



# Foley's Catheter Balloon Avulsion of Posterior Urethral Valve in Children: How Effective?

Chukwubuike KE\*, Eze BU and Anijunsi LP

Department of Surgery, Enugu State University Teaching Hospital, Nigeria

\*Corresponding author: Chukwubuike Kevin Emeka, Department of Surgery, Enugu State University Teaching Hospital, Enugu, Nigeria, Email: chukwubuikeonline@yahoo.com

## Research Article

Volume 7 Issue 1

Received Date: April 04, 2023

Published Date: April 17, 2023

DOI: 10.23880/ijst-16000178

## Abstract

**Background:** Endoscopic ablation under direct vision is the gold standard for treatment of posterior urethral valve. However, when the facilities are not available, Foley's catheter balloon avulsion of the valve suffices. The aim of this study was to evaluate the initial outcome of management of children with posterior urethral valve treated by Foley's catheter balloon avulsion.

**Materials and Methods:** This was a retrospective study of children, aged 15 years and younger, who were treated for posterior urethral valves at the pediatric surgery unit of a teaching hospital in Enugu, Nigeria. The parameters evaluated included the age of the patient at presentation, duration of symptoms before presentation, time interval between presentation and intervention, presenting symptoms, procedure performed, post-intervention complications, duration of hospital stay and outcome of treatment.

**Results:** A total of 24 children underwent catheter balloon avulsion during the study period. The mean age of the patients at presentation was 18 months and the mean duration of hospital stay was 18 days. Poor urinary stream and overflow incontinence were the most common presentations of the patients. Twenty-three out of 24 (96%) patients achieved full recovery with marked improvements in urinary stream and resolution of urinary symptoms. Patients who had hydronephrosis and vesicoureteric reflux before treatment, had resolutions of their pathologies during the period of follow up. However, one tenth of the patients each, experienced urethral injury and temporary urinary incontinence.

**Conclusion:** In resource poor settings where the necessary facilities are not available, Foley catheter balloon avulsion of posterior urethral valve is a simple and effective modality of treatment.

**Keywords:** Catheter Balloon; Children; Effective; Posterior Urethral Valve; Urinary Stream

## Introduction

Posterior urethral valve is a congenital anomaly of the lower urinary tract and is the most cause of urinary tract outflow obstruction in males [1]. The reported incidence of posterior urethral valve ranges from 1: 5000 to 1: 25, 000 live births [1,2]. Consistent with paucity of data in developing

countries, the exact incidence of posterior urethral valve is not known. However, a study from Enugu, Nigeria reported that 71% of children with posterior urethral valve are already in renal failure at presentation [3,4]. The consequential pathology of the persistent increased pressure in the urinary tract caused by posterior urethral valve includes renal, ureteric, bladder and urethral changes. Posterior

urethral valve has adverse effects in the development of the urinary tract and evolution of bladder function. In utero, impaired renal development in posterior urethral valve may affect the fetal lung development [5]. Regarding prenatal diagnosis, prenatal assessment and evaluation of prenatal hydronephrosis make for early diagnosis of posterior urethral valve. These changes may lead to end stage renal disease and renal failure. Posterior urethral valve is associated with some morbidity such as urosepsis, overflow urinary incontinence and chronic renal insufficiency [6]. In some tertiary care hospitals in south west Nigeria, children with posterior urethral valve undergo open resection of the valves through the open bladder approach [1]. The obstructive uropathy caused by posterior urethral valve is ameliorated by an initial period of initial continuous bladder drainage and eventual valve resection, avulsion or ablation. Patients with posterior urethral valve, require follow up for life. This is very pertinent for early detection of complications and impaired renal function. However, in developing countries, non-compliance with follow up visits is common. The aim of this study was to evaluate the initial outcome of management of children with posterior urethral valve treated by Foley's catheter balloon avulsion.

## Materials and Methods

This was a retrospective study of children, aged 15 years and younger, who were treated for posterior urethral valves at the pediatric surgery unit of Enugu State University Teaching Hospital (ESUTH), Enugu, Nigeria. The study covered a 5-year period, from January 2017 to December 2021. The diagnosis of posterior urethral valve was made based on clinical features, investigative and intra-operative findings. At presentation, the patients were resuscitated and optimized which included the passage of all silicon catheter and the use of intravenous fluids and antibiotics. Electrolyte and acid-base imbalances, if any, were corrected. Input of the pediatric nephrology unit was also sort. Under general anesthesia and the patient positioned supine, catheter balloon avulsion of the posterior urethral valve was done using appropriate catheter for the age of the child. Patients who have had intervention for posterior urethral valve at a peripheral hospital before referral to ESUTH for re-intervention and patients with incomplete case records were excluded from this study. ESUTH is a tertiary hospital located in Enugu, South East Nigeria. The hospital serves the whole of Enugu State, which according to the 2016 estimates of the National Population Commission and Nigerian National Bureau of Statistics, has a population of about 4 million people and a population density of 616.0/km<sup>2</sup>. The hospital also receives referrals from its neighboring states. Information was extracted from the case notes, operation notes, operation register, and admission-discharge records. The parameters evaluated included the

age of the patient at presentation, duration of symptoms before presentation, time interval between presentation and intervention, presenting symptoms, investigations done, procedure performed, post-intervention complications, duration of hospital stay and outcome of treatment. The period of follow up was for 12 months. Ethical approval was obtained from the ethics and research committee of ESUTH. Statistical Package for Social Science (SPSS) version 21, manufactured by IBM Cooperation Chicago, Illinois, was used for data entry and analysis. Data were expressed as percentages, median, mean, and range.

