A Simple and Novel Method to Attain Retrograde Ureteral Access after Previous Cohen Cross-Trigonal Ureteral Reimplantation

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Key Words

Method • Technique • Retrograde • Ureteral access • Ureteral reimplantation • Ureteric orifice

Abstract

Objective: To describe a simple, novel method to achieve ureteric access in the Cohen crossed reimplanted ureter, which will allow retrograde working access via the conventional transurethral method. **Materials and Methods:** Under cystoscopic vision, suprapubic needle puncture was performed. The needle was directed (bevel facing) towards the desired ureteric orifice (UO). A guidewire (with a floppy-tip) was then inserted into the suprapubic needle passing into the bladder, and then easily passed into the crossed-reimplanted UO. The distal end of the guidewire was then removed through the urethra with cystoscopic grasping forceps. The straightened ureter then easily facilitated ureteroscopy access, retrograde pyelogram studies, and JJ stent insertion in a conventional transurethral method. **Results:** The UO and ureter were aligned in a more conventional orthotopic course, to allow for conventional transurethral working access. **Conclusion:** A novel method to access the Cohen crossed reimplanted ureter was described. All previously published methods of accessing the crossed ureter were critically appraised.

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Introduction

The Cohen cross-trigonal ureteral reimplantation operation is a well-established open surgical procedure for vesico-ureteric reflux (VUR) disease. The procedure entails the cross reimplantation of one or both ureters, which will open at a new ureteric orifice (UO) located at a region across the bladder trigone [1, 2].

This operation is performed to decrease the possibility of persistent VUR by achieving a longer ureteric transmural length, that is at least 5 times greater than the ureteric diameter (Paquin's rule) [3].

Although various therapeutic options and endoscopic advancements have been described in the management of VUR, the Cohen cross-trigonal ureteral reimplantation operation was the mainstay among surgical options in previous decades. More recent trends are endoscopic management or non-surgical (antibiotic prophylaxis) options [4, 5].

Despite these trends, a significant number of children who underwent the Cohen cross-trigonal ureteral reimplantation operation, in the 1980's and 90's, are now presenting to urologists as adult patients.

Although better endoscopic training and tips and tricks are now openly available along with the advancements in ureteroscopic miniaturization and technology [6, 7], the retrograde access of the crossed reimplanted ureter will always be a potential challenge.

Fig. 1. Step-by-step images (cystoscopic view) of the novel technique used for attaining retrograde transurethral working access in the Cohen cross reimplanted ureter. **a.** Left crossed reimplanted UO. Postero-lateral angle of UO insertion depicted by white arrow. **b.** Suprapubic needle inserted into the contralateral aspect of the bladder, with bevel facing the desired UO. **c.** Guidewire (with hydrophilic tip) inserted into the suprapubic needle. **d.** UO easily catheterized as the angle of approach is now conducive to insertion. **e.** Guidewire advanced up to level of the kidney, (cf. with fig. 2a). **f.** Cystoscopic grasper inserted into the bladder. **g.** Distal (stiff) end of the guidewire is grasped, and brought into the bladder from the suprapubic tract. **h.** Guidewire (distal end) is now gently removed from the bladder, taking care not to dislodge the ‘floppy’ hydrophilic tip from the renal pelvis, (c.f. with fig. 2c). **i.** UO and ureter now straighter with the guidewire in situ. The new UO angle of insertion depicted with black arrow, (c.f. with fig. 1a). **j.** Gentle lateral movement of the stiff guidewire allows an even straighter, more orthotopic ureteric course. The new angle of UO insertion depicted with black arrow, (cf. with fig. 1i). **k.** Materials utilized: needle 18 G (1.3 × 45 mm), guidewire (Solo PLUS, BARD) Stiff Hybrid Guidewire with Hydrophilic-Tip (0.035 × 150 cm) (Hydrophilic-black tip) and (stiff guidewire component), Cystoscopic optical grasping forceps (Karl Storz, GmbH&Co. KG, Tuttlingen, Germany).

Previously techniques described cystoscopic access via the bladder, which can often be challenging or suprapubic access of the ureter via the bladder and then subsequent ureteric access via the suprapubic route [8–20].

To assist with the endoscopic management of these patients, we describe a simple technique of attaining urethral operative ureteral access in the Cohen cross reimplanted ureter.

Materials and Methods

We report on a simple, novel method, to attain ureteric access in a crossed reimplanted ureter in an adult patient with persistent flank pain, pyonephrosis, and recurrent pyelonephritis that required insertion of a left-sided double J stent. The patient had a history of previous bladder surgery for recurrent urinary tract infections in childhood. Relevant patient consent along with local internal institutional ethics committee approval had been attained

Fig. 2. Corresponding fluoroscopic and clinical images. **a.** Fluoroscopic image of guidewire passing into the left crossed reimplanted UO and up the left ureter. Contrast inserted into the bladder to better depict the bladder outline. White arrows depicting the suprapubic needle shaft that was used to facilitate passage of the guidewire into the bladder. **b.** Surface view of the guidewire after the needle shaft was removed. The Pfannenstiel incision scar from the previous Cohens procedure is also observed. **c.** Fluoroscopic image of the guidewire (Hydrophilic-tip) seen in the renal pelvis (c.f. with fig. 2d). **d.** Retrograde pyelogram study confirmed position in the left ureter, with the left pelvi-calyceal system outlined with contrast (c.f. with fig. 2c).

