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A modified technique for ureteral reimplantation: Intravesical detrusorrhaphy

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Abstract

Purpose: To describe the surgical procedure of intravesical detrusorrhaphy, a modified technique of ureteral reimplantation, and report our initial experience.

Methods: From October 2007 to March 2012, 55 children with vesicoureteral reflux (VUR) and 13 children with obstructive megaureter (OM) underwent intravesical detrusorrhaphy. All surgical procedures were performed via an open intravesical approach. The ureter was mobilized, and the bladder mucosa was separated from the detrusor in a cephalad direction. The separated detrusor was incised vertically and repaired underneath the mobilized ureter to create the submucosal tunnel. The ureteral orifice was anastomosed to its orthotopic position.

Results: Of 31 patients treated with bilateral intravesical detrusorrhaphy, no patient had postoperative urinary retention. Follow-up voiding cystourethrography was performed in 45 patients with 72 reimplanted ureters. VUR was resolved in 41 patients (91.1%) with 68 ureters (94.4%). Among 13 patients with 14 ureters treated for OM, hydroureteronephorosis improved in 11 patients (84.6%) with 12 ureters (85.7%).

Conclusions: Intravesical detrusorrhaphy is modified technique of ureteral reimplantation, which recreates the neo-ureteric orifice in the orthotopic position and does not produce postoperative urinary retention in bilateral cases. Intravesical detrusorrhaphy is safe and effective in treating patients with VUR or OM.

Ureteral reimplantation is a surgical procedure to correct vesicoureteral reflux (VUR) or ureterovesical junction obstruction. Various surgical techniques have been described for ureteral reimplantation [1–3]. All of the techniques have specific advantages and disadvantages and have demonstrated excellent outcomes in terms of correction of VUR [4,5]. In the case of severely dilated ureter, reimplantation could also be successfully performed with ureteral placation [6,7].

Cross trigonal reimplantation as described by Cohen is one of the most popular procedures [1]. Cohen's technique has the definite advantage of being entirely intravesical and easily applicable even in a small or deformed bladder and has been shown to be effective and safe with a low complication rate [8,9]. This procedure has also been reproduced using conventional and robot-assisted laparoscopic approaches

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[10–12]. However, the main concern with Cohen's technique is the relocation of the ureteral orifice and the anatomical realignment of the ureter.

Extravesical detrusorrhaphy modified from the Lich–Gregoir procedure is also an effective procedure for the correction of VUR and has advantages such as reduced bladder spasm, less pain, and short convalescence duration [13,14]. Moreover, the ureteral orifice maintains its orthotopic position following an extravesical approach. However, temporary postoperative urinary retention occurs in cases of bilateral procedures which might be associated with nerve damage [15]. Therefore, this technique is often preferable to intravesical procedures for dealing with unilateral VUR.

To overcome the disadvantages of the existing procedures, we devised a modified technique of ureteral reimplantation, which we have termed "intravesical detrusorrhaphy." This procedure maintains the orthotopic position of the ureteral orifice and prevents postoperative urinary retention from nerve damage. In this study, we aimed to describe the surgical technique and report the clinical outcomes.

1. Patients and methods

1.1. Patients

From October 2007 to March 2012, 72 pediatric patients underwent intravesical detrusorrhaphy by a single surgeon (SWH) as a ureteral reimplantation technique for VUR or obstructive megaureter (OM). Surgery was considered in patients with failure of antibiotic prophylaxis, persistent high grade VUR, worsening renal function or parental wish for surgical intervention. Patients with ectopic ureter, neurogenic bladder or history of previous ureteral reimplantation were excluded, and 68 patients were included in the analysis.

We retrospectively reviewed medical records after institutional review board approval (4-2012-0802). Preoperative evaluation included age, gender, voiding cystourethrography (VCUG) and ultrasonography. Hydronephrosis and VUR were graded according to the Society for Fetal Urology guidelines and the system of the International Reflux Study in Children, respectively [16,17].

1.2. Surgical technique

In our series, all procedures were performed with an open technique. The patient was placed in the supine position, and the bladder was opened using a Pfannestiel incision. The intravesical space was approached with a vertical incision of the bladder. After flattening the trigone using a retractor, the ureteral orifice was identified. The distal ureter was dissected by sweeping off connective tissues around the ureteral hiatus to minimize injury to the pelvic plexus [18]. The bladder mucosa was separated from the detrusor in a cephalad direction of the ureteral orifice, usually up to 2–3 cm. However, the length of the dissection was decided according to the diameter of the ureter (Fig. 1A). With upward lifting of the bladder mucosa, the detrusor was incised vertically using needle-tip cautery (Fig. 1B). The ureter was lifted, and the detrusor was repaired in an interrupted manner below the ureter to create the submucosal tunnel using absorbable 3-zero or 4-zero polyglactin (Fig. 1C). The ureter was laid on the detrusor bed, and the ureteral orifice was anastomosed to its orthotopic position with absorbable 5-zero or 6-zero polyglactin (Fig. 1D).

In the case of a severely dilated ureter, the ureter was plicated using the Starr technique [19]. The dilated ureter was folded over a 6 Fr silicon Foley catheter, and medial part was sutured in an interrupted manner using absorbable 5-zero polyglactin. After folding, a 6 Fr catheter was placed in the plicated ureter. The ureteral catheter was connected with the urethral catheter using polypropylene 4-zero, which was removed 1 week postoperatively. In patients without ureteral placation and stenting, the urethral catheter was generally removed on postoperative day 3 or 4.

1.3. Follow-up

Operation time from surgical incision was obtained from medical records. Oxybutinin was given during the catheterization. To evaluate voiding function after surgery, post voiding residual urine was measured by ultrasound. Postoperative evaluation included VCUG and ultrasonography. Clinical success was defined as absence of VUR and improvement of hydronephroureterosis. Surgical outcome was evaluated in terms of renal units. Patients with VUR were scheduled for VCUG at 6 months after surgery, and all patients were scheduled for regular follow-up with ultrasound at 1, 6 and 12 months.

2. Results

2.1. Patients

A total of 68 patients underwent intravesical detrusorrhaphy. The study cohort consisted of 55 children (80.9%) with VUR and 13 children (19.1%) with OM. Of these patients, 30 patients with VUR and one patient with OM were bilateral cases. Thus, a total of 99 ureters were reimplanted, which included 85 reflux ureters (85.9%) and 14 OMs (14.1%). Patient characteristics are summarized in Table 1. The mean age was 19.4 months and 17 (25%) were male.

2.2. Perioperative outcomes

Mean operative time was 105 min (IQR 80–120) and there were no intraoperative complications. Of 99