

Evaluation of Prognostic Factors Affecting Outcome of Posterior Urethral Valve Cases Treated at a Paediatric Tertiary Care CenterEdamakanti Swetha Soni¹, Ranjeetsinha Kakasaheb Jadhav², Mayur Soni³,
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Abstract:**Introduction:** Posterior urethral valves (PUV) is the most common cause of bladder outlet obstruction in male newborns causing renal damage leading to end-stage renal failure. This study was done to compare the data and evaluate the prognostic factors in the patients presenting with the PUV at our centre.**Material & Methods:** This prospective study was done at Sushrut Jadhav Kinderchirurgie Paediatric Surgery Centre and P.G. Institute, Vishrambag, Sangli, from August 2017 to June 2019 and the sample size was 31. Patients presenting with PUV were observed for the presentation, investigated, and Fulguration and vesicostomy surgical procedure was done. Patients were followed for 2 years.**Results:** Serum creatinine more than 0.8 mg/dl at presentation was an indicator of poor prognosis. VUR resolution was an indicator of good prognosis and 2/3rd of our cases showed resolution after 2 years follow up. GFR correlates well with development of CRF. Mean GFR at presentation less than 30 was an indicator of poor prognosis in our study.**Conclusion:** Patients who had Serum Creatinine >0.8 mg/dl at presentation, with bilateral HUN and bilateral VUR at presentation had an average and poor outcome. Whereas patients who presented with serum creatinine < 0.8mg/dl, with unilateral HUN, with unilateral VUR had good outcome on follow up.**Key words:** Posterior urethral valve, Creatinine, Hydroureteronephrosis, Vesicoureteric reflux, GFRThis is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Posterior urethral valves (PUV) is the most common cause of bladder outlet obstruction in male newborns causing renal damage leading to end-stage renal failure. Posterior Urethral Valves (PUV) are obstructing membranous folds in the lumen of the posterior part of the urethra and are seen exclusively in male patients. PUV comprise the most common congenital anomaly causing the bladder outlet obstruction in boys [1]. Hugh Hampton Young defined and named the condition as posterior urethral valves [2].

There are certain prognostic factors mentioned in the literature like antenatal diagnosis, age and complaints at presentation, physical signs at presentation, serum creatinine, serum blood urea, vesicoureteric reflux, pop off mechanisms, renal parenchymal changes. Early diagnosis, management, and long-term follow up of PUV

patients are challenging. Only a few prospective studies have been performed till date to determine the prognosis of patients with PUV considering the above facts this study aims to evaluate the various presentations of PUV, its diagnosis, and surgical management as factors determining the prognosis of PUV by doing a regular follow-up at our institute. This study was done to compare the data and evaluate the prognostic factors in the patients presenting with the PUV at our centre. The objectives of the study were 1. To correlate the age of presentation, serum creatinine, USG, MCU (micturating cystourethrogram) findings, time of intervention and type of interventions done with outcome in cases of PUV; 2. To analyze the different parameters postoperatively during follow-up and correlate them with its outcome in cases of PUV.

Material and Methods:

This prospective study was done at Sushrut Jadhav Kinderchirurgie Paediatric Surgery Centre and P.G. Institute, Vishrambag, Sangli, from August 2017 to June 2019 and the sample size was 31. The study was done after obtaining IEC clearance. Study participants were patients presenting with PUV. The analysis was done using Microsoft excel and SPSS software. Paired t-test was used to test the mean difference between the two sets (pre and post treatment) of observations. The P-value was calculated for various variables.

Patients presenting with PUV at this center falling into the inclusion criteria were chosen for study. Patient age at presentation and symptoms with which patients presented were noted. The written informed consent of parents was taken. For every individual consenting to participate in the study, a case record form was filled. Antenatal sonography findings were noted. Height and weight of patient at presentation were noted. Examination findings of patients were noted. Patients were admitted and further investigated. Routine investigations including complete blood count, serum creatinine, blood urea and urine routine were done. Other investigations like serum electrolytes, ABG were also done. Patients were admitted and started on IV fluids and IV antibiotics. Catheterization was done with feeding tube at admission in those patients who presented with urinary retention. Patients after fluid resuscitation, correction of electrolyte imbalance and acidosis was done. USG abdomen, MCU were done in all patients for final diagnosis.

Surgical procedure was decided based on clinical findings and radiological findings. Fulguration with Bugbee was done in patients as primary treatment. Post fulguration stream of urine was checked by giving supra pubic pressure. Catheterization was done and left for 3 days post fulguration, for edema to subside. Vesicostomy was done in patients presenting with urinoma, urinary ascites, and gross refluxing ureters with raised creatinine even after catheterization. The patients were observed for any complications during hospital stay. Patients were counselled about the condition and need for long term follow-up at discharge. Patients were advised to visit the hospital after 7 days, 1, 3, 6, 12, 18, 24months. In patients with Vesicostomy, fulguration of valves was done after 3 months of diversion and checkscopy was done 3 months post fulguration.