(Human Research Ethics Committee Clearance Certificate Number M170157).

Surgical Technique

Under cystoscopic vision, a suprapubic needle puncture (18 G, 1.3×45 mm) was performed in the contralateral bladder quadrant, to allow for an angle of approach into the crossed reimplanted UO. A stiff guidewire with a floppy hydrophilic tip (fig. 1k) was used for insertion and negotiation into the UO. The needle was directed with the bevel facing the desired UO. The guidewire was

then inserted into the suprapubic needle passing into the bladder, and the floppy hydrophilic-tip was easily passed into the crossed-reimplanted UO. Guidewire placement was then confirmed up the desired ureter by fluoroscopy screening, and it later confirmed floppy-tip coiling in the left renal pelvis.

The distal end of the guidewire was then passed via the suprapubic tract, into the bladder and subsequently removed through the urethra with cystoscopic grasping forceps (while simultaneously ensuring that the floppy hydrophilic tip was not removed or slipped out of the ureter or renal pelvis). The ureter was then easily straightened with gentle lateral movement of the stiff guidewire.

Table 1. Tabulation of all previously described methods utilized in attaining access of the Cohen crossed reimplemented ureter

Ref (year)	Patient (n)	Materials utilized	Technique described	Comments
De Castro [8] (1981)	1 p	needle, endoscopic rubber tip, ureteral catheter	Endoscopic (cystoscopic) vision – SP catheter needle inserted opposite the (intended) ureter. Common endoscopic rubber tip to maintain water tightness.	Using endoscopic vision the ureteral catheter is easily inserted in the UO via the SP tract
Lamesh [9] (1981)	5 p	thin trocar (rubber tip used if bilateral)	Transverse SP stab incision and trocar insertion. Ureteral catheter inserted through SP trocar.	Due to risk of persistent drainage, post-op Foleys catheter needed for 24 hrs.
Lamesh [10] (1982)	Letter to Editor	trocar with 130 degree distal curve, rubber seal	SP Trocar inserted opposite the ureter, to accommodate the curve of the ureter. Rubber seal avoids bladder emptying.	Decreases the risk of posterior ureteral mucosal injury.
Erlich [11] (1982)	Letter to Editor	Catheter (VPI Company of Spencer, Indiana), deflecting wire guide	Inserted in a retrograde fashion, under cystoscopic guidance.	Obviates the need for SP puncture.
Rich [12] (1987)	1 p	nephrostomy set, angiographic catheter, 0.038 guidewire	Anterograde delineation of the UO via floppy tip guidewire passed into the bladder. Distal ureter dilated with balloon dilator (5 mm balloon, 12 atmospheres).	Rigid ureteroscopy (13.5 Fr) and lithotripsy successfully performed.
Argueso [13] (1991)	1 p	cobra head catheter (5 Fr), 0.035 guidewire	Inserted in a retrograde fashion, under cystoscopic guidance.	Authors also suggest using a flexible cystoscope to place guidewire.
Santarosa [14] (1993)	1 p	needle 18 gauge, 2 × guidewires 0.038, Amplatz dilators	Bladder distended, SP needle assisted passage of 2 guidewires. Dilation performed with Amplatz dilators. Rigid cystoscope passed through the SP Amplatz sheath.	UO incised at 6 o'clock. Flexible ureteroscopy also successfully performed.
Wallis [15] (2003)	6 p	angiographic glide catheter (4 Fr) (Terumo, New Jersey), 0.035 angled-tip guidewire (Boston Scientific) with torque device attached	Inserted in a retrograde fashion, under cystoscopic guidance. Super stiff guidewire used to literally straighten the ureter.	Super stiff guidewire exchanged (Boston Scientific) to accommodate rigid ureteroscopy.
Chaudhary [16] (2004)	1 a	anterograde guidewire (type n/s)	Anterograde delineation of the crossed UO, during PCNL.	Incidental finding, with surgical history of Cohens procedure only confirmed post-op.
Krambeck [17] (2007)	7p, 2a	anterograde guidewire (type n/s)	Failed ureteroscopic access in 2/2 patients. Anterograde delineation of the crossed UO. Failed retrograde UO access despite use of angiocatheter and angled guidewire.	PCNL successfully performed.
De Castro [18] (2010)	13 p	IV needle, IV catheter, ureteric access wire (based on surgeon preference)	SP Puncture with needle/catheter. Ureteral catheter inserted via the SP route, under cystoscopic guidance. Post procedure ureteral catheter and wire removed and sterile dressing placed on SP puncture site.	Listed indications for intervention: Retrograde pyelography and JJ stent (n = 10/13), Removal of migrated JJ stent (n = 2/13), Flexible ureteroscopy (n = 1/13).
Lusuardi [19] (2011)	8 (14–29 yr)	Tiemann (5 Fr/70 cm) ureteral catheter, hydrophilic angled-tip guidewire 0.035 (HiWire, Cook Medical, USA)	Inserted in a retrograde fashion, under cystoscopic guidance. The Tiemann catheter is inserted into the desired UO.	Dual Lumen Ureteral Access Sheath (Flexor DI, Cook Medical Inc.) used for ureteroscopy if needed
Khalil [20] (2013)	1 a	2 × 0.035 curve guidewires, flexible ureteroscopy	Guidewires inserted during visualization of UO, using a flexible ureteroscope. This method requires experience in handling the flexible ureteroscope.	Flexible ureteroscopy and laser successfully performed for 12 mm calculus.
Index Case [*]	1 a	needle 18 G (1.3 × 45 mm), guidewire (Solo PLUS, BARD) stiff with hydrophilic-Tip (0.035 × 150 cm), cystoscopic grasping forceps (fig. 1k)	Under cystoscopic vision, SP needle puncture performed. Guidewire inserted into the SP needle, then passed into the UO. Distal end of guidewire removed through the urethra with cystoscopic grasping forceps. Ureter straightened with the stiff guidewire <i>in situ</i> . fig. 1 (a–k), fig. 2 (a–d) and video (supplemental file attached)	New straightened ureter facilitates easy ureteroscopy or conventional JJ stent insertion. Guidewire exchange not needed due to stiff core.

