

Evaluation, Management and Follow Up of Vesicoureteric Reflux in the Setting of Posterior Urethral Valve

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Abstract

Introduction: Posterior urethral valve represents the most common etiology of congenital urethral obstruction in boys. 35-50% of PUV cases have vesicoureteric reflux at the time of diagnosis. Endoscopic ablation of valves is the treatment of choice. In this study we evaluated the association of primary kidney function and VUR in patients with PUV and assessed the rate and timing of resolution of VUR after valve ablation.

Materials and Methods: A prospective, observational study was done in which children with VUR secondary to PUV were included. A clinical history was taken. Preoperative work up with complete blood picture, renal function tests, ultrasonography, voiding cystourethrogram was done. All patients underwent cystoscopy and fulguration of the posterior urethral valves. The patients were followed up with ultrasound, MCUG and DMSA scan. Resolution of VUR was studied.

Keywords

- Vesicoureteric reflux
- Posterior urethral valve
- Urinary tract infection
- Cystoscopic fulguration

Results: 56 patients were included in the study. 38 out of 56 cases had an antenatal history of HDN. Bilateral VUR was seen in 33 cases (59%). Unilateral VUR was seen in 23 cases. Each side of reflux was considered as an individual unit in bilateral cases. The total number of units was 89. Resolution of reflux was seen in 27 units. Downgrading of reflux was seen in 53 units. 9 units neither showed resolution nor downgrading.

Conclusion: VUR is the major cause of postnatal damage in PUV. Early resolution of reflux after valve ablation was seen in cases with low grade reflux. Resolution of reflux is more in cases with unilateral reflux than with bilateral reflux.

Introduction

Posterior urethral valve (PUV) represent the most common etiology of congenital urethral obstruction in boys and the most common urologic cause for end-stage renal disease in children. Hugh Hampton Young initially described posterior urethral valve and proposed the current classification scheme.¹ Posterior urethral valves occur in 1 in 5000 live births. 35-50% of cases with valves have vesicoureteric reflux at the time of initial diagnosis.²⁻³ Reflux is secondary to increased intravesical pressure and loss of ureterovesical junction competence, although some primary reflux may also present. In the most severe cases, the bladder outlet obstruction from the

valve results in severe hydroureteronephrosis and cystic dysplasia within the kidney. In some of these boys, pulmonary hypoplasia is the cause of death in the neonatal period. The varied spectrum of outcomes noted in boys born with valves may represent differences among patients in the degree of obstruction, the timing of the obstruction, and underlying genotypic risk factors. Although bilateral reflux appears to be associated with kidney failure, unilateral reflux with an ipsilateral nonfunctioning kidney has been suggested to protect contralateral kidney function.⁴⁻⁶ Although an endoscopic ablation or urinary diversion will address the immediate

uropathy, the embryologic insults to the bladder and kidneys manifest to varying extents, requiring that these boys remain under the extended care. The regression of VUR during long-term follow up and the need for surgery have not been explored extensively. In this study we evaluated the association of primary kidney function and VUR in patients with PUV and assessed the rate and timing of spontaneous resolution of VUR after valve ablation in the patients attending to the department of pediatric surgery, Niloufer Hospital.

Materials and Methods

A prospective, observational study was done from November 2017 to November 2019, at the Department of Pediatric Surgery, Niloufer Hospital, Hyderabad.

All children with vesicoureteral reflux secondary to PUV on preoperative Voiding cystourethrogram from newborn babies to 5 years of age were included in this study. Cystoscopic fulguration was done in babies who responded to catheterization with lowering of the creatinine values. If the creatinine values did not decrease with catheterisation either a vesicostomy or ureterostomy was performed.

Children who did not complete 2 years of follow up and children who underwent

treatment other than primary cystoscopic fulguration such as vesicostomy and ureterostomy were excluded from the study.

For all the patients with VUR secondary to PUV a detailed clinical history was taken. Preoperative work up with complete blood picture, renal function tests, ultrasonography of kidney, ureter and bladder, voiding cystourethrogram is done. Renal function tests were done after 72 hours of birth, as earlier reports reflect the mother's renal values, and renal function tests are repeated every 24 hours to look for the trend.

All patients underwent cystoscopy and fulguration of the posterior urethral valves. Cystoscopy was done under general anesthesia with the child placed in lithotomy position. Cystoscopy was performed using 7.5 Fr scope.

