CASE REPORT

Pediatrics Sciences Journal (*PedScij)* 2024, Volume 5, Number 1: 22-27
P-ISSN: 2722-0427, E-ISSN: 2722-1474

Pediatric Sciences Journal

Published by
Pediatrics Sciences Journal

A successful management of children with retroperitoneal abscess due to recurrent renal staghorn calculi

Krisni Subandiyah[1], Astrid Kristina Kardani[1*], Tita Luthfia Sari[2]

[1]Nephrology Division, Pediatric Department, Faculty of Medicine, Universitas Brawijaya, Saiful Anwar Hospital Malang, Indonesia
[2]Pediatric Residency, Faculty of Medicine, Universitas Brawijaya, Saiful Anwar Hospital Malang

*Corresponding to:
Astrid Kristina Kardani; Nephrology Division, Pediatric Department, Faculty of Medicine, Universitas Brawijaya, Saiful Anwar Hospital Malang, Indonesia;
astridkardani.fk@ub.ac.id

Received: 2024-02-28
Accepted: 2024-05-06
Published: 2024-06-02

ABSTRACT

Introduction: A particular kind of urolithiasis known as "staghorn calculi" occurs when the calculus grows into the pelvis and renal calyces. It was characterised by fast growth, which might progress to kidney damage and result in other consequences if left untreated. Although the disease's clinical presentation in paediatric patients might be non-specific, it still dramatically raises morbidity and death rates. This case report aimed to identify the risk factors, clinical manifestation, and treatment of children with retroperitoneal abscesses due to recurrent renal calculi.

Case description: We describe a case of a young woman with severe acute malnourishment who had a history of painful swelling in her left renal angle after contracting a urinary tract infection. A radiological examination revealed a massive staghorn calculus in the left kidney with significant hydronephrosis, resulting in a retroperitoneal abscess. The patient had surgical treatment along with free drainage of 1000 millilitres of pus. The systemic antibiotic was given as urosepsis treatment. Percutaneous nephrolithotomy (PCNL) and placement of a double-J catheter were performed as definitive treatment for staghorn calculi three months later. Interestingly, it was the second episode of urolithiasis in this patient in 10 years. Malnourishment and recurrent Urinary Tract Infection (UTI) may be predisposing factors to staghorn calculi and perirenal abscess.

Conclusion: Considering its significant problem, early evaluation, treatment, and prevention of recurrence were essential to decrease morbidity and mortality in pediatric urolithiasis.

Keywords: renal calculi; retroperitoneal abscess; urinary tract infection; children.
Cite This Article: Subandiyah, K., Kardani, A.K., Sari, T.L. 2024. A successful management of children with retroperitoneal abscess due to recurrent renal staghorn calculi. *Pediatrics Sciences Journal* 5(1): 22-27. DOI: 10.51559/pedscij.v5i1.46

INTRODUCTION

Over the last 20 years, the incidence of paediatric urolithiasis has grown by 2% yearly, and there is a significant risk of morbidity and recurrence.[1] Numerous reasons, including genetic, anatomical, urinary tract infection, metabolic, nutritional, and environmental ones, have been implicated in this rise.[2] Data on renal calculi prevalence in pediatric patients, especially in Indonesia, was limited. However, a study reported that the incidence of renal calculi was 8.3/100,000 population per year, and a peak age of 2–4 years, with complicated to end-stage renal disease.[3]

Gram-positive and gram-negative bacteria that generate the urease enzyme, such as *Proteus, Staphylococcus, Pseudomonas, Providencia,* and *Klebsiella*, are linked to the production of kidney stones. However, not all strains produce urea-degrading enzymes. The bacteria first attach to the kidney papillae. The bacteria raise the pH of the urine by increasing the ammonia production. The increased urine pH reduces the solubility of phosphate. Extracellular polysaccharides that the bacterial microcolonies produced encased the bacterium and caused crystal formation. Apatite and struvite crystallisation may happen intrabacterially or peribacterially. If crystallisation takes place inside the bacterium, bacteriolysis results in the production of microliths, which then propagate the stone formation. On the other hand, if the crystallisation is peri-bacterial, the infection is believed to be contained inside the stone due to the bacteria being encased within it. Planktonic bacteria then adhere to the pre-existing crystal surface, which is followed by the creation of microcolonies and the synthesis of extracellular polysaccharides. The extracellular polysaccharide forms crystals. A staghorn stone is created by repeating this cycle.[4–6]

