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Research Article

# Outcomes of Endoscopic Ablation of Posterior Urethral Valves in Children: A Retrospective Review

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## Abstract

*Introduction:* The management of posterior urethral valves is challenging in the absence of early diagnosis and optimal technical facilities. Once performed, endoscopic resection of the valves does not guarantee complete healing. The aim of our study was to investigate the outcome of patients treated for posterior urethral valves by endoscopic resection in two hospitals in the city of Yaounde. *Materials and methods:* This was a 5 years retrospective cross-sectional study conducted in two hospitals in the city of Yaounde from 2019 to 2024. All patients included had been treated for posterior urethral valves by endoscopic resection. Socio-demographic, diagnostic, therapeutic and prognostic variables were investigated. *Results:* A total of 35 patients were treated over the five-year period, with an admission rate of 6 cases per year. The median age at presentation was 02 years, and 29 participants (82.8%) presented late. Dysuria and recurrent urinary tract infections were the main reasons for consultation. Endoscopic valve ablation relieved obstruction in all participants except 5 (14.3%) who had residual valves. Creatinine levels and glomerular filtration rate before and after resection were measured in 15 participants; among them, 9 (47.5%) had renal insufficiency with a GFR < 60 ml/min/1.73 $m^2$, which did not improve after valve resection. Uroflowmetry showed abnormalities in three patients with a Qmax < 15 ml/s. The mortality rate was 2.9%. *Conclusion:* Endoscopic resection of posterior urethral valves significantly improves micturition. Follow-up is necessary to prevent complications.

## Keywords

Outcome, Posterior Urethral Valves, Endoscopic Resection, Yaounde

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## 1. Introduction

Posterior urethral valves (PUVs) are a congenital obstruction of the posterior urethra [1]. This disorder was first described by Morgagni in 1717 and then by Langenbeck in 1802 and occurs mainly in males [2]. They manifest early in gestation, exposing the bladder and upper urinary tract to high pressure, leading to significant alterations in bladder function and kidney damage [1].

Despite the rarity of posterior urethral valves, they are the most common cause of urological obstruction in male foetuses, with an estimated incidence of 1 infant in every 5,000 to 8,000 live births worldwide [3, 4]. Between 1950 and 1969, 38% of children with PUV died between the third hour and the eighth year of life, with an average of 10 months [4]. The mortality rate for newborns with severe neonatal distress syndrome with septicaemia and renal failure was previously around 50%. According to a 30-year study conducted in Canada by Jeff Warren et al. in 2004, he found that 11% of cases progressed to end-stage renal failure with a mortality rate of 6.6% [5]. In Cameroon, in 2018, Tambo et al. reported a low complication rate after endoscopic resection of valves with urethral stenosis in 11.2% of cases. Mortality in the same study was 5.6%, while in Nigeria, Uba et al. reported 4.9% deaths [6, 7].

The management of neonatal surgical conditions is problematic in developing countries due to the rarity of antenatal diagnosis, resulting in high intraoperative morbidity and mortality [8]. These diagnostic shortcomings have led to many children with fever being treated incorrectly for malaria or recurrent urinary tract infections before being transferred to the appropriate department [8]. The miniaturisation of endoscopes in paediatric settings has minimised urethral trauma, operating time and bladder irrigation, and has also significantly reduced the rate of post-operative infectious complications [1, 9]. However, relief of the obstruction may not guarantee a good renal and urinary prognosis due to the long-term consequences of the obstruction that may be felt after removal [3]. In Cameroon, in specialist hospitals where valve ablation is performed, most patients do not attend follow-up visits due to a mistaken belief that they will be completely cured once the obstruction has been removed [6]. The aim of this study was to investigate the outcome of patients treated for PUVS by endoscopic resection in two hospitals in the city of Yaounde.

