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Original Article

Diversion in Posterior Urethral Valves: Needs and Results

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Abstract

Objective: The objective is to evaluate the outcome of diversion procedures done for posterior urethral valves (PUV).

Materials and Methods: A retrospective study was done on 29 patients out of 203 patients of PUV treated in the Department of Paediatric surgery at a tertiary care center from January 2011 to December 2016. Data regarding clinical history, examination findings, investigation results, and treatment given were collected from their case records. Data collected were analyzed.

Results: A total of 203 patients with a mean age of 31.78 ± 9.11 months presented to the Paediatric Surgery Department with dribbling, poor urinary stream (55.17%), and urinary tract infection (36.94%) as the major symptoms. Vesicoureteric reflux was found in 55.66% cases. While 71.92% patients had cystoscopic fulguration, in 13.79% patients, we had to use Chooramani hook to ablate the valves and 28 (14.29%) patients had to be diverted to treat urosepsis. Valve bladder syndrome occurred in 60.59% cases. Of the 28 diverted patients, 21 had vesicostomy and 8 had ureterostomy. Of the 12 patients with vesicostomy, 7 showed lessening of serum creatinine and lessening of reflux with age; two patients showed high pressure, small capacity bladder. Two patients showed poor voiding and are on chronic kidney disease medications as advised by the nephrologist. One patient had bilateral ureteric reimplant after optimization of bladder function. Rest 12 patients are still on vesicostomy. Of the eight patients with ureterostomy, 2 had ureterostomy closure and are doing well on follow-up; 2 had bilateral ureteric reimplant, of which 1 died and the other is doing well; other 4 are still on ureterostomy. Urodynamic evaluation could be done in only two patients after vesicostomy closure and one after ureterostomy closure. Closed vesicostomy patients showed small capacity, high-pressure bladder, while closed ureterostomy patient showed normal capacity and normal pressure bladder. Other patients are awaiting urodynamic evaluation. Mean follow-up in our series was 2.6 ± 1.1 years.

Key words: Children, Posterior urethral valves, Ureterostomy, Urinary diversion, Urinary drainage, Valve ablation, Vesicostomy

INTRODUCTION

Being the most common cause of bladder outlet obstruction in male children, posterior urethral valves (PUV) are notorious for their heterogeneous and variable presentation and outcome.[1] PUV has devastating effects on bladder dynamics resulting in significant morbidity and mortality in pediatric patients. Repeated urinary tract infection (UTI), chronic renal failure, urinary incontinence, urinary ascites, and urosepsis represent the spectrum of manifestations of this anomaly. A subset of these patients present with bladder characteristics which do not revert by simple valve fulguration and bladder dynamics have a significant role in determining the extent of damage to the kidneys in such patients. It is these patients who benefit from diversion. We present the results of a retrospective study conducted at our center to share the results of urinary diversion in PUV patients.

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MATERIALS AND METHODS

A retrospective study was conducted on patients presenting with poor urinary stream, UTI and fever and diagnosed to have PUV on investigation in the Department of Pediatric Surgery, Indira Gandhi Institute of Medical Sciences

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(IGIMS), Patna. All patients of PUV managed by urinary diversion in the department from January 2011 to December 2016 constituted the study group. A total of 203 patients of PUV were managed during this period, of which 29 patients who were diverted constituted the study group. These patients were managed according to the standard protocol for management of PUV patients in our department. Details of each patient were collected from their case records, investigation sheets, and operative records. Patients who turned up for follow-up in the outpatients department gave an opportunity to include their follow-up details in this study. The collected data were analyzed.

Protocol for Management of PUV in our Department

PUV patients represent a heterogeneous group depending on the age of presentation, symptoms at the time of presentation, and extent of damage to the urinary tract.

