

Unilateral Ureterolithiasis Accompanied By the Risk of Acute Kidney Injury: Case Report

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ABSTRACT

Background: Urolithiasis is the condition of stone formation in the urinary tract, which remains a significant health issue worldwide. The incidence of cases is higher in men than women. Flank pain is the most common manifestation in patients with urolithiasis. The management of urolithiasis includes conservative treatment, lifestyle modifications, medication therapy, medical intervention, and surgical procedures. Complications of urolithiasis may include urinary tract infection and urinary tract obstruction, both of which have the potential to cause acute kidney injury.

Case Report: A 36-year-old male presented with severe left flank pain (visual analogue scale 8) that had worsened since two days prior to hospital admission. The pain was continuous, non-radiating, and worsening. The complaint was accompanied by a burning sensation during urination, incomplete urination, and difficulty in passing urine. The patient also reported reddish and cloudy urine.

Physical examination revealed tenderness in the left lumbar region and pain upon percussion of the left costovertebral angle (CVA). Hematologic tests showed *leukocytosis*, *neutrophilia*, elevated serum creatinine, and a decreased estimated glomerular filtration rate (eGFR). Routine urinalysis revealed increased white blood cells, red blood cells, and protein. A Urology Computed Tomography (CT) scan showed left ureterolithiasis at the L4 level, measuring 2.28 cm, along with hydroureter and grade IV hydronephrosis. An open left ureterolithotomy was performed based on medical indications and due to the limitations of urological facilities at our hospital.

Conclusion: Flank pain is the most common manifestation in patients with urolithiasis. Early diagnosis of complications can improve the patient's prognosis. The management of urolithiasis depends on medical indications and can be adjusted according to available facilities.

KEYWORDS: flank pain, ureterolithiasis, hydronephrosis, open ureterolithotomy

ARTICLE DETAILS

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BACKGROUND

Urolithiasis is a condition characterized by the formation of stones in the urinary tract, which remains a significant health issue worldwide. The incidence of cases is higher in males compared to females. Patients with urolithiasis typically present with complaints of flank pain, nausea, vomiting, pain during urination, hematuria (blood in urine), and cloudy urine. The most common flank pain occurs due to obstruction caused by stones in the ureter, particularly at

two sites of narrowing: near the ureteropelvic junction (UPJ) and at the ureterovesical junction (UVJ).^{1,2,3}

In general, the hypothesis for the formation of urolithiasis is due to supersaturation triggered by three factors: an excess of crystal or stone-forming substances, a decrease in substances that inhibit crystal or stone formation, and an excess concentration of salts in the urine. About 75-85% of urinary stones are composed of calcium oxalate or calcium phosphate, while the remaining

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composition includes struvite (5%), uric acid (15%), and cystine (<1%).^{3,4}

In some cases, urolithiasis can cause obstruction of the urinary tract and infection, leading to hydronephrosis and impaired kidney function. Management of urolithiasis includes conservative, medicinal, medical intervention, and surgical approaches. The prognosis for urolithiasis is generally favorable, as approximately 80% of stones can pass spontaneously.^{5,6,7}

CASE REPORT

A 36-year-old male presents with severe left flank pain (visual analogue scale 8) that has worsened over the last 2 days prior to hospitalization. The pain is continuous, does not radiate, and has been intensifying. The patient also reports dysuria, with a burning sensation, difficulty urinating, and incomplete voiding. The urine is described as reddish and cloudy.

Physical examination reveals tenderness in the left lumbar region and pain on percussion of the left costovertebral angle (CVA). Hematologic examination shows *leukocytosis* of 15,300/uL (normal range: 3,800–10,600/uL), neutrophilia at 91.1% (normal range: 50–70%), increased creatinine levels of 1.3 mg/dl (normal range: 0.5–1.2 mg/dl), and an estimated glomerular filtration rate (eGFR) of 76 ml/min/1.73m² (normal range: >90). Routine urine analysis shows white blood cells +++ (normal range: negative), erythrocytes +++ (normal range: negative), and proteinuria +++ (normal range: negative).

