

Clinical Study of Posterior Urethral Valves

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Abstract

Background: Posterior urethral valves are the commonest structural cause of urinary outflow obstruction in boys.⁽¹⁾ It is also the most common type of obstructive uropathy leading to childhood renal failure. **Aims and Objectives:** To observe the clinical, biochemical and imaging patterns of posterior urethral valves and how they change after initial treatment and during follow up. To review the results of Primary valve ablation and Vesicostomy in management of Posterior urethral valves. **Materials and methods:** We prospectively studied 28 patients from October 2015 to September 2017 with posterior urethral valves who were primarily treated at our hospital or referred from other hospitals for subsequent therapy.

Results: Only two patients (i.e., 7.14%) had a prenatal diagnosis as part of antenatal ultrasound examination. Decreased urinary stream and straining to void are the most common symptoms in present study. Reflux resolved completely in 7 of 16 units (43.75%), reduced in grade in 3 of 16 units (18.75%) and remained unchanged in 6 out of 16 units (37.5%). In the present study 10.71% of patients had CRF, whose age at presentation was more than 5 years of age. All these patients had serum creatinine at presentation > 2 mg/dl. **Conclusion:** In any male child with bilateral hydronephrosis & distended bladder on ultrasonography, a diagnosis of PUV should be entertained. The management of PUV at the first outset should be, urethral catheterization, stabilization of general condition, followed by primary valve ablation. The short-term results of Primary valve ablation are good. Vesicostomy is equally effective. Reflux tends to disappear or decrease in grade in majority following appropriate surgical management. Delay in diagnosis results in poor outcome of renal function. A much longer period of follow up is needed to understand the long-term results.

Keywords: valves, urethral

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Introduction

Posterior urethral valves are the commonest structural cause of urinary outflow obstruction in boys.⁽¹⁾ It is also the most common type of obstructive uropathy leading to childhood renal failure.⁽²⁾ The incidence of PUV ranges from 1 in 8000⁽³⁾ to 1 in 25000 live male births and it constitutes about 10% of prenatally diagnosed hydronephrosis.⁽⁴⁾

Patients with severe form of disease often die immediately after birth and do not present for treatment.⁽⁵⁾ In addition, 26% of patients treated in the neonatal period subsequently develop end stage renal failure.⁽⁶⁾ There is an intermediate group that does not require renal transplantation but also does not have enough renal function to permit growth and development.⁽⁷⁾

In this study we tried to observe various clinical, biochemical, imaging patterns and analyze the results of various treatment modalities offered to posterior urethral valve patients at our institute, and look at the results of Primary Valve Ablation and Vesicostomy.

Aims and Objectives

- To observe the clinical, biochemical and imaging patterns of posterior urethral valves and how they change after initial treatment and during follow up.
- To review the results of Primary valve ablation and Vesicostomy in management of Posterior urethral valves.

Materials and Methods

Type of Study: This is a Prospective clinical study of posterior urethral valves for a duration of 3 years

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Data collected on

- Demographic details
- Modes of presentation
- Diagnostic evaluation
- Presence of reflux
- Renal status
- Treatment modalities offered
- Follow up

Evaluation

All the patients were evaluated with Serum electrolytes, BUN, creatinine. Ultrasonography, Voiding cystourethrogram.

Treatment

- Treatment consisted of valve ablation and vesicostomy.
- Valve ablation was performed by endoscopic incision at 5 and 7 o'clock positions using a paediatric cystoscope with Bugbee electrode.
- Where Vesicostomy was employed, the technique used was the Blocksom Vesicostomy.
- Where the patient had a primary vesicostomy, valve fulguration was done at variable period of time, mostly after 1 year of diversion. Retrograde Valve fulguration and closure of vesicostomy were done in same sitting, a urethral splint (foleys catheter 8Fr or 10Fr) was left insitu and voiding trial was given on 3rd post operative day.
- Circumcision was performed to all patients at the time of valve fulguration.

Results

Total Number of Patients

- 28 patients from October 2015 to September 2017 were evaluated.
- Patients were primarily treated at our hospital or referred from other hospitals for subsequent therapy.
- Follow up varied significantly among patients, with at least 6 months of follow-up.