An untreated staghorn calculus could risk damaging the kidney because of obstruction and other problems. Peri renal abscess frequently occurred secondary to renal tract calculi. Complications of abscesses include life-threatening sepsis and renal failure. There was a strong correlation between late diagnosis and high mortality, especially in pediatric patients.[7] This case report aims to identify the risk factors, clinical manifestation, and treatment of children with retroperitoneal abscesses due to recurrent renal calculi.

CASE DESCRIPTION

A 15-year-old girl presented to the emergency department with a history of

increasingly painful and swelling in her left lumbar region for one week before admission. Three months previously, she had tenderness in the left lumbar region associated with mobilization. It was neither stabbing nor referred pain but intermittent. The patients also complain that the swelling in the left lumbar region has rapidly increased in size for one month. There was no history of lumbar trauma. She had also suffered from a low-grade fever for one week. There were no episodes of dyspnea, cough, or diarrhea. The patient complained of bloody and cloudy urination. A decrease in body weight was reported for 6 months before.

There was a history of open vesicolithotomy due to vesicolithiasis in 2014. There was no other family member with a similar disease. She was born by spontaneous labor at term gestational age and had no perinatal problems. Her development was age-appropriate, and she had received all basic and follow-up immunization programs. From nutritional history, the patient got breast milk from birth to 6 months old, then started with porridge. There is no history of formula milk consumption, and eating with family food 2-3 times per day for half a portion. However, a bodyweight decrease for 6 months before, approximately 10 kgs.

On physical examination, the child looked severely ill and undernourished. Her temperature was 38.8^{0}C at the time of first examination. She was in tachycardia with a pulse of 110 beats/min, blood pressure of 110/50 mmHg, and arterial oxygen saturation of 98% on room air. Her weight was 25.5 kg, and her height was 145 cm, below the 5th percentile for her age. Physical examination revealed an acutely wasted child with significant pallor. Chest and abdominal physical examination were normal. There was enlargement and tenderness of the left lumbar region, fluctuant and well-demarcated, and warm in palpation (shown with a black arrow) (Figure 1).

Laboratory investigations revealed a leucocyte count of 45.75 x109/L with neutrophilia. The platelet count was 976x109/L. Hemoglobin was 7.9 g/dl with hypochromic and microcytic type anemia. Serum levels of ureum and creatinine were 37.6 mg/dl, and 0.64 mg/dl, respectively.

Figure 1. The clinical picture of swelling in the left lumbar region and scar in the lower abdominal region

Figure 2. A plain abdominal x-ray showed a radiopaque at the left hemiabdomen at the vertebrae level L2 to L3, which suspected a left renal staghorn calculus.

Glomerular filtration rates were within the normal limit. Uric acid serum level was 4.7 mg/dl. Results of urinalysis showed leucocyte +3 (2691.9/HPF), erythrocyte +3 (52.9/HPF), protein +1, bacteria 501,9 x 103, nitrite (-), with urinary pH was 6. Blood and urine cultures were performed, and the results were negative for pathogenic bacteria.

