

# Vesicoureteric Reflux in Children: a 13-years experience

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## Abstract

**Objective:** We review our thirteen year's experience (1997 and 2009) with surgical treatment of vesicoureteric reflux (VUR) at King Hussein medical center, pediatric surgery section.

**Methods:** All files of patients who underwent intravesical cross-trigonal uretric reimplantation for VUR, between January 1997 and December 2009 in our hospital were reviewed. Demographic details, reflux grade, bilaterality, radiological investigations, surgical approach and outcome were analyzed.

**Results:** 334 patients with VUR (grade II to V) underwent uretric reimplantation during the study period. 47.6% of the patients were males and 52.4% were female. The patients were between two and a half months to fourteen years of age. 11.7% were less than one year of age and 61% < 5 years. 294 (88%) of the patients were classified as primary VUR and 40 (12%) as secondary. The duration of follow up was from 8 months to 13 years. Persistent VUR requiring re-do ureteral reimplantation in 18 (5.4%) cases, and nephrectomy due to end-stage renal disease (ESRD) were performed in 33 (9.8%) patients. Successful rate was achieved in 90.2% of cases.

**Conclusions:** The most frequent clinical abnormality leading to the diagnosis of VUR is UTI; the ultimate objective of treatment of VUR is to prevent infection, to allow normal growth and to prevent permanent renal parenchyma damage.

**Keywords:** Vesicoureteric Reflux, Children, Surgery.

(J Med J 2014; Vol. 48 (1):21- 27)

Received

June 17, 2012

Accepted

Nov. 27, 2013

## Introduction

Vesicoureteric reflux refers to the retrograde flow of urine from the bladder into the upper urinary tract, it is a common urological anomaly in children, but is less recognized in adult population<sup>(1,2)</sup>.

VUR is found in up to 35% of asymptomatic sibling and in 66% of offspring of a patient with a history of primary reflux<sup>(3, 4)</sup>. Genetic factors may be associated with the development of vesicoureteric reflux<sup>(5)</sup>.

The association of urinary tract infection (UTI), obstruction and reflux is the leading cause of nephrectomies in children<sup>(6,7)</sup>.

VUR is classified into five grades (Grade I-V) based on voiding cystourethrography (1), and categorized into: primary reflux, caused by a congenital abnormality of the urinary tract system without obstruction. And secondary reflux is due to obstruction anywhere in the urinary system<sup>(8,9,10)</sup>.

In older children the most common symptom

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of VUR is UTI, voiding dysfunction, nocturnal and diurnal enuresis<sup>(11)</sup>, while in infants VUR can be presented with fever, vomiting, respiratory distress, failure to thrive, renal failure, flank masses, or generalized sepsis<sup>(9)</sup>.

A basic diagnostic work-up comprises a detailed medical history, and complete physical examination. Voiding cystourethrogram (VCUG), intravenous pyelogram, nuclear scans, isotope cystograms, and magnetic resonance urography<sup>(9)</sup>.

Therapeutic options comprise conservative medical management, including antibiotic prophylaxis to prevent infection and to prevent renal parenchyma damage and its late complications, chronic reflux nephropathy, the cause in up to 25% of children undergoing dialysis and in 10 to 15% of adults' renal transplantation<sup>(12, 13, 14)</sup>.

Interventional approaches including: endoscopic subureteral injection, laproscopic or open surgical correction of reflux. Open surgical correction of the reflux has traditionally been reserved for IV-V reflux, in the presence of associated congenital anomalies of the urinary tract system, in cases of breakthrough urinary infection with pyelonephritis, poor medical compliance, and new renal scars<sup>(9)</sup>.

### **Patients and Methods:**

The medical records of 334 patients (159 boys and 175 girls) who underwent surgery, for treatment of VUR in a 13-year period were reviewed.

Age, sex, reflux grade, bilaterality, radiological investigations, surgical approach, follow up and outcome were analyzed. Outcome results included, persistent VUR and nephrectomies due to end stage renal disease and rates of curative treatment.

