CASE REPORT

Bladder Outlet Obstruction Secondary to a Posterior Urethral Stone in a 9-Month-Old Infant

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ABSTRACT

Introduction: Bladder Outlet Obstruction (BOO) due to urethral stone in an infant is rare, and may be misdiagnosed for other common causes such as posterior urethral valves (PUV), hence it requires a higher index of suspicion. However, the lack of facilities for endoscopic surgery and stone analysis in low-resource-settings, with associated financial constraint, hinders proper evaluation and management of this condition.

This report discusses the rare presentation and management of a 9-month-old infant with BOO secondary to an obstructing posterior urethral stone, while highlighting the challenges of management of this condition in a resource limited setting.

Patient's concerns and clinical findings

He presented on account of difficulty in passing urine of 3 weeks duration, culminating into an episode of acute urinary retention, with associated suprapubic swelling. Abdominal USS done was suggestive of PUV, however VCUG was essentially normal.

Primary diagnosis, intervention and outcome

An initial assessment of acute urinary retention secondary to BOO from suspected PUV was made, which was relieved with urethral catheterization.

He subsequently had a cystoscopy which excluded PUV, with findings of multiple bladder-trabeculations, a moderately dilated posterior-urethra and a non-impacted smooth greyish-colored stone measuring about 4mm by 5mm in the posterior urethra, for which he had an open cystolithotomy. Post operative period was uneventful, and he was

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discharged to be followed up in clinic for further evaluation.

He is currently voiding satisfactorily per urethra at 6 months follow-up with no recurrence of symptoms. Analysis of the stone could not be done also, due to unavailable facilities for stone analysis, and parents are unavailable to do other requested investigations due to financial constraint.

Conclusion: BOO from a urethral stone is a rare diagnosis in an infant, hence it requires a high index of suspicion. In resource limited settings, appropriate evaluation and management may be hindered, due to limitations in facilities and financial resources.

INTRODUCTION

Urolithiasis is quite rare in the paediatric age group compared to the adult population particularly in infants, and its presentation may also vary [1]. Urethral stones are more particularly rare in infants and young children, accounting for less than 1% of all urinary tract calculi in paediatric cases [2].

The various postulated theories on the pathogenesis of urolithiasis include the nucleation theory, the matrix theory, crystal inhibition theory, theory of mass precipitation, etc., and in many instances, an underlying etiological factor may be identified [3]. There are several etiological risk factors associated with this condition, varying from genetic to environmental factors, which include; metabolic abnormalities like hypercalciuria, recurrent urinary tract infection, urinary tract abnormalities, and the use of medications such as furosemide [4]. Dietary factor plays an important role that can contribute to changes in urine biochemistry and predispose to stone formation, implicated in the paediatric age group is vitamin D through the excessive use of vitamin supplements that predispose children to hypercalciuria [5].

Bladder outlet obstruction (BOO) secondary to a urethral stone in infancy is quite an exceptional finding, often mimicking more common congenital obstructive pathologies such as posterior urethral valves (PUV), hence there is need for a high index of suspicion, proper evaluation, and appropriate management [6]. Appropriate management may however be limited in low- and middle-income countries due to financial constrain, and where facilities for stone analysis and endoscopic surgeries are not readily available. [7]

This report discusses the presentation and management of a 9-month-old infant with BOO secondary to an obstructing urethral stone, initially thought to be a PUV. It also highlights the challenges of management of this condition in a resource limited setting.

Patient Information

A 9-month-old male child who resides with Yoruba parents in the northern part of Nigeria, presented to our emergency paediatric unit on account of difficulty in passing urine of 3 weeks duration, characterized by poor stream with associated straining. There were no history of associated frequency or fever. Symptoms progressively worsened culminating into an episode of acute urinary retention with associated suprapubic swelling which was relieved via urethral catheterization at our facility. There was no history of similar symptoms in the past. No history if recurrent urinary tract infection, gross hematuria, metabolic disorders or the chronic use of medications such as vitamin D supplements or loop diuretics in the patient or care giver. His prenatal, natal and post-natal history was uneventful, with no family history of urolithiasis or metabolic diseases.

Clinical Findings

On examination, He was conscious, not pale, anicteric, not cyanosed, well hydrated, with no pedal edema. His vital signs were essentially normal, with a PR of 110/m, RR of 25c/m and an SPO2 of 98%. Abdominal examination revealed a full abdomen, that moved with respiration, with a suprapubic swelling, and no palpable organ enlargement. He had a circumcised phallus, with palpable intra-scrotal testes bilaterally. The meatal opening was normally sited at the tip of the penis, and he had no

urethral in durations or palpable urethral mass. Neurological examination was essentially normal.

