

Extravesical (modified Gregoir Lich) versus intravesical (Cohen's) ureteric reimplantation for vesicoureteral reflux in children: A single center experience

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ABSTRACT

Introduction: There are multiple techniques for surgical correction of vesicoureteral reflux (VUR). We compared the outcomes of extravesical versus Cohen's reimplantation for VUR in children.

Methods: Records of all children ($n = 118$) who underwent reimplantation for VUR between 2003 and 2014 were analyzed (male: female = 43:75). Children with secondary VUR, duplication anomalies, and ectopic ureter were excluded from our study. Extravesical reimplantation (EVR) was performed bilateral in 32 children (Group 1a) and unilateral in 19 (Group 1b), while bilateral Cohen's reimplantation was performed in 67 (Group 2). Parameters compared were length of the surgical procedure, average duration of stay in the hospital, postoperative bladder spasms, significant hematuria >72 h, and long-term complications.

Results: The mean age at operation was 15 months in Group 1, and 36 months in Group 2. The mean duration of surgery was significantly less ($P = 0.0001$) in Group 1a ($n = 32$; mean 104 min; standard deviation [SD] 18 min) compared to Group 2 ($n = 67$; mean 128 min; SD 15 min). The mean (SD) postoperative stay was significantly lower ($P = 0.0001$) at 4.5 (1.5) days in Group 1a compared to 6.5 (0.5) days in Group 2. Postoperative bladder spasms were significantly lower ($P = 0.03$) at 10/32 in Group 1a compared to 37/67 in Group 2. All patients responded well with anticholinergics. Postoperative hematuria and bladder spasms were significantly lower ($P = 0.03$) in Group 1a compared to Group 2. There was no significant difference in persistent VUR between Group 1 and Group 2. At 1 year follow, none of them had any evidence of ureteral obstruction.

Conclusions: EVR has lower operative time, less postoperative discomfort and shorter hospital stay compared to Cohen's reimplantation. Both techniques are equally effective in treating reflux.

Key words: Children, ureteric reimplantation, vesicoureteral reflux

INTRODUCTION

Vesicoureteral reflux (VUR) is an abnormal retrograde flow of urine from the bladder into the ureters and the pelvicalyceal systems, caused by incompetent valvular mechanism at the vesicoureteral junction. Recurrent urinary tract infections (UTI), renal scarring, and the subsequent end-stage renal disease

can be life threatening in these children. The main goal of treatment of VUR is to prevent further episodes of UTI and to avoid progressive renal scarring.^[1,2] Open surgical reimplantation can be attempted intravesical, extravesical, or a combined intra- and extra-vesical approach. Each of these techniques has its own indications and advantages. Various authors have reported an increased incidence of postoperative bladder spasms, hematuria, and prolonged hospital stay with intravesical repairs.^[3-8] The purpose of this article is to assess the outcomes of the extravesical ureteral reimplantation (EVR) of modified Gregoir Lich

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Access this article online	
Quick Response Code: 	Website: www.indianjurol.com
	DOI: 10.4103/0970-1591.189721

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How to cite this article: Sriram K, Babu R. Extravesical (modified Gregoir Lich) versus intravesical (Cohen's) ureteric reimplantation for vesicoureteral reflux in children: A single center experience. Indian J Urol 2016;32:306-9.

technique and intravesical Cohen's ureteral reimplantation (CUR).

MATERIALS AND METHODS

Between 2003 and 2014, children diagnosed with primary VUR and undergoing ureteric reimplantation at our institution were evaluated for inclusion in this study.

Patients with Grade 1–2 VUR, who were conservatively managed with antimicrobial prophylaxis and were not included. Those with higher Grade of reflux were initially conservatively managed, but those who developed recurrent breakthrough UTIs/worsening of scars were intervened surgically. Those with secondary VUR (posterior urethral valves, neurogenic bladder, or bowel bladder dysfunction), associated anomalies such as ureterocele, duplex systems, and ectopic ureters were excluded from our study. Those patients who did not have a follow-up evaluation or who did not turn up for follow-up were also excluded from our study.

Among the remaining patients with primary VUR, EVR was performed in Group 1, whereas CUR in Group 2 Modified nerve sparing EVR^[9] was performed in children younger than 2 years with bilateral VUR, as gaining adequate transtrigonal tunnel by a CUR would have been difficult in this cohort (Group 1a) and in those with unilateral VUR (Group 1b; the ureteric orifices would be placed one over the other with CUR in unilateral reflux, and this may cause confusion in instrumentation of the ureteric orifices later in life, if needed). CUR ($n = 67$) was performed in children older than 2 years with bilateral VUR [Figure 1].

The following parameters were compared: Length of the surgical procedure, average duration of stay in the hospital, postoperative bladder spasms (excessive colic immediately



Figure 1: Selection criteria for type of reimplantation. (a) Unilateral Grade 4 vesicoureteral reflux in a 15-month-old child with a small bladder capacity, a typical case for extravesical reimplantation; (b) bilateral Grade 4–5 vesicoureteral reflux in a child older than 2 years with a good bladder size, a typical case for Cohen's reimplantation

before voiding/pericatheter leakage of urine/requirement of anticholinergics in addition to regular painkillers), significant postoperative hematuria (for more than 72 h/required blood transfusions/clot retention).

Long-term complications of the procedure such as persistent reflux and ureteral obstruction were also assessed. Postoperative evaluation included ultrasound + voiding cystourethrography (VCUG) at 3 months and ultrasound + radionuclide imaging at 1 year postoperatively. The mean duration of follow-up was 3 years (1–7 years). Urodynamic assessment was not performed in the pre/postoperative period as a part of this study.