A renal ultrasound, voiding cystourethrogram (VCUG) and Nuclear Scan (DMSA or MAG-3), were the main diagnostic tools to detect the reflux or to confirm previously detected VUR, and for evaluation of the regional renal function (R.R.F) and cortical lesions of the kidneys before surgery.

Indication for surgery was failure of medical treatment, febrile breakthrough UTI, and reduced split renal function (SF) <45%. The surgical approach was the traditional intravesical cross-trigonal ureteric reimplantation.

The patients were followed up with clinical assessment, serial urine cultures, hematological and biological tests, renal ultrasounds, voiding cystourethrogram and renal scintigraphy at 3 to 4 months after the procedure.

### **Results**

Over the study period ureteric reimplantation was performed for patients with reflux (grade II to V). 159(47.6%) patients were males and 175 (52.4%) were female; (M: F ratio was 1:1.1)

Age distribution at the time of operation was between two and a half months to fourteen years. Mean age (4.2 years). Approximately (11.7%) of the patients were less than one year of age, 61% were <5years of age, and 7.4% were more than 10 years of age. The males were four times more than females in patients of less than six months of age (M=12 vs. F=3) (Fig.1).

Females with VUR were observed to be increased with advancing age: from 11.5% in patients less than 2 years to 20.8% at ages between 5-10years, then started to decline (Fig.1).

Two hundred ninety four (88%) patients were

classified as primary VUR. Among them, 40.4% were boys and 47.6% were girls. The remaining forty (12%) patients were having secondary reflux associated with congenital urinary tract abnormalities. (Table 1).

Reflux was found unilateral in 55% of patients and bilateral in 45%. Right sided (n= 73) and

left sided (n =111). The left sided VUR was significantly more common in females (25.7% vs 12.9%) than in males (Table 1).

Delay in surgical intervention up to 18 months was observed in 15 patients, all of them were below 4 years of age, and the majority was males ;(13 M vs. 2 F).

**Table 1. Demographic data of children with primary and secondary vesicoureteric reflux.**

Causes of VUR		No. of cases	Male	Female	Right	Left	Bilateral	Total nephrectomy	Partial nephrectomy
Primary		294	135	159	59	95	140	28	
Secondary	Duplication with Ureterocele	5	1	4	2	2	1		2
	Duplication	8	4	4	2	5	1		
	Ureterocele	2		2	1	1			
	Diverticulum	5	4	1	1	3	1		
	Ectopic Ureter	2	2		2				
	PUV	2	2		1	1			
	Neurogenic bladder	6	4	2			6	1	
	Ambiguous	2		2	1	1		1	
Associated cong. abnormalities	PUJO	2	2		2			1	
	VUJO	6	5	1	2	3	1		
Total		334	159	175	73	111	150	31	2

All patients were postoperatively followed up from 8 months to 13 years. Hypertension was observed in 3 of our patients, whom were referred from and followed by nephrologists of our center. Persistent VUR requiring re-ureteral reimplantation in 18 cases, (13 males and 5 females), among them seven patients (38.8%) were < 2 years of age (Table 2).

Nephrectomy was performed in 33 patients due to ESRD, 28/33 nephrectomies related directly to primary reflux, right sided

nephrectomy (n= 20). The overall successful rate was achieved in 90.2% of cases (Table 2).

**Discussion**

The overall incidence of vesicoureteric reflux in normal children ranges from 1% to 18.5% as reported by Panzironi and Kolterman<sup>(1, 9)</sup>, and in up to 50% of children presenting with urinary tract infection<sup>(15, 16, 17, 18)</sup>.