Time line

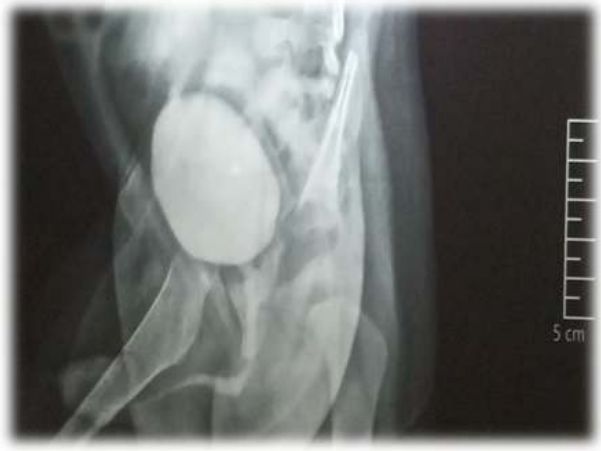
Table 1: Timeline of events

Time	*Event*
3 weeks duration	*Onset of poor urinary stream and straining*
Day 0	Acute urinary retention and suprapubic swelling relieved with catheterization
Day 1	USS suggestive of PUV
Day 5	Normal VCUG
Day 10	Cystoscopy findings of urethral stone and open cystolithotomy
Post-op day 10	Removal of urethral catheter
Post op day 12	Discharged home
6 months post op.	Follow up visit and normal clinical status

Diagnostic Assessment

Result of requested investigations showed a normal FBC and EUCr. Urine MCS yielded no growth. The abdominal USS done showed thickened bladder wall and trabeculations, with a key-hole sign suggestive of PUV. There were no features of hydronephrosis or hydroureters. VCUG done however showed normal findings, with normal bladder contour, normal urethral caliber and absent vesicoureteral reflux (Image 1). An initial assessment of BOO secondary to suspected posterior urethral valve was made, to rule out other possible differentials such as a urethral stricture, a neurogenic bladder or an obstructing meatal stenosis.

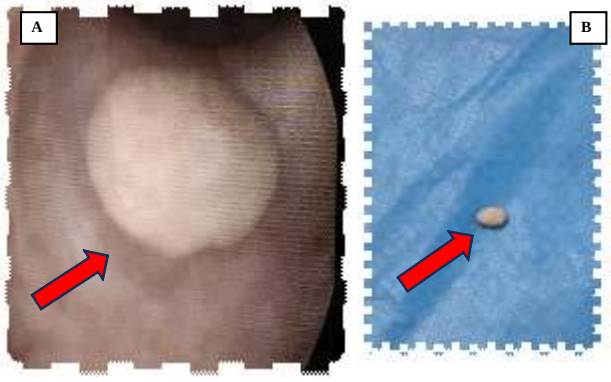
Image 1; Voiding cystourethrogram showing normal posterior urethral contour and bladder outline



Therapeutic Intervention

He was placed on continuous bladder drainage, and also commenced on analgesics and antibiotics. He subsequently had a rigid cystoscopy which showed intraoperative findings of multiple trabeculations, a moderately dilated posterior urethra, a normal bladder neck, and a non-impacted greyish-colored stone measuring about 4mm by 5mm, located in the posterior urethra, which was "pushed back" into the bladder, and then had an open cystolithotomy done to retrieve the specimen (Image 2). There were no evidence of posterior urethral valves, urethral stricture, polyp, or bladder diverticulum.

Image 2; (A) Intra-operative view of urethral stone in the posterior urethra (B) Retrieved 4*5 mm stone specimen



Surgery was done under general anesthesia with endotracheal intubation, in supine position. Broad spectrum antibiotics prophylaxis with ceftriaxone was administered prior to incision. A suprapubic transverse skin incision was made, and dissected down to expose the bladder maintaining an extraperitoneal approach. A 2cm vertical cystostomy was done in between two stay sutures on the dome of the bladder, and the stone was palpated and retrieved with the use of a forceps. Water tight closure of the blader was done in two layers with an inner continuous closure, and outer seromuscular interrupted closure using vicryl 4-0 suture, as well as abdominal wall and subcuticular skin closure.

Endoscopic retrieval was not feasible for this case due to unavailability of paediatric sized endoscopic equipment.

