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UROLOGY - ORIGINAL PAPER

Insertion of a single double-J stent for bilateral open ureteral reimplantation: introducing a novel technique and assessment of feasibility

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Abstract
Purpose To propose a novel technique for bilateral placement of a single double-J stent during bilateral open ureteral reimplantation in order to reduce the intravesical length of stent and potentially minimize the irritative symptoms.
Methods A retrospective chart review was performed to find patients who underwent bilateral open ureteral reimplantation. According to the patient's age, an appropriate single double-J stent is used for stenting both ureters after open reimplantation using the Politano–Leadbetter technique. The stent is fixed to the bladder wall with a 4-0 chromic absorbable suture in the midline, superior to the intertrigonal ridge. A non-absorbable suture is also fixed to the stent in the midline as an extraction string.
Results From June 2009 to July 2013, 20 patients underwent bilateral ureteric surgery. Twelve (60 %) were female. Patients' age ranged from 3 months to 2 years. Double-J stents were successfully removed within 2 weeks postoperatively in all patients.
Conclusions This technique might reduce the stent-related symptoms after open bladder surgery for bilateral ureteral surgery. Using this technique will reduce the redundant mass of ureteral stents in bladder and potentially minimize the trigonal irritation and subsequent pain and discomfort.

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Introduction

Insertion of double-J stents is a common procedure in pediatric urology practice. These stents are widely used for preventing or relieving ureteral obstruction and keeping the ureter patent in both adults and children. In case of reconstructive surgeries, double-J stents prevent urine leakage and can also provide a scaffold for the healing ureter [1]. However, double-J stents are associated with bothersome symptoms and may cause hematuria, urinary tract infection, and irritative symptoms like pain, discomfort, and dysuria [1, 2]. The exact etiology behind the stent-related symptoms remains unknown, but most of the irritative symptoms may arise from trigonal irritation by the free distal end of double-J in the bladder floor [1, 2].

Although the overall trend in pediatric urology is toward minimally invasive surgeries and endourologic procedures, open surgery remains the gold standard in some cases. An example is open intravesical ureteral reimplantation for treatment of vesicoureteral reflux (VUR) in cases of failed attempts of endoscopic correction or presence of concurrent anatomic abnormalities [3, 4]. Placement of bilateral double-J stents is warranted in some of these cases to provide anastomotic alignment and integrity for suture line and prevent obstruction by ureteral edema; however, pain, discomfort, and trigonal irritation from bilateral stents would be an important concern in pediatric patients. Although some have tried to find pharmacological solutions to treat symptoms related to ureteral stents [5], technical modifications in stent placement in order to minimize patients'

discomfort are less frequently addressed specifically in pediatric patients.

We hereby propose a novel technique for bilateral placement of a single double-J stent during open ureteral reimplantation to get rid of free distal tips of double-J in bladder and minimize the intravesical length of stent.

Patients and methods

After obtaining ethical approval from institutional review board, we retrospectively reviewed the records of patients between June 2009 and July 2013 to identify those who underwent bilateral ureteric surgery with placement of a single bilateral double-J stent. An informed consent was obtained from patient's parents before surgery.