RESULTS

Over a period of 11 years, between 2003 and 2014, 750 children with VUR were diagnosed and 188 ureteric reimplants were performed in our institution. After excluding 70 patients as per our exclusion criteria, a total of 118 patients were recruited into the study. EVR was performed in 51 patients (Group 1), whereas CUR in 67 (Group 2). The mean age at operation was 15 months for Group 1 (range 10–24 months), whereas in Group 2, it was 36 months (range 24–60 months). The median age for the two Groups was 16 months and 40 months, respectively. There was a female preponderance (male:female = 43:75). Among Group 1, 32 underwent bilateral EVR (Group 1a), whereas the remaining underwent unilateral EVR (Group 1b). All patients in Group 2 underwent bilateral CUR.

The mean duration of bilateral reimplantation was significantly less ($P = 0.0001$) in Group 1a ($n = 32$; mean 104 min; standard deviation [SD] 18 min) compared to that in Group 2 ($n = 67$; mean 128 min; SD 15 min). The mean (SD) postoperative stay was significantly lower ($P = 0.0001$) at 4.5 (1.5) days in Group 1a compared to 6.5 (0.5) days in Group 2. Postoperative bladder spasms were significantly lower ($P = 0.03$) at 10/32 in Group 1a compared to 37/67 in Group 2. All patients responded well with anticholinergics. Postoperative hematuria was significantly lower ($P = 0.03$) at 10/32 in Group 1a compared to 31/67 in Group 2.

On a repeat VCUG at 3 months, persistent VUR was noted in 4/51 (7.85%) in Group 1 compared to 5/67 in Group 2 (7.5%). There was no significant difference between the Groups and none of these patients developed recurrent febrile UTI to warrant further intervention. At 1 year follow, none of them had any evidence of ureteral obstruction on the radionuclide imaging. Table 1 summarizes all these findings.

DISCUSSION

The principal goal of any antireflux procedure is to restore the near normal antirefluxing mechanism of the ureterovesical junction.^[1,2] The fact that there are a plenty of surgical

Table 1: Outcomes between the groups. Group 1a (bilateral extravesical reimplantation) had significantly less duration of surgery, duration of stay, postoperative hematuria, and bladder spasms compared to Group 2 (bilateral Cohen's reimplantation)

	Group 1 (n=51)		Group 2 (n=67)	Significance
	Extra vesical reimplantation (EVR)		Bilateral Cohen's reimplantation	P value (between group 1a & 2)
	Group 1a (n=32)	Group 1b (n=19)		
	Bilateral EVR	Unilateral EVR		
Mean (s.d) duration of surgery for bilateral reimplant in minutes	104 (18)	62 (21)	128 (15)	0.0001
Mean (s.d) duration of stay in days	4.6 (1.6)	4.2 (1.4)	6.5 (0.5)	0.0001
Post op bladder spasms	10/32	1/19	37/67	0.03
Significant hematuria	10/32	2/19	31/67	0.03
Post op obstruction	-	-	-	-
Post op VUR	3/32	1/19	5/67	0.71

techniques available for correction of VUR means there is not a single foolproof technique that would suffice in the management of these patients.^[3-5] The EVR has generally been considered to be associated with reduced morbidity in comparison to CUR.^[4,5] The overall incidence of hematuria, bladder spasms, convalescence period, and the overall hospital stay have all been less with EVR than with CUR.^[4,5]

In an attempt to further reduce the postoperative complications, Zaontz *et al.*^[6] used a modified extravesical technique, where they created a submucosal tunnel, advanced the ureteral meatus and anchored it onto the trigone and closed it with a detrusor buttressing of the ureter, for which they coined the term "detrusorrhaphy." They claimed a very minimal postoperative morbidity with such procedure.

Ellsworth *et al.*^[7] compared the extravesical detrusorrhaphy with CUR and claimed that the success rate is the same in both Groups. However, patients undergoing EVR needed fewer pain medications and lesser anticholinergics to control bladder spasms. They also noted that patients undergoing bilateral extravesical approach were associated with transient urinary retention. They recommended minimal dissection of the region of trigone during bilateral procedures.

Wacksman *et al.*^[8] in 1992 performed EVR in 132 patients and observed that EVR and detrusorrhaphy are associated with a reduced postoperative morbidity and shortened hospital stay. In our study, the EVR technique was found to be superior to that of CUR, in terms of duration of surgery, postoperative hospital stay, incidence of hematuria and bladder spasms, and overall postoperative complications. The long-term outcomes were comparable to that of CUR. The difference in the age distribution between Groups could be a pitfall in the current study design.

Lipski^[10] reported higher voiding dysfunction following bilateral EVR. However, a nerve-sparing technique proposed

by David^[9] reduced these complications, and in our study, none of the patient, who underwent bilateral EVR developed retention. Several authors^[9,11-13] have reported successful EVR as a day case procedure.

The significant advantage of EVR is short convalescence and less morbidity. In addition, a relatively straight access of ureter makes it easier for upper tract instrumentation, if needed at a later date. With the advent of laparoscopic and robotic techniques,^[14-17] the morbidity is further reduced for both EVR and CUR. Further studies should through more light on the superiority of these techniques via a minimally invasive route.

CONCLUSIONS

EVR has less postoperative discomfort and hospital stay compared to Cohen's reimplantation. It has the advantage of keeping a straight access to the upper tract for future instrumentation.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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