. Suprapubic catheters and their complications could be avoided while patients with anticoagulants or concomitant bleeding could be effectively managed.

The limitation of the study is its retrospective nature. Information on 34 patients was not sufficient for reporting their course while the lack of a prospective trial does not allow for a strict methodology for the evaluation of the strictures before the dilation and during the follow-up. A control group could provide additional integrity to the currently presented data and further strengthen to use of these dilators. The prospective comparative studies would provide the evidence for the wider acceptance of the technique and the establishment of the most appropriate indications.

CONCLUSION

The experience of our tertiary center with the SCCDs showed that these dilators are safe and effective for the management of cases with urethral strictures of diverse length, location, and etiology. The hydrophilic coating and the shape of the dilators limit the traumatic events of urethral dilations.

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Conflicts of interest
There are no conflicts of interest.

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