The technique is best applied during bilateral open intravesical ureteral reimplantation using Politano–Leadbetter technique [6], in which the ureteral orifices are reimplanted in the normal anatomic position allowing for retrograde cannulation of ureters. After entering the bladder in vertical axis, reimplantation of the ureters is completed using the classic technique [6, 7]. According to the patient's age, a 3F or 4F, 12–26-cm-long (based on patient's age and size or using age plus 10 formula [8]) both-end-open double-J stent is chosen and marked in the midpoint with a suture. After completion of ureteral reimplantation, floppy end of a guidewire is inserted into one ureter and the stent is passed over the guidewire into the ureter in a manner that 2–3 stent side holes remain between the ureteral orifice and the midpoint suture; the wire is then removed. For the other side, the floppy end of the guidewire is first inserted through one of the side holes in the double-J stent body, getting out from the open end of the stent, and then inserted into the ureter. The other end of the stent is then passed over the guidewire into the ureter and the wire is removed from the hole afterwards. Alternatively a one-end-open double-J stent can be used using a modified technique; first, the floppy tip of the guidewire is inserted through the open end of the double-J stent and pushed forward to meet and straighten the closed end. The closed end of the stent is then inserted into the ureter for the previously specified length with the guidewire inside; the wire is then removed. For the other side, the same steps are repeated as for both-end-open double-J using the side holes in the stent body to introduce the floppy end of the guidewire. It is important to note that coiling of double-J ends in the renal pelvises is not a concern since providing adequate drainage of the enlarged ureters and avoiding obstruction in lower parts are the main goals of stenting. Ideally the coiling in renal pelvises should be avoided to minimize irritation of the upper system by pelvis spasm, and 4–5 side holes should be left between the ureteral openings in the bladder. The stent is then fixed to the bladder wall with a 4-0 chromic absorbable suture in the midline, superior to the intertrigonal ridge, to avoid both trigonal irritation and early stent migration

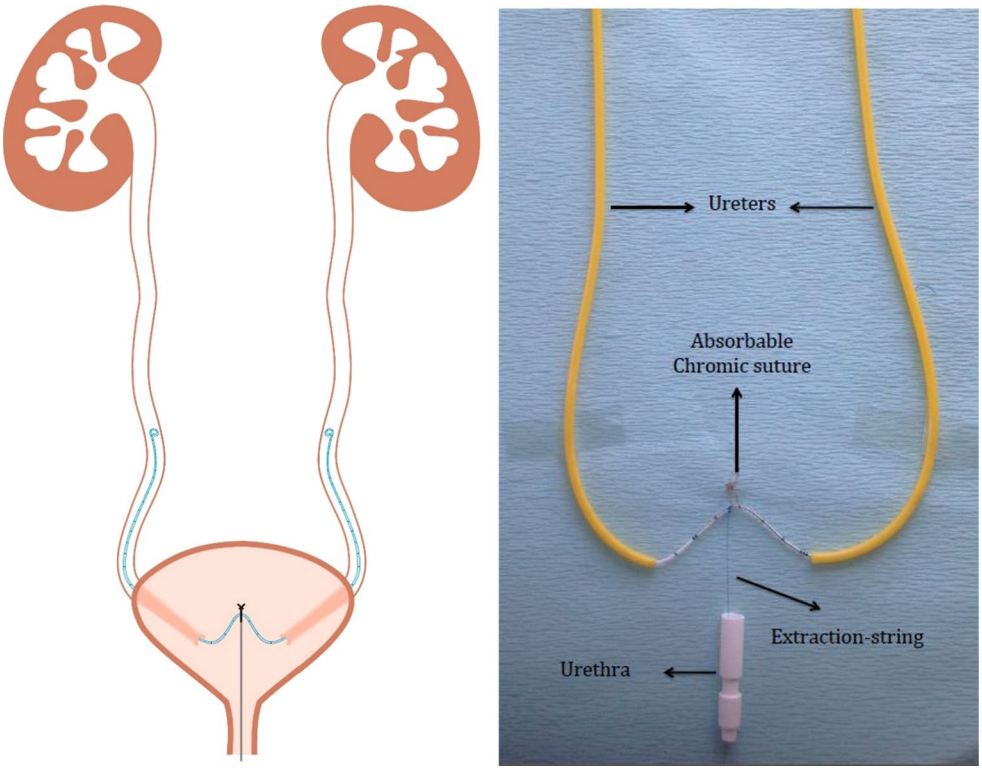

Fig. 1 Schematic drawing and model showing the position of a single double-J in bladder for stenting both ureters with a tether attached

(Fig. 1). A 5-0 Prolene stitch is also fixed to the stent in the midline as an extraction string. This extraction string is then passed through the urethra using an 8F Nelaton catheter. An additional 4-0 non-absorbable stitch is sutured to the lateral subcoronal skin in boys or inner surface of labia majora in girls and is cut to the desirable length. Then these two strings are knotted together externally fixing the extraction string without any tension [9]. A urethral catheter is then placed for 4–5 days postoperatively. The extraction string is used for non-cystoscopic stent retrieval after 2 weeks postoperatively, when the absorbable chromic suture loses its integrity. Bladder and wound closure and the postoperative care follow the standard protocol.

