



VESICoureTERAL REFLUX; EXTRAVESICAL VERSUS INTRAVESICAL URETERIC REIMPLANTATION IN CHILDREN.

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ABSTRACT... Objectives: The objective of our study is to compare the extravesical and intravesical ureteric reimplantation for the treatment of bilateral vesicoureteral reflux in children. **Period:** April 2013 and July 2016. **Setting:** Urology Department of Mayo Hospital, Lahore. **Methodology:** 66 children diagnosed with primary vesicoureteral reflux and undergoing ureteric reimplantation. The Cohen cross-trigonal reimplantation (intravesical) and modified Lich-Gregoir procedure (extravesical) were performed on two separate groups Group IR and group ER. The following parameters were compared: postoperative duration of stay in the hospital, hematuria and bladder spasm. Frequency of hematuria, bladder spasm and average duration of stay in the hospital were compared in both group. Mean and standard deviation was calculated for age, gender and duration of surgery in both groups.). Chi square test was applied to check the association of outcome variables with demographical variables and duration of surgery. **Results:** These 100% (n=66) patients were divided into 2 groups equally, 33 in each, i.e. group ER and group IR. The mean age and duration of surgery of the patients of group ER were 13.78 ± 2.83 years, 102.45 ± 4.13 minutes respectively. While the mean age and duration of surgery of the patients of group IR was 30.33 ± 4.58 years and 119.7 ± 10.70 minutes respectively (Table-II). The main outcome variables of this study were the hospital stay, postoperative bladder spasm and hematuria. The mean hospital stay of the patients of group ER and group IR was 4.30 ± 1.35 days and 5.84 ± 1.0 respectively (Table-II). It was observed that bladder spasm in group ER and group IR was 39.4% (n=13) and 54.5% (n=18) respectively (Figure-1). It was also observed that hematuria in group ER and group IR was 36.4% (n=12) and 48.5% (n=16) respectively (Figure-2). **Conclusion:** The observation of this study concludes that extravesical ureteric reimplantation has an edge over conventional procedure of intravesical ureteric approach. Intravesical procedure has disadvantages of more frequency of postoperative complications like, hospital stay, bladder spasms and hematuria.

Key words: Vesicoureteral Reflux, Extravesical ureteric reimplantation, Intravesical ureteric reimplantation

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INTRODUCTION

An abnormal reverse flow of urine from bladder into ureters and the pelvicalyceal systems, caused by inadequate valvular mechanism at vesicoureteral junction is call vesicoureteral reflux.¹ Vesicoureteral reflux (VUR) affects 1 % of children and predisposes to clinical pyelonephritis. Recurrent UTIs, the subsequent end-stage renal disease and renal scarring can be life threatening in these children.² Most children are managed initially with medical therapy, which includes assessment of bladder and bowel habits, determination of reflux risk to the child, behavioral modification, and selective

antibiotic prophylaxis. Treatment of vesicoureteral reflux is done to stop anymore UTI episodes and to avoid renal scarring. Different techniques are used to perform the open surgical reimplantation i.e. extravesical, intravesical or both extra and intravesical combined.³ Each technique has its own indications and advantages. With the use of intravesical technique an increased risk of hematuria, bladder spasms and postoperative hospital stay has been reported in many studies. The rationale of this study is mainly the assessment of outcomes of treatment of VUR by intravesical and extravesical approaches (intravesical Cohen's ureteral reimplantation and

extravesical ureteral reimplantation of modified Gregoir Lich technique).⁴

Open surgical repair of vesicoureteral reflux, when indicated, remains the gold standard against which other surgical interventions are compared. The Politano-Leadbetter technique described in 1958 has been widely used with excellent success rates. Other intravesical techniques such as Cohen's, Glenn-Anderson and Gil-Vernet techniques have achieved success rates between 90% and 100%. The morbidity after intravesical technique is well recognized. Intravesical ureteral reimplantation might cause bladder spasms and pain, requiring additional analgesics and anticholinergic medication. A prolonged hospital stay with urethral catheterization and postoperative gross hematuria is well documented.⁵

Extravesical ureteral reimplantation is extensively acknowledged technique with exceptional surgical outcomes for the surgical correction of vesicoureteral reflux.⁶ Its advantages comprise a very successful operative treatment of vesicoureteral reflux with minimal postoperative morbidity such as bladder spasms and hematuria. In this study we compared the outcomes and efficacy of extravesical ureteral reimplantation and intravesical ureteral reimplantation in patients with both primary and secondary vesicoureteral reflux. For our study sample size was calculated using reference from a previous study by Krishnamoorthy Sriram et al.⁷

The rationale of our study is that in our area there has been no study about comparing the efficacy of extravesical and intravesical approaches. So, this study will provide the basis for further studies regarding treatment of VUR.