The valves were fulgurated at 5, 7 and 12 o'clock positions using hook 3 Fr Bugbee electrode, cutting diathermy and usage of 0.9 normal saline as the irrigating agent. Applying a pure cutting diathermy at 20W will lead to ablation of the valve tissue. In addition, the instrument can be rotated 180° to visualize and ablate the obstructing valve tissue at the 12 o'clock position. Adequacy of fulguration was checked on table by

observing the urine stream with suprapubic pressure.

The bladder was catheterized for 3 days with a Foley. Patients were put on injectable antibiotics for 3 days. Catheter removed on post operative day 3 with prophylactic oral antibiotic of cephalexin 15mg/kg/night and advised for follow up.

USG KUB was advised on follow up every 6 months and assessed for grade of hydronephrosis. Any changes are noted accordingly.

MCUG is done following strict aseptic precautions on follow up for every 6 months. Radiological findings are noted. Post VCUG child is advised therapeutic dose of oral antibiotics for 5 days followed by prophylactic dose later on.

During follow up, history of febrile UTIs are noted and treated accordingly. Urine for culture and sensitivity was done in cases presenting with febrile UTIs.

All children were advised to undergo DMSA scan every year on follow up and any changes in renal function or any progression of scars are noted.

Consent was taken from the parents of the children included for the participation in the study. Institutional ethics committee approval was taken prior to starting the

study. Statistical analysis was done using SPSS software.

Results

56 patients with vesicoureteral reflux secondary to posterior urethral valve (PUV), who have completed 2 years of follow up are included in the study.

38 out of 56 cases had an antenatal history of HDN. 8 cases (14.3%) had poor urinary stream. The age at presentation ranges from "0" days of life to 5 years of life. 32 out of 56 cases (57%) presented in the newborn period. 14 out of 56 (25%) presented in infancy, 10 (18%) cases presented beyond 1 year (1-5 years).

Out of 56 cases 24 cases (42.85%) had raised creatinine values (>1mg/dl) at presentation. Most of these cases were diagnosed with bilateral VUR or unilateral high grade of VUR.

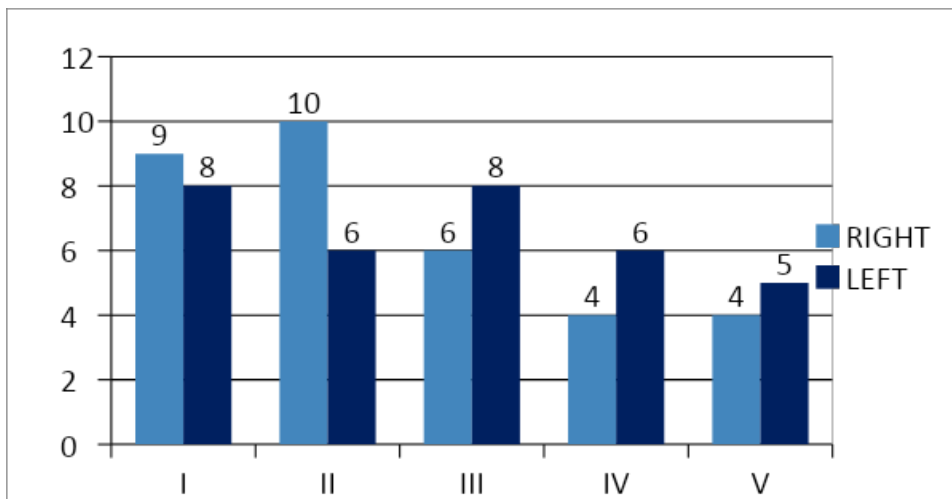
In ultrasound bladder diverticulum was seen in 4 cases at diagnosis. Urinary ascites/urinoma was seen in 7 cases, associated renal anomalies were present in 2 cases (renal agenesis) and undescended testes in 3 cases.

Bilateral VUR was seen in 33 cases (59%). Unilateral VUR was seen in 23 cases, right sided in 10 cases and left sided in 13 cases.