## 2. Materials and Methods

This was a retrospective cross-sectional study conducted in two specialist hospitals in the city of Yaounde: The Yaounde Gynaeco-Obstetrics and Paediatrics Hospital (YGOPH) and the Andre Fouda Medical Foundation (AFMF). Both hospitals have the necessary equipment for the medical and surgical management of posterior urethral valves. The study covered a period of five years from 1st January 2019 to 3rd January 2024. All patients who underwent endoscopic resection of PUVs were included. The study was approved by the Institutional Ethics and Research Committee (Ref 619/CIERSH/DM/2024). Socio-demographic variables included age, place of residence and method of recruitment. Clinical and paraclinical characteristics included the reason for consultation, length of hospitalisation, uroflowmetry, quality of urinary stream, glomerular filtration rate using the Schwartz formula, creatinine, urea, serum electrolytes, and imaging. The therapeutic and prognostic variables investigated were surgical history, date of endoscopic resection, short-, medium term outcomes, post-operative complications, and urine flow measurement after resection. The data collected were entered using CS Pro (Census and Survey Processing) software version 7.5 and analysed using SPSS 20 (Statistical Package for Social Sciences). Quantitative variables were expressed as mean ± standard deviation or median and interquartile range after verification of distribution by normality tests.

## 3. Results

We recruited a total of 35 cases that met the inclusion criteria and were treated over the five-year period (Figure 1).

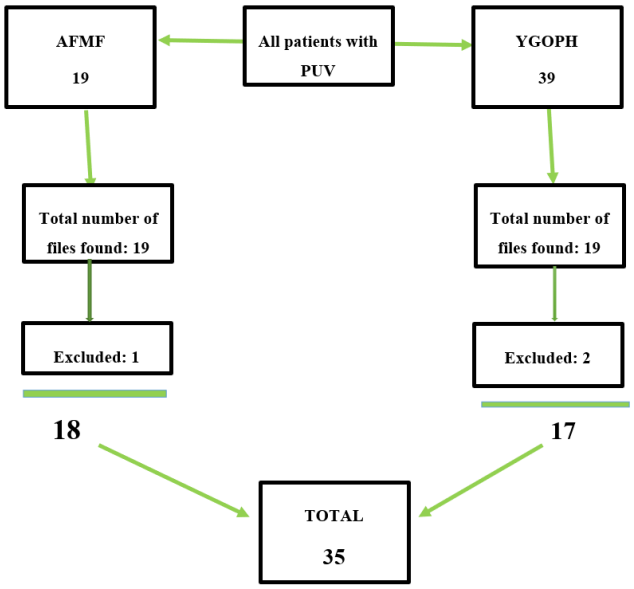


***Figure 1.*** *Study flow chart.*

During this period, we had an average admission rate of 06 cases per year (Figure 2). Only 54.3% resided in Yaounde.

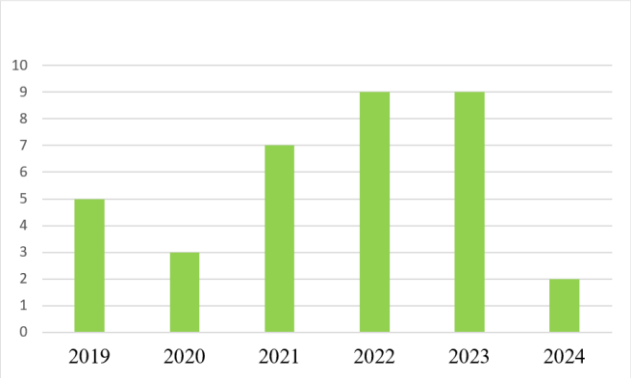


***Figure 2**. Distribution of posterior urethral valves over time.*

The median age of patients on admission was 2 [0.33–4] years, with extremes of 1 day and 17 years. Among them, 6 had an antenatal diagnosis (17.1%); 29 (82.8%) presented after the age of 1 month and 24 after the age of 1 year (67.9%). The majority were less than 1 year old at admission (31.4%). (Table 1)

***Table 1.** Population distribution by age group.*

| Variables | Frequency (n) | Percentage (%) |
|---|---|---|
| Age range (years) | | |
| < 1 month | 11 | 31.4 |
| 1-2 | 9 | 25.7 |
| 3-5 | 7 | 20.0 |
| 6-9 | 1 | 2.9 |
| ≥ 10 | 7 | 20.0 |

In our study population, only 06 (17.1%) received an antenatal diagnosis, compared to 29 (82.9%) who received a postnatal diagnosis. All patients presented with dysuria upon admission, and 42.9% had a history of recurrent urinary tract infections (Table 2).