Results

During the study interval, 20 patients were found to have single bilateral double-J stent placed for them. Twelve patients (60 %) were female. Patients' age at the time of surgery ranged from 3 months to 2 years. None of the patients had undergone any procedure for VUR correction before. All patients tolerated single bilateral ureteral stent. All double-J stents were successfully removed after about 2 weeks postoperatively using the extraction string. No complication or inadvertent stent expulsion was encountered.

Discussion

To the best of our knowledge, this is the first report on using a single double-J for stenting both ureters to minimize bladder irritation. Placing a suture in the midline keeps the stent further away from trigone and also minimizes the chance of stent migration. Furthermore, applying an extraction string obviates the need for endoscopic stent removal and lowers the associated costs and discomfort.

Ureteral stents, although very useful, are not complication-free, and we are still far from the ideal stent. Modifying the placement technique, and finding effective medications for relieving ureteral stent-related symptoms, are some solutions to provide better patient care until the day ideal stents are available. Bladder surgery per se can cause pain and bothersome bladder spasms postoperatively. Additionally, ureteral stents act as a foreign body in the bladder and are associated with pain, frequency, dysuria and other irritative symptoms known as "stent syndrome" [1]. However, most studies that address these symptoms focus on drug therapy and use of smaller and softer stents and are conducted in adult populations, with fewer studies addressing children patients. Although several pain scale and questionnaires (e.g., VAS [visual analog scale], PIPP [premature infant pain profile], and FLACC [face, legs, activity, cry and consolability]) are designed for use in pediatric patients [10], in contrast to adults, assessing the stent-related symptoms in children is more problematic and no standard and specific questionnaire or scale is available for this purpose. Also the stent-related symptoms may be vague in children and the pain may radiate to the perineum and anal area, making it harder to diagnose and score. Some experts have evaluated different medications like oral and parenteral and intravesical medications to overcome the pain after bladder surgery and stent placement, but the results were controversial and inconclusive [5]. After all, given the difficulties in diagnosing and treating pain in children, minimizing the bladder irritation and pain after bladder surgery remains the main step to decrease analgesic requirements and bothersome urinary symptoms.

Our suggested method is a possible way to minimize the trigonal irritation by the J-ends of ureteral stents and potentially reduce the stent-related pain and discomfort after bladder surgery. Although not fully known, stent-related symptoms may be largely attributed to irritation of nerve-rich trigonal area by free distal ends of stents and subsequent smooth muscle spasm [2, 11]. Several studies have shown that longer length of intravesical ureteral stents or stent ends that pass the midline of bladder are associated with more severe urinary symptoms [12–15]. In a study on 86 adults, Giannarini et al. [15] showed that stent length and location of distal stent loop are the strongest predictors for stent-related symptoms and morbidity; they also suggested that stents which cross the midline may directly irritate the contralateral bladder wall and cause more severe symptoms. Also, Al-Kandari et al. [14], in a randomized clinical trial, reported that stent length and location of stent distal end are significantly associated with more severe symptoms. Interestingly, a prospective randomized study by Damiano et al. [16] did not show difference in patients' symptoms with two different diameters of ureteral stent (4.8 F vs. 6 F in adults); this finding also highlights the importance of distal stent loop in the bladder and stent length (and not diameter) in increasing patients' discomfort. Taken together, these studies show that with larger stent bulk in the bladder, the J-ends may irritate the bladder wall and trigonal area, especially when the bladder is empty. Although it seems intuitive that using shorter stents would alleviate these symptoms, this approach is also problematic due to higher risk of stent migration [17]. Moreover, stent length and location of the distal loop may not necessarily correlate [15]; the location of the distal loop may considerably change with patient's position, and even when the smallest possible stent is placed, the intravesical portion may cause bladder irritation in various anatomic positions [15, 18]. Using alternative techniques that reduce the intravesical bulk of stents and consequently reduce the

risk of complications would serve as useful options in different urologic settings. Our proposed technique would help to achieve this goal in the setting of open bladder surgery in children.