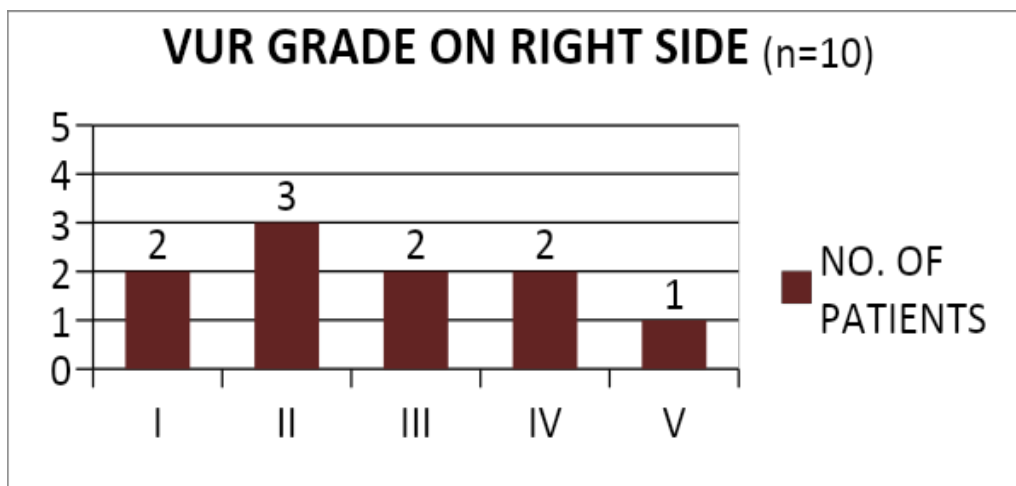
Distribution of reflux in bilateral VUR is shown in **Figures 1**.

Distribution of reflux in unilateral VUR on right side is shown in **Figures 2**.

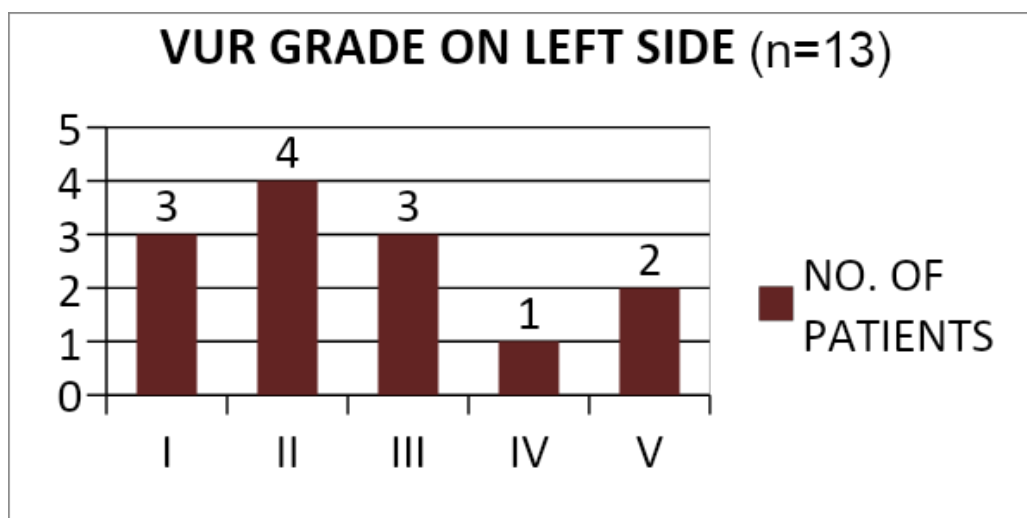
Distribution of reflux in unilateral VUR on left side is shown in **Figures 3**.



Figures 1: Distribution of reflux in bilateral VUR



Figures 2: Distribution of reflux in unilateral VUR on right side



Figures 3: Distribution of reflux in unilateral VUR on left side

Follow up of VUR after Valve fulguration

Considering each side of reflux as an individual unit in bilateral cases, the total number of units is follows.

Total number of units was 89 (n) $\{(33 \times 2 = 66) + 23\}$.

Changes in reflux grades before and after fulguration in unilateral cases is shown in **Table 1**. Changes in reflux grades before and after fulguration in bilateral cases is shown in **Table 2**.