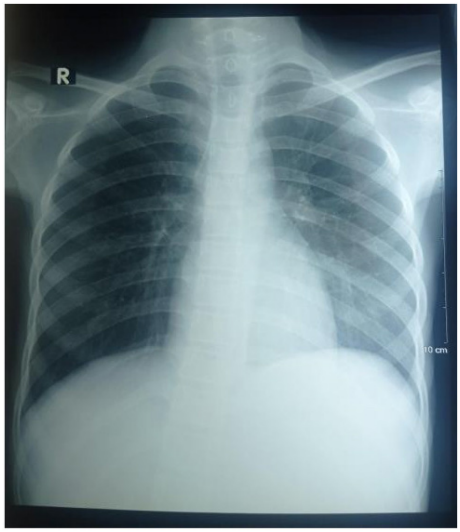

Figure 3. Chest x-ray showed normal finding

A plain abdominal x-ray (Figure 2) showed a radiopaque at the left hemiabdomen at vertebrae L2 to L3 level with a 3.4 x 1.4 cm diameter, suspected of left renal staghorn calculus. Chest radiography was normal (Figure 3). Ultrasound examination showed hyperechoic with acoustic shadow on left renal with size of diameters 2,9 x 1 cm suspected as renal calculi with perirenal abscess (Figure 4). Abdominal CT confirmed a staghorn calculus in the left renal pelvis with an associated retroperitoneal abscess extending into the

renal parenchymal, perirenal, left pararenal line, left diaphragm and subcutaneous region of posterior thoracoabdominal and surrounding muscle. Mild hydronephrosis on the left renal with delayed function of left renal due to nephrolithiasis and multiple paraortic lymphadenopathy were also found (Figure 5).

We diagnose the patient with left retroperitoneal abscess due to renal staghorn calculi + mild hydronephrosis left renal + urosepsis + anemia + severe acute malnourishment. The patient underwent drainage, with 1000 mL of offensive-smelling pus drained freely (Figure 6). Over the next 3 days, 200 mL of additional pus mixed with urine was drained. Aspirated pus was sent for microbiology examination. There were epithelial cells (+1) and inflammatory cells (+3) with growth of Escherichia coli and Klebsiella pneumonia with antibiotic sensitivity of Gentamicin, Ciprofloxacin, and Cotrimoxazole. Histopathology examination showed chronic suppurative granulomatous tissue.

The patient was previously given by systemic antibiotic with IV Ampicillin sulbactam 100 mg/kg/day, IV Gentamycin 5 mg/kg/day and IV Metronidazole 7,5 mg/kg/day, IV Fluconazole 6 mg/kg/times for 10 days then switch to IV Cefoperazon 40 mg/kg/day. Transfusion of packed red cells, albumin, and management of electrolyte imbalance were also given.

We manage acute malnutrition with targeted Recommended Dietary Allowance (RDA) and Ideal Body Weight. Formula 75 was given orally 12 times 150 ml in the stabilization phase, followed by the transition and rehabilitation phase. Multivitamins, folic acid, and zinc were also given. Monitoring of acceptance, tolerance, and effectivity was performed during nutritional treatment.

Three months later, the definitive treatment was conducted by percutaneous nephrolithotomy (PCNL), followed by unilateral placement of a double-J catheter (Figure 7). Fragmented stones were evacuated, and histopathology examination revealed that struvite renal calculi consisted of struvite (Figure 8). The patient recovered well with no complaints of pain or problems in urination. Pediatric and urology departments

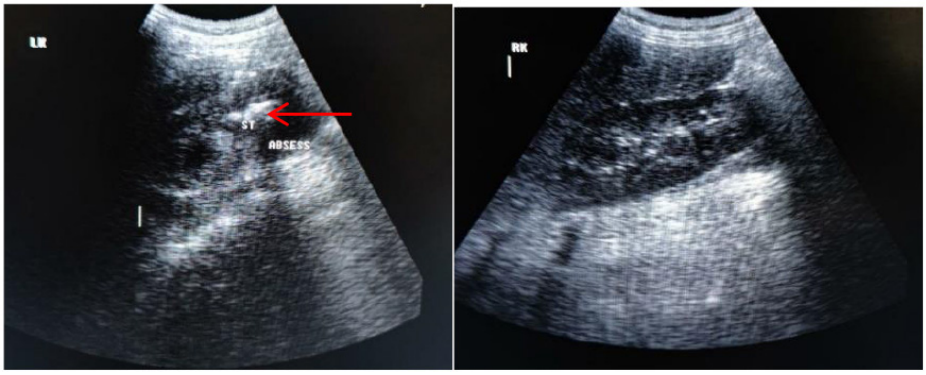

Figure 4. Ultrasound examination showed hyperechoic with acoustic shadow (red arrow) on left renal suspected as renal calculi with perirenal abscess

