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MANAGEMENT OF POSTERIOR URETHRAL VALVES- A CLINICAL EXPERIENCE FROM INDIAN SETTINGS

Urology

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ABSTRACT

Objective: The present study aimed to highlight the current trends in the management of male patients with posterior urethral valves (PUV). Furthermore, this study emphasized clinical, biochemical, and imaging patterns as well as examined the outcomes of various treatment approaches such as primary valve ablation and vesicostomy to manage PUV.

Methods: This prospective clinical study was conducted in department of urology, Kurnool Medical College, Kurnool, AP. A total of 34 PU valve patients with mean age of 2.87 years with at least 6 months of follow-up were included in this study. Data related to demographic details, modes of presentation, diagnostic evaluation, presence of reflux, renal status, treatment modalities and follow-up were collected. Surgical procedures included vesicostomy, and valve fulguration.

Results: All the patients presented with obstructive voiding symptoms (100.00%), followed by fever with chills and rigors (67.60%) and pyuria (61.76%). Serum creatinine was normal in 13 patients and elevated in 21 patients. In all the cases PUV was diagnosed using MCUG. Overall, 12 (35.29%) patients presented with vesicoureteral reflux prior to treatment. Bilateral and unilateral reflux was noted in four and eight patients, respectively. Overall, 23 patients underwent primary valve fulguration and 11 patients underwent vesicostomy. In total 80% of patients maintained normal parameters at variable period of follow-up.

Conclusion: The present study demonstrated favorable short-term results of primary valve ablation. However, vesicostomy was equally effective in patients with bilateral high-grade reflux or sepsis despite valve ablation and in circumstances where there is technical difficulty for valve ablation.

KEYWORDS

Bilateral, creatinine, reflux unilateral, valve fulguration, vesicostomy, voiding.

INTRODUCTION

Posterior urethral valve (PUV) is a frequently occurring congenital obstruction of proximal urethral development in male infants with an estimated incidence of 1:5000-1:8000 as reported by many epidemiological studies[1]. However, a national audit (BAPS-CASS) of United Kingdom and Ireland boys have demonstrated no change in the incidence (~1/4000) nor the proportion of antenatally diagnosed (~1/3) boys with PUV in past 30 years [2].

Posterior urethral valve has detrimental effects on the overall development of kidneys and urinary system commonly leading to bladder outlet obstruction, lower urinary tract dysfunction and renal insufficiency [3, 4]. Posterior urethral valve is also the common cause of chronic kidney disease due to urinary tract obstruction in male children [5, 6].The patient with PUV shows symptoms such as the kidneys swelling or antenatal hydronephrosis, painful urination and urinary tract infection [7].

The PUV may be suspected or diagnosed at different times in patient's life; nevertheless, several patients present late to the clinicians and hence have already established complications [4].It is diagnosed conveniently by voiding cystourethrography (VCUG) and endoscopy for confirming valve like structure in the posterior urethra [8]. Antenatal diagnosis helps in appropriate management of this disease with prompt prenatal and perinatal counselling, care and follow-up. The fetal urinary tract can be visualized ultrasonically from 11 -20 weeks, allowing for recognition of megacystis at 11–14 weeks.Urine routine and microscopy test, urine for culture and sensitivity test, serum creatinine level, ultrasound test including post void residual (PVR)are used for diagnosis and Endoscopic fulguration and valve ablation are the gold standard treatment strategies for PUV management in post natal period. Its treatment begins in antenatal period and followed up to puberty.

The present study aimed to highlight the current trends in the management of male patients with PUV. Furthermore, this study emphasized clinical, biochemical, and imaging patterns as well as examined the outcomes of various treatment approaches such as primary valve ablation and vesicostomy to manage PUV.

METHODS

This prospective clinical study conducted at the Department of Urology, Kurnool Medical College,Andhra Pradesh from January 2019 to March 2021. Patients with posterior urethral valves who were primarily treated at this hospital or referred from other hospitals for subsequent therapy were included in this study. Patients with at least 6 months of follow-up were included.

Data related to demographic details, modes of presentation, diagnostic evaluation, presence of reflux, renal status, treatment modalities and follow-up were collected.

Definitions:

Normal parameter was defined as serum creatinine value of 0.3 to 0.7 mg/dl upto 2 years of age.

Chronic renal failure was defined as creatinine of >2 mg% for more than 1 month.

End stage renal disease was defined as a requirement for dialysis, renal transplantation or death from renal failure.