Age

- The youngest patient in the series was 8day old. (Pt no 9).He was diagnosed by prenatal ultrasound. Ultrasound findings were Bilateral hydronephrosis, distended and thickened bladder and dilated posterior urethra. Patient had postnatal voiding cystourethrogram which revealed Posterior urethral valves and patient underwent vesicostomy. Patient underwent valve fulguration at age of 2 years and has normal serum creatinine.
- The oldest age at presentation was 13yr (pt no 11). Patient presented with obstructive voiding symptoms and on evaluation found to have posterior urethral valves. Patient underwent valve fulguration and has normal serum creatinine.
- The Average age at presentation was 2.87 years.

Table 1: Age presentation

Age at Presentation	No	(%)
Younger than 1 month	2	(7.14%)
1 month to 1 year	12	(42.86%)
More than 1 year upto 5 years	9	(32.14%)
More than 5 years	5	(17.86%)

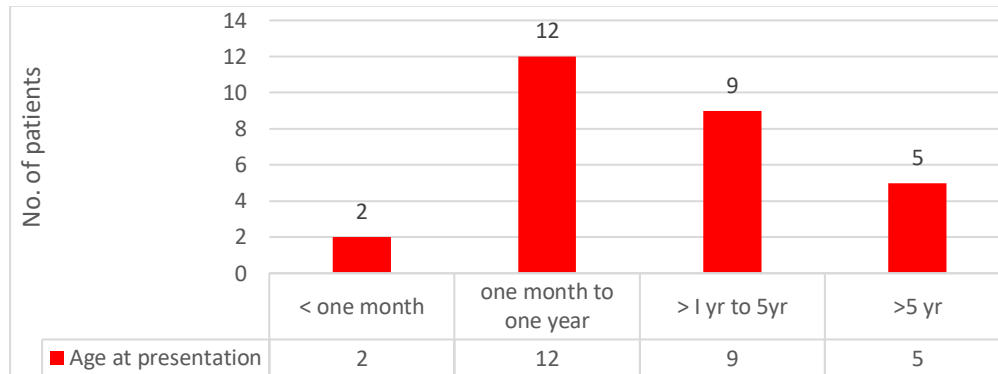


Fig 1: Age presentation

Presentation

- A Prenatal diagnosis using Ultrasound was made in two patients.
- Obstructive voiding symptoms in the form of narrow stream and straining to void was present in all patients.
- At presentation symptoms of urinary tract infection were present in majority of patients.
- 18 patients had fever with chills and rigors and 12 patients had pyuria.
- One child in the series had an elder sibling who died of posterior urethral valve disease

18 Patients had fever of which 12 patients had turbid urine. They showed signs of dehydration. A palpable distended bladder was present in 6 patients. One patient had associated anomaly in the form of undescended testis. Features of CRF were noted in 2 patients.

Serum Creatinine

The serum creatinine at presentation was analyzed. Mean serum creatinine 1.38 mg/dl (Range 0.4 to 4.6 mg/dl). Normal creatinine was noted in 13 patients and elevated in 15 patients. All patients had urethral catheter drainage (6F to 10 F Infant feeding tube), Intravenous cephalosporin for 5-7 days. The serum creatinine after an initial period of catheter drainage normalized in 3 patients, mildly elevated in 7 and in CRF range in 5 patients.

Physical Examination

Table 2: Serum Creatinine at Presentation

Normal	Elevated
13	15

Table 3: Serum creatinine after Catherization

Normal	Elevated (0.9 to 2mg/dl)	CRF (>2 mg/dl)
3	7	5

VCUG (Voiding cystourethrography)

The diagnosis of Posterior urethral valves was made in all the cases using VCUG. It typically showed dilated and elongated posterior

urethra, posterior urethral valves, trabeculated bladder with cellules and diverticulae in some, and reflux when present.

VESICO-URETERAL REFLUX (VUR)-

Table 4: Reflux at presentation

	No of Patients	No of Units
Unilateral reflux (grade):		
Low (I-III)		
High (IV-V)	8	4(IV) + 4(V)
Total No. (%)	8/28 (28.57%)	8(50%)
Bilateral reflux (grade):		
Low (I-III)	4	8

High (IV-V)		
Total No. (%)	4/28(14.29%)	8(50%)
Total VUR at presentation	12/28(42.86%)	16 (100%)

Overall 12 (42.86%) patients presented with vesicoureteral reflux prior to treatment. Bilateral reflux was noted in 4 patients, which was of grade III in all. Unilateral reflux was noted in 8 patients, which is grade IV in 4 and grade V in 4 patients. A VURD pattern was seen in 3 patients (3/28 = 10.71%), all had unilateral grade V reflux and an isotope evidence of non-functioning refluxing unit.