***Table 2.** Distribution of the population according to the reason for consultation.*

| Variables | Frequency (n) | Percentage (%) |
|---|---|---|
| Reasons for consultation | | |
| Dysuria | 35 | 100 |
| Recurrent urinary tract infections | 15 | 42.9 |
| Abnormal urinary stream | 13 | 37.1 |
| Painful urination | 13 | 37.1 |
| Lower abdominal swelling | 12 | 34.3 |
| Incomplete urination | 8 | 22.9 |
| Favourable obstetric ultrasound scan | 6 | 17.1 |
| Fever | 6 | 17.1 |
| Anuria | 5 | 14.3 |
| Urinary incontinence | 3 | 8.6 |
| Oliguria | 3 | 8.6 |
| Haematuria | 1 | 2.9 |
| Oedema of the lower limbs | 1 | 2.9 |
| Ascites | 1 | 2.9 |

Voiding urethrocystography was the investigation of choice for all participants treated in the postnatal period. Bilateral hydronephrosis was present in 13 patients (37.1%) and unilateral hydronephrosis in 3 participants (8.6%). Vesicoureteral reflux (VUR) was present in 8 (22.9%) others, 6 (17.1%) patients had chronic kidney disease, and 2 patients had growth retardation (2.9%). Vesicostomy was performed in 25.7% (n=9) of cases as the first surgical procedure. The median length of hospitalisation was 4 [2-6] days, with extremes ranging from 2 to 16 days. The median duration of transurethral catheterisation was 4 days, with extremes ranging from 1 to 20 days.

At the end of the first month after valve resection, we observed a significant improvement in urinary function in 88.6% of cases,

marked in 97.1% of cases by normal urinary flow, complete bladder emptying in 88.6% of cases, and normal urine stream strength (8.6%). Complications were present in 45.7% of cases, predominantly urinary tract infections in 31.4% of cases.

Valve recurrence during the first month of follow-up was observed in 5 patients, or 14.3% of cases. Six months after valve resection, urine flow was normal in 94.3% of cases, with complete bladder emptying in 85.7% of cases and normal urine stream force in 85.7% of cases. Complications were common in 14.3% of cases, predominantly renal failure in 14.3% of cases. (Table 3).

Prior to surgical treatment, baseline creatinine levels were known in 27 participants (77.1%), ranging from 25.6 µmol/l to 136.1 µmol/l, with a mean of 64.5 µmol/l ± 31.2 µmol/l. Glomerular filtration rate (GFR) could be determined in 19 participants (54.30%). This showed an average GFR of 65.60 ± 27.06 ml/min/1.73 m ² with a range of 27.06 to 106.80 ml/min/1.73 m ², and most participants had a GFR between 30 and 89 ml/min/1.73 $m^2$. An average GFR of 65.60 ± 27.06 ml/min/1.73 $m^2$ with a range of 11 to 132 ml/min/1.73 $m^2$, and most participants had a GFR between ≥ 90 ml/min/1.73 $m^2$.

***Table 3.*** *Patient characteristics at 6 months post-operation.*

| Variables | Frequency (n) | Percentage (%) |
|---|---|---|
| Urinary flow | | |
| Normal | 33 | 94,3 |
| Abnormal | 1 | 2,9 |
| Undetermined | 1 | 2,9 |
| Bladder emptying | | |
| Complete | 30 | 85,7 |
| Incomplete | 4 | 11,4 |
| Undetermined | 1 | 2,9 |
| Urine Stream strength | | |
| Strong | 31 | 88,6 |
| Weak | 3 | 8,6 |
| Undetermined | 1 | 2,9 |
| Complications | | |
| No complications | 29 | 82,9 |
| Incontinence | 4 | 11,4 |
| Chronic renal failure | 1 | 2,9 |
| Residual valves | 1 | 2,9 |
| Stenosis | 1 | 2,9 |

In the post-operative phase, creatinine levels were known for 23 participants (65.7%), ranging from 21.22 µmol/l to 253 µmol/l, with an average of 59.3 µmol/l ± 49.6 µmol/l. Figure 3 shows the trend in serum creatinine levels before and after resection.