METHODOLOGY

Between 2013 and 2016, 66 children diagnosed with primary vesicoureteral reflux and undergoing ureteric reimplantation at Urology Department of Mayo hospital, Lahore were evaluated for inclusion in this study. Approval for the study protocol was obtained from the Hospital Ethics Committee and informed written consent was obtained from the parent of each child. In this

study 66 patients diagnosed with vesicoureteral reflux and indicated for ureteral reimplantation were included. For our study sample size was calculated using reference from a previous study by Krishnamoorthy Sriram et al.⁷ It was calculated with the help of WHO recommended sample size calculator for two proportions (23.52% and 46.26%), where confidence interval was 95% and power of study was 80%.

Exclusion criteria was considered as following; patients with unilateral and Grade 1-2 VUR, who were treated conservatively with the help of antimicrobial prophylaxis, secondary vesicoureteral reflux, neurogenic bladder, posterior urethral valves, or bowel bladder dysfunction, linked anomalies such as duplex systems, ureteroceles, and ectopic ureters, patients who did not turn up for follow-up or who did not have a follow-up evaluation. Conservative treatment was provided initially to those with higher grade of reflux but surgical intervention was made when they developed recurrent UTIs or renal scarring.

Patients were given general anesthesia and surgery was performed by a well experienced urologist with 5 years of experience. The person conducting the research assisted during these surgeries. Among the intravesical approaches Cohen's approach of ureteral reimplantation is most common open surgical procedure in practice for VUR treatment. Pfannenstiel incision was made, followed by performing an anterior cyctosomy and cautious mobilization of the ureter transvesically. It prevents the devascularization of the ureters. The original hiatus was re-approximated to avoid a bladder diverticulum, and a sub mucosal tunnel is created. The anastomosis of the ureter to the bladder was secured with an anchoring stitch placed through the muscle and bladder mucosa, taking ureteral serosa and mucosa. A Foley catheter was placed at the end of the surgery. Modified Lich-Gregoir procedure is an extravesical approach in which circumferential dissection of the detrusor muscles was performed around the ureter. Sub mucosal flaps were created by untying the bladder mucosa in trigonal region. A sub mucosal tunnel was

produced and the detrusor defect was closed with vest-type absorbable sutures.

Patients were divided into two groups group ER and group IR for EUR and IUR respectively. In group IR Cohen technique was used for primary VUR. The following parameters were compared: average duration of stay in the hospital, hematuria and bladder spasm. Average duration of hospital stay, bladder spasm and frequency of hematuria were compared in both group. Mean and standard deviation was calculated for age, gender and duration of surgery in both groups.

Chronic complications like ureteral obstruction and recurrent reflux after the procedure were also evaluated. Ultrasound and VUG at 3 months and ultrasound and RNI (radionuclide imaging) at 1 year postoperatively were also used as a tool for postoperative assessment. Chi square test was applied to see the association of outcome variables with age gender and duration of surgery for both groups and p value was calculated. P value less than or equal to 0.05 was taken significant.

RESULT

A total number of 100% (n=66) patients were included in this study, both genders. Gender distribution showed that there were more males than females i.e. 60.6% (n=40) and 39.4% (n=26) respectively. The mean age, duration of surgery and hospital stay of the patients was 22.06 ± 9.15 months, 111.08 ± 11.84 minutes and 5.07 ± 1.41 days respectively. It was observed that there were 65.2% (n=43) patients in 10-25 months of age group and 34.8% (n=23) patients in age group 26-60 months. Duration of surgery distribution showed that almost half of the patients i.e. 54.5% (n=36) had duration of surgery 90-105 minutes while 45.5% (n=30) had 106-130 minutes of duration of surgery. It was also noted that majority of the patients i.e. 66.7% (n=44) stayed in hospital 5-7 days while only 33.3% (n=22) patients stayed 1-4 days in hospital (Table-I).

