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ORIGINAL ARTICLE

Gil-Vernet antireflux surgery in children's primary vesicoureteral reflux

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Abstract
Purpose The assessment of the results of Gil-Vernet antireflux surgery in children with primary vesicoureteral reflux.
Materials and methods In a descriptive retrospective study, 72 patients with vesicoureteral reflux (VUR) and 104 refluxing units underwent Gil-Vernet antireflux surgery in Mofid children's hospital from Dec 2000 to Nov 2005. The study group was selected from among the patients with VUR who had been operated in our center. Data were collected from the medical records of the patients in the archive of the hospital and analyzed for gender, age, method of diagnosis, side of involvement, grading types, usage of catheter and stent, operating time, hospital stay, reflux down grading, operative success rate, recurrence and operative complication.
Results Among 72 patients, 47 (65%) were females and 25 (35%) were males with a mean age of 4.35 ± 2.96 years (range 1–13 years). 32 patients had bilateral and 40 had unilateral reflux, and 76% were in grades III and IV. Mean operative time was 55 ± 13 min, median hospital stay was 2 ± 0.9 days and mean follow-up period was 48 ± 9 months. Reflux was improved completely in 100 (96.15%) refluxing units, and down-graded in 4 (3.84%) units. Treatment was performed medically in 2 and surgically in 2 refluxing units, and all were improved successfully. There were no complications post-operatively.
Conclusion Gil-Vernet antireflux technique is a useful method, and it has many advantages such as simplicity, shorter operative time, lower complication rate and high success rate.

Keywords Gil-Vernet · Antireflux surgery · Vesicoureteral reflux · Children

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Introduction

Vesicouretral reflux (VUR) is still one of the main practices of pediatric urology. VUR, which is defined as retrograde flow of urine from bladder to the kidney, was first described in humans by POZZI more than 100 years ago [1]. Advances made in different fields of medicine have helped in better understanding of the pathologic process of VUR, thus enabling us to refine management and reducing morbidity up to now. Choosing between medical versus operating management and choosing between different surgical techniques are controversial. VUR is seen in 0.4–1.8% of otherwise healthy children [2–4]. The rate of VUR is much higher in children with symptomatic urinary infections, approximately 30–70% [2–5].

Treatment options include conservative medical management (prophylactic antibiotic therapy), and surgery (open or endoscope) [6]. Several surgical techniques have been introduced for management of VUR that have indication for surgery. There are three main technical groups: Intravesical, Extravesical, and endoscopic injection. Politano-Leadbetter was the first intravesical operation technique, Cohen was the second common method, and the third and the less invasive is Gil-Vernet technique [7].

Gil-Vernet technique increases the length of intra mural ureters by medial advancement of the ureters, and is based

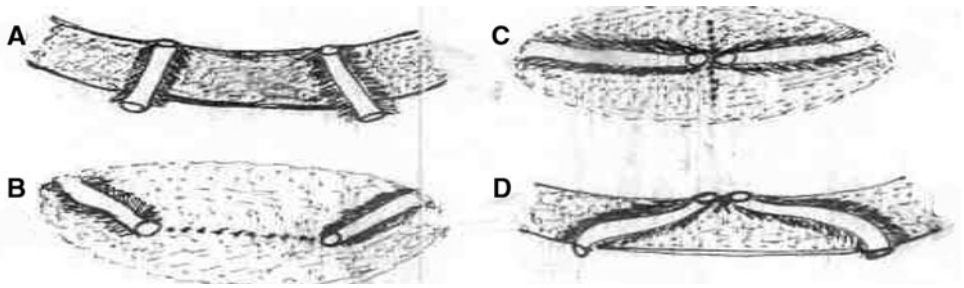

Fig. 1 Schematic representation of Gil-Verent antireflux technique. **a** Ureteral position in patient with vesicoureteral reflux. **b** Demonstrate transverse incision. **c** Traction sutures are used to demonstrate desired result. **d** On completion, ureteral orifices are in close proximity near midline and submucosal length of ureter has been increased, preserving intrinsic and extrinsic periureteral musculature

on the sphincteric action of intrinsic muscular fibers of the transmural Ureter and additional muscular backing [8].

In this study, we present our experiences in Gil-Vernet technique and highlight the advantages of this technique.

Materials and methods

This study was a descriptive retrospective study from Dec 2000 to Nov 2005 at Mofid children's hospital. The study group was selected from patients' record with VUR showed in voiding cystourethrography (VCUG) who had been operated with Gil-Vernet technique. We did perform DMSA for all patients before surgical intervention.

