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Role of vesicostomy in the management of posterior urethral valve in Sub-Saharan Africa

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Abstract *Objective:* To review the role of vesicostomy in the management of posterior urethral valve (PUV), in neonates and infants, given the limitations for endoscopic treatment in this setting.
Methods: A review of 35 patients who presented with posterior urethral valve over a 10-year period. Demographic and clinical information were prospectively recorded on a structured pro forma, and the data extracted analysed using SPSS 11.0.
Results: The 35 boys were aged 3 days to 10 years (median 3 weeks). Twenty-three (65.7%) had a vesicostomy (age range 3 days—3 years, median 3 weeks). The mode of presentation was poor urinary stream 15 (65.2%), urinary retention 4 (17.4%), and renal failure 6 (26.1%). Main findings were palpable bladder 23 (100%), hydronephrosis 4 (17.4%). Abdominal ultrasound confirmed hydronephrosis and thickened bladder wall, and voiding/expressive cystourethrogram confirmed dilated posterior urethra and vesicoureteric reflux in all 23 patients. Complications following vesicostomy were stoma stenosis 1 (4.3%), bladder mucosal prolapse 1 (4.3%), perivesicostomy abscess 1 (4.3%); there was no mortality. Following vesicostomy, 10 (43.5%) patients had excision of the valves and vesicostomy closure at age 2—8 years (median 4 years). They are well, with normal renal ultrasonographic findings, bladder capacity range 115—280 ml, and normal urea, serum electrolytes, creatinine, at 3 years of follow up. Thirteen (56.5%) are still awaiting valvotomy but have remained well and with normal ultrasonographic renal findings.
Conclusion: Vesicostomy is a useful temporising mode of urinary diversion in neonates and infants with posterior urethral valve (in the absence of unobstructed upper tracts) when facilities for endoscopic valve ablation are not readily available.

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Introduction

Posterior urethral valve is the commonest cause of bladder outflow obstruction in boys. The incidence is 1:5000—8000 live births [1]. If treatment is delayed, the obstruction may lead to end-stage renal failure [2]. Sometimes, end-stage renal failure may still occur after intervention if presentation is late [3].

There are several modalities for treatment of posterior urethral valves. The hallmark of all the modalities is valve ablation. This can be done by open, blind or endoscopic procedures. In developing countries endoscopic treatment is limited in neonates and infants due to lack of appropriate sized instruments. The neonatal cystoscope or valvotome may not be able to pass through a small neonatal urethra. In this circumstance, urinary diversion is used initially and followed later by definitive valve ablation when the urethral size would have reached an appropriate size.

The objective of this study was to review the role of vesicostomy, as a modality of urinary diversion in neonates and infants with posterior urethral valve, in a resource limited setting.

Patients and methods

In the period January 1999 to February 2009, 35 boys were managed for posterior urethral valve by the Division of Paediatric Surgery of Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. Clinical and operative details were prospectively recorded on a structured pro forma including: demographic data, mode of presentation, clinical findings, investigative evaluation, treatment, complications, outcome and follow up.

The information from the pro formas was extracted and analysed using SPSS version 11.0.

Results

The 35 boys were aged 3 days to 10 years (median 3 weeks). Twenty-three (65.7%) boys had a vesicostomy and have been reviewed.

Presentation

Fifteen (65.2%) patients presented with poor urinary stream, 4 (17.4%) had urinary retention at presentation, and 6 (26.1%) had renal compromise (Table 1). Those with urinary retention had a size 8 feeding tube passed to relieve the obstruction while awaiting vesicostomy. Vesicostomy was done after adequate resuscitation. Those with poor urinary stream had similar treatment before a vesicostomy. In all the 23 patients, a size 8 feeding tube was passed per urethra to empty the bladder, while laboratory investigations and imaging evaluation were being pursued.

All the patients had a palpable bladder. Four (17.4%) patients had ballotable kidneys as a result of hydronephrosis. Urine samples for culture were found to be sterile in all patients. Abdominal ultrasound confirmed hydronephrosis and bladder hypertrophy in all the patients. Voiding cystourethrogram showed dilated posterior urethra and bilateral vesicoureteric reflux in all the patients (Figs. 1 and 2).

Initial treatment

At presentation, patients were given antibiotics. Vesicostomy was done under general anaesthetic in 22 patients and in 1 under local anaesthetic due to poor clinical state (Fig. 3).

Complications

There was stomal stenosis in 1 (4.3%). This patient responded well to stomal dilatation. One (4.3%) patient had bladder mucosal prolapse which was left until the vesicostomy was closed. One (4.3%) patient had perivesicostomy abscess which was controlled by abscess drainage and local wound care.

Definitive treatment

Ten (43.5%) patients have had a valvotomy using Mohan's valvotome and vesicostomy closure at a median of 4 years, age range 2—8 years. Thirteen (56.5%) patients are still

Table 1 Renal status before and after vesicostomy, and bladder volume after vesicostomy closure.

