CASE REPORT
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Bladder stone in a 1-year infant with recurrent urinary tract infections: a rare case report

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ABSTRACT

Background: Bladder stone is a rare disease accounting for 5% of all urinary calculi. It is more common in middle- and low-income countries due to nutritional obstacles, water sanitation, and warm climates. Primary bladder calculi are most common in children younger than 10 years old, with a peak incidence at 2 to 4 years. There have been no reports of bladder stones in children under 2 years of age. This case study aims to evaluate the bladder stone in a 1-year infant with recurrent urinary tract infections.

Case Presentation: An infant boy 1 year and 2 months presented with a 6-month history of complaints of pain on micturition presented with pulling the penis, cloudy urine, and recurrent fever in our clinic. During the 6 months before admission, he visited several pediatric clinics and was diagnosed with and treated for UTI. On ultrasonography, we found a bladder stone 1,9 x 1,3 cm in size. Then we performed open cystolithotomy under general anesthesia. One day after surgery, the patient was discharged from the hospital.

Conclusion: Children who live in endemic areas are more likely to develop bladder stones due to dietary issues. Preventing dehydration, treating urinary tract infections effectively, and securing metabolic abnormalities are the methods for reducing the prevalence of pediatric bladder stones. Pediatric bladder stones must be diagnosed and treated to avoid the stones' recurrence and improve quality of life.

Keywords: Pediatric, Bladder stone, Endemic bladder stone, Open cystolithotomy.
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INTRODUCTION

Bladder stones are the most common manifestation of lower urinary tract lithiasis, accounting for 5% of all urinary stone diseases and approximately 1.5% of urologic hospital admissions in the Western world.[1] There has been a paradigm shift in the size and location of stones in the lower urinary tract. In the past 50 years, the incidence of vesical calculus has steadily declined in the Western world. The underdeveloped nations continue to see vesical calculi, particularly in children.[2] Bladder calculi in nonendemic areas are common in adults and secondary to other disease processes. In endemic areas, the calculi are seen frequently in children and do not exist with other anomalies.[1,2] Traditionally, bladder stones are classified as migrant, primary idiopathic, or secondary. Primary bladder stones usually are described as those that form without any predisposing cause, whereas a secondary reason is found in most patients with certain predisposing causes.[1] Primary bladder stones are historically associated with nutritional deficiency.[2] Children in endemic areas consume a cereal-based diet thatis poor in animal protein and low in phosphate. Low dietary intake of phosphates leads to hypophosphaturia, promoting the precipitation of calcium oxalate and ammonium acid urate. In addition to the earlier-mentioned factors, it has been proposed in endemic areas that a diet rife withoxalates leads to hyperoxaluria, leading to calcium oxalate stones.

The primary bladder stones are known to form within the first 5 years of life and have a male preponderance. Primary bladder calculi are most common in children younger than 10, with a peak incidence at 2 to 4 years. The disease is much more common in boys than in girls, with ratios ranging from 9:1 to as high as 33:1.[3] The composition of primary bladder stone is commonly ammonium acid urate, calcium oxalate, uric acid, and calcium phosphate.[2] Children suffering from bladder stones rarely seek medical attention acutely. There are often preceding symptoms, such as the passage of cloudy and sandy urine. Children often experience abdominal discomfort, dysuria, frequency, and haematuria. Pulling the penis, in children, is considered pathognomonic of bladder stone. In adults, the presentation can be acute urinary retention; however, this is rare in children with primary bladder stones.[4]

The options for treating bladder stones are medical management, extracorporeal shock wave lithotripsy, transurethral lithotripsy, suprapubic cystolithotomy,

suprapubic cystolithotripsy, and open surgery.[4,5] The factors that decide the line of management are the size of the stone, stone composition, age of the patient, build of the patient, coexistent location of urolithiasis elsewhere, concomitant bladder outlet obstruction, and available expertise or equipment. Open cystolithotomy has been considered the gold standard surgical procedure in pediatric bladder stones. Workers have also reported the feasibility of catheterless and drainless cystolithotomy in children with two layered closures. However, recent advances in minimally invasive technology and endoscopic techniques have improved the urological armamentarium to treat bladder stones in pediatrics definitively.[4–7]

In this report, we present a case of a bladder stone in an infant with recurrent urinary tract infection with the complaint of irritative voiding symptoms successfully managed with open cystolithotomy.