## Results

### Patients' Demographics

A total of 24 children underwent catheter balloon avulsion during the study period. The mean age of the patients at presentation was 18 months with a range of 1 month to 14 years. The mean duration of symptoms before presentation was 5 months, range 1-18 months. The time interval between presentation and intervention ranges from 10 days to 21 days, median 15 days. The mean duration of hospital stay was 18 days with a range of 7 to 28 days.

### Presenting Symptoms

The predominant presenting symptoms are shown in Table 1.

Presenting symptoms	Number of patients (%)
Poor urinary stream	23 (95.8)
Overflow incontinence	21 (87.5)
Lower urinary tract symptoms (frequency, dysuria etc)	20 (83.3)
Recurrent fever/UTI	18 (75)
Failure to thrive (poor weight gain)	6 (25)
Renal failure	5 (20.8)

**Table 1:** Predominant presenting symptoms

### Pre-intervention Investigations

Ten (41.7%) patients had bilateral hydronephrosis on ultrasound and there was vesicoureteric reflux in 4 (16.7%) on micturating cystourethrogram.

### Procedure Performed

All the patients had catheter balloon avulsion of the posterior urethral valve under general anesthesia.

### Outcome of Treatment

Twenty-three (95.8%) patients achieved full recovery with marked improvements in urinary stream and resolution of urinary symptoms. Hydronephrosis and vesicoureteric reflux resolved in the patients during the period of follow up. The serum electrolytes, urea and creatinine also returned to within normal limits. However, 1 (4.2%) patient had unsuccessful avulsion which was evidenced by persistent symptoms of posterior urethral valve.

### Complications Resulting from Intervention

Two (8.3%) patients sustained urethral injuries during the avulsion that required rail-roading of the urethra to re-align the urethra. There was temporary loss of continence in 2 (8.3%) other patients. One (4.2%) patient who presented with end stage renal disease benefitted from renal replacement therapy.

### Discussion

In male pediatric patients, posterior urethral valve is a consistent congenital cause of urethral obstruction [7]. Embryologically, the exact etiology of posterior urethral valve is not known. However, abnormal Wolffian duct migration or persistent cloacal membrane has been postulated [8]. In 1919, Young, et al. classified posterior urethral valve into 3 types with type 1 as the most common [9]. Treatment of posterior urethral valve has evolved over time. Diamond and Ramsley, in 1986, documented the method of primary ablation of posterior urethral valve using Fogarty's catheter [10]. In 1988, Kalicinski reported the use of Foley's catheter to treat posterior urethral valve [11]. We evaluated our experience with respect to the use of Foley's catheter in the treatment of our patients that presented with posterior urethral valve.

In the present study, 24 children were treated during the study period. This number excludes children who presented in renal failure and those that expired during resuscitation and optimization. This number of patients is consistent with the report of other series on posterior urethral valve in Nigeria. For instance, Uba, Chirdan LB, Ihezue CH, et al. [12] in Jos, Nigeria documented 3-8 cases per year and Jaja et al reported that posterior urethral valve accounted for 1 in 2,447 children seen in a tertiary hospital in Port Harcourt, Nigeria [12,13]. The mean age of the patients at presentation in the current study was 18 months. This mean age is comparable to the report of a similar study in south-south Nigeria [13]. The mean age may be explained by the fact that posterior urethral valve is a congenital anomaly whose development and its deleterious effects started in utero. However, it should be noted that posterior urethral

valve have been reported in adolescents and adults. In fact, Mahony and Laferte studied 26 cases of posterior urethral valve in adults older than 21 years of age [14].

In the index study, there is delayed presentation of the patients. Paucity of resources and lack of parental awareness may account for the delayed presentation. Odetunde et al reported that about two-thirds of their patients were already in renal failure as at the time of presentation due to late presentation [4]. Children with posterior urethral valve require resuscitation and optimization before the valve ablation/avulsion is performed. This accounted for the interval between presentation and intervention.

Poor urinary stream was the most common presenting symptom in the current series. Posterior urethral valve has a wide spectrum of presentations ranging from severe obstruction, resulting to severe pulmonary hypoplasia due to oligohydramnios, to mild obstruction. Patients with mild obstruction may have few symptoms that may escape early detection and manifest in older childhood, adolescence or adulthood [15-17]. Lower urinary tract symptoms, overflow incontinence, recurrent infections, hematuria and renal insufficiency have been found more in older patients who have posterior urethral valve [14,17]. However, early presentation of symptoms in the life of a patient with posterior urethral valve is associated with impaired renal function [18].

Catheter balloon avulsion of the posterior urethral valve was performed in all the patients and this is the focus of the current research. Endoscopic valve ablation was not carried out because of the absence of the necessary facilities.

Regarding the effectiveness of the catheter avulsion, almost all the patients, except one, experienced improvements in their symptoms. There was relief of the valve obstruction in 23 out of 24 patients. This relief of obstruction was evidenced by good urinary stream, absence of straining on micturition and resolution of other symptoms. Post intervention (follow up) imaging and biochemical investigation revealed no hydronephrosis and serum electrolyte, urea and creatinine were normal. Other studies on posterior urethral valve also established this positive outcome when Foley's catheter is used for the avulsion [1,18]. It must be stated that treatment of posterior urethral valve using Foley's catheter is not the best form of treatment. Research has shown that use of Fogarty catheter, transvesical excision of valve, valvotomy, vesicostomy and endoscopic valve ablation are other options of treatment [18].

Complications can occur during the course of treatment of posterior urethral valve. Urethral injury can occur during the valve ablation requiring operative re-alignment of the urethra. Injury to the external urethral sphincters could

result in urinary incontinence.

## Conclusion

In resource poor settings where the necessary facilities are not available, Foley catheter balloon avulsion of posterior urethral valve is a simple and effective modality of treatment. However, endoscopic ablation under direct vision is advised to minimize collateral injuries and complications.

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