Neonates may present with difficulty non-passage of urine, urosepsis with raised serum creatinine, and altered electrolytes; some of them may have an antenatally-diagnosed PUV, and some may present with urinary ascites or other pop-off mechanisms. After general assessment, management at our center begins with urethral catheterization, fluid and electrolyte resuscitation with intravenous antibiotics after initial evaluation of blood counts, serum electrolytes and creatinine, blood gas, and urine culture. Once patient's condition stabilizes and his counts and culture normalizes, ultrasonography (USG) and micturating cystourethrogram (MCUG) are done. Due to lack of small-sized resectoscopes in our department, we use Chooramani hook for valve ablation with constant monitoring of the urinary stream on suprapubic pressure in the operation theater. Children who have difficulty in accommodating this instrument or have persistent UTI or urosepsis are diverted with either vesicostomy or ureterostomy depending on the findings on MCUG and normalization of serum creatinine level on catheterization. Periodic evaluations are done by USG, serum creatinine, routine urine examination, and renograms if needed on follow-up visits to the hospital. Follow-ups are initially advised monthly and also at the time of any febrile UTI.

We routinely come across older children who present with chronic kidney disease (CKD), valve-bladder syndrome, and renal rickets. They are very difficult to manage despite adequate valve management and need periodic urodynamic evaluation to guide bladder management and CKD medications. Due to cost constraints and ease of performance, we have now begun bedside cystometry to assess the bladder dynamics. Some of these patients ultimately need renal replacement therapy in the form of dialysis or renal transplantation. Two of our patients were had to be referred to higher centers excelling in pediatric renal transplantation.

Vesicoureteric reflux (VUR) in patients of PUV is very commonly seen; it is initially managed on prophylactic antibiotics after valve fulguration with circumcision. In case, recurrent UTI occurs or there is evidence of renal scarring on dimercaptosuccinic acid scan, diversion is done for the protection of kidneys.

The RIFLE system criteria were used to define acute renal failure[2,3] and estimated glomerular filtration rate[4] and persistent proteinuria are used to define CKD.

RESULTS

Table 1 shows the demographic data of all 203 PUV patients treated in our department during this period. Maximum patients were late presenters.

Table 2 shows the symptoms of all PUV patients at the time of their presentation to the Department. Dribbling and poor stream and UTI are the common complains at the time of presentation.

VUR in PUV Patients

A total of 113 (55.66%) of PUV patients in this study had VUR. While 82 (40.39%) had bilateral reflux, 31 (15.27%) had unilateral reflux.

PUV-associated VURD (Unilateral VUR and Renal Dysplasia)

VURD was found in 8 patients; 5 on the left side and 3 on the right side.

Table 3 depicts the results of patients who underwent diversion procedures.

Results of Diversion Procedure in PUV

Figure 1 shows the results of patients of PUV who were diverted for proper management.

Long-term Follow-up

Mean follow-up time in our series is 2.6 ± 1.1 years. Table 4 summarizes the long-term results in our PUV patients.

Urodynamic evaluation could be done in only two patients after vesicostomy closure and one after ureterostomy closure. Closed vesicostomy patients showed small capacity, high-pressure bladder; while closed ureterostomy patient showed normal capacity and normal pressure bladder. Other patients are awaiting urodynamic evaluation.

DISCUSSION

Valve fulguration and diversion procedures are the twin ways to relieve the obstructed system in PUV patients. However, whether these methods optimize the bladder

Table 1: Demographic details

Age at presentation	Frequency (%)
Neonates	25 (12.31)
1–12 months	55 (27.09)
12 months	123 (60.59)
Total	203

Table 2: Presenting symptoms

Symptoms at presentation	Frequency (%)
Dribbling and poor stream	112 (55.17)
UTI	75 (36.94)
Fever	6 (2.96)
Hematuria	2 (0.98)
Hypertension	2 (0.98)
Renal rickets	2 (0.98)
Abdomnal distension (urinary ascites)	2 (0.98)
Seizures	2 (0.98)
Total	203