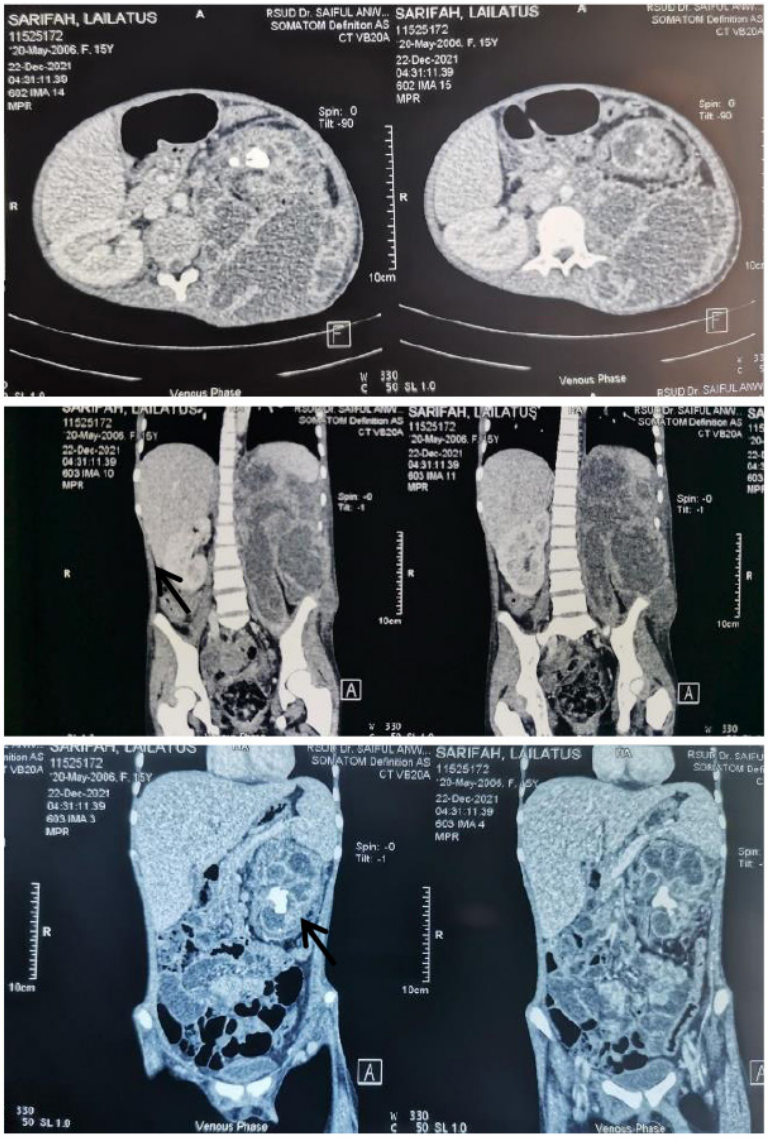

Figure 5. Abdominal CT showed a staghorn calculus in the left renal pelvis with an associated retroperitoneal abscess extending into surrounding tissue. Mild hydronephrosis on left renal due to nephrolithiasis and multiple paraortic lymphadenopathy.

routinely control her until right now. She was planned for DJ stent removal by a urologist after monitoring and evaluation. Understanding the risk factors is necessary to prevent the recurrence of renal calculi. In this patient, we suspected low water intake and UTI as risk factors for renal stone formation. However, further investigation should be performed to evaluate renal calculi risk and etiology, such as diet and metabolic factors.

