Follow-up of 50 children after posterior urethral valve management in Al-Azhar University Hospitals
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**Objective** This study was performed to assess the various clinical presentations, complications, and surgical management, as well as follow-up, of patients with posterior urethral valve (PUV).

**Patients and methods** This is a prospective descriptive analysis of the data of 50 patients with PUVs of different age reviewed. Serum creatinine levels, clinical examination, abdominopelvic ultrasound, and magnetic resonance urography were performed, and the diagnosis was confirmed by voiding cystourethrography. The patients were divided into two categories: primary intervention and surgical intervention.

**Results** A total of 50 boys with a mean age at diagnosis of 100 ± 15 days were included in this work. The most common presentation in patients managed by valve ablation was difficult micturition (60%), whereas in patients managed by initial vesicostomy the most common presentation was febrile urinary tract infection (67%). Vesicoureteral reflux presented in 61.2% and hydronephrosis in 82.6%, whereas complications occurred in three (6%) children. Mortality occurred in five (10%) patients. Postoperative improvement of hydronephrosis grade in both categories is not appreciably different.

**Conclusion** Urinary drainage using small catheters or nasogastric tube in the early days of infancy followed by valve ablation is the best treatment modality in PUV. *Ann Pediatr Surg* 14:116–120 © 2018 Annals of Pediatric Surgery.

**Patients and methods**

This is a prospective descriptive analysis of the data of 50 patients admitted at the Urology Department of our University Hospital (from October 2011 to July 2015) in whom PUVs were reviewed after local and ethical committee approval, and an informed written consent was obtained from the patient’s relative. The patients were classified according to surgical management into two different categories. Complete blood count, urinalysis, blood urea, creatinine, and serum electrolytes were analyzed. Ultrasonography, VCUG, and cystoscopy was performed in all children. In all neonates with urinary retention, the bladder was drained with a small-caliber catheter or feeding tube in the urethra within the early neonatal period. After that they were treated with fulguration/ablation of the PUVs by pediatric resectoscope. The major area of continuing controversy involves the most right approach for management of the infant who has significant renal insufficiency that persists after a satisfactory period of transurethral drainage. The options for managing this group of children include endoscopy fulguration of the urethral valves only, elective vesicostomy, or high-loop ureterostomy [7].

The aim of this work is to decide which method achieves the current PUV management goals of preserving renal function, as well as the lower urinary tract function integrity. It also aimed to evaluate and record the various clinical presentations and management maneuvers, complications, and surgical management and long-term outcome (for 1 year) of PUV.
scope under general anesthesia; valve ablation was accomplished using cutting current and incisions at the 5 o'clock, 7 o'clock, and 12 o'clock positions. Vesicostomy was performed in 15 newborns and infants with urinary sepsis or poor general condition in spite of urethral catheter drainage and corrective medical treatment. Another indication for temporary vesicostomy in 10 cases was a small-caliber urethra, which precluded primary transurethral valve ablation. Vesicoureteral reflux (VUR) and hydronephrosis were assessed after 3, 6, and 12 months by ultrasonography; VCUG and isotope scan were performed using DTPA and DMSA for all cases. Pelvic ultrasound was used to evaluate the urinary bladder size, the urinary bladder wall thickness, the presence of diverticula, posterior urethral dilatation, and postvoiding residual urine. VCUG was performed to confirm the diagnosis and to assess the urinary bladder for associated findings such as VUR, its degree, diverticula, and residual urine. Urodynamic study was performed for persistent bladder dysfunction and videourodynamics was performed to assess bladder capacity in cases associated with VUR.

**Statistical analysis**
The data were analyzed using statistical package for the social sciences (SPSS version 20.0) for Windows (SPSS Inc., Chicago, Illinois, USA). The results were expressed as mean±SE with 95% confidence interval by using medians for quantitative variables, and using the frequencies and percentages for qualitative ones; a P-value of less than 0.05 is statistically significant.

**Results**
A total of 50 boys with a mean age at diagnosis of 100±15 days (1 day to 4 years) were included in this work. The most common presentation in cases treated with primary valve ablation was difficult micturition in 15 (60%) patients, urinary frequency in 13 (52%) patients, febrile urinary tract infection (UTI) in 10 (40%) patients, and urge incontinence in five (20%) patients. At 1 year of follow-up, 12 out of 25 (48%) patients were free of complaints. The remaining patients were complaining of urinary frequency in 10 (40%) patients, febrile UTI in seven (28%) patients, urge incontinence in seven (28%) patients, and difficult micturition in five (20%) patients (Table 1).

In cases treated by initial vesicostomy, the most common presentation was a febrile UTI in 17 (68%) patients, difficult micturition in eight (32%) patients, chronic retention with overflow incontinence in five (20%) patients, suprapubic swelling in seven (28%) patients, and upper abdominal swelling in four out of 25 (16%) patients. PUV was diagnosed during an antenatal period in two out of 25 (8%) patients.