Surgical procedures

Surgical procedures included vesicostomy, and valve fulguration. Valve ablation was performed by endoscopic incision at 5 and 7 O'clock positions with a pediatric resectoscope or bugbee electrode. Blocksom vesicostomy procedure was employed. At the time of 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 (Infant feeding tube no .10 F) was left insitu and voiding trial was given on 3rd postoperative day. In two cases, ante grade cystoscopic fulguration was done.. Circumcision was performed in all the patients at the time of valve fulguration.

Vesicoureteral reflux and dysplasia (VURD) pattern, considered to be present when unilateral high-grade reflux with Isotope evidence of faint or absent tracer uptake noted.

Follow-up

The patients were followed up with serum creatinine, urine for complete $_{urine}$

examination and culture sensitivity, ultrasound KUB every 3 months, micturating cystourethrogram(MCUG) at the end of 3 months and thereafter at one year if reflux present or patient developed recurrent urinary tract infections, and lower urinary tract symptoms. Cystoscopy was done when there is any doubt about completeness of valve ablation.

Table 1: Baseline characteristics

Characteristics	Number of patients (N=34)
Age (months)	
<1	2 (5.88)
1-12	15 (44.11)
>12-60	11 (32.35)
>60	6 (17.64)
History	
Obstructive voiding symptoms	34 (100)
Fever with chills and rigors	24 (67.60)
Pyuria	22 (61.76)
Prenatal diagnosis	2 (5.88)
Consanguinity in parents	1 (2.94)
Twins	1 (2.94)
Sibling died of same disease	1 (2.94)
Physical examination	
Fever	24 (70.59)
Turbid urine	22 (64.71)
Palpable distended bladder	2 (5.88)
Undescended testis	1 (2.94)
Serum creatinine	
Normal	13 (38.23)
Elevated	21 (61.67)
Serum creatinine after catherization	
Normal	3 (8.82)
Elevated	11 (32.35)
CRF	7 (20.58)
Data shown as n (%). CRF, chronic renal failure.	

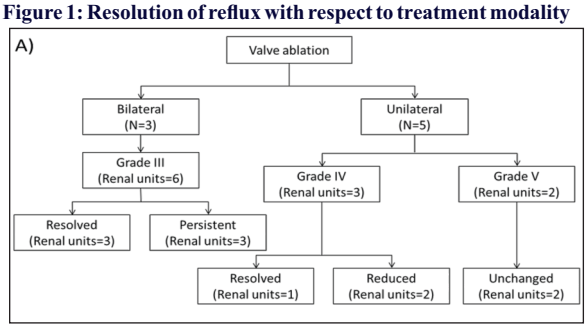
Table 2: Reflux At Presentation

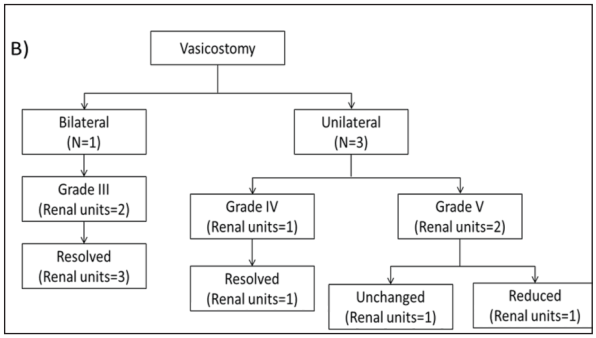
	Number of patients (N=34)	Number of renal units
Unilateral reflux (grade)		
Low (I-III)	-	-
High (IV-V)	8	4 (IV) + 4 (V)
Total	8 (23.52)	8 (50.00)
Bilateral reflux (grade)		
Low (I-III)	4	8
High (IV-V)	-	-
Total	4 (11.76)	8 (50.00)
Total VUR at presentation	12 (35.29)	16 (100.00)
Data shown as n (%). VUR, vesico-ureteral reflux.		

Table 3: Analysis of serum creatinine with respect to treatment modality

	Valve ablation (N=23)	Vesicostomy (N=11)
Creatinine at presentation (mg/dL)		
<0.8	10 (43.48)	6 (54.54)
0.9-2	9 (39.13)	2 (18.18)
>2	4 (17.39)	3 (27.27)
Creatinine at follow-up (mg/dL)		
<0.8	18 (78.26)	9 (81.82)
0.9-2	-	2 (18.18)
>2	5 (21.74)	-
Data shown as n (%).		