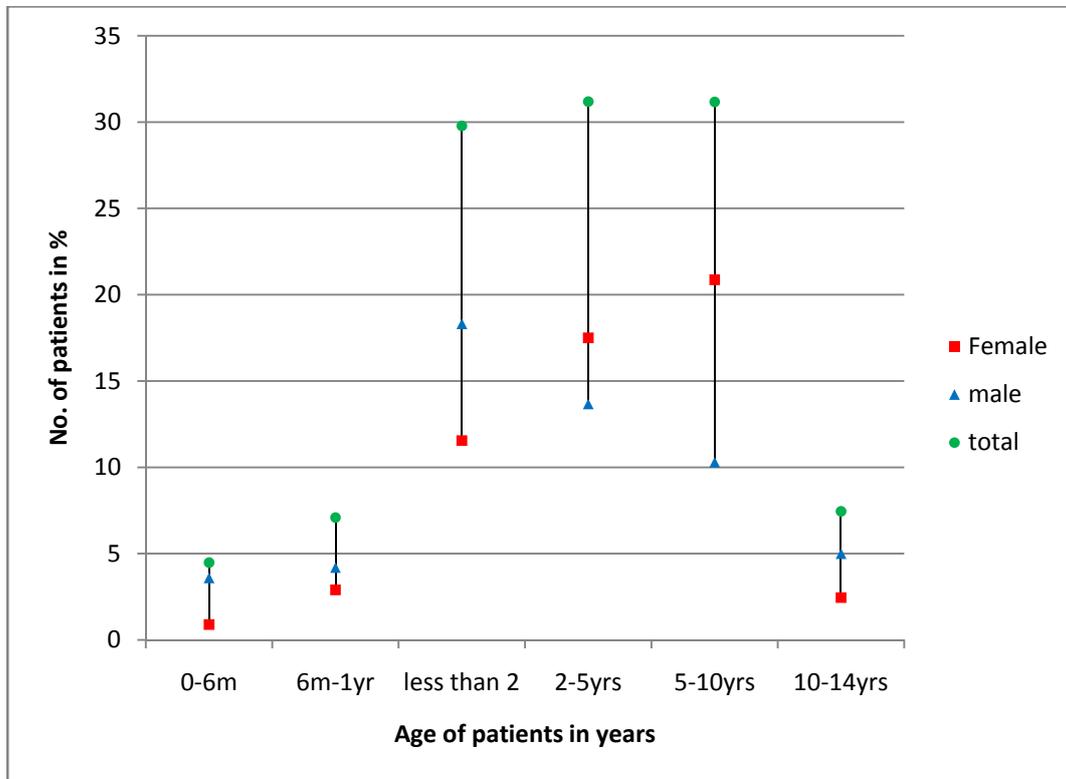
The most frequent clinical abnormality leading

to the diagnosis of VUR is UTI; in our series, 85% of the children had UTI as an early

manifestation, and a history of UTI's was observed in all patients.

**Table 2. Surgical results of primary reflux in children, divided according to gender and age.**

Re-ureteric reimplantation(n=18)						Nephrectomies(n=28)		
Age in years	Gender	Right	Left	Bilateral	Total	Left	Right	Total
<2	M	2	1	1	4	8	20	3
	F	2	1		3			
2-5	M	2	2		4			10
	F	1			1			
5-10	M		3		3			8
	F		1		1			
10-14	M			2	2			7
	F							
Total		7	8	3	18	8	20	28



**Figure 1: Age and sex distribution of patients at the time of surgical intervention.**

Congenital anomalies of the urinary tract also are well known causes of UTI in children. This was observed in 12% of our patients (Table 1). Approximately 13-15% of end stage renal disease in children is related to unrecognized UTI<sup>(19, 20, 21, 22)</sup>.

The incidence of VUR is declines with advancing age (2.9). Although 61% of the patients in our study were <5years of age, only 7.4% were more than 10 years (Fig.1).

The neonatal reflux is predominating in males<sup>(19)</sup>, this was observed in infants of less than six months of age (12 males vs. 3 females) (Fig.1). Neonatal evaluation and treatment of these children allows the elimination of infection, relief of obstruction and reflux.

Because the chance of spontaneous resolution is as high as 85% in infants below one year of age with any grade of reflux medical treatment is suitable<sup>(5,9,13,23)</sup>.