- Among 4 patients with bilateral grade III reflux, post-operative followup revealed persistence of reflux in one patient, resolution on one side and persistence of reflux on other side in one patient, complete resolution in 2 patients.
- Among 8 patients with unilateral reflux, reflux completely resolved in 2 patients with grade IV, reduced to grade III in 2

patients. 3 out of 4 patients with grade V had persistent reflux leading to VURD, reduced to grade III in one patient.

- Reflux resolved completely in 7 of 16 units (43.75%), reduced in grade in 3 of 16 units (18.75%) and remained unchanged in 6 out of 16 units (37.5%).
- Grade III reflux resolved in 5 out of 8 renal units (62.5%), grade IV reflux resolved in 2 out of 4 renal units (50%), grade V reflux reduced in one renal unit out of 4 (25%).
- Among patients with bilateral reflux, 5 out of 8 renal units (62.5%) resolved and unilateral reflux resolved completely in 2 patients, reduced in grade in 3 out of 8 renal units (37.5%), unchanged in 3 renal units.
- Patients with VURD pattern had no change in reflux

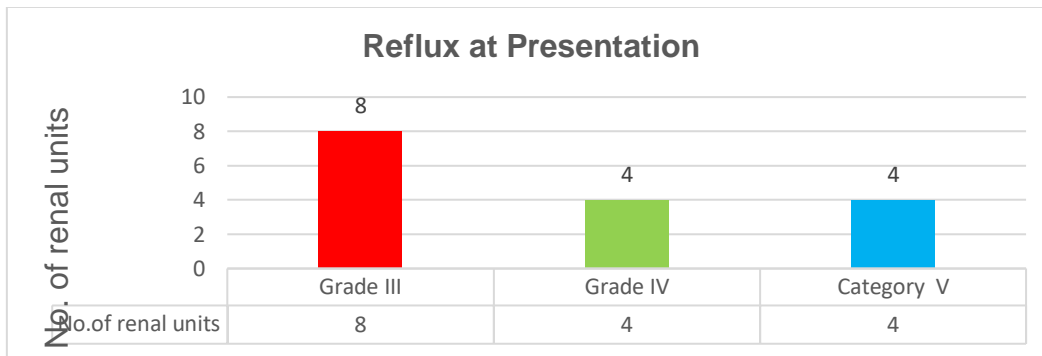


Fig 2: Reflux Distribution and Resolution with Valve Management

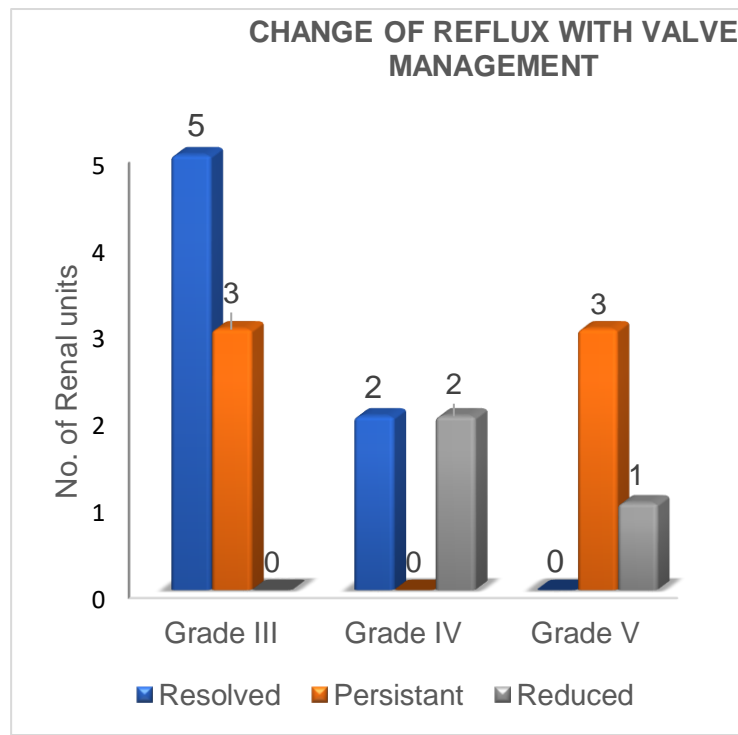


Fig 3: Resolution of reflux with respect to treatment modality

Table 5: Procedure

Treatment	No
Primary Valve Ablation	17(60.71%)
Vesicostomy	11(39.28%)

Valve Ablation Group

Overall 17 patients underwent Primary valve fulguration. Of these, 2 patients underwent re-fulguration for residual valves. Both the patients had recurrent UTI, and MCUG at 3 months showed residual valves, confirmed, and ablated endoscopically. Two patients had to undergo vesicostomy for urosepsis. Both patients recovered following vesicostomy. Notably both patients had unilateral reflux prior to valve ablation. The reflux reduced in grade in one patient following the vesicostomy but unchanged in the other who had a VURD pattern.