Figure 1: Resolution of reflux with respect to treatment modality





RESULTS

A total of 34 pediatric patients with mean age of 2.87 years were included in this study. The majority of pediatric population (44.11%) belonged to the age group of 1-12 months. All the patients presented with obstructive voiding symptoms (100.00%), followed by fever with chills and rigors (67.60%) and pyuria (61.76%).Mean serum creatinine was 1.38 (0.4-4.6) mg/dL.Serum creatinine was normal in 13 patients and elevated in 21 patients (Table 1).All the patients had urethral catheter drainage (8F or 10 F Infantfeeding tube), intravenous cephalosporin for 5-7 days. The serum creatinine after an initial period of catheter drainage normalized in three patients, mildly elevated in 11 and was in chronic renal failure (CRF) range in seven patients.

VCUG (Voiding cystourethrograthy)

In all the cases PUV was diagnosed using MCUG. It typically showed dilated and elongated posteriorurethra, PUV, hypertrophied and elevated bladder neck trabeculated bladder with Sacccules, diverticulae, and reflux. Overall, 12 (35.29%) patients presented with vesicoureteral reflux prior to treatment (Table 2). Bilateral reflux was noted in four patients, which was of grade III. Unilateral reflux was noted in eight patients, which was grade IV in four and grade V in four patients. A VURD pattern was seen in three patients (8.82%), all had unilateral grade V reflux and an isotope evidence of non-function of the refluxing unit. Among four patients with bilateral grade III reflux, post-operative follow-up revealed persistence of reflux in one patient, resolution on one side, persistence of reflux on other side in one patient, and complete resolution in two patients. Among eight patients with unilateral reflux, reflux completely resolved in two patients with grade IV, reduced to grade III in two patients, all the patients with VURD pattern had persistent reflux, reduced to grade III in one patient with grade V. Out of 16 units, reflux resolved completely in seven units (43.75%), reduced in grade in three units (18.75%) and remained unchanged in six units (37.50%). Bilateral reflux resolved in five out of eight renal units (62.50%) with VURD pattern no change of reflux was noted

Overall, 23 patients underwent primary valve fulguration (Figure 1). Of these, two 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, had adequate capacity bladder and serum creatinine was normal.

Vesicostomy was performed by Blocksom method. Overall, 11 patients underwent vesicostomy as initial treatment modality (Figure 1). Four patients are waiting for closure of vesicostomy, while the remaining patients underwent valve fulguration and closure of vesicostomy. Two patients of the primary valve fulguration group underwent vesicostomy later due to urosepsis. In the primary valve ablation group 18 (78.26%) patients maintained normal renal parameters at follow up. In the vesicostomy group, 9 (81.82%) patients maintained normal renal parameters.

Overall, 80% of patients maintained normal parameters at variable period of follow-up. In total, five patients (14.70%) had CRF in this series. All these patients had serum creatinine>2 mg/dL at presentation. The age at presentation was higher in this group, ranging from 6-10 years. The follow-up stable creatinine values were stable between 2 and 3 mg/dL. None of them required dialysis support and are on medical management of CRF. Although a urodynamic study has

been advised to all these patients, none underwent the study (Table 3).in view of financial problem

DISCUSSION

The major findings of the present study were that majority of the pediatric patients belonged to the age group of 1-12 months presenting with symptoms such as obstructive voiding symptoms, fever and pyuria. Micturating cystourethrogram was used to diagnose PUV in all the patients. Majority of patients showed VUR prior to treatment. Most patients underwent primary valve fulguration procedure followed by vesicostomy. Both the procedures demonstrated comparable rates of normal renal parameters at follow up.

In this study the age at presentation was variable. In most of the studies up to 40% of the patients present within one month. However, in the present study the reason for the lower percentage of patients presenting within a month, may be that some patients being referred to pediatric surgeon, and low socioeconomic and duration status. The delayed presentation at more than 5 years constituted nearly 17.64%. In other studies, the rate of delayed presentation was 4.9%[13] and2.7% [14].In the present study five of six patients with age > 5 years were associated with chronic renal insufficiency and also one case of consanguinity in parents of PUV patient. Older age at presentation generally meant better prognosis, but not all children presenting late do well. In another series, 40.80% of patients who presented at >2 years of age developed renal insufficiency at a mean follow-up of 9.8 years [15]. The present study also reported CRF in five of six patients who presented above 5 years of age, showing an association of late presentation with higher incidence of CRF. This might be due to delay in diagnosis of PUV which could have lead to CRF in those patients.

In the present study only 5.88% patients had a prenatal diagnosis as part of antenatal ultrasound examination while in studies by Narsimhan et al. [16] and Talabi et al. [14], the rate of antenatal diagnosis was 15.56% and 8.10% respectively. The rate of prenatal diagnosis may be a slightly higher in other studies, lower in present study. Although, a vast majority of patients in western series are diagnosed prenatally, the long-term outcome among boys detected antenatally did not differ from that among those cases detected postnatally after developing symptoms [17].

