

Role of MCU in the Management of Posterior Urethral Valves

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Abstract

Original Research Article

Objective: In infancy, the most common cause of bladder outlet obstruction is Posterior urethral valves (PUV), which impair renal and bladder function. This study was planned to evaluate and record the role of MCU in the various clinical presentations and management, complications, surgical management, and long-term outcomes of PUV. **Methods:** In this study, 49 patients treated for PUV were evaluated at the Bangladesh Shishu Hospital and Institute from May 2018 to April 2021. Complete data were taken, paraclinical examinations were performed on each patient, and the diagnosis was confirmed by micturating-cysto-urethrography (MCU). Posterior urethral valves were ablated in all patients using an electric hook. **Results:** A total of 49 patients with a mean age at diagnosis of 42(±21) days were included in this study. Catheterization was done within one to 5 days of life in 29 patients. PUV was ablated by an electric hook in all 49 patients. The most common symptoms in our group were dribbling, poor stream (71%), and urinary tract infection (UTI) (46%). There was vesico-ureteral-reflux (VUR) in 52% and hydronephrosis in 92.5%. The most common associated anomaly was kidney anomalies (Renal agenesis/dysplasia and multicystic kidney disease) in 4(8.2%) patients. About ten patients had prenatal diagnosis of PUV. Complications occurred in two (4.2%) patients. Mortality occurred in 3 (6.4%) patients. The mean follow-up period was 3.2±0.8 years (1.5 months to 4 years). **Conclusion:** MCU is the gold-standard imaging modality for documenting PUV and Postoperative follow-up to assess the condition of the posterior urethra urinary drainage by catheter in the early days of infancy. The factors like renal dysplasia and UTI have their role in the outcome.

Keywords: PUV, Urinary Drainage, Valve Ablation, Urinary Diversion, Outcome, Children.

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INTRODUCTION

The most common cause of lower urinary tract obstruction in male infants is posterior urethral valves. The congenital mucosal membrane in the prostatic urethra is called the posterior urethral valves (PUV). It is associated with morbidities, including urinary tract infection (UTI), chronic renal failure (CRF), urinary incontinence, and even death, and the incidence is 1 in 4000 to 25000 live births. Some patients with PUV are being diagnosed in utero. PUVs are classified into three types: Valves representing folds extending inferiorly from the verumontanum to the membranous urethra (Type 1), Valves as leaflets radiating from the verumontanum proximally to the bladder neck (Type 2), and Valves as concentric diaphragms within the prostatic urethra, either above or below the verumontanum (Type3). The most common type is type one. PUV should be evaluated in all males in the family, even in asymptomatic ones. Long-term follow-up for children with PUV is mandatory, even after 20 to 25 years old. In this circumstance, blood pressure, growth and weight,

creatinine, urine analysis and electrolytes, urinary tract ultrasonography, diethylene triamine peracetic acid (DTPA) isotope scan, dimercaptosuccinic acid (DMSA) isotope scan, and voiding cystourethrography evaluations are needed. PUV is diagnosed by visualization of the valve leaflets, trabeculated bladder, dilated and elongated posterior urethra, and bladder neck hypertrophy. Micturating cystourethrogram (MCU) is still the gold-standard imaging modality for documenting PUVs. Urinary drainage by a feeding tube in infancy, followed by valve ablation, is the best treatment for PUV. Surgical management of urethral obstruction is usually done by endoscopic valve ablation. Post-valve ablation management is, therefore, essential in improving the outcome of patients with PUV. This study was planned to evaluate and record the role of MCU in the various clinical presentations, management, complications, surgical management, and long-term outcomes of PUV.

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METHODS AND METHODOLOGY

This retrospective study was conducted at the Department of Pediatric Urology in Bangladesh Shishu Hospital and Institute from May 2018 to April 2021. Forty-nine patients treated for PUV were included in the study. Most of the patients were diagnosed by ultrasonography, MCU, and cystoscopy in all cases, as well as urine analysis, complete blood count (CBC), blood urea, serum creatinine, and serum electrolytes. All neonates with urinary retention received all silicon Foley catheters within the early neonatal period and were not cured. They were treated with fulguration/ablation of the posterior urethral valves by pediatric resectoscope under general anesthesia after valve ablation catheterization was done for five days. For the patient who persisted in difficulty in micturition, MCU was performed after three months of operation to assess the residual valve. If it persisted, reduced valve ablation was done. DTPA and DMSA isotope scans are checked for Hydronephrosis and VUR every 6 to 12 months.

All patients had received injectable ceftazidim (50mg/kg/BD)/Ceftriaxone (50mg/kg/day) and injection of Amicacine (5mg/kg/TDS) for seven days. All patients received Nitrofurantoin (1-2 mg/kg/night) as prophylactic and were followed for 3.2 ± 0.8 years with routine tests checked in every visit and MCU performed in those who had persistent hydro-ureteronephrosis to check vesico-uretral-reflux (VUR).

RESULTS

A total number of 49 patients with PUV were included in our study; the mean \pm SD age at diagnosis was 52 ± 11 days (one day to two years) thirty patients (66.3%) was less than 1 month, 28.1% was 1-12 months and just 4.1% was more than one year. Twelve patients (25.5%) presented with urinary retention. Symptoms and signs in PUV patients are shown in Table 1. Dribbling and poor stream were the most common presenting symptoms (51%). The most common associated anomaly was kidney anomaly (multicystic kidney disease and renal agenesis/dysplasia) in 4(8.2%) patients (Table 2). We catheterized all silicon Foley Catheter 6 FR 49 patients to relieve obstruction, regular urine stream, and correction of urea, creatinine, and electrolytes. VUR was presented in 30 (61.2%), of which 15 cases had bilateral and 16 unilateral refluxes (VUR grading was V=9 units, IV=11 units, III=10 units, II=11 units, and I=8 units). Hydronephrosis presented in 41(82.7%) patients was mild (15 units), moderate (16 units), and severe (18 units). DTPA at follow-up of our cases showed persistent upper tract dilatation (mostly unilateral) with mild to moderate functional obstruction in 5 patients, which improved later. PUV was diagnosed in 10 (20%) patients prenatally. All patients were treated with fulguration/ablation of PUV by a pediatric resectoscope under general anesthesia. Forty cases had type one PUV. With a urethral catheter, 22% of cases showed improvement in renal function (fall in serum creatinine level). The mean follow-up period was 3.4 ± 1.2 years (1.5 months to 5 years).