One patient in this group had incontinence, MCUG showed no residual valves, adequate capacity bladder. Serum creatinine was

normal. Urodynamic study advised but the patient could not get it done due to financial reasons.

Vesicostomy Group

Vesicostomy performed by Blocksom method. Overall 11 patients underwent vesicostomy as initial treatment modality. Four patients are waiting for closure of vesicostomy, while the remaining patients underwent valve fulguration and closure of vesicostomy.

The reasons for doing Primary vesicostomy included

- Neonate with very small urethra.
- Urosepsis, with raised renal parameters.
- Reflux with small capacity bladder
- Two patients of the primary valve fulguration group underwent vesicostomy later due to urosepsis.

Table 6: Analysis of serum creatinine with respect to treatment modality

Presentation creatinine	Valve Ablation	Vesicostomy
Normal (<0.8 mg/dl)	10	6
Elevated	7	5
0.9 - 2mg/dl	5	2
>2	2	3
Follow up values		
Normal	10 + 4	6 + 3
Elevated (0.9 - 2mg/dl)	0	2
CRF(>2mg/dl for >1 month)	3	0

In the primary valve ablation group, 14 (82.35%) maintained normal renal parameters at follow up. In the vesicostomy group, 9 (82%) maintained normal renal parameters. Over all 80% of patients maintained normal parameters at variable period of follow-up.

CRF

Overall 3 patients (10.71%) had CRF in this series. All these patients had serum creatinine at presentation > 2 mg/dl. The age at presentation was more in this group from 6yr to 10 yr. The follow-up stable creatinine values were between 2 and 3 mg/dl. None of them required dialytic support as yet and are on medical management of CRF. Although Urodynamic study was advised to all these patients, none got it done.

Discussion

The age at presentation was variable. In most of the series up to 40% of the patients presented with in first one month. The delayed presentation at more than 5 years constituted nearly 17.86%. In other studies by Gangopadhyay et al⁽⁸⁾, AK BASU et al⁽⁹⁾ and Choudary⁽¹⁰⁾ the rate of delayed presentation were 20.37%, 21%, 3% respectively. In our study 3 of 5 patients of more than 5 years of age were associated with chronic renal insufficiency.

Decreased urinary stream and straining to void were the most common symptoms in present study seen in 100%. The occurrence of symptoms of urinary tract infection were also common and similar to that reported by Bhaumik et al⁽¹¹⁾. The incidence of palpable bladder and palpable kidney was low in this series compared to other series. Acute renal failure was the presenting feature in 14.28%, similar to that reported by Choudhary et al⁽¹⁰⁾. There were no cases of Urinary ascites or respiratory distress in this series.

Baseline serum creatinine after adequate bladder drainage indicates the baseline renal parenchymal functional status.⁽¹²⁾ In present study 15 patients had elevated serum creatinine at presentation. Normalized in 3 patients after bladder drainage, remained elevated in 12 patients above 0.8 mg/dl, 5 patients had features of chronic renal insufficiency during our study period. In a study by RR Kukreja & RM Desai⁽¹³⁾, 16 of 20 patients with renal insufficiency had baseline serum creatinine above 0.8 mg/dl

Most of the series demonstrate that primary valve ablation is being offered commonly as the first line treatment. In the present study, 60.71% of patients underwent primary valve ablation. Method employed is valve fulguration with 8 F pediatric scope with bugbee or hook.

There is no need to always confirm the completeness of valve ablation, because only 7.14% of patients in this study required re-fulguration for persistent valves causing obstruction. There was one case of incontinence in this series attributable to sphincter injury. Nijman and Scholtmeyer⁽¹⁴⁾ reported an incidence of only 5% urethral injury in a group of 85 boys undergoing electro incision of urethral valves. Gangopadhyay et al⁽¹⁵⁾ used a blunt hook valve ablator (chloramine's valve ablator) and quoted good results.

