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Case report

Giant Bladder stone and rectal prolapse complication in pediatric patient: Case report and literature review

Agung Hidayatulloh [a], Alif Firman Firdausy [b,*], Muhammad H. Mahyuddin [c], Olga P. Atsira [c], Sekar A. Priandhini [c], Nailah Ibtisam [c], Rakha R. Ibrahim [c]

[a] Department of Emergency Room, Sakinah Islamic Hospital, Mojokerto, Perumahan Japan Raya Tahap 3 Blok TT No. 17 Japan, Sooko, Mojokerto 61361, East Java, Indonesia
[b] Department of Biomedical and Clinical Science, Faculty of Medicine and Health Science, UIN Maulana Malik Ibrahim Malang, Indonesia
[c] Faculty of Medicine, Airlangga University, Surabaya, Jl. Morowudi No 66 Cerme, Gresik, East Java 60132, Indonesia

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ABSTRACT

Introduction and importance: A giant bladder stone (BS) in the urinary tract system with a rectal prolapse complication is a rare urologic problem; it is even rarer in pediatric patients. In the case of bladder stone formation, a variety of steps result in a variety of stone compositions. This study aims to understand the rare disease course of a one-year-old patient with bladder and urethral stones and a rectal prolapse complication.

Case presentation: A one-year-old boy presented with an inability to urinate since morning. It was a recurring incident for about a year but never resolved. The patients experienced irregular diarrhea and difficulty eating and drinking. Anal inspection revealed prolapse recti. The laboratory investigation found leukocytosis and anemia with normal blood urea nitrogen and creatinine. Urine tests revealed leukocyturia and hematuria. A plain radiograph of the abdomen showed a round opacity around the pelvic area. Ultrasonography of the abdomen and urinary tract revealed a giant BS and severe bilateral hydronephrosis. Thus, a cystolithotomy procedure was performed, and an additional urethral stone was found. Obtained bladder stones with a size of 30 × 21 × 15mm, with 57 % of uric acid and 33 % of calcium oxalate. A manual reduction of the prolapsed rectum was also performed during surgery. There was no recurrence of the prolapsed rectum after surgery.

Clinical discussion: BS is very rare in the pediatric population. The development of our case's stone composition starts with pure uric acid, which is later enveloped by calcium oxalate due to its lack of acidic atmosphere. Rectal prolapse occurs due to increased abdominal pressure caused by straining during urination.

Conclusion: The pathogenesis of BS is multifactorial, with local and systemic factors. Early diagnosis and comprehensive history-taking are essential for BS management decisions. The management of BS depends on its size, composition, and symptoms.

1. Introduction

Bladder stone incidence rates are very rare in pediatric patients. Only 1 % to 5 % of cases are found in epidemiological studies (1). The type of stone that is frequently found in developed countries is struvite or calcium oxalate dihydrate, whereas ammonium uric acid is the type of stone that is frequently found in developing countries. The reasons why bladder stones are common in low-income countries are poor nutrition, poor water sanitation, and warm temperatures (2). Other factors, such as metabolic, environmental, and urogenital abnormalities, can also cause BS (3). In Indonesia itself, especially in West Sumatra, the incidence of bladder stones obtained is 8.3/100,000 population, with ages 2–4 years as the peak. Families with low protein and phosphate diets are more likely to have these conditions. Many children suffer from diarrhea (4). Pediatric patients experience BS at a rate of roughly 1.1 per 1000 each year. According to research from Malang, Indonesia, kidney stones affect 2.2 % of all stone diseases. Bladder stones make up 71.1 % of all urinary tract stones in pediatrics (5).

The most common symptoms of urinary tract stones in pediatrics are frequency and urgency incontinence; other symptoms such as dysuria, pyuria, difficulty urinating, and lower abdominal pain are also often encountered. About 20 % to 50 % of these children report having fever-

* Corresponding author.
E-mail address: aliffirman.firdausy@uin-malang.ac.id (A.F. Firdausy).

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related systemic problems (6). In addition, 33–90 % of patients with bladder stones also have hematuria, either microscopically or macroscopically (7). In this case report, we will present a one-year-old patient with kidney and urethral stones who underwent surgical treatment at a secondary healthcare facility.

'This case report has been reported in line with the SCARE Criteria (8).

