

## POSTERIOR URETHRAL VALVES- OUR EXPERIENCE

Khumallambam Ibomcha Singh<sup>1</sup>, NG. Javan<sup>2</sup>, K. Sholay Meitei<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Surgery, Jawaharlal Nehru Institute of Medical Sciences, Porompat, Imphal, Manipur.

<sup>2</sup>Associate Professor, Department of Surgery, Jawaharlal Nehru Institute of Medical Sciences, Porompat, Imphal, Manipur.

<sup>3</sup>Assistant Professor, Department of Urology, Jawaharlal Nehru Institute of Medical Sciences, Porompat, Imphal, Manipur.

### ABSTRACT

#### BACKGROUND

Posterior Urethral Valve (PUV) is the most common structural cause of urinary outflow obstruction in paediatric practice. It is also the most common type of obstructive uropathy leading to childhood renal failure. This study was carried out to evaluate the various clinical presentations, investigations, surgical management, complications and outcome of PUV in our region.

#### MATERIALS AND METHODS

For the study, a total of 45 patients who had attended the Outpatient Department of Surgery during the period from 2010 to 2016 were included. The selection of the patients was done based on clinical history, clinical examination, laboratory tests and radiological and cystoscopy examinations. Patient above 12 years of age and patient with spinal dysraphism were excluded from the study.

#### RESULTS

The commonest age group at the time of presentation is 1 - < 5 yrs. comprising about 53.3% and second commonest is the group of 0 - < 3 months comprising about 26.7%. In this present study obstructive symptoms, i.e. poor urinary stream and urinary dribbling and a palpable bladder are the most common mode of presentation which occur in 33 cases (73.33%) of posterior urethral valves. In 30 cases (66.67%) of posterior urethral valves blood urea levels were above normal, while serum creatinine levels had significantly raised in 36 cases (80%) at the time of admission. In this study electrolyte abnormality was observed in 30 cases (33.33%) at the time of admission, which returned to within normal range after initial resuscitation. The most common cystoscopic finding during evaluation of children are Type-I urethral valves in the posterior part of urethra with trabeculation of bladder walls. Urinary incontinence is the most common post-operative complication observed in this present study, which persists in 12 cases even at the time of discharge.

#### CONCLUSION

The potential of PUV to cause renal failure in infants and children if not treated on time should necessitate for early diagnosis and treatment of this condition. These seemingly simple but with a devastating potential should be dealt timely and properly. The need for a prolonged followup should be emphasised to the parents for a better overall outcome and to minimise long-term complications.

#### KEYWORDS

Obstruction, Cystoscopy, Incontinence.

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#### BACKGROUND

Posterior Urethral Valves (PUV) is the most common structural cause of urinary outflow obstruction in paediatric practice.<sup>1-3</sup> It is also the most common type of obstructive uropathy leading to childhood renal failure.<sup>4</sup>

PUV obstruction is estimated to occur in 1 of every 4000 to 25000 birth.<sup>3,5,6</sup> Although PUV is seen mainly in male, there have been a few reported cases of valvular obstruction in the female urethra also.<sup>7,8</sup> It is difficult to know the true incidence of posterior urethral valves. Although most cases are diagnosed in childhood, the majority before 10 years of age.

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*Corresponding Author:*

*Dr. NG. Javan,*

*Associate Professor,*

*Department of Surgery,*

*Jawaharlal Nehru Institute of Medical Sciences,*

*Porompat, Imphal East-795005, Manipur.*

*E-mail: ngjavan@yahoo.co.uk*

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Landes and Rail<sup>9</sup> reported that 20 percent of their patients were older than 20 years of age at presentation; their oldest patient was 89.

Posterior urethral valves are congenital.<sup>10-12</sup> Although congenital, valves do not seem to have a genetic basis. Most cases have been sporadic. Rare familial cases have been reported.<sup>11,13-15</sup>

The clinical presentation of the child with posterior urethral valves depends on the age of the patient at the time of presentation, which in turn is often related to the severity of the obstruction. A palpably enlarged bladder is the most common clinical finding regardless of age. In less severe cases a palpably enlarged bladder, urinary tract infection, failure to thrive or gastrointestinal disturbances may lead to investigation. A weak urinary stream has been reported in less than 30 percent of cases, so that a strong stream does not preclude the diagnosis of posterior urethral obstruction.<sup>16,17</sup>

The gold standard for diagnosis remains the radiographic voiding cystourethrography and retrograde urethrography.<sup>18,19</sup> Prenatal ultrasound screening of PUV has significantly increased early diagnosis and management of this pathology in most developed societies. In fact, PUV's are

now commonly diagnosed by the postnatal evaluation of infants who had prenatal hydronephrosis.<sup>6</sup>

This study was carried out to evaluate the various clinical presentations, investigations, surgical management, complications and outcome of PUV in our region.