Many authors recommend surgical correction for higher grades of reflux (IV-V), in addition to those cases associated with congenital malformations (i.e. duplex system, ureterocele, diverticulum and ectopic ureter etc.) (Table 1), because spontaneous resolution is less likely to occur<sup>(5)</sup>. 86% of the patients, surgically treated in our study was having grade IV-V reflux (Table 1).

Currently three options are available to treat VUR in children, including long term antibiotic prophylaxis, endoscopic treatments, and open surgery<sup>(9)</sup>. Lately in addition to traditional intravesical ureteric reimplantation, laparoscopic licho-gregoir started to gain popularity in our department.

The increase in the failure rate with increasing reflux grade is well reported in the

literature<sup>(17)</sup>. Failure rate ;ureteral obstruction or persistent reflux was observed more in males than females (72%vs28%) and more in infants (38.8%) <2 yrs of age(Table 2) .This trend was attributable to the fact that the youngest age's group shows the highest rate of high grade reflux<sup>(17)</sup>.

Partial or total nephrectomies due to ERSD were performed for moieties and kidneys that are non-functioning or very poorly functioning(less than 10% of total function) in 33 patients (Table 1), among them (71.5%) underwent right sided (nephrectomy) despite the fact that the left VUR was seen much more in our series; (Table 2).

Although open surgery, corrects the reflux in 98% of patients for grades 1 to IV reflux, and in 80% of those for grade V reflux<sup>(17, 19)</sup>. In our study, open surgery corrects the reflux in 90.2% of the patients, because the majority were having grade IV-V.

However, in all cases of reflux, surgery may be indicated at any time when there is failure of medical treatment<sup>(6)</sup>. Patients should be monitored regularly for life; even if reflux resolves the risk of kidney malformation, hypertension, and kidney related problems may still exist<sup>(9)</sup>.

## **Conclusion**

VUR is common in children and must always be suspected in those presenting with urinary tract infection and in those with urological abnormalities. Surgery in early infancy carries a high risk of severely damaging bladder function; only exceptional cases should undergo primary surgical correction. All patients with reflux should be monitored regularly for life; the risk of kidney related problems may still exist.

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## الارتداد البولي عند الأطفال

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### الملخص

**الهدف:** أجريت هذه الدراسة في قسم جراحة الأطفال/ مدينة الحسين الطبية على 334 طفلاً تراوحت أعمارهم بين شهرين و13 عاماً، حيث أجريت لهم عمليات زراعة الحوالب بسبب الارتداد البولي (الجزر المثاني الحالي) لذوي الدرجات (2-5) في الفترة ما بين 1997-2009.

**الطريقة:** لقد تركز البحث على درجة الارتداد الحالي، وجهة الحالب المصاب، والتشوهات الخلقية المصاحبة في الجهاز البولي، والفحوصات الشعاعية، والمداخلات الجراحية ونتائجها.

وتبين أن 11% ممن أجريت لهم العمليات الجراحية للارتداد كانت أعمارهم دون السنة، وأن 61% أيضاً دون الخامسة من العمر.

**السيارة المرضية:** أشارت إلى أن كل من أجريت لهم العملية بسبب الارتداد البولي كانوا قد أصيبوا بالتهاب المجاري البولية حتى ولو "مرة واحدة" وكذلك 12% من الأطفال تبين أنهم مصابون بتشوهات خلقية مصاحبة في الجهاز البولي.

وبالرغم من أن نسبة نجاح عمليات الزراعة للحوالب لمختلف الدرجات تصل إلى 90%؛ فإن ما نسبته 5% احتاجوا إلى إعادة زراعة الحوالب، وأن ما نسبته 10% فقدوا الكلية المصابة بالارتداد.

وعليه؛ فإن التهاب المجاري البولية يعد إنذاراً حقيقياً على وجود الارتداد البولي، ومثل تلك التشوهات الخلقية المصاحبة المذكورة في البحث.

**الكلمات الدالة:** الارتداد البولي، الأطفال، الجراحة.