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Interventional urethral balloon dilatation before endoscopic visual internal urethrotomy for post-traumatic bulbous urethral stricture: A pediatric case report

Ha *et al.* Interventional urethral balloon dilatation pre-EVIU

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Abstract

BACKGROUND

While several treatment options are available for pediatric urethral strictures, the appropriate treatment must be based on several factors. Although endoscopic visual internal urethrotomy (EVIU) could be a first-line treatment option for short pediatric urethral strictures, it is not feasible if the urethroscope cannot pass through the stricture point. Here we present a pediatric case of severe post-traumatic bulbous urethral stricture that was successfully treated by EVIU after securing the urethral route via interventional balloon dilatation.

CASE SUMMARY

A 12-year-old boy presented at our outpatient clinic because of the inability to urinate. He had sustained a straddle injury three months prior. The post-void residual (PVR) urine volume was 644 mL, and retrograde urethrography confirmed severe stricture of the bulbous urethra. EVIU was planned; however, the first attempt to treat the stricture failed because the urethroscope could not pass through the stricture point. The urethral route was subsequently secured via balloon dilatation of the stricture, which was performed in collaboration with specialists from the department of interventional radiology. The urethroscope was then able to pass, and the repeat EVIU was successful.

CONCLUSION

Interventional urethral balloon dilatation prior to EVIU may be helpful to secure the urethral route in the treatment of pediatric urethral strictures.

Key Words: Urethral stricture; Endoscopic visual internal urethrotomy (EVIU); Urethroplasty; Urethral balloon dilatation; Interventional radiology; Case report

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Core Tip: Urethral stricture ^{is} one of the most challenging problems in urology, with traumatic and iatrogenic etiologies accounting for most cases. Appropriate treatment methods, including endoscopic management [dilation and endoscopic visual internal urethrotomy (EVIU)], urethroplasty, and urethral stenting, depend on the site and length of urethral stricture and the clinical situations. EVIU could be the first-line treatment for pediatric urethral stricture, though it is not a viable option when the urethroscope cannot pass through the stricture. Here we describe the successful management of a severe urethral stricture by EVIU after securing the urethral route *via* interventional balloon dilatation.

INTRODUCTION

A urethral stricture is a narrowing of the urethral lumen caused by the formation of scar tissues due to collagen and fibroblast proliferation, which ultimately causes lower urinary tract obstruction ^[1]. The etiologies of pediatric anterior urethral stricture are divided into iatrogenic (hypospadia-associated or post-catheterization), traumatic, inflammatory (lichen sclerosis-associated), post-infectious, and congenital ^[2]. Symptoms of pediatric anterior urethral stricture include ³ hematuria, pain, nighttime or daytime wetting, urinary tract infection, decreased stream, high post-void residual (PVR) urine volume, straining to void, and dysuria ^[3]. While several surgical treatment options for pediatric urethral stricture have been introduced in recent years, there is no consensus regarding the optimal treatment method ^[4,5]. However, reserving open urethroplasty as the final option for the treatment of short bulbous urethral stricture is an important and cost-effective strategy ^[6].

Endoscopic visual internal urethrotomy (EVIU) could be a first-line treatment option for pediatric patients with short urethral stricture. However, when the urethroscope cannot

pass through the stricture point, EVIU is not viable. Here we report a case involving a 12-year-old boy with severe urethral stricture through which a urethroscope could not pass. The patient was successfully treated by EVIU after securing the urethral route by interventional balloon dilatation.

CASE PRESENTATION

Chief complaints

A 12-year-old boy presented at our outpatient clinic with the inability to urinate.

History of present illness

The patient experienced difficulty urinating for approximately three weeks prior to the outpatient visit. He could not start urinating properly when he needed to urinate and could not completely empty his bladder. He frequently woke up in the night to urinate. He could not recollect any characteristics of his urine stream or any aggravating or relieving factors influencing his symptoms.

History of past illness

The patient reported suffering a straddle injury from a falling off a trampoline three months prior to his presentation. He presented to the emergency room (ER) with blood in the urethra meatus and the inability to urinate. Retrograde urethrography (RGU) performed in the ER (Figure 1) confirmed partial rupture of the bulbous urethra, which was treated *via* the insertion of a 12F foley catheter.

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Personal and family history

The patient reported no relevant family history.

Physical examination

The boy appeared well oriented and cooperative, and his vital signs were stable.

Laboratory examinations

At the outpatient visit, the PVR urine volume was 644 mL.

Imaging examinations

RGU performed during the outpatient visit confirmed severe stricture of the bulbous urethra.

FINAL DIAGNOSIS

The patient was diagnosed with post-traumatic severe bulbous urethral stricture.

TREATMENT

EVIU was attempted after the patient was admitted to the hospital, although the endoscopic guide wire could not be passed through the stricture point due to the severity of the bulbous urethral stricture. Forcibly performing EVIU under such circumstances could cause unnecessary urethral injury; therefore, we discontinued the operation after an emergency suprapubic cystostomy. The operative outcome was explained to the patient and his guardian, and the need for an open urethroplasty was discussed. However, the patient and his guardian desired another EVIU attempt. Interventional urethral dilatation was attempted based on our consultation with specialists from interventional radiology.