## MATERIALS AND METHODS

The present prospective study of posterior urethral valve in children has been carried out in the Department of Surgery, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal, Manipur. The approval of Medical Ethics was taken from Medical Ethics Committee of JNIMS, and all informed consent were signed by the parents.

For the study, a total of 45 patients who has attended the Outpatient Department of Surgery during the period from 2011 to 2016 were included.

The selection of the patients was done based on the clinical history, clinical examination, laboratory tests and radiological and cystoscopy examinations. Patient above 12 years of age and patient with spinal dysraphism were excluded from the study.

As soon as the patients were admitted, a detailed history and clinical examinations of the patients were carried out along with the laboratory tests. Investigations done included serial blood urea nitrogen, serum creatinine, urine microscopy and culture and sensitivity. Initial radiological investigations consisted of abdominopelvic ultrasound followed by voiding cystourethrogram and cystoscopy (where appropriate size scope was available) when patients had been clinically stabilised. After fully diagnosing the pathological cause with the help of investigations and full resuscitation, patients were put up for operation. In the post-operative period patients were monitored, viz. pulse, blood pressure, temperature, respiratory rate, urine output, serum creatinine, etc. Any complications in the post-operative period were dealt with immediately.

At the time of discharge from the hospital, patients were instructed to attend the followup clinic in the outpatient department at 2 weeks and thereafter 1 monthly interval. In the followup clinic detailed history was taken, haematological tests were done and weight of the patients was recorded.

## RESULTS

### Age and Sex

The age at presentation in the present study is as shown below.

Age Group	No. of Cases	Percentage
0 - < 3 months	12	26.7%
3 m. - < 1 yr.	6	13.3%
1 yr. - < 5 yrs.	24	53.3%
5 yrs. - < 12 yrs.	3	6.7%

**Table 1. Age distribution of Patients**

The commonest age group at the time of presentation is 1 - < 5 yrs. comprising about 53.3% and second commonest is the group of 0 - < 3 months comprising about 26.7%. The youngest age of presentation in this series is 8 days old male infant and the oldest is an 11-year-old boy.

In this present study male comprises 100%, i.e. all the cases were male patients.

## Mode of Clinical Features

The clinical features of patients with PUV in this study are as below:

Clinical Presentations	Present Study	Percentage
Poor Urinary Stream	33	73.33%
Dribbling of Urine	33	73.33%
Inability to Pass Urine	30	66.67%
Dysuria	6	13.33%
Poor Feeding	18	40.00%
Fever	6	13.33%
Haematuria	3	6.66%
Palpable Bladder	33	73.33%
Dehydration	27	60.00%
Abdominal Pain	15	33.33%

**Table 2. Clinical features of Patients**

The presenting symptoms and physical signs of patients fell into two groups, namely obstructive (Poor urinary stream, dribbling, palpable bladder) and infective (Poor feeding, abdominal pain, positive urine culture). The presenting symptoms of posterior urethral valves depend on the age of the patient. In this present study obstructive symptoms, i.e. poor urinary stream and urinary dribbling and a palpable bladder are the most common mode of presentation, which occur in 33 cases (73.33%) of posterior urethral valves. Inability to void and distended abdomen are seen in 30 cases (66.67%). Infective symptoms like poor feeding is seen in 18 cases (40.00%), abdominal tenderness in 15 cases (33.33%), dysuria and fever were found in 6 cases. Twenty-seven patients (60%) are dehydrated and haematuria is seen in 3 cases. Blood pressure of all the patients during this study period is within normal range.

## Renal Functions

The blood urea and serum creatinine and bicarbonate levels in PUVs at the time of admission are as follows.