CASE REPORT

An infant boy, 1 year and 2 months, presented with a 6-month history of complaints of pain on micturition presented, with pulling the penis, cloudy urine, and recurrent fever in our clinic. Duringthe 6 months before admission, he visited several pediatric clinics and was diagnosed with and treated for UTI. His symptoms did not improve, and he was referred to Balimed Buleleng Hospital Urology Clinic for further evaluation and management.

The boy's parents was a farmer; he had one brother and they lived together in a poor, rural seaside area. There was no family history of bladder stones. From birth until 1 year of age, he was fed formula milk. His diet consisted of starchy foods and foods with high fiber content. His water and total protein intake were insufficient, especially animal protein.

On physical examination, we found the patient's weight was 8 kg and height was 72,5 cm (Z score < -1). Vital signs were within normal limits. There was no flank knocking pain, abdominal tenderness, or palpable mass. Other physical findings were normal. On laboratory investigation, hemoglobin was 10,2 g/dL, leukocyte count was 11930/uL, and platelet count was 409 x 10^3 /uL. Urinalysis revealed

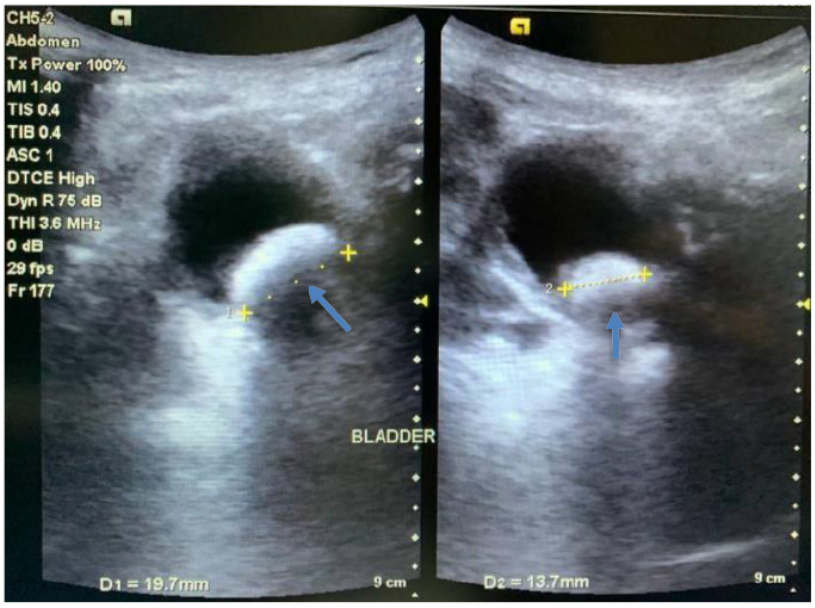
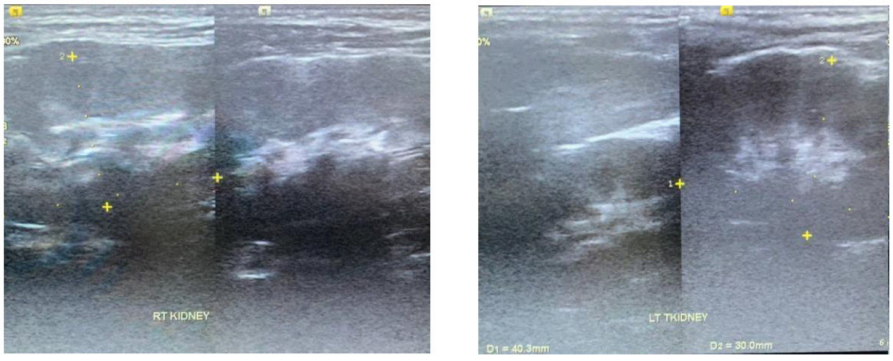


Figure 1. Urology ultrasound confirmed the bladder stone (blue arrow) about 1,9 x 1,3 cm in size.



(a) **(b)**

Figure 2. Urology ultrasound of the right (a) dan left (b) kidneys were normal.

pH 6.0, albumin +1, ketone +1, leukocyte +3 on macroscopic examination and 2 -3 erythrocytes / high power field, 15 – 17 leukocyte / high power field on microscopic examination. Blood urea nitrogen, creatinine, sodium, potassium, calcium, and chloride were all normal on biochemical analysis. Bleeding time and clotting time checks were

normal. On urology ultrasound, we found a bladder stone 1,9 x 1,3 cm in size. Another abdominal organ, including both kidneys, was normal (**Figure 1** and **Figure 2**).