2. Case presentation

A one-year-old Austronesian boy, accompanied by his parents, came to our emergency room complaining that their kid had been completely unable to pee since morning. He had difficulty with micturition before and had been brought to a clinic a couple of times, but nothing resolved it. Onset occurred about a year ago. He also experienced pain in the lower abdominal area and occasional painful voiding, which has been going on for a few months. The patient also complained of difficulty eating and drinking after the illness. It was also found that the patient often had hard stools and then developed irregular diarrhea. Family history of bladder stones also did not mention. A physical examination was performed and found mild tenderness in the suprapubic region and a slightly palpable mass. He had no penile deformity and had already been circumcised. Parents complained that their kid was always crying and irritated every time he urinated. Now the crying has been more frequent, even when he is not urinating. To our surprise, anal inspection revealed that there was a bright red-colored mass that was also painful in palpation, indicating a prolapse recti (Fig. 1). It has been said that he was always straining during micturition. The laboratory investigation found leukocytosis (WBC: 18.430/µl) and slight anemia (Hb: 11,3 g/dl) with normal blood urea nitrogen and creatinine. Urine tests revealed leukocyturia (15–17 on the microscopic level) and slight hematuria (positive 1). A plain radiograph of the abdomen showed a round opacity around the pelvic area (Fig. 2). Ultrasonography of the abdomen and urinary tract revealed a 2,7 × 1,6 cm bladder stone and severe hydronephrosis in both kidneys. Thus, our urologist preferred to do a cystolithotomy procedure with general anesthesia immediately to remove the stone. Ceftriaxon as a profilaxis antibiotic was given. While the bladder stone was successfully removed and has a size of 30x21x15mm, another stone measuring 0,5 × 0,3 mm was found in the urethra during ureteroscopy and was also successfully removed (Fig. 3). For the prolapsed rectum, manual reduction was performed along with an open cystolithotomy. A urinary catheter was inserted after surgery and removed one day later. Antibiotics such as cefuroxime were administered, as were analgesics and tranexamic acid. There was no recurrence of the prolapsed rectum after surgery. Patient was discharged 3 days after surgery, and the length of hospitalization was 4 days.

3. Discussion

Bladder stones are very rare in the pediatric population, even though pediatric bladder stones are endemic in some parts of the world (3). Epidemiologically, BS in children is found to be around 1–2 % of the bladder stone population. Bladder stones can occur in children, especially in low-income countries. Several related factors also affect the composition of stones, such as diet, environment, heredity, and socioeconomic factors (9). Bladder stones The percentage of bladder stones in urinary tract stone cases in children is around 70–85 %, and boys are more commonly affected than girls because they have a longer urethra (10). Bladder stones generally affect young boys under 5 years of age (11).

The formation of bladder stones can be divided into two categories: primer and seconder. In primer, stone formation is accompanied by the absence of anatomical, functional, and infectious abnormalities. Whereas in seconder, the formation of stones will be found to have a definite etiology. Primary bladder stones are not uncommon in children, but determining the exact etiology is difficult (9). The composition of bladder stones varies and changes across decades (12). In general, bladder stones are composed of uric acid and calcium oxalate, but there are wide differences in composition in other regions due to factors such as diet, heredity, climate, and different socio-economic factors (9). According to Dahrill, 2021, of all patients with bladder stones, the percentage of ammonium acid urate (AAU) ranks first at about 74.37 %. followed by calcium oxalate (CaOx) at 39.5 %, and then gradually Uric acid (UA) at 11.46 %, calcium phosphate apatite (CaP) at 9.25 %, struvite (magnesium ammonium phosphate) at 4.34 %, cystine at 1.16 %, and xanthine at 3.85 % (9). In our case, we found that the stone is composed of 57 % uric acid stone and 33 % calcium oxalate stone. After the extraction of the stone, we see that the bladder stone has an oval shape and a jagged appearance on the surface. According to Li Song (2020), the top 3 stones found in clinical practice are mixed stones (13).

Fig. 1. Prolaps Recti of The Patient.