Resolution of reflux was seen in 27 units out of 89 units. **Figures 4-5**

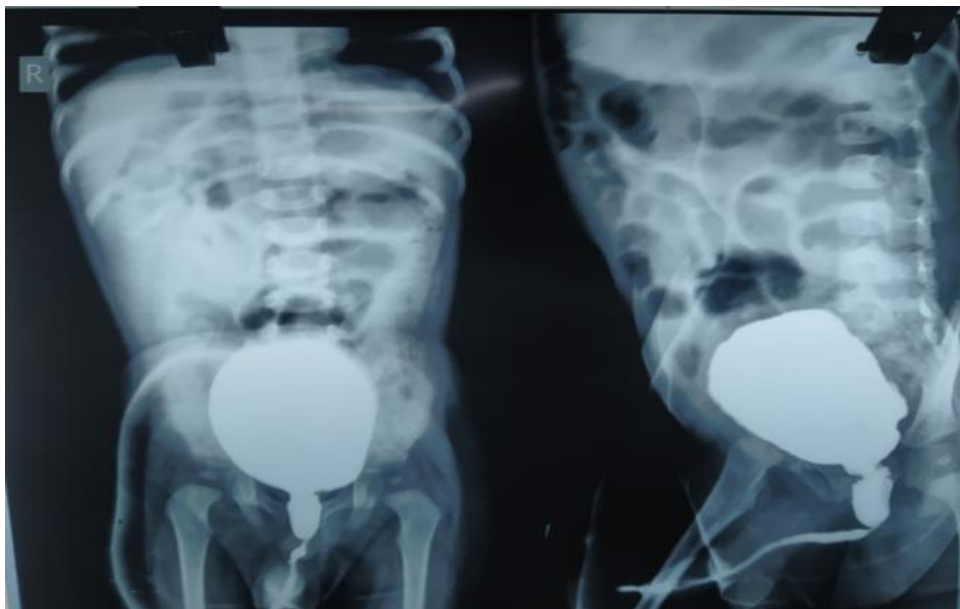
Downgrading of reflux was seen in 53 units out of 89 units on follow up. **Figures 6-7**

The other 9 units neither showed resolution nor downgrading. All the cases with persistence of reflux are being closely followed up and will be evaluated in the future for need for surgery.

The outcomes of reflux are shown in **Figures 7**.



Figures 4: PUV in a 5day old with Grade IV reflux on the right side



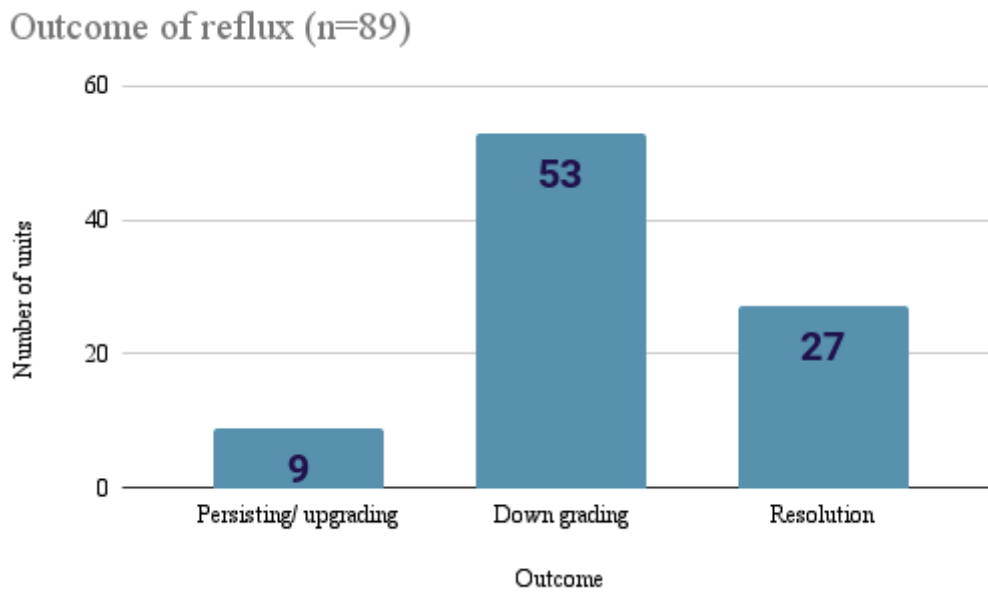
Figures 5: MCUG of the same child 18 months after valve fulguration showing improvement of bladder contour and complete resolution of reflux on right side.



Figures 6: PUV in a 5day old with Grade IV reflux on the right side



Figures 7: Same child after 2 years- Downgrading of VUR (Right grade 1, Left grade 3)



Figures 8: Outcomes of Reflux

Table 1: Changes in reflux grades before and after fulguration in unilateral cases.