Then, we performed cystolithotomy under general anesthesia (**Figure 3**). A Foley catheter was inserted and ceftriaxone 150 mg intravenous was administered for prophylaxis. We made a Pfannenstiel incision on the suprapubic region, deepened to the rectus fascia (**Figure 4**). Fascia opened, and the muscle then split. The bladder was incised, but before that, we instilled 200 ml saline liquid into it and the stone was removed with a stone tang. After that, we wash the wound and bladder with saline liquid until there are no more stone flakesand dirt. Then we removed the catheter and closed the bladder with one layer locking continuing suture using absorbable thread. We close the surgical wound without leaving a drain on it. We continued intravenous antibiotics and intravenous paracetamol for analgetic. One day after surgery, the patient's condition was good, and the urine

Figure 3. An elliptical bladder stone was extracted by open cystolithotomy.

Figure 4. Pfannenstiel incision and post-operative wound closure.

color was clear, so we let him be discharged from the hospital.

Six days after surgery, the patient went to the urology outpatient clinic, and the stone composition analysis was 90 % of uric acid and 10 % of the matrix. He just complained of mild pain in his penis, no fever, and no hematuria. The post-operative surgical wound was in good condition, with no sign of infection.

DISCUSSION

Bladder stones in children are evident from archeological discoveries, and historical reports show that 2-3 % of children can develop urinary calculi.[8] Nonetheless, in nations where the stone disease is endemic, urolithiasis remains a serious problem, accounting for 4-8% of cases of end-stage renal disease during childhood.[9] The prevalence of bladder stones was reported in Europe and North America in the 18th and 19th centuries.[10] This trend later shifted to the East, stretching in a broad stone belt from Egypt through Iran, Pakistan, India and Thailand to Indonesia.[11] Urinary bladder stone contributes about 50% of pediatric urolithiasis.[12] Endemic bladder stones are higher in developing nations and more common in males, with male-female ratios between 10:1 and 4:1 reported. Bladder stones were widespread in children in Indonesia, particularly in West Sumatra, with a yearly prevalence of 8.3 per 100,000 people, peaking at ages 2-4, and usually occurring in low-income families that consumed little protein and phosphate. A pediatric bladder stone is a rare disease; in the last five years, there have been few reports about this condition. Maulana et al., reported a large bladder stone in Sasak young teens with 4 cm in diameter.[13] Rizkyansyah H et al., reported bladder stones in a six-year-old boy with 2,4x 1,8 cm in size.[14] Sharma G et al. reported bladder and urethral stones 12-year-old child.[11] Our patient complains of pain on micturition, presented with pulling the penis, cloudy urine, and recurrent fever in the last 6 months. Based on our findings, there's no obstruction to the flow of urine and no evidence of pathological abnormalities in the organs. Therefore, the etiologyin this patient is a primary or endemic bladder stone.

Primary bladder stones are historically associated with nutritional deficiency. The cause for the formation of these calculi is believed to be a combination of decreased urine output, alteration in the urine PH, and other metabolic abnormalities. Vitamin deficiency and dietary compromise in the form of deficient animal proteins are responsible for the genesis of these stones. Children in endemic areas consume a cereal-based diet that is poor in animal protein and low in phosphate. Low dietary intake of phosphates leads to hypophosphaturia, promoting the precipitation of calcium oxalate and ammonium acid urate. In addition to the earlier mentioned factors, it has been proposed in endemic areas that a diet rife with oxalates leads to hyperoxaluria, leading to calcium oxalate stones. The composition of primary bladder stones is commonly ammonium acid urate, calcium oxalate, uric acid, and calcium phosphate.[4] Girls' urethras are less convoluted and shorter than those of boys, and they may pass the majority of calculus debris without holding nuclei in the bladder. A stone core forms and is retained in some males. The overall result of storage and resorptive mechanisms functioning over months or years determines subsequent stonedevelopment.[3]