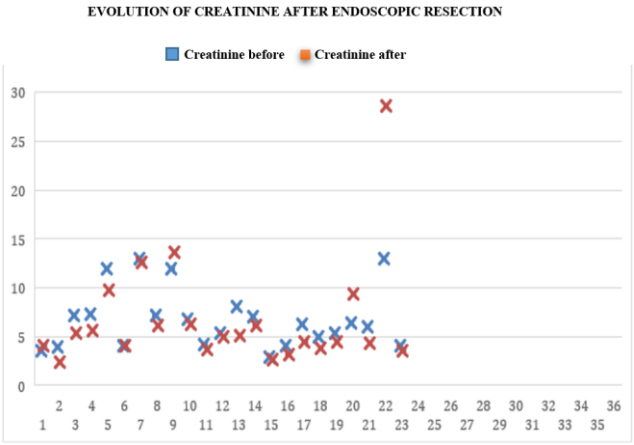


***Figure 3.*** *Changes in creatinine levels after Endoscopic valve resection.*

Postoperative GFR assessment was done in 15 patients. After resection, a significant improvement was noted in 4 patients (26.6%). Seven participants had a GFR ≥ 90 ml/min/1.73 $m^2$ (58.3%) and two participants had a GFR between 60-89 ml/min/1.73 $m^2$. A regression was noted in 2 participants (16.6%), one of whom had an GFR < 15 ml/min/1.73 $m^2$ (6.6%) and the other a GFR between 15-29 ml/min/1.73 $m^2$, and unchanged GFR in 2 participants, both of whom had a GFR between 30-59 ml/min/1.73 $m^2$ (16.6%).

Urine flow measurement was performed in 05 patients (14.3%), two of whom complained of incontinence and the others had no complaints at the time of the examination. It showed abnormalities in three patients with a Qmax < 15 ml/s.

We recorded 1 (2.9%) death.

## 4. Discussion

We recorded 35 cases over the entire study period, with an annual incidence of 06 cases per years, which is comparable to that of previous studies conducted in Cameroon by Tambo et al. [6] Angwafo et al. [10] and Chiabi et al. [11], in which it varies between 2 and 4 cases per year. Similarly, studies conducted in Nigeria by Jaja et al. [12] and Ajao et al. [13] found 7 and 8 cases, respectively. The low prevalence in our environment may be linked to early perinatal and neonatal deaths as a result of severe obstruction, superimposed infection, acute renal failure and pulmonary hypoplasia, which never reach hospital and have therefore never been diagnosed [7, 14].

In total, 82.8% presented after the age of 1 month, compared to 17.1% before 1 month with antenatal diagnosis. This suggests that the vast majority of patients in our population presented late. This is similar to studies previously conducted in Cameroon in 2018 by Tambo et al. [6] and in Nepal in 2022

by Sanjay et al [15], where 72.2% and 73.3% of the study population presented late, respectively. Among the factors that may have contributed to this late presentation are the lack of awareness or poor understanding of this malformation [16], as well as the high cost of radiological examinations and the absence of a universal health insurance system [16].

The clinical manifestations were dominated by dysuria and recurrent urinary tract infections. This result is similar to those of Trellu et al. [17] in France and Gargah et al. [18] in Tunisia, who reported clinical symptoms dominated by urinary signs and, above all, recurrent urinary tract infections in 43 and 44 cases, respectively. Indeed, the urethral obstruction prevents proper urine drainage and promotes reflux, resulting in urinary disorders and urinary tract infections as the main warning signs.

On admission, voiding cystourethrography was performed on all patients. We found vesico-ureteral reflux (VUR) in 22.9% of cases. These results are consistent with those of Schober et al. [19] in the United Kingdom, where VUR was found in 16% of cases, but are inconsistent with those found in Cameroon [6], where VUR was found in 50% of cases in the study. The incidence of VUR in our study is relatively lower compared to data in the literature [6, 20], but this could be explained by the lesser severity of the VUR. Vesicostomy as a temporary treatment was performed in 09 patients (25.7%). Although for some it should only be reserved for newborns whose weight or resuscitation conditions do not allow endoscopic surgery, for others it is a safety valve for the upper urinary tract [6, 21-23].