GRADE	NO. OF RENAL UNITS (n=23)			
	AT ADMISSION		AFTER 2 YEARS	
	RIGHT (10)	LEFT(13)	RIGHT(10)	LEFT(13)
I	2	3	1	2
II	3	4	2	1
III	2	3	1	1
IV	2	1	0	0
V	1	2	0	1
NON VUR	0	0	6	8
TOTAL	10	13	10	13

Table 2: Changes in reflux grades before and after fulguration in bilateral cases

GRADE	NO. OF RENAL UNITS (n=66)			
	AT ADMISSION		AFTER 2 YEARS	
	RIGHT (33)	LEFT(33)	RIGHT(33)	LEFT(33)
I	9	8	11	9
II	10	6	7	7
III	6	8	5	3
IV	4	6	3	4
V	4	5	2	3
NON VUR	0	0	5	7
TOTAL	33	33	33	33

Check Cystoscopy was done in 22 cases in view of persistence of symptoms (4 cases - 3 had dribbling, 1 had poor urinary stream) or history of febrile UTIs on follow up.

Residual Valve was seen in 20 cases (35.7%) for which redo fulguration was done.

There was no residual valve but the child presented with progressive dilatation of upper tracts in 2 cases and a diagnosis of Valve Bladder Syndrome (VBS) (4%) was made.

Out of 20 cases with residual valve 18 cases presented with febrile UTIs, 1 case had dribbling, 1 case had poor urinary stream.

Out of 20 cases of redo fulguration in 19 cases incidence of febrile UTI's has decreased post redo fulguration and parents were satisfied with the symptomatic relief of the children on follow up.

One case presented with recurrent UTI even after fulguration. On evaluation diagnosed to have left VURD syndrome causing recurrent UTI. The child underwent left nephroureterectomy.

Figure 8.

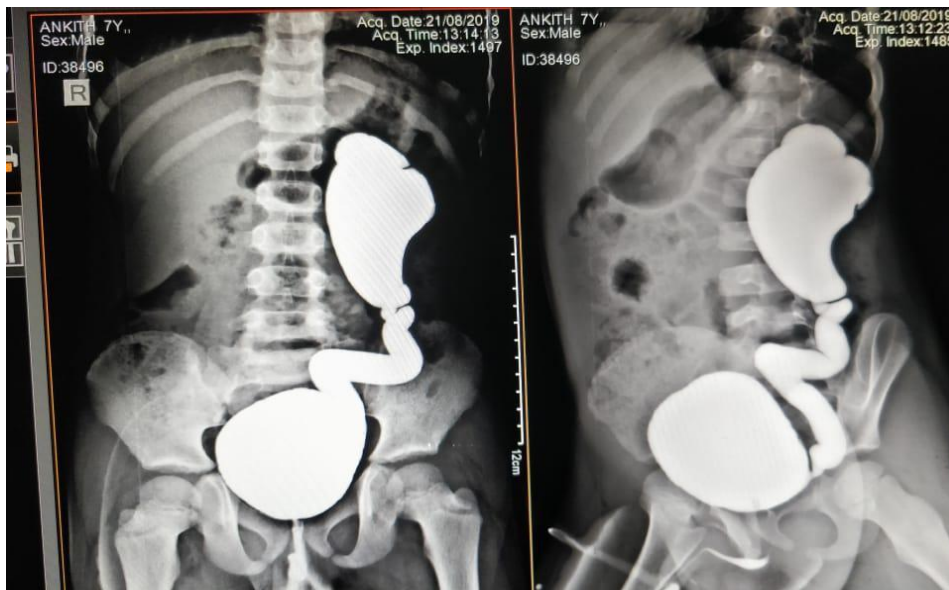


Figure 8: MCUG of a child with left VURD syndrome

Di mercapto succinic acid (DMSA) scan is advised after every 1 year on follow up. Out of 56 cases on follow up at 2 years, progression of scars was seen in 13 cases (23.2%).

Discussion

The folds of the type I valve progress distally and laterally from the lower portion of the verumontanum and join anteriorly at the 12 o'clock position. The folds can most clearly be seen at the 5 and 7 o'clock positions, and one can see the external sphincter just distal to the valve leaflets. To best visualize the valves, the bladder should be full, and the end of the cystoscope should be placed at the level of the external sphincter.