UTI: Urinary tract infection

Table 3: Diversion results

Blocksom's vesicostomy	21 (10.34%)
Ureterostomy	8 (3.94%)
Subsequent surgery following diversion procedures – (e.g., fulguration+vesicostomy closure/ ureterostomy closure)	15(7.39%)
Ureteric reimplantation for VUR patients after bladder management	3 (1.48%)

VUR: Vesicoureteric reflux

Table 4: Long-term results in PUV

Outcome	No. of patients (%)
ARF	62 (30.54)
Residual valve on repeat MCUG	32 (15.76)
CKD	13 (6.40)
VBS	123 (60.59)
Stricture	1 (0.49)
Mortality	7 (3.45)
Hypertension	2 (0.98)
Dialysis	2 (0.98)

PUV: Posterior urethral valves, ARF: Acute renal failure, MCUG: Micturating cystourethrogram, CKD: Chronic kidney disease, VBS: Valve bladder syndrome

dynamics is questionable. Whether simple fulguration of valves is adequate in itself for appropriate management has been addressed by many researchers and thereafter arose the need and concept of "valve bladder syndrome (VBS) management."[5,6] Furthermore, it is now evident that diversion also does not in itself correct the bladder changes but by diverting urine, further damage to upper tracts is limited and sepsis gets controlled. This is at the cost of continuous passage of urine from stoma site, its complications, and the need for subsequent corrective surgeries. Analysis of the outcomes of these diversions is important to establish them as treatment options.

That distal obstruction to the bladder has significant effects on bladder muscle cell, extracellular matrix, and nerves in the bladder muscle wall resulting in clinical effects as seen in the spectrum of the VBS.[7-9] Furthermore, early treatment of obstruction by adequate valve fulguration helps in alleviating and normalization of these changes.[10,11] This is in contrast to bladders which have changes secondary to neurogenic affection.[11] Since diversion procedures do not correct the obstruction distal to the bladder and also limit the urinary volume in the bladder, they are less likely to correct the altered bladder dynamics.

Diversion in PUV is indicated in cases where urosepsis does not settle after fulguration of PUV or fulguration is not possible due to non-availability of adequate sized cystoscopic instruments for neonates. Both these conditions are very common in clinical practice. With the improvement in cystoscopic instruments, it has now become possible to fulgurate valves in small children also. In addition to this, we use Chooramani's hook in case cystoscopy is not possible in small children. This is the reason for fewer numbers of diversions in our study compared to other similar studies.

The urodynamic patterns of PUV bladders managed by fulguration were compared with those which were diverted using vesicostomy or ureterostomy in a study by Puri *et al.*[12] While fulgurated and ureterostomy groups showed good capacity and compliant bladder, vesicostomy group showed small capacity and hyperreflexic bladder. Primary fulguration was, therefore, found to be better than vesicostomy and also vesicostomy and ureterostomy had different effects on the bladder and its dynamics. We also, at our center, prefer doing valve fulguration and divert only when urosepsis does not settle. In case both ureters are tortuous, we prefer to do bilateral ureterostomy instead of vesicostomy due to this reason.

In their series on PUV, Smith *et al.* concluded that by avoiding diversion in most cases, bladder function is preserved and the need for bladder augmentation decreases.[13] Podestá *et al.* reported better bladder functional outcome in patients who had valve ablation compared to patients who had diversion, on conducting urodynamic study.[14] Farhat *et al.* observed that the severity of hydronephrosis and reflux downgraded more in ablated patients and also renal function normalized more in ablated patients compared to diverted patients.[15] In their series of 26 patients with supravesical urinary diversion, Tietjan *et al.*[16] concluded that on biopsy of the diverted kidneys, progression to end-stage renal disease was not prevented and so questioned the benefits of supravesical diversion. Although modern-day Western literature leans strongly toward non-diversion, diversion in select groups of complicated patients in PUV