Abdominal X-ray reveals a left-sided urolithiasis, and a urologic CT scan shows a left-sided ureterolithiasis at the level of L4 with a 2.28 cm stone, accompanied by hydroureter and grade IV hydronephrosis. Based on the patient's history, physical examination, and supporting diagnostic findings, the diagnosis is confirmed as left ureterolithiasis with associated hydroureter and hydronephrosis, with plans for an open left ureterolithotomy. During treatment, the patient receives analgesic and antibiotic therapy.

DISCUSSION

Urolithiasis remains a major health issue in the field of urology worldwide, supported by an increase in incidence over the past 20 years. Globally, the prevalence of urolithiasis ranges from 2% to 20%, while in Asia, it is reported that approximately 1% to 19.1% of the population suffers from urolithiasis. Epidemiologically, urolithiasis is more commonly found in men than in women, with a ratio of 2:1, and the highest age range is between 20-30 years.^{6,8,9}

Clinical manifestations of urolithiasis patients can vary widely, ranging from no symptoms to severe flank

pain, hematuria, pain during urination, cloudy urine, nausea, vomiting, and fever. These symptoms depend on the location and size of the stones, whether they are in the kidneys, ureter (proximal, mid, or distal), bladder, or urethra.^{2,6,7}

Severe flank pain accompanied by hematuria is one of the main symptoms of urolithiasis. The type of pain can vary depending on the location of the stone obstruction in the urinary tract. When the stone has migrated, its location can be traced through the characteristics of the pain experienced, such as:

- If the stone is located at the ureteropelvic junction, pain occurs in the suprapubic area and flank without radiating to the inguinal region.
- If the stone is in the proximal third of the ureter, pain occurs in the flank or lumbar area.
- If the stone is in the mid-ureter, pain radiates anteriorly and caudally.
- If the stone is in the distal third of the ureter, pain radiates to the inguinal region or testicles.
- If the stone is located at the ureterovesical junction, pain occurs in the suprapubic area and at the tip of the penis.^{11,12}

Hematuria in urolithiasis patients may present as either gross hematuria or microhematuria. In a retrospective study of patients with acute urolithiasis symptoms, microhematuria on urinalysis had a sensitivity of 95% when tested on the first day of symptom onset but decreased to 65% three days later.^{12,13}

In some cases, urolithiasis can lead to secondary complications, such as urinary tract obstruction and urinary tract infection. Patients with obstructive urolithiasis accompanied by a urinary tract infection are at risk of developing acute kidney injury (AKI), which can worsen patient outcomes and potentially increase mortality rates. Therefore, comprehensive history-taking and examination are necessary to anticipate complications.^{2,3,12,13}

As the gold standard in radiologic examination, Computed Tomography (CT) is used, with a sensitivity of 94-97% and specificity of 96-100% (evidence level 1a, recommendation grade A), to detect and locate all types of stones, providing a clear depiction of the anatomy, structure, and extent of kidney obstruction.^{2,3,12,13}

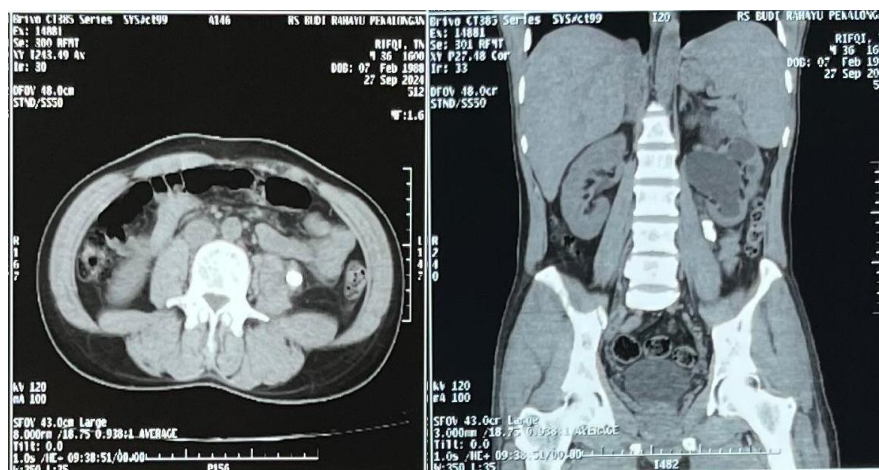


Figure 1. Left-sided ureterolithiasis with hydronephrosis and hydroureter on Urological Computed Tomography