In a study by Parkhouse et al. one-third of patients were detected between 0-1 month, one-third between one month and one year and one-third between one and six years.⁷ In our study, the majority of cases presented in the newborn period (32 out of 56 cases).

In our study antenatal history of hydronephrosis is seen in 38 out of 56 cases (67.8%). 57% (32 out of 56 cases) of patients presented in neonatal period. In a study done at Department of Urology, Wake Forest University School of Medicine neonatal presentation is seen in up to 50% cases.⁸ In patients presenting beyond neonatal period major complaint was symptoms of bladder outlet

obstruction (BOO). In our study symptoms of BOO were seen in 14 out of 56 cases (25%) In a study done at the Departments of Radiology and Urology, Medical University of South Carolina symptoms of BOO were seen in 32% of cases.⁹⁻¹⁰

Symptoms of BOO is seen in 80 % of cases in a study done by SAT Hospital, Government Medical College, Thiruvananthapuram.¹¹

In our study Bilateral VUR was seen in 60% of cases at the time of diagnosis. In a study done by Alireza Mirshemirani et al Shaheed Beheshti University of Medical Sciences 50 % cases had bilateral VUR ,¹² while it was 27% in Malik et al,¹³ and Sudarsanan et al¹⁴ reported 12 % bilateral VUR. Vesicoureteral reflux in PUV patients is presumably secondary to infravesical obstruction. Thus, after ablation of valves, resolution of VUR is expected. Early endoscopic valve fulguration is the best initial modality of management in the majority of children with PUVs.¹⁵ After fulguration, adequacy of fulguration is evaluated by asking the parents about the urinary stream.

In our study resolution of reflux is seen in 30% of units (27 out of 89) on 2 years of follow up. In a study done by Ali Tourchi et al reflux resolution was seen in 67%

cases after a period of 3.8 years of follow up in cases who were on prophylactic antibiotic for reflux after fulguration of PUV.¹⁵ Similarly, VUR resolution was seen in 57% of units in a study done by Hassan J et al in 5 years of follow up.¹⁶ This indicates that a considerable number of patients will experience VUR resolution in the long-term follow-up rather than in the short-term; it may be because of improvement in bladder function.¹⁷

Nilüfer Bıçakcıa et al reported that cases of PUV with bilateral reflux tended to have high grade reflux (grade IV or more). In long term follow-up, they reported that high degrees of VUR persisted and lower degrees tended to increase.¹⁸

In our study 18 out of 56 cases (32%) presented with history of febrile UTIs on follow up. In a study by Alireza Mirshemirani et al UTI was present in 40.8% of patients which was cured by antibiotics, and in severe/resistant cases, with diversion.¹² In our study all cases were initially treated with conservative management and later evaluated.

In the study done by Hiwote Assefa et al recurrent UTI was seen in 27.6% patients postoperatively, and around 57% had no UTI.¹⁹

In a study by Masud Pervez et al in BIRDEM hospital had 50% of cases with history of febrile UTI's on follow up.²⁰

All 18 cases underwent check cystoscopy later and were diagnosed to have residual valves. Redo fulguration was done and are on follow up.

In PUV patients, dysplastic changes in kidneys have been proposed to be caused by abnormal development of ureteric bud or bladder outlet obstruction itself.²¹⁻²²

In our study 1 case was diagnosed to have VURD and had recurrent episodes of UTI and hence nephroureterectomy was done.

Conclusion

Vesicoureteral reflux is the major cause of postnatal damage in PUV and persistence of reflux is associated with bad outcome. Antenatal history of HDN is associated with early presentation.

The incidence of urinoma in VUR with PUV is as high as 12.5%. Serum creatinine which is the marker of renal function is

elevated in PUV with higher grade of reflux either unilateral or bilateral. The ablation of valve is a justified procedure for VUR in PUV patients. Early resolution of reflux is seen in cases with low grade reflux at the time of presentation. Resolution of reflux is more in cases with unilateral reflux than with bilateral reflux.

Ethical Consideration

Approval from Institutional ethics committee was taken prior to the start of the study. Written consent for participation was obtained from the parents or guardians of all the participants in the study.

Acknowledgment

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Funding/Support

Not applicable

Conflict of interests

There is no conflict of interest

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