Abnormality	HCO <sub>3</sub> <sup>-</sup>	Blood Urea	Serum Creatinine
None	39 (83.33%)	15 (33.33%)	9 (20%)
Moderate	6 (16.67%)	21 (46.67%)	30 (66.67%)
Severe	0	9 (20%)	6 (13.33%)
<b>Total</b>	<b>45</b>	<b>45</b>	<b>45</b>

**Table 3. Blood Urea, Serum Creatinine and bicarbonate levels at the time of admission**

A serum creatinine concentration of between 1.2 mg/100 mL and 2.4 mg/100 mL and/or a urea concentration of between 30 mg/100 mL and 60 mg/100 mL were taken to indicate moderate renal failure. Levels above these values indicated severe renal failure. Taking these values into account it is observed that in 30 cases (66.67%) blood urea levels are above normal, while serum creatinine levels are significantly high in 36 cases (80%) at the time of admission. Electrolyte imbalance with metabolic acidosis is also observed in few patients at the time of admission.

The blood urea and serum creatinine levels in PUV before and after surgery are as follows.

Renal Function	Blood Urea		Serum Creatinine	
	Pre-Operative	Post-Operative	Pre-Operative	Post-Operative
Range	22 - 95	20 - 42.1	1.1 - 3.4	0.7 - 1.6
Average	45.48	28.17	1.82	1.02

**Table 4. Blood Urea and Serum Creatinine levels before and after Surgery**

In 30 cases (66.67%) of posterior urethral valves blood urea levels are above normal, while serum creatinine levels

are significantly raised in 36 cases (80%) at the time of admission. The levels of blood urea and serum creatinine returned to normal or near normal level after the treatment, except in 6 cases where the levels were marginally higher.

**Serum Electrolytes**

The serum electrolyte levels of the patients are as given below.

Serum Electrolytes	Pre-Operative mEq/L				Post-Operative mEq/L			
	Na <sup>+</sup>	K <sup>+</sup>	Cl <sup>-</sup>	HCO <sub>3</sub> <sup>-</sup>	Na <sup>+</sup>	K <sup>+</sup>	Cl <sup>-</sup>	HCO <sub>3</sub> <sup>-</sup>
Range	128 - 146.8	2.7 - 4.6	82.5 - 99.2	18 - 27.2	132.5 - 143.5	3.4 - 4.5	93 - 107	20 - 26
Average	135.5	3.85	94.17	23.3	137.2	3.78	99.58	23.53

**Table 5. Pre-operative and post-operative serum Electrolyte Levels**

In this study electrolyte abnormality is observed in 15 cases (33.33%) at the time of admission, which returned to within normal range after initial resuscitation. In the post-operative period, serum electrolytes were below normal in few cases.

A dilated bladder with a thickened wall and a markedly dilated posterior urethra are the most common sonographic findings in case of children with PUV, while a dilated posterior urethra with a filling defect in the posterior part of urethra are the commonest voiding cystourethrographic findings.

**Urine Examination**

The urinary examination findings in PUV are shown in the table below.

**Cystoscopy**

Cystoscopic examination is performed on the day of operation and the findings are given in the table below:

Urine Exam	Pre-Operative		Post-Operative	
	No. of Cases	%	No. of Cases	%
RBC	3	6.67	0	0
Pus > 5/hpf	30	66.67	0	0
Positive Culture	15	33.33	0	0

**Table 6. Pre-operative and post-operative Urinary examination findings**

In case of posterior urethral valves, urine examination shows pus cells in 30 cases and RBC in three cases and urine cultures are positive in 15 cases (33.33%) at the time of admission. The cultures became sterile after initial management and operation.

Disease	Findings
Posterior Urethral Valves	1. Urethral valves Type I
	2. Dilatation of posterior urethra
	3. Trabeculated bladder
	4. Abnormal ureteric orifices

**Table 8. Cystoscopic findings**

The most common cystoscopic finding during evaluation of children are Type-I urethral valves in the posterior part of urethra with trabeculation of bladder walls. Signs of cystitis are also observed in few cases.

**Imaging Study**

The different imaging findings in PUV are as given below.

**Types of Surgical Management**

The various mode of surgical treatment employed in this present study is summarised in the table given below.