A = Adult patient (above 18 years old); p = pediatric patient; n = patient number; n/s = not specified; SP = supra pubic; PCNL = percutaneous nephrolithotomy; IV = intravenous.

This straightened ureter now easily facilitated ureteroscopy access, retrograde pyelogram studies, and JJ stent insertion in the conventional transurethral method. See fig. 1 (a–k) and fig. 2 (a–d) and attached supplementary video.

Results

Using the conventional, urethral access method, the ureter was easily accessed with the stiff guidewire, and

the UO was now aligned in a more orthotopic course. The suprapubic puncture site was not visible at the end of the procedure.

Discussion

Our method is superior to previously described methods since it allows urethral access for ureteric instrumentation in the standard, conventional manner, but initially uses a suprapubic approach which allows for entrance

into the UO with a more conducive angle of insertion. The risk of fluid leakage from the bladder, suprapubic tract, or damage to surrounding anatomical structures is minimized, as a trocar or serial dilation of the suprapubic tract is not needed.

We reviewed all methods of ureteric access after Cohen reimplantation that was described in the literature, and tabulated them in table 1. The search was performed on the Scopus, Web of Science, and PubMed databases using search terms: “ureteric access” or “ureteral access” and “post Cohen cross-trigonal ureteral reimplantation” or “after Cohen cross-trigonal ureteral reimplantation”. Further, a full reference analysis was performed to ascertain other references (techniques) of ureteric access in this group of patients that may have been missed in the original search string. All the previous published methods are described, critically appraised, and tabulated in table 1 [8–20].

Although some previous reports showed that retrograde working access via the transurethral route is possible with the crossed reimplanted ureter, they all accessed this crossed UO, using specialized catheters, or angled guidewires, or experienced flexible ureteroscopy prior to their subsequent transurethral ureteric procedure [11, 13, 15, 19, 20]. This is the first description utilizing the benefit of a suprapubic access route into the crossed UO, having the added benefit of a subsequent transurethral retrograde working access approach.

Thus, we have described a simpler method, without the need for specialized equipment or significant expertise. After attaining access via the suprapubic route using a standard 18 G needle, we simplified the working access by grasping the distal remaining portion of the guidewire from the suprapubic tract (fig. 1h), into the bladder, and finally bringing it out of the urethra. This allows for a conventional, almost straightened ureteric working access route (fig. 1j and video supplement).

Certain tips found useful during this technique include: rotating the needle bevel to face the desired UO, suprapubic puncture to be done laterally and opposite the desired ureter, emptying the bladder slightly after the suprapubic puncture to decrease the needle bevel to UO distance, use of a second endoscopic monitor to allow an assistant to direct the cystoscope while the surgeon orientates the suprapubic needle. Further, the use of a stiff guidewire with a floppy tip allows easy manipulation of the ureter after access into the UO is gained. This obviates the need to exchange the guidewire for a stiffer wire for ureteric working access, which may be required in certain cases of semi-rigid ureteroscopy.

Conclusion

A simplified technique to attain a working ureteric access in the Cohen cross-reimplanted ureter is described utilizing materials found in every basic endo-urology unit. Now that the children of the 1980's and 90's are well into adulthood, the potential dilemma of accessing the ureter after previous Cohen cross-trigonal ureteral reimplantation will be a more common encounter for the attending urologist.

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