72 patients with 104 refluxing units, of which 47 (65%) were females and 25 (35%) were males. 52 patients (75%) presented with UTI, fever and chills, and in 20 patients (25%) UTI proved in screening tests.

The indications for antireflux surgery were breakthrough infection despite prophylaxis, non-compliance with medical management, failure of VUR improvement after 4 years of medical treatment, and the presence of new scars or deterioration of renal function.

Gil-verent antireflux technique

After opening the bladder, first the two ureteral orifices were cannulated by size 6 French catheter, then the mucosa is incised between ureteral orifices transversely deep to detrusor, after injection of 5 cc normal saline and bulging the area. Medial aspects of ureters are freed carefully from their surrounding tissues and detrusor, and were prepared for medial advancement by mattress sutures. Two 4-0 or 5-0 vicryl mattress sutures, incorporating ureteral musculature, are placed on the medial aspect of the ureters, which will bring ureters to the midline. It is highly recommended to include ureteral musculature in the mattress sutures for prevention from late lateralization of ureters, technique failure and VUR recurrence. Mucosa is closed vertically with interrupted 5/0 vicryl sutures (Fig. 1).

Gil-Vernet antireflux surgery was performed for all patients (both unilateral and bilateral). All 72 operated patients were followed every 3 months post-operatively and checked urinalysis and urine culture every month, ultrasonography every 3 months and finally radionuclide cystography (preferably) or VCUG after 6 months post-operatively.

Data of postoperative outcomes including primary improvement, hospital stay, complications and follow-up records were collected and assessed.

Results

Of the 72 patients, 47 (65%) were females and 25 (35%) were males with a mean age of 4.35 ± 2.96 years (range 1–13 years) underwent surgery with Gil-Vernet antireflux technique. Mean follow-up was 48 ± 9 months (range 26–59 months); among 72 patients, there were 32 with bilateral and 40 patients with unilateral reflux. Table 1 shows

Table 1 Patient's characteristics

Patients	72
Female	47
Male	25
Mean age (years)	4.35 ± 2.96
Mean follow-up (months)	48 ± 9
Bilateral	32
Unilateral	40
Refluxing unit	104
Mean operative time (minutes)	55 ± 13
Surgery without catheter	45
Surgery with catheter	27
Mean hospital stay (days)	2 ± 0.9
Reflux improvement (patients)	68
Unit improvement	100
Down-graded reflux (units)	4

Table 2 Grading in 104 refluxing units of 72 Patients

Grade	No.	Percentage
I	4	3.8
II	11	10.5
III	45	43
IV	34	33
V	10	9.7
Total	104	100

all the patients' characteristics. There were 104 refluxing units according to the international classification given in Table 2.

Mean operative time was 55 ± 13 min (range 40–90). 45 patients underwent surgery without using ureteral stent, urethral catheter and drain, and the rest had only urethral catheter after operation for 24–48 h. Median hospital stay was 2 ± 0.9 (range 1–4) days.

Reflux was improved completely in 68 patients (94.44%), and 96.15% of refluxing units. Three patients with down-graded reflux were put on prophylaxis, and followed for 1 year by VCUG. The Reflux was improved in two patients with unilateral reflux, but in one patient with bilateral and persisted reflux surgical treatment was performed by Cohen technique. All four units were improved after medical and surgical procedures. During the follow-up, 15 (21%) patients have developed UTI. There were no complications postoperatively in our patients.

Discussion

VUR is classified as primary and secondary based on etiology. Primary VUR is actually an abnormality in anatomy and function of the ureterovesical junction (VUJ) [9]. Research for finding a surgical method which is both simple and effective with the least post-operative complications is on-going. The Gil-Vernet technique is by far the most acceptable procedure in this regard, which has the least obstruction complications [10].

It also preserves the physiologic course of the ureter, eliminating the possibility of its bending. The technique does not make any difficulty in catheterization of the ureter in the future [11]. The procedure is simple and quick to perform and enables simultaneous correction of both sides in bilateral reflux. Both sides must be corrected also in case of unilateral reflux in order not to destabilize the trigone that can cause the development of reflux of the contralateral ureter [11].

Medical treatment as the initial management for all children with VUR diagnosed following UTI is recommended, which we have done it for our patients both pre- and post-operatively. For children over 1 year of age with grade V and older children with bilateral grade IV, VUR needs to be corrected surgically. This technique or a modified one can be used in patients with neurogenic bladders [12].