The patient was placed in the supine position on the fluoroscopy table in the intervention suite. A 5F catheter (KMP; Cook, Inc, Bloomington, Indiana, USA) was inserted into the anterior urethra, and 10 mL of 2% lidocaine was injected through the catheter for local anesthesia. An antegrade urethrography was performed by injecting 10 mL of 50% diluted contrast medium with normal saline through the suprapubic cystostomy catheter (Figure 2A). Under fluoroscopic guidance, a 0.035-inch angled guide wire (Radifocus glidewire; Terumo, Tokyo, Japan) was placed onto the 5F catheter and manipulated until it passed through the site of the urethral stricture. After the guide wire was successfully navigated to the entrance of the bladder neck, a 6 mm

balloon catheter (Mustang, Boston Scientific Corporation, Natick, MA, USA) was advanced over the guide wire and laid across the site of the urethral stricture (Figure 2B). The balloon catheter then was inflated for three minutes to widen the urethra. After balloon dilatation, the balloon catheter was removed and a 10F foley catheter was inserted along the guide wire.

On the following day, a urethrosopic guide wire was inserted into the 10F foley catheter to secure the urethral route and successfully complete EVIU. A post-EVIU RGU demonstrated an improved caliber of the affected urethra (Figure 3).

OUTCOME AND FOLLOW-UP

An RGU performed two months after the initial EVIU revealed a mild stricture; therefore, a second EVIU was performed. The patient is being monitored carefully, as an open urethroplasty may be required if symptoms recur in the future.

DISCUSSION

Pediatric anterior urethral strictures can be iatrogenic (associated with hypospadias or catheterization), traumatic, inflammatory (associated with lichen sclerosis), post-infectious, or congenital [2]. The majority of children present with an anterior urethral stricture, with bulbar, penile, and bulbopenile strictures accounting for 45%, 35%, and 3% cases, respectively [7]. Almost all adult strictures are acquired, of which the largest group are iatrogenic from urethral manipulations [8]. Several treatment options for urethral stricture have rapidly evolved in recent years [9]. Surgical options include urethral dilatation, EVIU, and urethroplasty. Urethroplasty techniques include excision and primary anastomosis, substitution urethroplasty, augmented anastomotic urethroplasty, and pull through urethroplasty [7, 9, 10]. Perineal urethrostomy and permanent urethral stenting are additional treatment options [11].

However, there is no consensus regarding the first-line treatment method [9, 10]. As most studies regarding the treatment of urethral stricture have focused on adults, treatment methods for pediatric urethral stricture have yet to be established. Despite this,

reserving open urethroplasty as the final treatment option for bulbous urethral stricture is considered an important and cost-effective treatment strategy [6, 10]. Nonetheless, the appropriate treatment method depends on the site, length, and underlying pathology of the stricture, the patient's previous surgery history and preference, and the experience and preference of the urosurgeon [12].

For the treatment of a short (<2 cm) bulbous urethral stricture, EVIU with or without urethral dilatation is commonly used [10, 13]. The American Urological Association (AUA) and Korean Urological Society recommend EVIU for the initial management due to its lower complexity, lower cost, less invasiveness, less time required, and subsequently, less hospitalization [10, 13]. However, several studies have reported that excision and primary anastomosis should be the standard treatment for short bulbous urethral strictures, though it is more invasive, due to a favorable overall success rate [5, 7]. Although the success rate of single EVIU is 26%-53%, that of repeated EVIU is up to 71% [5, 14, 15], which is similar to the success rate of excision and primary anastomosis (82%) [7]. During excision and primary anastomosis, excision of the urethral stricture segment and opposing 1-cm proximal and distal spatulation may lead to penile and urethral shortening [16]. Especially in adolescent boys who are still developing, as in our patient, urethral shortening may result in complications such as chordee [17]. Additional complications of open urethroplasty include erectile and ejaculatory dysfunction, insensate glans, urine dribbling, and incontinence, while stricture recurrence is the most common complication after EVIU [17, 18]. Therefore, when treating pediatric urethral strictures, it is necessary to consider the site and length of the strictures as well as treatment methods and complications when consulting with the patient.

When the guide wire cannot pass through the stricture point during EVIU, the operation is often converted from EVIU to an open urethroplasty [14]. In our patient, the urethroscope and guide wire could not pass through the stricture point during the first attempt of EVIU. Accordingly, we explained the need for an open urethroplasty to the patient and his guardian, but they expressed a strong desire to attempt a repeat EVIU. However, excessively forcing the urethroscope through the stricture point may lead to

additional urethral injury; therefore, the primary urologist consulted with the department of interventional radiology regarding interventional urethral balloon dilatation and foley catheter insertion. Under the guidance of urethrographic and fluoroscopic images, the stricture point on the bulbous urethra was successfully located using the guide wire and catheter, and urethral balloon dilatation was performed to allow for subsequent EVIU. Therefore, in patients in whom EVIU cannot be performed due to the urethroscope not being able to pass through the stricture point, interventional urethral balloon dilatation can be used to secure the urethral route prior to subsequent EVIU.

CONCLUSION

EVIU is a common treatment method of urethral stricture for various reasons, including its low complexity, low cost, low time requirement, and, subsequently, less hospitalization. EVIU may be a safe and useful first-line treatment option regardless of the stricture site and etiology, especially for pediatric urethral strictures measuring <1 cm. When EVIU cannot be performed due to the urethroscope not passing through the stricture point, interventional urethral balloon dilatation is helpful to secure the urethral route prior to subsequent EVIU.

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SIMILARITY INDEX

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