These 100% (n=66) patients were divided into 2 groups equally, 33 in each, i.e. group ER and group IR. The mean age and duration of surgery

of the patients of group ER were 13.78 ± 2.83 years, 102.45 ± 4.13 minutes respectively. While the mean age and duration of surgery of the patients of group IR was 30.33 ± 4.58 years and 119.7 ± 10.70 minutes respectively (Table-II).

Characteristics	Frequency	Percentage (%)
Gender		
Male	40	60.6
Female	26	39.4
Total	66	100.0
Stratified Age		
10-25 months	43	65.2
26-60 months	23	34.8
Total	66	100.0
Stratified Duration of Surgery		
90-105 Minutes	36	54.5
106-130 Minutes	30	45.5
Total	66	100.0
Stratified Hospital Stay		
1-4 days	22	33.3
5-7 days	44	66.7
Total	66	100.0
Descriptive Statistics		
	Mean \pm S.D	
Age	22.06 ± 9.15 months	
Duration of Surgery	111.08 ± 11.84 minutes	
Hospital Stay	5.07 ± 1.41 days	

Table-I. Demographic Variables (n=66)

Descriptive Statistics		
Groups	Variable	Mean \pm S.D
ER	Age	13.78 ± 2.83 months
	Duration of Surgery	102.4 ± 4.13 minutes
	Hospital Stay	4.30 ± 1.35 days
IR	Age	30.33 ± 4.58 months
	Duration of Surgery	119.7 ± 10.70 minutes
	Hospital Stay	5.84 ± 1.0 days

Table-II. Demographic variables in groups

The main outcome variables of this study were the hospital stay, postoperative bladder spasm and hematuria. The mean hospital stay of the patients of group ER and group IR was 4.30 ± 1.35 days and 5.84 ± 1.0 respectively (Table-II). It was observed that bladder spasm in group ER and group IR was 39.4% (n=13) and 54.5% (n=18) respectively (Figure-1). It was also observed that hematuria in group ER and group IR was 36.4% (n=12) and 48.5% (n=16) respectively (Figure-2).

Chi-Square test was used to find the association and it was eminent that stratified hospital stay had association with gender, groups, age and duration of surgery with p-values 0.000, 0.000, 0.045 and 0.002 respectively (Table-III).

Similarly, when Chi-Square was used to find the association, it was found that bladder spasm had association with stratified age and gender with p-values 0.007 and 0.016 respectively. But

it had no association with groups and stratified duration of surgery with p-values 0.218 and 0.344 respectively (Table-IV).

Furthermore, when Chi-Square was used to find the association, it was found that hematuria had no association with gender, groups, age and duration of surgery with p-values 0.122, 0.319, 0.241 and 0.256 respectively (Table-V).

Effect Modifiers		Stratified Hospital Stay		Total	P-value
		1-4 days	5-7 days		
Gender	Male	5	35	40	0.000*
	Female	17	9	26	
Total		22	44	66	
*P-value is statistically significant with Pearson Chi-Square value = 19.83, d.f=1					
Groups	ER	18	15	33	0.000*
	IR	4	29	33	
Total		22	44	66	
*P-value is statistically significant with Pearson Chi-Square value = 13.36, d.f=1					
Stratified Age	10-25 months	18	25	43	0.045*
	26-60 months	4	19	23	
Total		22	44	66	
* P-value is statistically significant with Pearson Chi-Square value = 4.03, d.f=1					
Stratified Duration of Surgery	90-105 minutes	18	18	36	0.002*
	106-130 minutes	4	26	30	
Total		22	44	66	
* P-value is statistically significant with Pearson Chi-Square value = 9.90, d.f=1					
Table-III. Association of stratified hospital stay with effect modifiers (n = 66)					