Vesicostomy performed by Blocksom method. 11 patients underwent Vesicostomy as initial treatment. There is one case of bladder mucosal prolapse (9%) & one case of vesicostomycystomalstenosis (9%) in this series. In a series by Lukung CS & Ameh EA⁽¹⁶⁾, reported an incidence of 4.3% of bladder mucosal prolapse & stomal stenosis in a group of 23 boys who underwent Vesicostomy.

At presentation 42.86% of patients had reflux. Of these, reflux resolved completely in 7 of 16 renal units (43.75%), reduced in grade in 3 of 16 (18.75%) and remained unchanged in 6 of 16 renal units (37.5%). Grade III reflux resolved completely in 5 of 8 renal units (62.5%), grade IV reflux resolved in 2 of 4 renal units (50%), grade V reflux reduced in 1 of 4 renal units (25%)

Unilateral reflux resolved completely in 2 patients (25%), reduced in grade in 3 renal units (37.5%). In VURD pattern no change of reflux is noted. The reflux resolution apparently is high in vesicostomy group; this is due to more number of patients with grade V reflux in valve ablation group - the resolution rate of grade V reflux is very low. In a Prospective study by Priti K et al (2004), VUR is present in 60% of the patients, being unilateral in 41.7%. Reflux subsided in 31.5% by 3 months and 78.94% by 6 months.

The reflux more often resolved in the bilateral than unilateral group (31.25% of units versus 12.5%) and usually did so on the initial study after obstruction relief. Neither the presence, grade, pattern of reflux

nor type of initial treatment impacted the outcome in terms of overall renal function. The function of the involved kidney did affect the likelihood of resolution in that unit. Resolution occurred in 10% of refluxing units that provided less than 20% function versus 39% in units with better function.

At presentation 42.84% of patients had elevated Serum Creatinine. Following surgical management, 82.11% of patients maintained normal parameters at variable period of follow up. This needs to be followed in long term up to age of 20 years to get the actual percentage of preservation of renal function.

In the Primary valve ablation group, 14 (82.35%) maintained normal renal parameters at follow up. In the Vesicostomy group 9 (81.81%) maintained normal renal parameters. The present study shows that the results of Primary valve ablation are good, although a much longer follow up, upto 20 years age is required to confirm this.

Prospective study by K.L. Narsimhan et al⁽¹³⁾ demonstrated that transurethral fulguration and vesicostomy are equally effective for neonatal valves and achieve similar renal function. Both groups showed retarded growth compared to healthy counterparts. Somatic growth was delayed by serum creatinine greater than 1.0 mg/dl and the presence of VUR. Vesicostomy seemed to help neonate's catch-up the growth deficit in the first 2 years of life.

In the present study 10.71% of patients had CRF. The age at presentation was more in this group, more than 5 years of age. All these patients had serum creatinine at presentation > 2 mg/dl. The follow-up stable creatinine values were between 2 and 3 mg/dl.

Older age at presentation generally meant better prognosis, but not all children presenting late do well, however. In one series, 35% of patients who presented at more than 5 years of age had renal insufficiency, and 10% ultimately developed end-stage renal failure (Bomalaski et al)⁽⁵⁸⁾ In another series, 40.5% of patients presented at more than 2 years of age developed renal insufficiency (Ansari MS et al)⁽¹⁷⁾

In the present study also older age at presentation was associated with higher incidence of CRF, with 4 of 5 patients who presented above 5 years of age were having CRF.

Conclusions

- In any male child with bilateral hydronephrosis & distended bladder on ultrasonography, a diagnosis of PUV should be entertained.
- The management of PUV at the first outset should be, urethral catheterization, stabilization of general condition, followed by primary valve ablation.
- The short term results of Primary valve ablation are good.
- Vesicostomy is equally effective when there is technical difficulty for valve ablation and also in patients who are having bilateral high grade reflux or sepsis despite valve ablation.
- Reflux tends to disappear or decrease in grade in majority following appropriate surgical management.
- Bilateral and lower grade reflux tends to have higher resolution rates.
- Serum creatinine value at presentation is not predictive of subsequent renal function but creatinine value after a brief period of urinary tract decompression is prognostically more useful.
- Delay in diagnosis results in poor outcome of renal function.

Conflict of Interest: Nil

Source of support: Nil

- A much longer period of follow up is needed to understand the long term results of valve ablation.
- The ultimate goal of management should be to maximize renal function, maintain normal bladder function, minimize and prevent iatrogenic problems

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