In our case, the patient was found to have urinary tract obstruction due to a urinary stone located in the proximal ureter. This was indicated by the patient's complaint of severe left flank pain without radiation, supported by physical examination revealing left-sided CVA tenderness. The patient's hematuria complaint further confirmed that the flank pain originated from the urinary tract. A urological CT scan showed ureterolithiasis at the L4 level, with a stone measuring 2.24 cm accompanied by grade IV hydronephrosis and hydroureter on the left side. As a result of urinary tract obstruction, urinary stasis occurred, providing bacteria the opportunity to adhere to the urothelium and cause infection. This led the patient to experience painful, incomplete urination with a sensation of heat, along with reddish, cloudy urine.^{13,14}

Hydronephrosis is a condition resulting from an obstruction of urine flow in the urinary system, leading to dilation and swelling of the kidney. If left untreated, hydronephrosis can potentially lead to kidney failure accompanied by permanent kidney damage.¹⁵

Management of urolithiasis generally includes conservative therapy, lifestyle modifications, medication therapy, medical interventions, and surgical procedures. The initial treatment for patients with colic pain upon arriving at the emergency department involves hydration and symptomatic medication. Analgesics, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids, can be used to manage acute pain, depending on its severity. Other symptomatic medications, like antiemetics or antipyretics, can be considered based on the patient's accompanying complaints.^{1,2}

Approximately 86% of urolithiasis cases do not require surgical intervention, as stones can pass spontaneously within 30-40 days, provided they are smaller than 10 mm. The larger the urinary stone, the longer it takes to pass spontaneously, with a lower success rate for spontaneous passage. Non-surgical therapies that may be considered for smaller stones include medical expulsive therapy (MET) for

stones measuring 5-10 mm, but treatment should be discontinued if complication develop (infection, refractory pain, deterioration of renal function).¹

Indications for removal of ureteral stones are stones with a low likelihood of spontaneous passage, persistent pain despite adequate analgesic medication, persistent obstruction, and renal insufficiency (renal failure, bilateral obstruction, or single kidney). The selection of the procedure depends on many factors, including stone-related factors, such as size, location, and density, as well as patient-related factors, such as body habitus, urinary anatomy, bleeding disorders, and other potential comorbidities. Compared with shockwave lithotripsy, ureteroscopy was associated with significantly greater stone-free rate up to four weeks, but the difference was not significant at three months in the included studies.¹

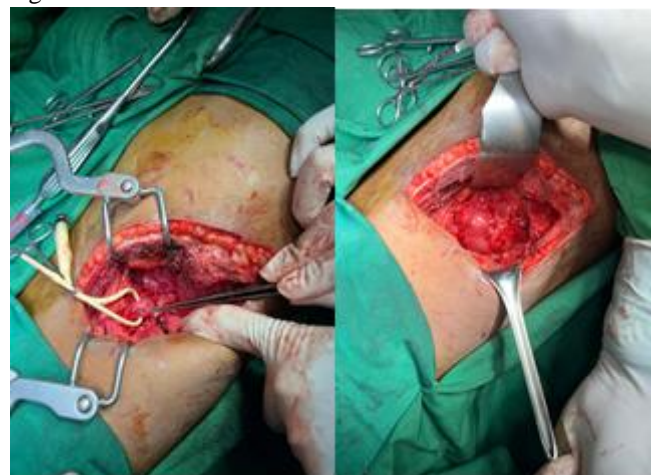


Figure 2. Swelling of the left ureter and kidney observed

In this case, due to limited urological facilities at our hospital, our surgeon decided to perform an open left ureterolithotomy based on medical indications, including a ureteral stone larger than 2 cm accompanied by complications such as infection and urinary tract obstruction.



Figure 3. Ureteral stone measuring 2.24 cm

CONCLUSION

Flank pain is the most common manifestation in patients with urolithiasis. Early diagnosis of complications can improve the patient's prognosis. The management of urolithiasis depends on medical indications and can be adjusted according to available facilities.

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