Follow Up and Outcomes

The post-operative period was well tolerated and uneventful. He was maintained on continuous bladder drainage for the next 10 days in order to allow adequate bladder healing, and was subsequently discharged to be followed up in clinic for further evaluation, and to have a full metabolic work up, stone analysis, and imaging done.

He is currently voiding satisfactorily per urethra at 6 months follow-up with no recurrence of symptoms; however, the parents are currently unable to do the requested investigations due to financial constraint.

DISCUSSION

Paediatric urolithiasis involves the formation of stones within the urinary tract of children, involving mainly the kidneys, ureters or bladder, and rarely the urethra. Globally, the prevalence of urolithiasis varies across different regions of the world due to factors such as dietary and environmental factors, with an estimated prevalence ranging from 1% to 13% [8]. Although paediatric urolithiasis is relatively rare compared to adult urolithiasis, its prevalence has been increasing in recent years and accounts for approximately 2%–3% of all urolithiasis cases [1]. Factors such as change in dietary patterns, obesity and genetic factors have been postulated as possible drivers for this rise in prevalence paediatric urolithiasis [9].

This patient presented with classical features of lower urinary tract symptoms (LUTS) including difficulty in urination, progressive suprapubic swelling, and eventual acute urinary retention (AUR). These features overlap significantly with the clinical presentation of PUV, which is a more common cause of congenital BOO in male infants [6]. This highlights the diagnostic challenge associated with urethral calculi in this age group, necessitating a high index of suspicion and reliance on appropriate imaging modalities.

Ultrasound scan (USS) remains the first-line imaging modality in children with suspected BOO due to its safety, accessibility, and effectiveness in detecting upper urinary tract dilatation and bladder wall changes [1]. In this patient, the USS suggested PUV, however, a voiding cystourethrogram (VCUG) done was essentially normal. This incongruity highlights the limitations of ultrasound in definitively diagnosing BOO etiology and reinforces the importance of combining imaging modalities for accurate diagnosis. The use of cystoscopy provided definitive diagnostic clarity in this case. The direct visualization revealed a non-impacted stone located in the posterior urethra, associated with bladder trabeculations and posterior urethral dilatation: findings likely secondary to chronic obstruction.

While stone analysis could not be conducted in this case due to resource and financial constraints, it is crucial in understanding the stone's composition, guiding metabolic evaluation, and preventing recurrence. According to the European Association of Urology (EAU) guideline, basic metabolic evaluation and reliable stone analysis are recommended for all stone formers, especially in paediatric patients and recurrent stone formers. [10]. Furthermore, in developed settings, minimally invasive techniques such as endoscopic lithotripsy and retrieval using paediatric-sized instruments are

often employed [1]. However, such interventions are limited in many low-resource settings due to the unavailability of paediatric endoscopic equipment and trained personnel [7]. Consequently, open cystolithotomy remains a feasible alternative despite its associated morbidity. The case illustrate pragmatic but safe adaptation in a resource limited setting, and shows that open surgery remains appropriate when endoscopic equipment and expertise are lacking.

The postoperative period in this patient was uneventful, indicating that with prompt intervention, outcomes can be favorable, despite infrastructural limitations. However, the inability of the caregivers to follow up with recommended evaluations due to financial constraints reflects a broader systemic challenge with respect to affordability of healthcare. In many low- and middle-income countries (LMICs), access to specialized urological care is limited, and affordability remains a significant barrier to comprehensive evaluation and follow-up, especially with limited health insurance coverage [7].

Strengths and Limitations

This case report describes a rare presentation of paediatric urethral stones occurring at a very young age, in an infant, with a clear operative management and outcome and its relevance to our resource limited setting. Its limitations include the absence of stone analysis, and incomplete metabolic work up of the patient due lack of facilities and financial constrain, as the caregiver could not afford doing any follow-up investigations for the child.

Patient Perspective

Informed consent was duly obtained from the parent of the child. They expressed great surprise at the possibility of a stone being formed inside their child's body. They were relieved at the resolution of symptoms following discharge, and were hopeful that the symptoms would not recur.

CONCLUSION

BOO secondary to a urethral stone in an infant is quite rare. This report underscores the importance of considering urethral calculi in the differential diagnosis of BOO in infants, particularly when initial diagnostic findings are inconclusive or atypical for PUV, hence the need to maintain a high index of suspicion for urethral calculi in this instance.

In resource-constrained environments, strengthening health systems through investment in paediatric urological training, affordable diagnostic facilities, and universal health coverage is imperative to improve outcomes in such rare but significant clinical presentations.

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