Similar to the present study, A retrospective survey from Oman [18], found an increased incidence of consanguinity among parents of PUV patients. The occurrence of PUV in twins (1 pair) and sibling (1 patient) in this series, does suggest that PUV also may have polygenetic factors similar to other anomalies of the mesonephric duct. There are studies which quote PUV in monozygotic twins and to have familial tendencies [19,20].

In present study one patient had an associated anomaly i.e., undescended testis. Although it does not indicate any higher incidence of associated anomalies, other studies have reported associated anomalies.Decreased urinary stream and straining to void were the most common symptoms in present study. The occurrence of symptoms of urinary tract infection were also common and similar to that reported by Orumuah et al[6]. The present study also reported palpable bladder on physical examination that is in congruence with the study by Orumuah et al [6].

In the present study 61.67% patients had elevated serum creatinine at presentation.

Serum creatinine normalized in three patients after bladder drainage, remained elevated in 18 patients above 0.8 mg/dL and seven patients had features of chronic renal insufficiency during the study period.In a study by Kukrejaet al. [22], 16 of 20 patients with renal insufficiency had baseline serum creatinine above 0.8 mg/dL.

Primary valve ablation is increasingly being offered as the first line treatment. In the present study, 67.65% of patients underwent primary valve ablation in which valve fulguration with 11 F pediatric resectoscope with loop or hook and occasionally with Bugbee electrode was employed. In two cases ante grade fulguration of valves was done, but blind valve ablation was not done in any patients.There is always a need to confirm the completeness of valve ablation, because up to 5.60% of patients in this study required re-fulguration for persistent valves causing obstruction and 4.34% patients showed incontinence. Urinary retention and urethral strictures are commonly reported complications occurring during or after primary ablation of PUV [10]. Direct vision internal urethrotomy or dilatation is suggested treatment approach for urethral stricture post ablation. However, implementation of accurate valve ablation technique and an appropriately sized resectoscope by a skilled pediatric urologist is critical in the prevention of stricture [23].None of the patients in this study developed this complication.

Overall, 11 patients underwent vesicostomy as an initial treatment in this study. There was one case of bladder mucosal prolapse and one case of vesicostomy stomal stenosis in this study. In a series of 23 patients who underwent vesicostomy reported by Lukunget al [24], an incidence of 4.30% of bladder mucosal prolapse and stomal stenosis was observed. The reasons for doing primary vesicostomy were existence of neonate with very small urethra, urosepsis with raised renal parameters, and reflux with small capacity bladder.

In this study, 35.29% of patients had reflux at presentation and the reflux resolution was apparently high in vesicostomy group that may be due to a greater 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 et al. [25], VUR was reported in 60.00% of the patients, being unilateral in 41.70%. Reflux subsided in 31.5% by 3 months and 78.94%by 6 months. Similarly, another retrospective study of 98 patients with PUV presented VUR in 61.2% patients, of which 30 cases had bilateral and 30 unilateral reflux [26].

A VURD pattern was seen in 8.82%, i.e., about 25% of refluxing patients showed VURD pattern. This finding correlates with 20.00% incidence in a series by Narasimhan et al [27]. In the primary valve ablation group 78.26% and in vesicostomy group 81.82% maintained normal renal parameters at follow up indicating comparable efficacy of both the treatment modalities, although a much longer follow up, up to 20 years age is required to confirm this. In a study by Mirshemirani et al.[26] valve ablation was done in 63.27% of cases and diversion in 42.86% of cases, concluded that valve ablation is a superior treatment method in PUV. Narsimhan et al.[16] demonstrated that transurethral fulguration and vesicostomy were equally effective for neonatal valves, attaining similar renal function. They reported a decrease in the serum creatinine levels to 0.7 mg/dL and 0.9 mg/dL at the end of 1 year, in both the groups; fulguration and vesicostomy, respectively.

Limitations

The author acknowledges limitations in this study such as short duration of follow up, lack of pressure data from voiding phase and urodynamic data. Urodynamic study was advised in few patients with persistent high grade hydronephrosis, incontinence, persistent reflux, but it was not done in any of the patients due to financial reasons. Further, comparison between patients with symptomatic and non-symptomatic PUV in terms of bladder and renal functions in large number of cases to obtain robust and statistically significant results will add value to the available clinical data.

CONCLUSION

Voiding cystourethrography is the gold standard method of diagnosing PUV. The present study demonstrated favorable short-term results of primary valve ablation. Vesicostomy was equally effective in patients with bilateral high-grade reflux or sepsis, despite valve ablation and is a useful procedure in circumstances where there is technical difficulty for valve ablation.

Acknowledgment
Conflict of interest : Nil

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