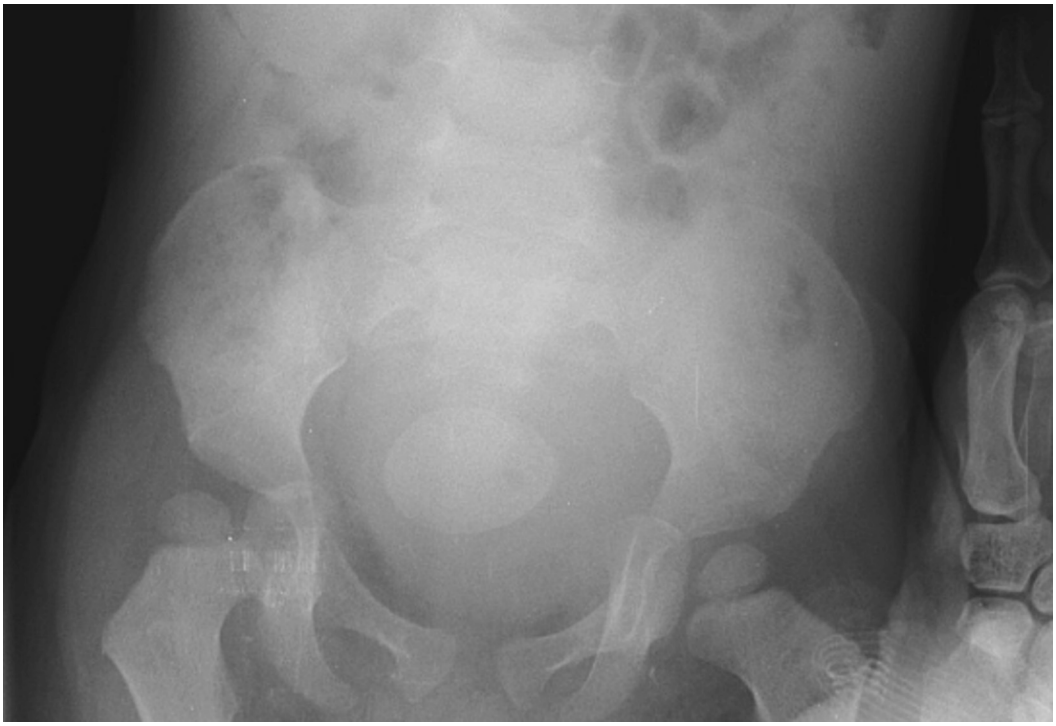

Fig. 2. Radiopaque shown in radiological examination.

Fig. 3. Gross Examination of The Stone.

In mixed stones, CaOx-dihydrate (COD) crystals often reside on the surface and cause a jagged odor (14). In the case of urinary stones, the composition of mixed uric acid and calcium oxalate stones is very rare. In a study by Fransisco et al. (2016) from a sample of 8854 patients, it was found that about 184, or 2 %, of patients had a mixed stone composition of uric acid and calcium oxalate (15).

The various types of stones occur due to the complex process of stone formation that goes through several steps and begins with urinary supersaturation, then crystal nucleation, growth, and aggregation (16). There are three main factors that can lead to the formation of uric acid stones: low urine pH, hyperuricosuria, and low urine volume (13). A low urine pH causes the urine to become acidic, which is the main factor determining the occurrence of uric acid stones. This can result in the protonation of urate so that it will form insoluble uric acid and precipitate in the urine (13). Low urine pH can also cause CaOx and uric acid crystallization and precipitation (16). A low urine pH may occur due to an overly high animal protein diet as well as gastrointestinal fluid loss, such as in chronic diarrhea (13). Due to the acidic pH of urine, uric acid cannot dissolve and causes the amount of uric acid in the urine to increase; this is called hyperuricosuria (14). In young children, the normal value of excretion of uric acid is 10 mg per kg of body weight and decreases with age (21). A diet high in purines can cause hyperuricosuria, as can endogenous uric acid production (14). Hyperuricosuria can also lead to an increased risk of calcium oxalate stones (13). There are three mechanisms that may explain how hyperuricosuria leads to calcium oxalate crystallization: 1) the presence of heterogeneous nucleation that causes precipitation of calcium oxalate on monisodium urate cryocrystals; 2) colloidal urate particles remove calcium oxalate crystallization inhibitors; and 3) reduced solubility of calcium oxalate due to increased urate concentration, resulting in a salting mechanism that causes calcium oxalate precipitation. Although in our case the composition of the stones is predominantly uric acid stones, there is no decrease in PH on urine examination, and there are also no crystals in the urine that indicate the beginning of uric acid stone formation. This could be possibly happened if initially the stones formed were pure uric acid stones, then over time the urine atmosphere became less acidic, and stone formation continued with the composition of calcium oxalate that enveloped the uric acid stones. Supported by the plain radiograph of abdomen examination, we found a picture of opaque stones in the bladder, while uric acid stones and cystine stones will not show up on plain film (3). In calcium stones, the main cause is idiopathic hypercalciuria, which is then followed by acidic urine ph and hyperuricosuria (15). Although hyperuricosuria plays an important role in the occurrence of uric acid stones and calcium oxalate stones, unfortunately, our patient was not checked for uric acid levels in the urine. Abdul, 2020, says local factors play an important role in the creation of bladder stones. Different places have different factors that lead to different types of stones. In Indonesia, which has a dry and hot climate, it causes faster evaporation of body fluids, and when coupled with the habit of drinking less water, it causes dehydration, which then leads to low urine volume and easier crystal precipitation, and then urinary stones are formed (17).