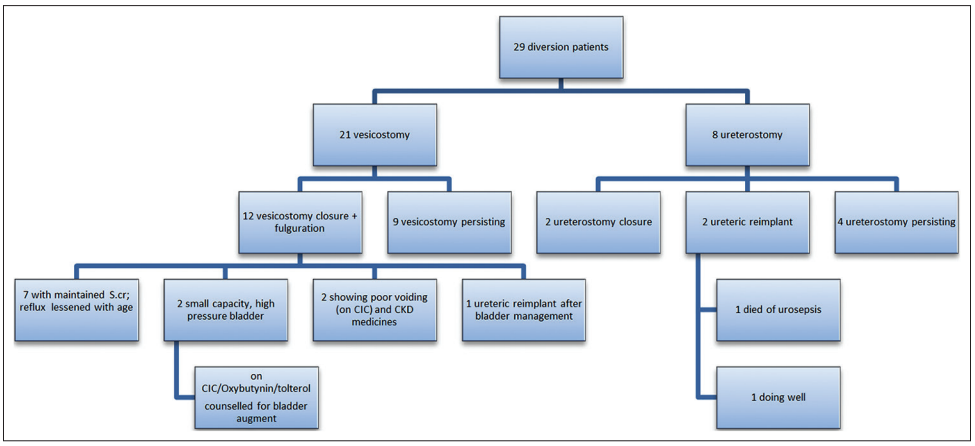

Figure 1: Results of Diversion in PUV patients

presenting late in developing countries need diversion to allow recovery of renal function and correct urosepsis.[16]

In contrast, Ghanem *et al.* in their analysis of patients managed by bilateral Sober's ureterostomy,[17] inferred that high diversion does not have negative influence on bladder dynamics and immediately releases high intrarenal pressures but only improves renal function temporarily. Liard *et al.* advocated that for severe cases of PUV, one should not hesitate in doing temporary high diversion and that Sober's ureterostomy does not damage the bladder.[18] Jaureguizar *et al.* reported that supravesical diversion did not affect the long-term bladder dysfunction adversely.[19] Kim *et al.* found that temporary diversion does not damage the bladder and actually improved the bladder function in the long run by putting the detrusor of the damaged bladder at rest.[20] Parag *et al.*, in their series, had 26 bilateal loop ureterostomy and found them effective in optimizing renal function and serum creatinine in these patients.[21]

Of the 21 patients with vesicostomy in our study, 12 patients had valve fulguration with vesicostomy closure, while in 9 patients, vesicostomy has not yet been closed. Of the 12 patients with vesicostomy, 7 showed lessening of serum creatinine and lessening of reflux with age; two showed high pressure, small capacity bladder with high-pressure bladder. These children were kept on clean intermittent catheterization and anticholinergic medications. They have been counseled for bladder augmentation and are awaiting bladder augment. Two patients showed poor voiding and are on CKD medications as advised by the nephrologist. One patient had bilateral ureteric reimplant after optimization of bladder function.

Of the 8 patients with ureterostomy, 2 had ureterostomy closure and are doing well on follow-up; 2 had bilateral ureteric reimplant, of which 1 died and the other is doing well; and 4 patients are still on bilateral ureterostomy.

In comparison to other studies, urodynamic evaluation, in our study, was done in fewer number of patients as most of the patients either did not have their stoma closed or had not attained a comfortable age for this procedure to be done. Urodynamic evaluation could be done in only two patients after vesicostomy closure and one after ureterostomy closure. Closed vesicostomy patients showed small capacity, high-pressure bladder; while closed ureterostomy patient showed normal capacity, normal-pressure bladder. Other patients are awaiting urodynamic evaluation.

CONCLUSION

Although the use of diversion in PUV patients has lessened in the developed world, it still is important in patients in developing world where patients have uncontrolled sepsis, persistent dilatation of the upper tracts following valve ablation and valve ablation is not possible due to non-availability of small-sized cystourethroscopes. Periodic follow-up and monitoring of bladder function and dynamics are equally important in patients with urinary diversion.