After resection, we observed 31.4% urinary tract infections, 11.4% incontinence, persistent VUR in 5.7%, stenosis in 2.9%, and progression to end-stage renal failure in 2.9% of cases. This is similar to the studies by Sanjay et al. [15] and Sagna et al. [23], which reported that the main post-resection complications were urinary tract infection, stenosis, and persistent VUR.

The results revealed impaired renal function prior to endoscopic resection, with a glomerular filtration rate < 60 ml/min/1.73 $m^2$ in 47.4% of cases (09 patients). These results are comparable to those of Talabi et al. [24] and Tambo et al. [6], who reported 40.5% in 2015 and 55.6% in 2018, respectively. The assessment after resection revealed an eGFR < 60 ml/min/1.73 $m^2$, which is consistent with the current literature on the fact that high serum creatinine levels are associated with a poor prognosis in patients with PUV, and this may not be reversed even with the removal of the obstruction [6, 25-27].

Post-resection urinary flow rate measurement was performed in only five patients, undoubtedly due to parents' reluctance to continue hospital visits when urine flow was satisfactory after the obstruction had been relieved, but also due to a lack of financial resources. Among these patients, two had continence problems and three had no complaints. Uroflowmetry showed abnormalities in three patients with a Qmax < 15 ml/s, one of whom had reported no complaints and was satisfied with the resection. Even after surgical treatment, the consequences of obstruction related to the antenatal presence of VUPs can continue in the long term, including into adulthood [22].

With regard to deaths, 1 (2.9%) case was recorded. This is comparable to the 4.9% reported in Nigeria by Uba et al in 2007 [7] and the 5.6% reported in Cameroon in 2018 by Tambo et al [6], but a higher death rate of 21% was observed in a study conducted by Chiabi et al in 2004 in Cameroon [11]. The modernisation of endoscopy tools and the strengthening of the local team in Cameroon could explain the relatively low mortality rate in our series.

Half of the patients were lost to follow-up from the third month post-operatively. This could be due to parents' reluctance to continue hospital visits in the presence of satisfactory urine flow after relief of the obstruction, combined with the long distances required to travel to the hospital, but also to a lack of financial resources. It is therefore necessary to educate parents and guardians about the importance of long-term follow-up and the risks of continued renal and bladder deterioration even after improvement in urination.

*Limitations of the study*

Although our study described significant clinical and biological results following PUV ablation in the city of Yaounde, its applicability may be limited by:

1) A significant number of participants not residing in the city of Yaounde;
2) Incomplete and missing information on many parameters;
3) Reluctance of some patients to participate in the study, possibly due to their ignorance of the long-term consequences of this malformation, even with satisfactory urinary flow and output after removal of the obstruction.

## 5. Conclusion

In Yaounde, endoscopic resection of the posterior urethral valves improves urination in the majority of children. Short- and medium-term follow-up reveals persistent renal function impairment, but with low mortality.

## Abbreviations

| | |
|---|---|
| PUV | Posterior Urethral Valve |
| GFR | Glomerular Filtration Rate |
| VUR | Vesico-ureteral Reflux |
| Qmax | Maximum Flow Rate |
| YGOPH | Yaounde Gynaeco-Obstetrics and Paediatrics Hospital |
| AFMF | Andre Fouda Medical Foundation |

## Author Contributions

**Landry Oriole Mbouche:** Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software,

Visualization, Writing – original draft

**Achille Aurele Mbassi:** Conceptualization, Data curation, Funding acquisition, Investigation, Methodology

**Frantz Guy Epoupa Ngalle:** Conceptualization, Data curation, Funding acquisition, Investigation, Methodology

**Irene Nadine Tsala Kouna:** Investigation, Software

**Eugenie Caroline Dikongue:** Writing – review & editing

**Bright Che Awondo:** Writing – review & editing

**Rick Tristan Nguetsop:** Writing – review & editing

**Justin Kamga:** Writing – review & editing

**Faustin Tambo Mouafo:** Supervision, Validation

**Forbuzshi Fru Angwafo III:** Supervision, Validation

## Conflicts of Interest

The authors declare no conflicts of interest.

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