No.	Age at valvotomy (years)	Renal state before vesicostomy	Renal state after vesicostomy closure	Bladder volume 6 weeks after vesicostomy closure (ml)	Expected bladder volume for age (ml)	Correlation coefficient for bladder volume (*r*)
1	2	RF	N	115	120	0.96
2	2	N	N	118	120	0.98
3	2	RF	N	119	120	0.99
4	2	RF	N	120	120	1.00
5	4.5	RF	N	240	247.5	0.97
6	7	RF	N	279	285	0.98
7	8	RF	N	315	320	0.98
8	4	N	N	235	240	0.98
9	4	N	N	240	240	1.00
10	7	N	N	280	285	0.98

RF = Renal failure, N = Normal.

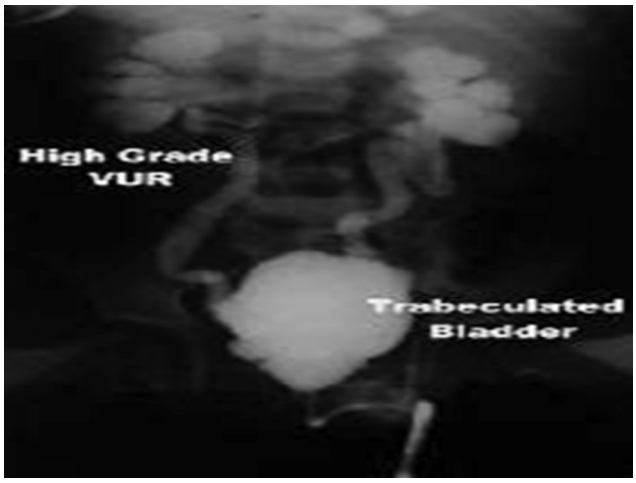

Figure 1 Voiding cystourethrogram showing bilateral vesicoureteric reflux.

awaiting valvotomy. These patients have however remained well with normal upper tracts and normal urea, serum electrolytes and creatinine at follow up.

Follow up

Follow up after vesicostomy was at 2 weeks, 4 weeks and thereafter monthly for 3 years. The bladder volume measured using ultrasonography 3 years after the vesicostomy closure in the 10 patients was 115—280 ml, age range 2—8 years (Table 1).

Discussion

Posterior urethral valve is a common cause of bladder outflow obstruction in children. The aetiology of this condition is not known, but it is believed to result from abnormal fusion of mesonephric ducts or anomalous insertion of these ducts into the cloaca during embryonic development [4].

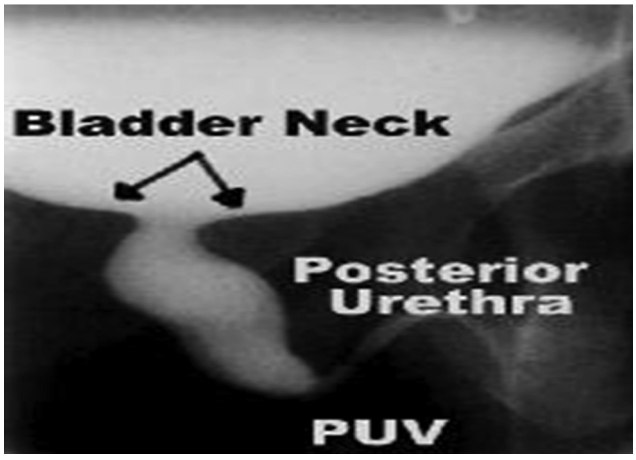

Figure 2 Voiding cystourethrogram, showing dilated posterior urethra.

Figure 3 Child with vesicostomy.

Young described three types of valve [5]. Type 1, where the obstructing membrane radiates distally and anteriorly from the verumontanum to the urethral membrane, most often causes urinary obstruction. Type 2 valves are prominent longitudinal folds of hypertrophied smooth muscle that radiate cranially from the verumontanum to the postero-lateral bladder neck; these are usually non-obstructive and may be clinically insignificant. The type 3 valves appear as a membranous diaphragm with a central aperture at the level of the verumontanum; this type of obstructive tissue has been termed congenital obstructing posterior urethral membrane or COPUM [6]. There is a type 4 valve in patients who have prune belly syndrome [7]. This was not described by Young, but these valves occasionally cause urinary obstruction.

The type of valves in our patients could not be ascertained due to lack of paediatric endoscopes in the centre. This was one of the major limitations of the study.

Most of our patients presented with poor urinary stream. This symptom may sometimes be difficult to identify because most neonates would urinate with nappies on, making it difficult for parents to readily notice this symptom. This may account for the late presentation in the present report. The four patients who presented with urinary retention came as soon as this was noted. Other symptoms, such as straining during micturition, frequent urination, urinary incontinence, were not present in our patients. Prenatal diagnosis was not made for any patient in the present report. Prenatal diagnosis may attract foetal intervention, such as vesico-amniotic shunts and intrauterine valve ablation, which has been attempted in some centres [8—10].