Follow up was done for a period of a minimum of 2 years in all the patients. Following parameters were observed at each visit; Height and Weight of the patient, Urinary analysis, Serum creatinine; Checkscopy was done after 3 months in post fulguration patients; MCU was repeated after 2

years in all the patients to assess the changes post treatment. DTPA or EC SCAN was done at 1 year. DMSA was done in patients with bilateral reflux or in cases with small kidneys on USG, on follow up to see scarring and function of kidney. Findings were recorded and analyzed.

Patients who expired were classified under 'poor outcome group. Patients with complaints at the end of 2 years were classified under 'average outcome' group, patients with no complaints at the end of 2 years are classified as 'good outcome' group.

Results

Table 1 shows descriptive features of study subjects. The cases (31) were divided according to the age of presentation into 3 groups: Group - 1: PUV patients presented within 15 days after birth. Group - 2: PUV patients presented between 15 days to 6 months of life. Group - 3: PUV patients presented above 6 months of age. Table 2 shows Distribution of clinical features, biochemical parameters, MCU and USG findings by groups.

Post-operatively, out of 31 patients, 5 patients expired despite medical and surgical management, so this study showed mortality of 16%. Out of 5 patients 2 patients expired within 1 week of follow up, 3 patients expired within 1 month of follow up. The follow up was noted for general growth parameters like height and weight. The clinical signs and symptoms on follow up were noted. Any post-operative complications were noted, and treatment given accordingly. Serum creatinine was noted in each follow up visit and noted. Follow-up USG and MCU findings were noted. The follow-up was done at 1 week, 3, 6,12,18,24 months. At the end of 24 months the outcome was assessed, and patients were grouped accordingly. **Group -A: Poor/Fatal Outcome:** 5 Patients (16%) who expired were considered as poor outcome. **Group -B: Average:** 13 Patients (42%) with persistent complaints were considered as Average Outcome. **Group-C: Good:** 13 Patients (42%) with no complaints throughout follow up were considered as Good Outcome. Table 3 & 4 show correlation of various parameters with the outcome. Paired t-test showed statistically significant difference in the pretreatment and post treatment GFR values.

HUN resolution was seen more in Fulguration (78%) group than Vesicostomy (12%) group by the end of 2 years follow up. VUR resolution was seen more in Fulguration (83%) group than in Vesicostomy (62%) group by the end of 2 years follow up. Small capacity bladder and thick-walled bladder were seen more in Vesicostomy group and Fulguration group. About 16% of Fulguration group and 25% of Vesicostomy group landed in CKD by the end of 2 year follow up.

Table 1: Descriptive features of study participants. (n=31).

Feature	Frequency	%
Age at presentation		
< 15 days	13	41.94
15 days – 6 months	10	32.26
Above 6 months	8	25.81
Antenatally diagnosed		
Yes	18	58.06
No	13	41.94
Oligohydramnios		
Yes	8	25.81
No	23	74.19
Term at delivery		
Preterm delivery (associated with LBW)	3	9.68
Full term delivery	28	90.32

Table 2: Distribution Of Clinical Features, Biochemical Parameters, MCU And USG Findings By Groups. (N=31)

Group	Serum creatinine values n (%)			Group	MCU findings n (%)					
	<0.8mg/dl	0.8-3mg/dl	>3mg/dl		Small capacity bladder	Diverticulum	VUR Unilateral	VUR Bilateral	VUR absent	
Group -1 (13)	4 (30)	7 (53)	2 (15)	Group -1 (13)	7 (53)	2 (15)	3 (23)	3 (23)	7 (53)	
Group -2 (10)	4 (40)	6 (60)	0	Group -2 (10)	5 (50)	2 (20)	5 (50)	4 (40)	1 (10)	
Group -3 (8)	4 (50)	4 (50)	0	Group -3 (8)	3 (37)	1 (12)	1 (12)	4 (50)	3 (37)	
	Electrolyte disturbances present n (%)				USG findings n (%)					
Group -1	5 (38.46)				Right HN	Left HN	Bi-lateral HN	Dilated ureters	Thick-walled Bladder	Posterior urethral dilatation
Group -2	1 (10)			Group -1	1 (7)	0	12 (92)	13(100)	13(100)	10 (76)
Group -3	0 (0.00)			Group -2	0	1(10)	9 (90)	10(100)	10(100)	7 (70)
	Acidosis present n (%)			Group -3	0	1(12)	7 (87)	8(100)	8(100)	4 (50)
Group -1	8 (61.54)				According to procedure done n (%)					
Group -2	1 (10.00)				Fulguration		19 (61.29)			
Group -3	1 (12.50)				Vesicostomy		12 (38.48)			

Table 3: Correlation of biochemical parameters and USG findings with outcome.