At 1 year of follow-up, six (40%) cases were free of complaints. The postoperative presentations in the remaining patients were urinary frequency in seven (47%) patients, urge incontinence in six (40%) patients, and difficult micturition in three (20%) patients (Table 2).

**Serum creatinine**
The mean preoperative serum creatinine after stabilization with urethral catheter drainage in primary urethral valve ablation patients was 1.16±0.32, which is significantly improved with a mean value of 0.55±0.22 when measured 1 year after valve ablation (P<0.001). One patient had renal insufficiency with serum creatinine level of 1.2 mg/dl. The mean serum creatinine after stabilization with a urethral catheter in vesicostomy patients was 1.529±0.522. When serum creatinine was measured at 1 year of follow-up, the mean value was significantly improved for 0.8±0.39 (P<0.01). Three patients had renal insufficiency with serum creatinine level of 1.4, 1.5, and 1.6 mg/dl. Comparison of postoperative serum creatinine in both categories showed that postoperative serum creatinine is significantly lower in primary valve ablation cases.

**Radiological hydronephrosis**
Radiological hydronephrosis shows a comparison between the preoperative and postoperative state of the renal units as regards backpressure changes in cases of primary valve ablation patients. Out of 50 renal units affected by hydronephrosis, 35 (70%) renal units demonstrated postoperative improvement in hydronephrosis grade. A comparison was made between the preoperative and postoperative state of the renal units as regards backpressure changes in initial vesicostomy patients after 3, 6, and 12 months. Out of 50 renal units affected by hydronephrosis, 32 (64%) renal units showed postoperative improvement in hydronephrosis grade. Postoperative hydronephrosis grade improvement in both groups was not significantly different.

**Vesicoureteric reflux**
Comparison between the preoperative and postoperative state of the renal units as regards vesicoureteric reflux in
patients of primary valve ablation patients. Out of 35 affected renal units with vesicoureteric reflux, 27 (77.1%) renal units showed postoperative improvement in vesicoureteric reflux grade (Fig. 1). Out of 32 affected renal units with vesicoureteric reflux in initial vesicostomy patients, 21 (65.6%) renal units showed postoperative improvement in vesicoureteric reflux grade (Fig. 2).

The ultrasonographic bladder volume for these patients after 6 months, with an age range of 1–4 years, was found to be 100–240 ml.

**Bladder score**
The mean preoperative bladder score was 4.26±1.38, which is significantly improved during follow-up with a mean value of 2.13±1.45 ($P<0.001$) in both categories.

**Discussion**
PUV is considered as a common cause of infravesical obstruction in pediatrics. PUV severity varies from mild to fatal prognosis, according to the degree of upper urinary tract obstruction [8]. Complications may develop, after valve ablation, on long-term follow-up. PUV management needs adequate care for neonates and infants with a Nephrology consultant to support and treat a UTI and prevent or correct metabolic acidosis and electrolyte imbalance [9,10]. The role of early urinary diversion in the management of boys with PUV is limited. In spite of its potential to improve renal function in the short-term (which is very important in male patients with precarious renal function) and to defer renal replacement to a later stage, there is no convincing evidence to support its role as a way of improving long-term renal function. Its effect on long-term bladder function remains unsatisfactory. Primary valve ablation appears to result in better long-term outcomes, and thus remains the treatment of choice. Nonetheless, urinary diversion must be considered in selected cases with clear goals and endpoints in mind. Given the frequency of chronic and progressive renal impairment, the importance of long-term evaluation of all patients with PUV cannot be overemphasized. Serial measurements of renal function, periodic urinalysis, blood pressure checks, and growth monitor should be performed for such patients [11].

We performed this study to evaluate which method obtains the current PUV management purpose of preserving renal function and functional lower urinary tract integrity.

PUV is increasingly recognized by routine prenatal ultrasound. The diagnostic findings are bilateral hydronephrosis and a distended thick-wall bladder. Occasionally, a dilated posterior urethra is seen. Low amniotic fluid and bright renal parenchyma (suggestive of dysplasia) provide important clues about the severity of renal damage [12]. PUV can present with antenatal hydronephrosis or postnatally with bladder outflow obstruction. Endoscopic valve ablation is the main modality of treatment and diversion is reserved if the former fails or is contraindicated. The prognosis of patients with mild disease and normal renal function is good, and in those with intermediate severity disease postnatal therapy improves the outcome [13].

Out of 50 patients with PUVs in our series, two (8%) patients were diagnosed antenatally. The lower incidence of antenatal diagnosis in our study could be attributed to improper antenatal care in Egypt. Our hospital is a referral university hospital and we receive patients from rural areas with low standard in social and education conditions; therefore, there is less interest in the antenatal care. In addition to the low experience of their physicians to aware of fetal anomalies.