DISCUSSION

The constitution has a variable called Staghorn Calculi. It may be composed of struvite, cystine, uric acid, and calcium oxalate. UTIs and struvite staghorn calculi are intimately associated. Struvite staghorn calculi are made of magnesium, ammonium, and phosphate.[8,9] The infections most linked to the pathophysiology of Staghorn calculi include those brought on by *Proteus, Klebsiella, Pseudomonas,* and *Staphylococcus*—organisms that produce the urease enzyme, which facilitates the production of ammonia and hydroxide from urea.[7] There exists an additional mechanism by which UTI might trigger the development of calculi linked to heightened crystal adhesion; however, the details of this theory remain unclear. According to this theory, Escherichia coli is linked to 13% of struvite calculi even though it is the bacteria that causes 85%–90% of UTIs.[10]

According to reports, children who suffer from severe acute malnutrition are more likely to get a UTI, yet incidence rates might vary from 6% to 37%. Gram-negative coliform bacteria, like the ones this patient had, such as E. coli and Klebsiella, continue to be the most frequently isolated bacterial species from urine cultures. According to much published research, children suffering from severe acute malnutrition often develop complex UTIs, including those linked to renal calculi. The immune deficiencies that malnourished children experience were linked to the suggested mechanism.[11]

Staghorn calculi may be difficult to diagnose and treat in children since they are infrequent. Patients of any age might suffer from this ailment; however, in children, the average age of diagnosis is between 7 and 10 years old. These calculi are a serious issue because of the increased risk of blockage and infection, which may lead to renal parenchyma damage and other consequences including abscesses.[8]

A accumulation of suppurative material between Gerota's fascia and the renal capsule in the retroperitoneal area is called a retroperitoneal abscess. More than 80% are caused by ascending urinary tract infections and renal tract calculi. A painful, uncomfortable swelling that is located between the ribs and the iliac crest is often reported by patients, along with systemic symptoms such as fever, rigours, anorexia, nausea, and vomiting. More subdued symptoms may include dysuria, hematuria, pyuria, malaise, prolonged

Figure 6. Pus drained freely during incision from left flank mass

Figure 7. Plain abdominal x-ray after stone removal and left double-J catheter placement

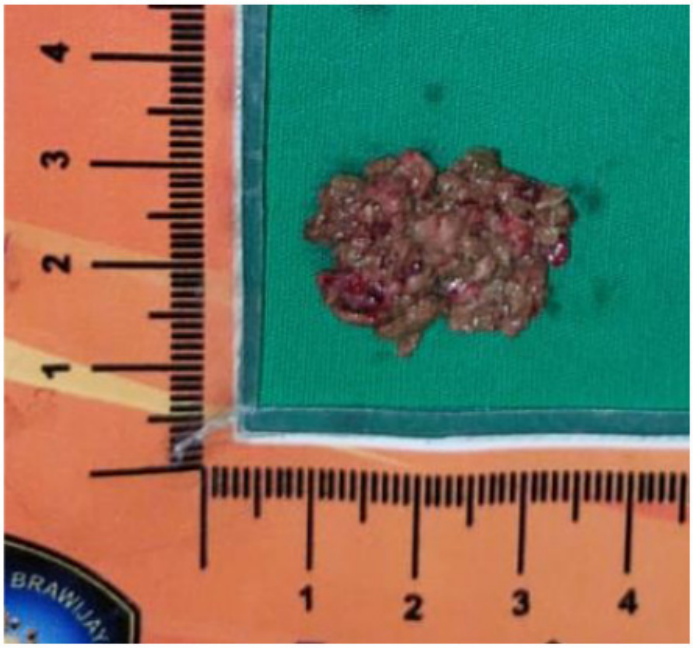

Figure 8. Fragmented stone evacuated by percutaneous nephrolithotomy

fever, weight loss, or abscesses in the thighs, groyne, or chest. Traditionally, to reduce psoas muscle tension, patients lay supine with their hips flexed.[7] As presented in this case report, she presented increasingly painful swelling in the left lumbar region, especially during mobilization for three months, and worsening within one week, accompanied by a low-grade fever.