Imaging	Findings	No. of Cases	Percentage
USG KUB	1. Markedly dilated posterior urethra	15	33.33%
	2. Dilated and thickened bladder	18	40%
	3. Hydroureter	12	26.67%
	4. Hydronephrotic kidney	12	26.67%
VCUG	1. Trabeculated distended bladder	12	26.67%
	2. Ureteric reflux	12	26.67%
	3. Dilatation of posterior urethra	39	86.67%
	4. Filling defect in posterior urethra	27	60%

**Table 7. Various imaging findings of Patients**

Treatment	No. of Cases
Cystoscopic Fulguration (CF)	27
CF + Vesicostomy Closure	6
Vesicostomy	12

**Table 9. Various mode of surgical treatment of our patients**

The various mode of surgical treatment employed depending on age of the patient is given in the table given below.

Type of Treatment	Age Group			
	< 1 Month	1 M - < 1 yr.	1 - < 5 yrs.	5 - < 12 yrs.
Cystoscopic Fulguration	0	6	18	3
CF + Vesicostomy Closure	0	0	6	0
Vesicostomy	12	0	0	0

**Table 10. Various mode of Surgical Treatment depending on age of the Patients**

In this study, a temporary drainage procedure in the form of cutaneous vesicostomy is employed in 12 infants who presented with renal failure. In other older children, cystoscopic fulguration of the valve leaflets is done as a definitive treatment. Closure of vesicostomy opening is done at the time of cystoscopic fulguration in those patients who were treated with cutaneous vesicostomy drainage.

**Post-Operative Complications**

The various post-operative complications encountered during this study are as below.

Complications	No. of Cases
Haematuria	3
Dysuria	12
Incontinence	12
Retention of Urine	6

**Table 11. Post-operative Complications**

Urinary incontinence is the most common post-operative complication observed in this present study, which persists in 12 cases even at the time of discharge. Urinary retention is observed in 6 cases which last for 1 day, dysuria in 12 cases for a period of 1 - 3 days and haematuria in 3 cases.

**Post-Operative Assessment**

In the post-operative periods, all the patients are questioned for any relief from the previous symptoms, examined and investigated and the observations are tabulated in the table given below.

Criteria	No. of Cases	
Symptoms	Relief	39
	Persists	6
Signs	Absent	15
	Present	0
Urine R/E	WNL	15
	Abnormal	0
Urine Culture	Negative	15
	Positive	0
Blood Urea	WNL	24
	Above Normal	21
S. Creatinine	WNL	30
	Above Normal	15

**Table 12. Post-operative clinical and Biochemical Results**

During post-operative examinations and investigations, it is observed that there is marked improvement in the presenting symptoms in all the patients except in 6 cases with some residual symptoms. There are no significant

physical findings during immediate post-operative periods. It is also observed that the blood urea and serum creatinine levels either returns to normal range or reduce from the previous higher levels, during the post-operative periods.

Urinary examination during the post-operative period does not yield any significant finding.

**Follow-Up**

Improvement in incontinence is seen in 9 cases out of the 18 cases at discharge, serum creatinine levels of those 15 children returns to normal. Only one child show persistent reflux at the end of this study. The short duration of study period is a limiting factor for proper evaluation of the children in the followup period. Still it is observed that there is improvement in the pre-operative obstructive features and renal functions in the subsequent followup.

**DISCUSSION**

In our study the most common age group at the time of presentation is of 1 - < 5 years (53.33%), while 18 cases (40%) presented during infancy of which 26.67% are neonates; 50 to 70 percent of boys with posterior urethral valves presented during the first year of life and 25 to 50 percent are initially seen in the neonatal period in different clinical study.<sup>1,18,20,21</sup> The number of cases diagnosed during neonatal period in our study is as per with other studies.<sup>20,21</sup> But the numbers of infant patients are lower than other studies.<sup>1,18,21</sup> This discrepancy is probably due to the inclusion of temporarily treated child in later age groups.