In our proposed method, the double-J stent is fixed in the midline superior to the intertrigonal ridge. Aside from the abovementioned benefits, this approach also prevents the stent from migration and also from malpositioning in the proximal urethra and the consequent risk of incontinence. Moreover, applying an extraction string to the stent obviates the need for cystoscopic stent removal and associated costs, anesthesia and complications [9]. It also minimizes the risk of neglecting the stent and facilitates easy stent removal. Recent evidence from adults shows that tethered stents are advantageous without increasing the undesirable symptoms and complications; hence, it can be used to reduce the hospital visits and costs [19, 20].

We believe that children treated with this technique will have subjectively less severe symptoms and less analgesic need postoperatively with no complications regarding the stent placement or removal method. Furthermore, the stent will be easily removed using the extraction string, obviating the need for cystoscopic stent extraction.

We are aware that this study has some limitations. Firstly, the main focus of this study is on the technical aspects and feasibility of this approach. The retrospective nature of the study and also lack of a control group and accurate outcome measurement render the outcomes subjective. Further prospective studies and well-designed clinical trials are mandatory to assess the efficacy of this technique in reducing the stent-related symptoms and complications. Moreover, a pain scoring system should be applied to assess patients' pain relief objectively. Additionally, in some centers this type of surgery is performed without using ureteral stents [21], but we believe that indwelling ureteral stents can prevent possible transient postoperative ureteral obstruction and provide the anastomotic alignment. We are aware that clinical application of this technique is limited considering the increasing popularity of endoscopic correction of primary VUR, but open ureteral reimplantation surgery is still the preferred choice in many cases such as bilateral megaureters, failure of endoscopic correction of VUR and also in some developing countries where bulking agents are expensive or unavailable. However, to the best of our knowledge this is the first time that this method is presented as a novel surgical technique to reduce redundant stent mass in urinary bladder and minimize the trigonal irritation.

In conclusion, using a single double-J stent for bilateral ureteral stenting is a simple and potentially viable method to reduce stent-related symptoms after open bladder surgery for bilateral anti-reflux surgery. Using this technique will reduce the redundant mass of ureteral stents in bladder and potentially minimize the trigonal irritation and subsequent pain and discomfort. Developing novel techniques for double-J placement and non-cystoscopic removal may serve as a practical and important mean to reduce stent-related symptoms in children.

Compliance with ethical standards

Conflict of interest No conflict of interest exists in relation to the material of the manuscript to none of the authors.

Ethical standard All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional review board and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