The most common presentation in cases managed by valve ablation was difficult micturition (60%), out of them five only 20% were not improved during the postoperative period ($P<0.03$). The most common presentation was a febrile UTI (68%) in cases who were managed by initial vesicostomy, with five of them (20%)
still complaining in the postoperative follow-up ($P < 0.0001$).
The preoperative presentations have significantly improved
during the postoperative follow-up. Retention of urine
disappeared completely after management in both groups.
Although incontinence was not improved, the possible
cause is irreversible detrusor dysfunction.

Acute kidney injury (AKI) is not only of concern to adults,
as the pediatric population can also be affected just as in
adults, etiologies of pediatric AKI can be classified as
prerenal, intrinsic renal and postrenal. Although postrenal
causes are not the most common, they are associated with
the same complications and have as particularity that
surgical intervention is required for remission. PUV is the
most common pediatric obstructive uropathy and equally
represents an undermined cause of preventable AKI in
children [14]. To prevent this outcome in a low-income
population like ours, where an antenatal diagnosis is rarely
done, physicians should be aware of obstructive signs,
UTIs in children less than 2 years, and perform imaging of
the urinary tract when it is required [15].

Renal failure presented in 30% of boys with severe PUVs
before adolescence. Deterioration of renal function in
those children is due to bladder dysfunction, which is
irreversible even with adequate valve ablation [16].

In our study, the mean serum creatinine after stabilization
with urethral catheter drainage was higher in cases treated
with initial vesicostomy than in patients treated with valve
ablation $1.529 \pm 0.622$ mg/dl (range: 0.70–2.22). In both of
our studies, the preoperative serum creatinine is signifi-
cantly improved during follow-up after 1 year of the
management. Postoperative serum creatinine is significantly
decreased in primary valve ablation than vesicostomy cases.

In our study, postoperative hydronephrosis grade improve-
ment in both was not significantly different. In primary
valve ablation, backpressure changes improved in 25 of 35
(71.4%) evaluated renal units.

Sudarsanan et al. [17] studied 50 patients with PUV; out
of them, 44 underwent valve ablation and four patients
underwent initial vesicostomy, pyelostomy was per-
formed in two patients and primary valve ablation was
encountered in 44 patients, and two cases required
secondary vesicostomy. In those patients who underwent
valve ablation, 33 renal units were affected by hydroneph-
rosis, and 23 (69.69%) renal units demonstrated
postoperative improvement in hydronephrosis degree.

In our series, the VUR incidence was 63.3%. In group 1
managed by valve ablation, reflux improved in 27 of 35
(77.1%) evaluated renal units, whereas in group 2 21 out
of 32 were improved (65.6%). However, these results
were statistically insignificant ($P > 0.5$).

The most common symptom in the study by Malik
et al. [18] was associated fever (72%), whereas in our group it
was a febrile UTI (68%) and poor stream (60%). In our
cases, there was 70% VUR (right 15%, left 20.4% and
bilateral 34.6%). UTI was found in 40.8% of our
patients, who were treated with antibiotics, whereas in
severe or persistent cases they were treated with a
diversion. Mirshemirani et al. [19] concluded that
urinary drainage by small catheter or nasogastric feeding
tube in the early days of infancy – 7–15 days – followed
by valve ablation is the best treatment modality in PUV,
and urinary diversion if indicated improves the out-
come. Vesicostomy plays an important role in the initial
management of PUV where primary valve avulsion

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(a) Magnetic resonance urography in a 1-month-old boy who presented with retention of urine. (b) Marked regression of ureterorenal backpressure,
after initial vesicostomy, with reduction of serum creatinine from 2.1 to 0.6 mg/dl. However, he is still has detrusor dysfunction after posterior urethral
valve ablation.

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Fig. 2
cannot be readily done owing to lack of appropriate facilities and instruments [20]. In this series, vesicostomy was performed for 15 newborns and infants with urinary sepsis or poor general condition in spite of urethral catheter drainage and corrective medical treatment. Another indication for temporary vesicostomy in 10 cases was a small-caliber urethra, which precluded primary transurethral valve ablation.

VCUG is the most important imaging procedure for diagnosing PUV. Follow-up of our cases using DTPA revealed that there is a persistent upper tract dilatation (mostly unilateral) with mild to moderate functional obstruction in 10 patients, which improved in later follow-up. In this study, 14 of the 25 (56%) patients treated with primary valve ablation had severe bladder scores preoperatively versus 17 of the 25 (68%) treated with primary vesicostomy. Bladder appearance improved in both procedures within 12 months postoperatively.

The ultrasonographic bladder volume for these patients after 6 months of follow-up, age range 1–4 years, was found to be 100–240 ml. These values correlate with expected bladder capacity for age in our patients, which ranged from 115 to 250 ml [20]. Postoperative bladder score improvement is insignificant in both procedure categories.

Conclusion
Urinary drainage using small catheters or nasogastric tube in the early days of infancy followed by valve ablation is the best treatment modality in PUV, whereas there is an indication for initial vesicostomy management in prematurity, small body size, severe UTI or septicemia, and high-grade renal insufficiency.

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Conflicts of interest
There are no conflicts of interest.

References