REFERENCES

1. Hodges SJ, Patel B, MaLorie G, Atala A. Posterior urethral valves. Sci World J 2009;14:1119-26.
2. Hoste EA, Clermont G, Kersten A, Venkataraman R, Angus DC, Bacquer DD, *et al*. RIFLE criteria for acute kidney injury are associated with hospital mortality in critically ill patients: A cohort analysis. Crit Care 2006;10:R73.
3. Venkataraman R, Kellum JA. Defining acute renal failure: The RIFLE criteria. J Intensive Care Med 2007;22:187-93.
4. National Kidney Foundation: K/DOQI. Clinical practice guidelines for chronic kidney disease: Evaluation, classification and stratification. Am J Kidney Dis 2002;39:S1-266.
5. Koff SA, Mutabagani KH, Jayanthi VR. The valve bladder syndrome: Pathophysiology and treatment with nocturnal bladder emptying. J Urol 2002;167:291-7.
6. Glassberg KI. The valve bladder syndrome: 20 years later. J Urol

2001;166:1406-14.
7. Halachmi S. The molecular pathways behind bladder stretch injury. J Pediatr Urol 2009;5:13-6.
8. Greenland JE, Brading AF. The effect of bladder outflow obstruction on detrusor blood flow changes during the voiding cycle in conscious pigs. J Urol 2001;165:245-8.
9. Aitken KJ, Bägli DJ. The bladder extracellular matrix. Part I: Architecture, development and disease. Nat Rev Urol 2009;6:596-611.
10. Thomas J. Etiopathogenesis and management of bladder dysfunction in patients with posterior urethral valves. Indian J Urol 2010;26:480-9.
11. Hutcheson JC, Stein R, Chacko S, Carr M, Canning DA, Zderic SA. Murine in vitro whole bladder model: A method for assessing phenotypic response to pharmacologic stimuli and hypoxia. Neurourol Urodyn 2004;23:349-54.
12. Puri A, Grover VP, Agarwala S, Mitra DK, Bhatnagar V. Initial surgical treatment as a determinant of bladder function in posterior urethral valves. Pediatric Surg Int 2002;18:438-43.
13. Smith GH, Canning DA, Schulman SL, Snyder HM 3rd, Duckett JW. The long-term outcome of posterior urethral valves treated with primary valve ablation and observation. J Urol 1996;155:1730-4.
14. Podestá ML, Ruarte A, Gargiulo C, Medel R, Castera R. Urodynamic findings in boys with posterior urethral valves after treatment with primary valve ablation or vesicostomy and delayed ablation. J Urol 2000;164:139-44.
15. Farhat W, McLorie G, Capolicchio G, Khoury A, Bägli D, Merguerian PA. Outcomes of primary valve ablation versus urinary tract diversion in patients with posterior urethral valves. Urology 2000;56:653-7.
16. MacKinnon AE. Posterior urethral valves: The value of high diversion. J Indian Assoc Pediatr Surg 2005;10:158-62.
17. Ghanem MA, Nijman RJ. Long-term followup of bilateral high (sober) urinary diversion in patients with posterior urethral valves and its effect on bladder function. J Urol 2005;173:1721-4.
18. Liard A, Seguier-Lipszyc E, Mitrofanoff P. Temporary high diversion for posterior urethral valves. J Urol 2000;164:145-8.
19. Jaureguizar E, Pereira PL, Urrutia MJ, Espinosa L, Lobato R. Does neonatal pyeloureterostomy worsen bladder function in children with posterior urethral valves? J Urol 2000;164:1031-3.
20. Kim YH, Horowitz M, Combs A, Nitti VW, Libretti D, Glassberg KI. Comparative urodynamic findings after primary valve ablation, vesicostomy or proximal diversion. J Urol 1996;156:673-6.
21. Parag P, Sen S, Chacko J, Zachariah N, Thomas G, Mammen KE. Bilateral high loop ureterostomy in the primary management of posterior urethral valves in a developing country. Pediatr Surg Int 2001;17:157-9.

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