Even though underlying urinary tract disease is widespread, only 6%–32% of individuals have hematuria. Pyuria is more common. Blood tests and urinalysis are neither sensitive or specific for retroperitoneal abscess, but white blood cell counts, and inflammatory markers could be raised.[7] As in these patients, we found significant leukocyturia and hematuria, with increased white blood cell count.

Up to 60% of patients have abnormal abdominal radiographs, indicative signs include nephrolithiasis, retroperitoneal gas, obliteration of the renal shadow, enlarged kidney, elevated diaphragm with concomitant pleural effusion, and missing psoas border. The preferred method for identifying kidney stones and their consequences is computerised tomography. Non-specific signs in perirenal abscess include thickening of Gerota's fascia, hydronephrosis, renal enlargement, and intraparenchymal tumors. Thickness of the psoas muscle and accumulation of posterior renal fluid are very suggestive, although perinephric gas is pathognomonic.[7] In this case, the plain abdominal x-ray showed a radiopaque staghorn stone in the left renal. A urologic ultrasound was performed to evaluate the left flank mass, and there was a suspected perirenal abscess. Abdominal CT confirmed a staghorn calculus in the left renal pelvis with an associated retroperitoneal abscess extending into surrounding tissue and mild hydronephrosis.

Perinephric abscess complications included potentially fatal sepsis, including urosepsis.[7] In this patient, urosepsis was diagnosed. Urosepsis is a systemic reaction to infection and is defined as sepsis brought on by urogenital tract infection. At first, the diagnosis of sepsis was thought to require the presence of SIRS signs and symptoms.[12] Early empirical antibiotics should target the most prevalent organisms since many illnesses are caused by many microorganisms. The right first agents are beta-lactams and aminoglycosides; dosages should be modified after culture. Drainage should be used to treat perirenal abscesses to eliminate the source of infection. Life-saving measures include early diagnosis, drainage, and antibiotic therapy. This patient had systemic antibiotic therapy with ampicillin sulbactam, gentamycin, fluconazole, and metronidazole before switching to cefoperazone for urgent abscess draining.[13]

Removing stones with extracorporeal lithotripsy (ECL), endoscopic lithotripsy, open pyelolithotomy, and PCNL was the last interventional therapy for urolithiasis.[14] The behavior is selected based on the location of the calculus and how it affects the kidneys. Furthermore, choices need to be personalized, taking considered the age and condition of each patient. These days, open surgery is seldom performed, even when it is advised in difficult instances.[15] Three months later, this patient had a percutaneous nephrolithotomy (PCNL). Renal calculi may be removed using PCNL. Complete stone clearing rates for staghorn stones in large series were found to be 98.5% and 71%, respectively, using PCNL. This study's overall complication rate was a mere 4%.[5] Due to the potential for localized inflammation brought on by the ureteral walls adhering, ureteral obstruction is a common side effect following renal surgery. Considering this, inserting a double-J catheter is advised.[16]

As this patient had recurrent urolithiasis episodes, it had to be evaluated dan treated for risk factors of renal calculi. UTIs are the most common risk factor for urolithiasis.[17] Other studies reported that metabolic factors such as calcium and uric acid abnormalities were the most common risk factors for calculus formation. In addition, vesicoureteral reflux in children also contributes to urinary infection, stasis, and calculus formation.[18] Early diagnosis, adequate treatment, and prevention of recurrence are beneficial to avoid complications, such as kidney failure in children with renal calculi.

CONCLUSION

The patient in the case had a history of uncomfortable swelling in her left renal angle and was presenting with severe acute malnourishment. A massive staghorn calculus in the left kidney was the cause of a retroperitoneal abscess, as shown by a radiological test. In addition to receiving systemic antibiotic therapy, the patient had a surgical incision and drainage. As a last resort, PCNL and double-J catheter implantation were done. Complications from staghorn calculi in children were a major issue. Kidney failure was prevented by early diagnosis, treatment, and avoidance of the condition.