Table 1: Symptoms and signs in posterior urethral valve patients

Symptoms	Frequency (n)	Percentage (%)
Dribbling and poor stream	25	51.02
Urinary tract infection	20	40.82
Fever	4	8.16
Hematuria	2	4.08
Hypertension	1	2.04
Total	49	100.00

Table 2: Associated anomalies in posterior urethral valve patients

Anomalies	Frequency (n)	Percentage (%)
Kidney anomalies (Multicystic kidney, renal agenesis/ dysplasia)	4	8.16
Cardiac anomaly (PDA, ASD)	3	6.12
Others (UDT, Imperforate anus, Prune belly)	2	4.08
None	40	81.63
Total	49	100.00

PDA: Patent ductus arteriosus; ASD: Atrial septal defect; UDT: Undescended testis

Table 3: Long-term outcome of posterior urethral valves

Outcome	Frequency (n)	Percentage (%)
Residual valve	8	16.40
Acute renal failure	23	46.40
Stricture	4	8.16
Chronic kidney disease	3	6.10

Outcome	Frequency (n)	Percentage (%)
Dialysis	3	6.10
Mortality	3	6.10
Hypertension	1	1.00

DISCUSSION

PUV is the most common cause of lower urinary tract obstruction in male children. The severity of PUV varies from mild to severe, according to the degree of obstruction. Complications may develop in patients even after valve ablation and on long-term follow-up. The management of PUV needs adequate neonatal and infant care with nephrological support to treat urinary tract obstruction, correct metabolic acidosis, and eliminate electrolyte imbalance if necessary. Improved management of patients with severe PUV has resulted in a better long-term outcome. Three anatomical variables in PUV may provide a "pop-off" mechanism: 1) urinoma/ urinary ascites, 2) syndrome of PUVs, and 3) PUV+ large congenital diverticula that result in preservation of intact renal and bladder function. Urinary ascites result from urine leakage from the urinary system, and usually, there is a high level of blood urea nitrogen and serum creatinine. In this situation, the pop-off mechanism preserves the kidneys from excessive pressure and is a good prognostic sign. Patients who failed to respond to urinary catheter drainage, associated severe VUR, and urinary leakage finally required diversion. Table 2: Associated anomalies in posterior urethral valves patients Four (96%) patients of our study group were in the first year of life; in the Choudhury *et al.*, study, 77% Were in this age group, and Malik *et*

al., 's series less than 30%. The incidence of renal failure at presentation is reported as 66-90% in the literature, but in the Choudhury *et al.*, group, it was 71%, and in our series, 46%, of which 6.1% required dialysis. The most common symptom in the Malik *et al.*, study was fever (72%), whereas in our group, it was a dribbling and poor stream (51%). In our cases, there was 61.2% VUR (right 10.2%, left 20.4%, and bilateral 30.6%), while it was 22% (16% left and 6% bilateral) in Malik *et al.*, and Sudarsanan *et al.*, had 12 bilateral VUR and eight hydronephroses. In our study, VUR subsided within 3 to 4 months in most cases post valve ablation. UTI was present in 40.8% of our patients, which was cured by antibiotics and in severe/resistant cases with diversion. DTPA at follow-up of our cases showed persistent upper tract dilatation (mostly unilateral) with mild to moderate functional obstruction in 10 patients, which improved in later follow-up. Our long-term outcome of PUV patients is presented in Table 3 and compared with other studies in Table 4. The reported incidence of stricture following endoscopic ablation is between 3.6 to 25%. The 7.1% incidence means an improved result in our study. Our residual valve incidence rate was higher than the other reports; maybe it depends on our technique av, available instruments, or both. Our diversion rate and renal failure at follow-up were acceptable compared to the other studies, but the mortality rate was higher than in different reports.

Table 4: Comparison with other studies in PUV patients

Parameter	Lal23	Basu25	Choudhury 21	Shittu26	Sudarsanan2 2	Our study
No. of patients	82	130	90	26	61	49
Treatment modalities	Fulguration	Fulguration	Fulguration	Mohan's valvotome	Fulguration or valvotome	Fulguration or valvotome
Follow-up period	1-21 yrs	ND	ND	18 mo-5 yrs	8-75 mo	3.4 yrs
Stricture rates (%)	3.6	ND	ND	5	8.2	7.1
Residual valves (%)	13.4	6.2	ND	ND	13	15.3
Diversion rates (%)	46	20	71	0	1.6	
RF at follow-up (%)	ND	ND	8.8	20	1.6	6
Mortality rates (%)	ND	0.8	3.3	ND	0	5.1

ND: Not documented; RF: Renal failure

CONCLUSION

MCU is still the gold-standard imaging modality for diagnosis and post-operative follow-up for residual valve documentation. PUV Urinary drainage by catheter in infancy, followed by valve ablation, is the best treatment for PUV, and urinary diversion improves the outcome. The factors like renal dysplasia and Urinary tract infection have their role in the outcome.

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