Vesicostomy as a mode of urinary diversion has some advantages. It is easy to construct. It decompresses the bladder and upper tracts. It does not affect bladder growth. This is because vesicostomy allows the bladder to cycle and grow, with voiding at low pressure via the stoma, and allows the bladder to be in contact with urinary growth factors. The other advantage is that valve avulsion can be done retrogradely via the vesicostomy with a valvotome. This is because the bladder neck can be accessed through the vesicostomy. Vesicostomy has been reported to be as effective as valve ablation as initial therapy [11—13]. Vesicostomy is easy to manage in terms of care and it protects the upper urinary tracts from further deterioration [14,15].

Table 2 Urea, electrolytes and creatinine at presentation before vesicostomy.

No.	Urea (mmol/l)	Na^+ (mmol/l)	K^+ (mmol/l)	Cl^- (mmol/l)	HCO_3^- (mmol/l)	Creatinine (Mg%)
1	9.6	133	4.1	102	24	56
2	6.1	140	5.2	98	29	44
3	20.0	118	5.6	86	18	1012
4	2.4	136	3.7	98	23	71
5	27.5	138	5.2	98	20	236
6	7.1	126	7.2	82	16	94
7	35.7	130	5.8	90	10	212
8	4.3	130	5.2	94	20	32
9	4.4	138	5.1	98	26	40
10	6.2	137	4.8	108	24	30

Ten (43.5%) patients had a valvotomy using Mohan's valvotome and vesicostomy closure at the same sitting. Evaluation of these patients after valve ablation and vesicostomy closure showed normal bladder volume and good urinary stream. This agrees with findings by Al'bitskaia et al., in which normal urinary bladder function was noted in patients with epicystotoma [16]. Measurement of bladder capacity was not done before the valve ablation, making it difficult to compare the preoperative and postoperative bladder capacities.

The ultrasonographic bladder volume for these 10 patients, age range 2—8 years, was found to be 115—280 ml (Table 1). These values correlate with expected bladder capacity for age in our patients [17]($r = 0.99$). Hydronephrosis was also noted to have resolved in the patients at 3 years of follow up.

The urea, electrolyte and creatinine levels of these patients were also assessed. The overall picture showed normalization of these levels after the vesicostomy (Tables 2 and 3). There was a significant difference between the urea and creatinine levels before the vesicostomy and after the vesicostomy closure (Z, $P < 0.05$). There was also a significant difference in electrolyte values before the vesicostomy and after the vesicostomy closure (X^2, $P < 0.05$).

In this study, another limitation was lack of facilities for urodynamic studies and lack of renal scintigraphy to assess renal function. It was difficult to reassess vesicoureteric reflux after vesicostomy closure in some of our patients due to financial constraints. However, in 4 (17.4%) patients, no reflux was noted on the voiding cystourethrogram, 3 years after vesicostomy closure.

The other modalities of upper urinary tract diversion may appear as better drainage procedures when compared to vesicostomy. But these procedures may be difficult to perform and may affect bladder capacity when urine is diverted from it [18]. Proximal diversion has not been shown to prevent end-stage renal disease in most of these patients [19].

The gold standard for the treatment of posterior urethral valve is valve ablation. This could be effected by open or endoscopic approaches. Neonatal cystoscopes are often not readily available in our environment, thereby making primary valve ablation difficult in this category of patients. As a consequence, urinary diversion is done before the definitive valve ablation.

Some authors have compared vesicostomy and primary valve ablation, with vesicostomy having a tendency for favourable outcome, when these patients were evaluated for dryness and glomerular filtration [11]. However, some authors believe that early valve ablation may achieve good maximum bladder capacity and socially functional recovery [12].

In conclusion, vesicostomy plays an important role in the initial management of posterior urethral valve where primary valve avulsion cannot be readily done due to lack of appropriate facilities and instruments.

Table 3 Urea, electrolytes and creatinine 6 weeks after vesicostomy closure.

No.	Urea (mmol/l)	Na^+ (mmol/l)	K^+ (mmol/l)	Cl^- (mmol/l)	HCO_3^- (mmol/l)	Creatinine (Mg%)
1	4.5	138	4.2	108	24	28
2	3.3	140	3.8	96	23	25
3	6.1	138	5.1	98	30	44
4	2.5	136	3.5	94	21	30
5	5.6	138	3.7	96	23	24
6	5.1	137	3.5	98	24	30
7	6.2	140	5.0	102	28	40
8	3.3	136	3.8	98	21	20
9	3.6	137	3.5	96	24	22
10	3.4	135	3.7	98	28	25

Conflict of interest

None.

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