Effect Modifiers		Bladder Spasm		Total	P-value
		Yes	No		
Gender	Male	14	26	40	0.016*
	Female	9	17	26	
Total		35	31	66	
*P-value is statistically significant with Pearson Chi-Square value = 5.841, d.f=1					
Groups	ER	13	20	33	0.218*
	IR	18	15	33	
Total		35	31	66	
*P-value is statistically insignificant with Pearson Chi-Square value = 1.521, d.f=1					
Stratified Age	10-25 months	15	28	43	0.007*
	26-60 months	16	7	23	
Total		35	31	66	
* P-value is statistically significant with Pearson Chi-Square value = 7.236, d.f=1					
Stratified Duration of Surgery	90-105 minutes	15	21	36	0.344*
	106-130 minutes	16	14	30	
Total		35	31	66	
* P-value is statistically insignificant with Pearson Chi-Square value = 0.894, d.f=1					
Table-IV. Association of bladder spasm with effect modifiers (n = 66)					

Effect Modifiers		Hematuria		Total	P-value
		Yes	No		
Gender	Male	20	20	40	0.122*
	Female	8	18	26	
Total		28	38	66	
*P-value is statistically insignificant with Pearson Chi-Square value = 2.386, d.f=1					
Groups	ER	12	21	33	0.319*
	IR	16	17	33	
Total		28	38	66	
*P-value is statistically insignificant with Pearson Chi-Square value =0.99, d.f=1					
Stratified Age	10-25 months	16	27	43	0.241*
	26-60 months	12	11	23	
Total		28	38	66	
* P-value is statistically insignificant with Pearson Chi-Square value = 1.374, d.f=1					
Stratified Duration of Surgery	90-105 minutes	13	23	36	0.256*
	106-130 minutes	15	15	30	
Total		28	38	66	
* P-value is statistically insignificant with Pearson Chi-Square value = 1.292, d.f=1					
Table-V. Association of hematuria with effect modifiers (n = 66)					

DISCUSSION

In our study, it is evident that extravesical ureteral reimplantation (modified Lich-Gregoir) is superior to intravesical type (Cohen's procedure) for treating vesicoureteral reflux. In previous studies similar results have been demonstrated. In a study, it was demonstrated that, both unilateral intravesical and extravesical reimplantation certainly correct vesicoureteral reflux. In Lich-Gregoir technique mean operative time was significantly shorter which highlights its simplicity; in addition using this technique can prevent gross hematuria. Extravesical approach decreases postoperative bladder spasm and pain. Thus use of extravesical technique not only provides high success rates in treating VUR but operative morbidity is also significantly low. In other words EVR is method of choice in unilateral VUR correction.⁸ In another study, it was stated that, by 15 months on follow up success rates were the same with both approaches, the intravesical technique is equivalent to extravesical approach and is a practical option in terms of economics and outcome given the shorter duration of hospital stay.⁹ Intravesical and extravesical ureteral reimplantation are good options to correct the vesicoureteral reflux, with success rates of more than 98%.¹⁰ Extravesical approach is a quite simple technique that avoids gross hematuria, mean duration of the surgical procedure

and minimum hospital stay postoperatively. Extravesical repair is also an option for associated diverticula and duplicated systems. In addition, bladder emptying is equally good with either surgical technique.¹¹ Extravesical reimplantation creates fewer co morbidities and less pain than transvesical surgery. The most important aim of any antireflux method is to restore the usual antirefluxing system of the UV junction.¹² In fact there are multiple surgical procedures that exist for correction of vesicoureteral reflux. This means that there is not a single fail-safe procedure that would be satisfactory in managing these patients.^{13,14,15}

In a previous study postoperative pain assessment was done to compare the robotic versus open surgical approaches for treatment of VUR. Author of this study concluded that robotic ureteral reimplantation was associated with lower intensity of postoperative pain according to a direct pain assessment tool and with lower narcotic requirement compared to open surgery.¹⁶ When outcomes of robot assisted extravesical procedure were evaluated in a latest study, it was found that in children going through complex robot-assisted laparoscopic ureteric reimplantation (RALUR) experienced a shorter duration of stay but had comparable analgesic requirements to those going through open

repair. Clinical success rates, radiographic and complication risk were similar.¹⁷