References

1. Lawrentschuk N, Russell JM (2004) Ureteric stenting 25 years on: routine or risky? ANZ J Surg 74(4):243–247. doi:10.1111/j.1445-2197.2004.02947.x
2. Mendez-Probst CE, Fernandez A, Denstedt JD (2010) Current status of ureteral stent technologies: comfort and antimicrobial resistance. Curr Urol Rep 11(2):67–73. doi:10.1007/s11934-010-0091-y
3. Moreira-Pinto J, Osorio A, Pereira J, Sousa C, de Castro JL, Reis A (2013) Ureteroneocystostomy after failed dextranomer/hyaluronic acid copolymer injection for vesicoureteral reflux treatment. J Pediatr Urol 9(5):665–669. doi:10.1016/j.jpurol.2012.07.021
4. Sung J, Skoog S (2012) Surgical management of vesicoureteral reflux in children. Pediatr Nephrol 27(4):551–561. doi:10.1007/s00467-011-1933-7
5. Dellis A, Joshi HB, Timoney AG, Keeley FX Jr (2010) Relief of stent related symptoms: review of engineering and pharmacological solutions. J Urol 184(4):1267–1272. doi:10.1016/j.juro.2010.06.043
6. Steffens J, Stark E, Haben B, Treiyer A (2006) Politano-Leadbetter ureteric reimplantation. BJU Int 98(3):695–712. doi:10.1111/j.1464-410X.2006.06407.x
7. Politano VA, Leadbetter WF (2002) An operative technique for the correction of vesicoureteral reflux. 1958. J Urol 167 (2 Pt 2):1055–1061; discussion 1062
8. Palmer JS, Palmer LS (2007) Determining the proper stent length to use in children: age plus 10. J Urol 178(4 Pt 2):1566–1569. doi:10.1016/j.juro.2007.03.191
9. Kajbafzadeh AM, Nabavizadeh B, Keihani S, Hosseini Sharifi SH (2015) Revisiting the tethered ureteral stents in children: a novel modification. Int Urol Nephrol 47(6):881–885. doi:10.1007/s11255-015-0963-7
10. Wong C, Lau E, Palozzi L, Campbell F (2012) Pain management in children: part 1 - Pain assessment tools and a brief review of nonpharmacological and pharmacological treatment options. Can Pharm J (Ott) 145(5):222–225. doi:10.3821/145.5.cpj222
11. Lamb AD, Vowler SL, Johnston R, Dunn N, Wiseman OJ (2011) Meta-analysis showing the beneficial effect of alpha-blockers on ureteric stent discomfort. BJU Int 108(11):1894–1902. doi:10.1111/j.1464-410X.2011.10170.x
12. Ho CH, Chen SC, Chung SD, Lee YJ, Chen J, Yu HJ, Huang KH (2008) Determining the appropriate length of a double-pigtail ureteral stent by both stent configurations and related symptoms. J Endourol 22(7):1427–1431. doi:10.1089/end.2008.0037

13. Rane A, Saleemi A, Cahill D, Sriprasad S, Shrotri N, Tiptaft R (2001) Have stent-related symptoms anything to do with placement technique? J Endourol 15(7):741–745. doi:10.1089/08927790152596352
14. Al-Kandari AM, Al-Shaiji TF, Shaaban H, Ibrahim HM, Elshebiny YH, Shokeir AA (2007) Effects of proximal and distal ends of double-J ureteral stent position on postprocedural symptoms and quality of life: a randomized clinical trial. J Endourol 21(7):698–702. doi:10.1089/end.2007.9949
15. Giannarini G, Keeley FX Jr, Valent F, Manassero F, Mogorovich A, Autorino R, Selli C (2011) Predictors of morbidity in patients with indwelling ureteric stents: results of a prospective study using the validated Ureteric Stent Symptoms Questionnaire. BJU Int 107(4):648–654. doi:10.1111/j.1464-410X.2010.09482.x
16. Damiano R, Autorino R, De Sio M, Cantiello F, Quarto G, Perdona S, Sacco R, D'Armiento M (2005) Does the size of ureteral stent impact urinary symptoms and quality of life?. A prospective randomized study. Eur Urol 48(4):673–678. doi:10.1016/j.eururo.2005.06.006
17. Slaton JW, Kropp KA (1996) Proximal ureteral stent migration: an avoidable complication? J Urol 155(1):58–61
18. Chew BH, Knudsen BE, Nott L, Pautler SE, Razvi H, Amann J, Denstedt JD (2007) Pilot study of ureteral movement in stented patients: first step in understanding dynamic ureteral anatomy to improve stent comfort. J Endourol 21(9):1069–1075. doi:10.1089/end.2006.0252
19. Barnes KT, Bing MT, Tracy CR (2014) Do ureteric stent extraction strings affect stent-related quality of life or complications after ureteroscopy for urolithiasis: a prospective randomised control trial. BJU Int 113(4):605–609. doi:10.1111/bju.12541
20. Fernando A, Bultitude M (2014) Tether your stents! BJU Int 113(4):517–518. doi:10.1111/bju.12635
21. Austin JC, Cooper CS (2004) Vesicoureteral reflux: surgical approaches. Urol Clin North Am 31(3):543–557. doi:10.1016/j.ucl.2004.04.018