Bladder stones are rarely asymptomatic at the time of presentation. The most common manifestation of bladder calculi is terminal haematuria. In addition, the patients have various lower urinary tract symptoms, including intermittency, frequency, urgency, decreased flow, urge incontinence, and abdominal pain. Children suffering from bladder stones rarely seek medicalattention acutely. There are often preceding symptoms, such as the passage of cloudy and sandy urine. Children often experience abdominal discomfort, dysuria, frequency, and haematuria. Pulling thepenis, in children, is considered pathognomonic of bladder stone. In adults, the presentation can be acute urinary retention; however, this is rare in children with primary bladder stones.[4] Rarely, bladder stones can lead to kidney damage.[15] In general, they are mobile within the intravesical space. As a

result, they hardly restrict the bladder exit and do not reduce urine flow. Large stones may remain for a very long time without showing any symptoms.[3] However, larger stones can damage the bladder neck and put a mechanical strain on the ureteral orifice if left untreated, leading to intravesical obstructive uropathy.[15]

Abdominal radiography, ultrasonography, intravenous pyelography, and computed tomography are the most useful tools for diagnosing children with stones. Clinicians use plain abdominal radiography and ultrasonography for initial assessment. Ultrasonography can diagnose and reveals many types of stones, including some radiolucent stones.[2] Our patient underwent a cystolithotomy (open bladder stone surgery) with a 1,9 x 1,3 cm stone size. The options for treating bladder stones are medical management, extracorporeal shock wave lithotripsy, transurethral lithotripsy, suprapubic cystolithotomy, suprapubic cystolithotripsy, and open surgery. The factors that decide the line of control are the size of the stone, stone composition, age of the patient, build of the patient, coexistent location of urolithiasis elsewhere, concomitant bladder outlet obstruction, and available expertise or equipment.[4] According to the Association ofIndonesian Urologists' 2018 guidelines for urinary tract stones, endoscopic lithotripsy is the main treatment option for stones smaller than 20 mm. The main treatment option for stones larger than 20 mm or in children is open surgery (open cystolithotomy), but endoscopic lithotripsy is also an option.[16] Due to the excellent stone-free rate and accessibility of published long-term data, traditional open cystolithotomy is the gold standard surgical method for treating children's bladder stones.[17,18] Transurethral cystolithotripsy has recently gained popularity as an alternativeto open cystolithotomy. However, because urethral diameters are tiny and there are issues with iatrogenic urethral constriction, the usefulness of this method is restricted, particularly in boys.[19,20] Many modern techniques and equipment are still unavailable in some underdeveloped nations, and many patients cannot afford the prices of less invasive operations. Under these circumstances, open surgery is risk-free, productive, has a manageable hospital stay, is very well received by the patient, is inexpensive, causes little morbidity, and has a high stone-free rate.[19]

Our patient was discharged one day after surgery without the urethral catheter. Workers have reported the feasibility of catheterless and drainless cystolithotomy in children with two-layered closure.[4] Six days after surgery, the patient went to the urology outpatient clinic. He just complained of mild pain in his penis, no fever, no haematuria, and he could void spontaneously without any sign of inflammation. A catheter in the bladder following surgery is advised in some publications, as is the placement of a drain in the retropubic area for a few days to allow for the drainage of urine or hematoma in the event of postoperative leakage. However, some negative effects of catheter use, including infection and stricture, need to be watched carefully.[21] In order to reduce catheter-associated urinary tract infections, the length of the catheterization should not exceed 8 days.[22-25]

This case report described the patient's disease and treatment in detail, which can be helpful to physicians dealing with similar cases. But it just reflects one case, it is limited in that it cannot prove causation or generalize results to a larger population.

CONCLUSION

Children who live in endemic areas are more likely to develop bladder stones due to dietary issues. Preventing dehydration, treating urinary tract infections effectively, and securing metabolic abnormalities are the methods for reducing the prevalence of pediatric bladder stones. Pediatric bladder stones must be diagnosed and treated to avoid the stones' recurrence and improve quality of life.

CONFLICT OF INTEREST

The author declares no personal or financial conflict of interest in writing the casereport.

ETHICS APPROVAL

Permission or informed consent has been approved by the patient and urology doctor of Balimed Buleleng Hospital for using the patient information and medical record in this case report.

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AUTHOR CONTRIBUTIONS

All authors contributed equally in writing and revising the case report from the conceptual framework until draft manuscript preparation before being published.

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