Our patient's complete blood count showed leukocytosis, and the urine test showed a high number of leukocytes. This indicates a urinary tract infection in our patient. The most important thing is the early diagnosis and management of bladder stone therapy in children because it can reduce complications such as recurrent tract infections and massive antibiotic use, which tend to develop antibiotic resistance, and the worst is kidney damage (3). Our patient's onset occurred several months ago. Urinary tract infections occurred due to prolonged diagnosis and management. What often happens is that the diagnosis is made too late, as significant symptoms appear when the size of the bladder stone becomes large and causes obstruction (12).

Therapeutic management of bladder stones varies depending on symptoms, size, and composition (10). Open cystolithotomy is still the most preferred treatment as it provides satisfactory results for stone removal, which in turn ensures that the obstruction is properly managed (3). However, open cystolithotomies come with several disadvantages, such as painful scars, prolonged treatment, the risk of infection, and an increased cost of care (10). An open cystolithotomy was performed on our patient. The operation went smoothly. And no postoperative complications occurred. On the other hand, minimally invasive surgery techniques such as uteroscopy lithotripsy for stone extraction were not performed because they were not feasible due to the large size of the stone. It is very difficult to break the stone into small fragments that can be passed through the urinary tract.

There were several complications with our patient. The first was severe hydronephrosis in both kidneys. This was due to reflux caused by the bulbous stone obstruction. BUN and creatinine were also tested in this patient, but no increase was found. Kidney damage due to bladder stones has rarely been reported (18). Another complication is rectal prolapse. Rectal prolapse occurs due to increased abdominal pressure caused by straining during urination (19). Our patient had difficulty urinating due to obstruction of the urinary tract due to a stone in the urethra. Manual reduction was done for the management of prolaps recti along with open cystolithotomy. Manual reduction should be performed immediately if the rectal prolapse does not spontaneously reverse itself, as the longer it is left, the more difficult it will be to reverse (19). No further rectal prolapse was found after open cystolithotomy surgery. Treating the underlying cause of rectal prolapse is of utmost importance to prevent recurrence (20).

4. Conclusion

Early diagnosis and prompt treatment of bladder stones in pediatric patients are important to prevent any complication that can occur, like urinary tract infection, hydronephrosis, and the rectal prolapse that we found in this patient. The occurrence of bladder stones that consist of mixed uric acid and calcium oxalate stones is rare but can still be found due to the complex formation process. Local factors are also important for the occurrence of mixed stone variations. Open cystolithotomy in children is still the most commonly performed procedure, with favorable results despite its many disadvantages. Management of rectal prolapse in children is sufficient to treat the source of the problem. Maintaining hydration status, drinking plenty of water, and avoiding consumption of foods high in purines are also some of the things that need to be emphasized to prevent urinary tract stones in children.

Consent

Written informed consent was obtained from the patient's parents or legal guardian for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Availability of data and materials

The author of this manuscript is willing to provide additional data needed for this case report.

Ethical approval

This case report has been submitted ethically and approved.

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Author contribution

Agung Hidayatulloh, M. Hanun Mahyuddin: wrote the paper, collected pictures, revised and submitted the paper.

Sekar Afifah, Naila Ibtisam, Rakha Rahmatullah: conducted a history

and physical examination and wrote part of the paper.

Olga Atsira: translated paper into english and contributed to the paper as well.

Guarantor

Agung Hidayatulloh

Research registration number

This research held in our Hospital, Sakinah Islamic Hospital in Mojokerto Indonesia, and have been agreed by our hospital director with index number 420/SMI/RSIS/PERMO/VII/2023.

Conflict of interest statement

No potential conflict of interest relevant to this article was reported.

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