DISCLOSURES

Funding

There were no specific grants from any funding agency for this work.

Conflict of Interest

None of the authors has any conflicts of interest in this case report.

Author Contribution

KS was involved in concepting, designing, and supervising this work. TL and AK described and analyzed the data. And AK as the corresponding author. The final draft of the manuscript is prepared by all authors, and they all consent to its submission to this publication.

ACKNOWLEDGMENTS

We thank the patient and the patient's family for allowing us to present this case report. We are also very grateful to all medical staff in the Pediatric Department at Saiful Anwar Hospital Malang, who have supported this work.

REFERENCES

1. Krzemień G, Szmigielska A, Jankowska-Dziadak K, Pańczyk-Tomaszewska M. [Renal staghorn calculi in small children - presentation of two cases]. Dev Period Med. 2016;20(1):23–6.
2. Baştuğ F, Düşünsel R. Pediatric urolithiasis: causative factors, diagnosis and medical management. Nat Rev Urol. 2012;9(3):138–46.
3. Soliman NA, Rizvi SAH. Endemic bladder calculi in children. Pediatric Nephrology. 2017;32(9):1489–99.

4. Flannigan R, Choy WH, Chew B, Lange D. Renal struvite stones - Pathogenesis, microbiology, and management strategies. Vol. 11, Nature Reviews Urology. Nature Publishing Group; 2014. p. 333–41.
5. Diri A, Diri B. Management of staghorn renal stones. Ren Fail. 2018;40(1):357–62.
6. Torricelli FCM, Monga M. Staghorn renal stones: what the urologist needs to know. International braz j urol. 2020;46(6):927–33.
7. Salvatierra O, Bucklew WB, Morrow JW. Perinephric Abscess: A Report of 71 Cases. Journal of Urology. 1967;98(3):296–302.
8. Silva IE, Abreu GC, Moura WM, Cerqueira DC, Leandro CAC. Case report of staghorn calculus in a pediatric patient. J Bras Patol Med Lab. 2019;55(3).
9. Viprakasit DP, Sawyer MD, Herrell SD, Miller NL. Changing Composition of Staghorn Calculi. Journal of Urology. 2011;186(6):2285–90.
10. Dagistan E, Uyeturk U, Ozturk H. A child with a large bladder stone: A case report. Pediatric Urology Case Reports. 2014;1(4):22–22.
11. Uwaezuoke S. The prevalence of urinary tract infection in children with severe acute malnutrition: a narrative review. Pediatric Health Med Ther. 2016;Volume 7:121–7.
12. Wagenlehner FM, Lichtenstern C, Rolfes C, Mayer K, Uhle F, Weidner W, et al. Diagnosis and management for urosepsis. International Journal of Urology. 2013;20(10):963–70.
13. Dreger NM, Degener S, Ahmad-Nejad P, Wöbker G, Roth S. Urosepsis—Etiology, Diagnosis, and Treatment. Dtsch Arztebl Int. 2015;
14. Horuz R, Sarica K. The management of staghorn calculi in children. Arab J Urol. 2012;10(3):330–5.
15. Salerno A, Nappo SG, Matarazzo E, De Dominicis M, Caione P. Treatment of pediatric renal stones in a Western country: A changing pattern. J Pediatr Surg. 2013;48(4):835–9.
16. Cavalli AC, Tambara Filho R, Slongo LE, Cavalli RC, Rocha LC de A. The use of double-J catheter decreases complications of retroperitoneoscopic ureterolithotomy. Rev Col Bras Cir. 2012;39(2):112–8.
17. Acar B, Inci Arikan F, Emeksiz S, Dallar Y. Risk factors for nephrolithiasis in children. World J Urol. 2008;26(6):627–30.
18. Naseri M, Varasteh AR, Alamdaran SA. Metabolic factors associated with urinary calculi in children. Iran J Kidney Dis. 2010;4(1):32–8.