In a study Cohen's procedure was compared with extravesical detrusorrhaphy and it was concluded that success rate of both techniques were almost similar.¹⁸ Apart from similar success rate, need for anticholinergics and pain medications to treat bladder spasms was lesser in patients undergoing bilateral EVR. Temporary urinary retention was also reported in these patients. As a result it was suggested by Ellsworth *et al* that *minimal dissection should be performed in trigonal region of bladder in bilateral procedures*. The considerable advantage of extravesical technique is less morbidity and short convalescence. With the advent of robotic techniques and laparoscopy,^{19,20,21,22} the morbidity is further decreased for both CUR and EVR. More studies should be performed to throw more light on the supremacy of these procedures by means of a minimally invasive route.

CONCLUSION

From our study, we conclude that extravesical ureteric reimplantation has an edge over conventional procedure of intravesical ureteric approach. Intravesical procedure has disadvantages of more frequency of postoperative complications like, hospital stay, bladder spasms and hematuria.

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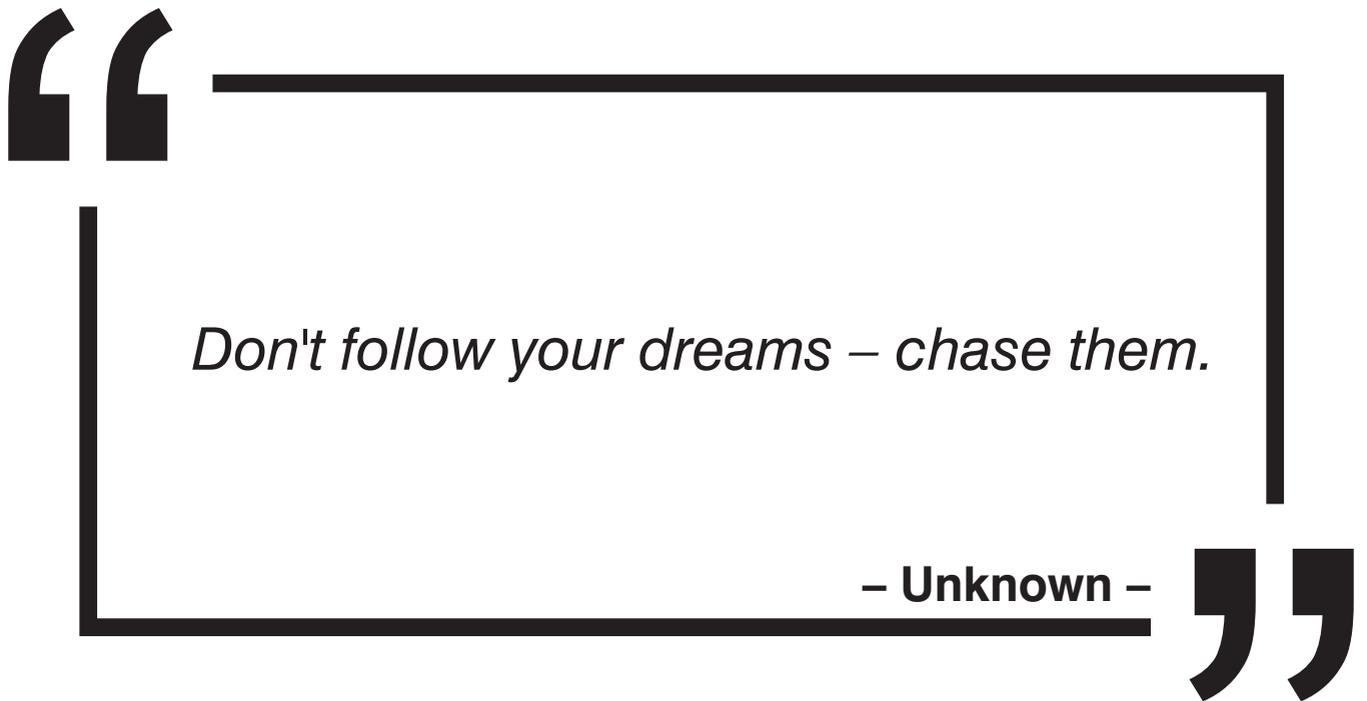
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