Group	Height and weight of patients at presentation and follow up					Group	Serum Creatinine at presentation with outcome		
	Age at presentation (median age)	Median wt. at presentation (percentile)	Median ht. at presentation (percentile)	Median wt. at 2-year follow-up (percentile)	Median ht. at 2-year follow-up (percentile)		Serum. Creatinine >0.8mg/dl		
Group A (5 cases)	5 Days	<3	<3	-----	-----		n	%	Mean
Group B (13 cases)	2 Months	3	3	50	50	Group A	5	100	3.1
Group C (13 cases)	3 Months	3	3	25	50	Group B	8	61.53	1.14
	Type of presentation with outcome n (%)					Group C	6	46.15	1.13
	Urinary retention	Dribbling	Poor Stream	UTI	Palpable bladder		Significance of serum creatinine value in this study.		
Group A	2 (40)	4 (80)	4 (80)	0	5 (100)		t value	p value	Sig. p< 0.05
Group B	3 (23.07)	10 (76.92)	11 (84.61)	7(53.84)	13(100)	Group B	- 3.316	0.003	p< 0.05
Group C	2 (15.38)	11 (84.61)	11 (84.61)	3 (23.07)	13(100)	Group C	- 2.925	0.006	p< 0.05
	Other significant prognostic factors with outcome n (%)					Correlation of HUN on USG with outcome			
	Oligohydramnios	Ascites	Preterm and LBW	Acidosis	Electrolyte imbalance		Unilateral HUN		Bilateral HUN
Group A	3 (60)	4(80)	3(60)	5(100)	5(100)	Group A	0		5 (100)
Group B	2(15)	0	0	3(23)	1(7)	Group B	3 (23)		10 (76)
Group C	3(23)	1(7)	0	2(15)	0	Group C	10 (76)		3 (23)

Table 4: Correlation of MCU finding and GFR with outcome.

Group	MCU findings with outcome n (%)				
	VUR unilateral	VUR bilateral	VUR	Small capacity	Diverticulum
Group A (5 cases)	1 (20)	2 (40)	3(60)	5 (100)	1 (20)
Group B (13 cases)	2 (15)	6 (46)	8(61)	7 (53)	3 (23)
Group C (13 cases)	6 (46)	3 (23)	9(69)	1 (7)	3 (23)
	GFR and outcome n (%)				
	CKD stage 1 GFR >90	CKD stage 2 GFR 60-89	CKD stage 3 GFR 30-59	CKD stage 4 GFR 15-29	End stage Renal Dis. <15
Group B	0	8 (61)	5 (38)	0	0
Group C	6 (46)	7 (53)	0	0	0
	GFR at presentation and follow up				
	t Value	p Value	Sig. at p< 0.05		
Group B	14.737	< 0.00001	Significant		
Group C	24.611	<0.00001	Significant		

Discussion

The most common age of presentation in this study was neonates presenting within 15 days of life. The median age of presentation was 1month. This was like studies done by Bajpai et al., who reported 70% of PUV patients presented within 1 year in which 30% were within 1 month [3]. Divya et al., reported 49% of patients presented within 1 year of age [4] whereas Richajaiman et al., reported 60% of patients presented within 1 year of life [5].

MCU is diagnostic for PUV in our study where 100% were diagnosed with dilated posterior urethra. 16% patients were diagnosed with diverticuli on MCU. Small capacity bladder was present in 48% of patients at presentation. 20 (64%) patients presented with VUR (vesicoureteral reflux) in which 35% had bilateral VUR and 29% had unilateral VUR. Assefa et al reported that 23.8% had unilateral VUR and 16.3% cases had bilateral VUR [6]. In a study published by Roth et al., VUR was present bilaterally in 50% patients and unilaterally in 30% patients [7]. S.

Uthup et al., reported VUR in 55% cases in which VUR is unilateral in 13.8% patients and 41% had bilateral VUR [8]. Our study results were comparable with previous authors.

The primary mode of surgical management in this study is by primary fulguration of PUV by Bugbee. 61% of patients underwent fulguration whereas 12 patients i.e., 38% in this study underwent vesicostomy. In the study done in Ethiopia by Assefa et al 65.2% patients underwent fulguration primarily and vesicostomy was done in 34.8% cases [6]. In this study vesicostomy was done in patients who presented with preterm, low birth weight, high serum creatinine, with bad bladder and with bilateral or unilateral gross VUR. Fulguration was done as primary line of treatment in patients who presented with primary PUV without any other features like acidosis, uremia, high serum creatinine and unilateral or bilateral gross VUR.