The presence of a duplex ureter is one of the situations, which complicate reflux, duplicated systems with lower pole reflux, is also corrected with this method [13]. Recently, successful results following extra peritoneal laparoscopic trigonoplasty by complete duplication of Gil-Vernet open technique, achieving 93% success rate in all grades of II–IV is reported by Simforoosh et al. [11, 14].

In this study, we reported the results of Gil-Vernet antireflux surgery in 72 patients with 104 refluxing units within 5 years. 62.5% of our patients underwent surgery without any stent, catheter and drain, same as reported by Simforoosh et al. [14]. Median hospital stay was 2 ± 0.9 (range 1–4) days. 62.5% of patients were followed by radionuclide cystography post-operatively, similar to the study of Spajic et al. [15].

Reflux was improved completely in 94.44% of patients and 96.15% of refluxing units, similar to Gil-Vernet's report [8]. Reflux was down-graded in four units (3.84%), as Atala et al. reported [16]. Treatment was performed medically in two and surgically in two units, and all were improved successfully. There were no complications post-operatively in our patients, same as the report of Kliment et al. [10] and Irani et al. [17].

Conclusion

Gil-Vernet trigonoplasty seems to be one of the least invasive, simple, rapid, safe, and highly successful, with the advantage of possible future ureteroscopy, and its potential to be performed on an outpatient setting. Contralateral reflux will not follow this technique in managing unilateral reflux which is the unique advantage of this technique.

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References

1. Godley ML (2001) Vesicoureteral reflux: Pathophysiology and Experimental studies. In: Gearhart JP, Rink RC, Mouriquand PDE (eds) Pediatric urology. WB Saunders, Philadelphia, pp 359–381
2. Bundy DC (2007) Vesicoureteral reflux. Pediatric rev 28(2):6–8
3. Jacobson SH, Hansoon S, Jakobsson B (1999) Vesico ureteric reflux: occurrence and long-term risks. Acta Paediatr Suppl 88(431):22–30
4. Bailey RR (1979) Vesicoureteric reflux in healthy infants and children. In: Hodson J, Kincaid-Smith P (eds) Reflux nephropathy. Masson, New York, pp 59–61

5. Kunin C, Deutscher R, Paquin AJ (1964) Urinary tract infection in school children: an epidemiological, clinical and laboratory study. Medicine (Baltimore) 43:91–130
6. Simforoosh N et al (1988) A new approach to vesicoureteral reflux persisting after posterior urethral valve ablation using Gil-vernet antireflux technique. Med J Islam Repub Iran 2:254–259
7. Green Baum LA, Mesrobian HG (2006) Vesicoureteral reflux. Pediatr Clin North IS 53(3):413–427
8. Gil-vernet J (1984) A new technique for surgical correction of vesicoureteral reflux. J Urol 131(3):456–458
9. Brick JW III, Demarco RT (2007) Surgery for vesicoureteral Reflux. In: Docimo SG, Canning D, Khoury A (eds) The Kelalis-King-Belman textbook of clinical pediatric urology, 5th edn. Informa health care UK Ltd., London, p 111
10. Kliment J, Fetisov I, Svitac J (1990) Surgical management of vesicoureteral reflux by modified Gil-vernet Methodist. Int Urol Nephrol 22(6):531–535
11. Simforoosh N, Hariri H (2010) Management of vesicoureteral reflux without indwelling catheter and drain, using trigonoplasty technique. J Pediatr Urol (in press)
12. Zhao J, Zhang Y (2005) Trigonoplasty to treat secondary vesicoureteral reflux in neurogenic bladders. Urol Int 74(2):135–139
13. Kazemi-Rashed F, Simforoosh N (2005) Gel-vernet antireflux surgery in treatment of lower pole reflux. Urol J 2(1):20–22
14. Simforoosh N, Nadjafi-Semnani M, Shahrokhi S (2007) Extra peritoneal laparoscopic trigonoplasty for treatment of vesicoureteral reflux: novel technique duplicating its open counterpart. J Urol 177(1):321–324
15. Spajic B, Delmis J, Spajic M et al (2006) Choice of operative methods for primary vesicoureteral reflux. Acta Clin Croat 45:187–192
16. Atala A, Keating M (2006) Vesicoureteral reflux and megaureter. In: Walsh PC (ed) Campbell's Urology, 8th edn. WB Saunders, Philadelphia, pp 2087–2088
17. Irani D, Heidari M (2004) Results of modified Gil-vernet antireflux surgery in the treatment of vesicoureteral reflux. Urol J 1(2):107–110