The clinical features of patients with PUV seen in our study are Poor urinary stream (73.33%), Dribbling of urine (73.33%), Palpable bladder (73.33%), Inability to pass urine (66.67%), Dehydration (60%), Poor feeding (40%), abdominal pain (33.33%) and Dysuria (13.33%). The commonest presenting symptom in the study of Egami and Smith<sup>16</sup> is weak urinary stream. In the study of Scott ES<sup>21</sup> 39% of patients had obstructive symptoms, while 56.5% infective. In the study of Bhaumik K et al,<sup>18</sup> dribbling of urine was the most common presenting symptom, recurrent UTI was seen in 62%. Bhandari M et al<sup>22</sup> observed distended bladder in 52% and UTI in 70% of cases. Cass and Stephens<sup>20</sup> observed a readily palpable non-tender distended bladder in 77% of their patients. Except for UTI, other findings of the present study are in accordance with other previous studies.<sup>18-22</sup>

In our study, blood urea of 30 cases (66.67%) are above normal, while serum creatinine levels are significantly high in 36 cases (80%) at the time of admission. Scott ES<sup>21</sup> in his series of 46 children observed that 33 children (71.7%) had biochemical evidence of moderate or severe renal failure at the time of admission. Seventy of the 103 children (68%) in the series of Cass and Stephens<sup>20</sup> were uraemic at the time of admission. Bhaumik K et al<sup>18</sup> in his series reported that blood urea and creatinine was raised in 91% of their patients. Bhandari M et al<sup>22</sup> reported the occurrence of renal failure in 63% of their patients. It is observed that there is no much difference regarding the renal status in our study from other studies.<sup>17,20-22</sup>

In our study obstructive features are detected in 33 (73.33%) cases by USG, in 39 (86.67%) cases by VCUG and are confirmed in 33 (73.33%) cases at the time of cystoscopy. Various authors used voiding cystourography as the main

diagnostic tool assisted by Intravenous Urography (IVU) and ultrasonography of KUB region to study the renal status.<sup>18,19,23</sup>

In our study, a temporary drainage procedure in the form of cutaneous vesicostomy is employed in 12 infants who present with renal failure, cystoscopic fulguration in 9 cases and cystoscopic fulguration + vesicostomy in 2 cases. Many studies have reported various operative techniques and the advantages of each procedure have been documented.<sup>21,24,25</sup>

Urinary incontinence is the most common (40%) post-operative complication observed in this present study, which was also reported by various authors ranging from 14 to 38 percent after valve avulsion.<sup>20,26,27</sup> In many boys this is a temporary manifestation following valve ablation, which improved with time.

The mortality rate of this study is zero so far. Atwell JD<sup>1</sup> reported a mortality rate of 7.4% and Uba et al<sup>3</sup> a mortality rate of 4.9% in their studies.

Improvement in the presenting signs and symptoms is detected in the immediate post-operative period. Few patients complained of incontinence, dysuria and retention in the post-operative period. The routine examinations of urine are within normal limits during the post-operative periods and cultures are negative. Estimations of the blood urea and serum creatinine levels in the post-operative period show marked improvement. Only in 15 (33%) patients, the levels are above normal range. In the series of Scott ES<sup>21</sup> of all the patients with depressed renal functions, return of normal renal function was observed in 60.6% of patients after treatment.

In our study during followup, improvement in incontinence is seen in 9 cases out of the 18 cases at discharge, serum creatinine levels of those 15 children returned to normal and only one child showed persistent reflux at the end of this study. Scott ES<sup>21</sup> reported spontaneous disappearance of reflux in 32.3%, spontaneous subsidence of upper tract dilatation in 49% of his cases in the subsequent followup. In the series of Cass and Stephens,<sup>20</sup> incontinence was present in 74 children out of 113 following valve ablation. These children were followed for 5.4 years and only 11 children had some degree of incontinence.

#### Limitations

One of the drawback of our study is the lack of a long-term followup for proper evaluation of the children in the followup period.

#### CONCLUSION

The potential of PUV to cause renal failure in infant and children if not treated in time should necessitate for early diagnosis and treatment of this condition. These seemingly simple, but with a devastating potential should be dealt timely and properly. The main hope for lowering the incidence and the severity of chronic renal failure is early diagnosis (e.g. antenatal diagnosis in posterior urethral valves) and treatment (e.g. either intrauterine bladder drainage or early delivery of the foetus in PUV). The need for a prolonged followup should be emphasised to the parents for a better overall outcome and to minimise long-term complications.

#### Abbreviations

PUV- Posterior Urethral Valve.

CF- Cystoscopic Fulguration.

VCUG- Voiding Cystourethrography.

KUB- Kidney Ureter Bladder.

WNL- Within Normal Limit.

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