This mortality rate is comparable to other studies i.e., Mortality rate was observed to be 21% in a study done by Cameroon, in which causes of the deaths were septicemia (50%) post-obstructive diuresis (33%) and chronic renal failure [9].

Oligohydramnios was seen in 25% of all patients and 60% of poor outcome group. It is in correlation with a study done by Eckoldt et al., on prenatal diagnostic signs which reported oligohydramnios as poor outcome factor¹⁰. S.Uthup et al., published similar results that patients who presented with history of oligohydramnios had poor outcome than those without history of oligohydramnios [8]. Oligohydramnios is an indicator of poor prognosis. [10]

All in poor outcome group, 60% of average outcome group, 46% of good outcome group had creatinine >0.8mg/dl at presentation predicting it as poor prognostic factor in this study. The comparison between Creatinine values at presentation and at final follow up showed statistically significant correlation with p value of < 0.003 in average and < 0.006 in good outcome group. This is in contrary with Bajpai et al., study which has shown no significant correlation between Creatinine values at presentation and at follow up³. Sudarsanan et al., recorded mean serum Creatinine as 0.5mg/dl in their study [11].

Bilateral HUN is present in higher percent in average outcome group (76%) when compared to good outcome group (23%) in this study. 76% cases of HUN resolved in good outcome group and 53% cases of HUN resolved in average outcome group. In a study done by Assefa et al 41.5% cases showed resolution of HUN compared to presentation[6].

VUR is associated with 60% of all cases. Bilateral VUR is present in 46% cases of average outcome group whereas unilateral VUR was seen in 46% of

good outcome group. Resolution of VUR occurred in 76% of average outcome group where bilateral reflux was seen commonly and 92% of good outcome group where unilateral reflux was common. In this study presence of unilateral reflux had a better outcome compared to bilateral reflux. Overall VUR resolved spontaneously in 84% of cases which is compared to other studies. Assefa et al., recorded that VUR resolution occurred in 14.8% patients [6]. Diverticuli are present in 23% of both average outcome group and good outcome group.

In this study, 61% of patients underwent primary Fulguration of valves and 39% underwent Vesicostomy. On follow-up HUN and VUR resolution occurred more in Fulguration (78% and 83% respectively) group compared to Vesicostomy (12% and 62% respectively) group. These findings are like Richa Jaiman et al., where VUR resolved more in Fulguration (52%) group than in Vesicostomy (40%) group [5]. CKD was seen in 16% of fulgurated patients and 28% of Vesicostomy patients at the end of 2 years follow up. About 30% patients in this study had residual valves for which refulguration was done after 3 months. This is comparable to study done by Tambo et al., where 16% of patients had residual valves and underwent refulguration again [12]. Sudarsanan et al., reported 13% patients having residual valves on checkscopy [11].

46% of patients presented with dribbling at the end of 2 years follow up when compared to Richa jaiman et al., where they noticed 28% of patients with incontinence [5]. S Uthup et al., study mentioned enuresis, dribbling and polyuria as main post-operative symptoms 5 years after surgery. Nocturnal enuresis was the most common symptom with diurnal urgency and frequency in a study done by Lal et al., and it was seen in 35% patients [13]. Double voiding, triple voiding, maintenance of voiding daily was suggested in these patients. Post void residue is seen in 53% of average outcome patients. It is absent in good outcome group. A long-term follow-up is required in patients of PUV to confirm these findings.

About 19% of our patients landed in CKD at the end of this study. Tambo et al., showed that 55% of patients landed with CKD by the end of 10 year follow up. Ylinen et al., reported that 30% had a GFR <60 ml/min/1.73 m² in a follow up study of 46 children with PUV [14].

In conclusion, PUV patients presented at a median age of 1 month and early presentation was associated with severe disease and poor outcome. Patients who presented early with associated preterm delivery, who were detected antenatally with oligohydramnios, who had acidosis, urinary ascites electrolyte disturbances at presentation, who had Serum Creatinine >0.8 mg/dl at presentation, with bilateral HUN and bilateral VUR at presentation had

an average and poor outcome. Whereas patients who presented late without history of oligohydramnios, without acidosis, without electrolyte disturbance, without urinary ascites, serum creatinine < 0.8mg/dl, with unilateral HUN, with unilateral VUR had good outcome on follow up. However, a long-term follow-up study will enlighten us about prognostic indicators in PUV cases.

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