

Giant Pyonephrosis Due to Calculus of Ureter: A Case Report

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Abstract

Giant pyonephrosis (GP) is a rare and severe form of pyonephrosis characterized by a massive enlargement of the affected kidney due to the accumulation of infected fluid. This study presents case of a 51-year-old male patient with giant pyonephrosis who underwent nephrectomy as treatment. The clinical manifestations of giant pyonephrosis are nonspecific, necessitating the use of imaging and laboratory techniques to aid in diagnosis. Nephrectomy is the preferred treatment option for these patients. One week after nephrectomy, the laboratory results showed improvements. Making the right treatment decision is challenging in this particular case.

Keywords: Abdominal mass, case report, giant pyonephrosis, ureteropelvic junction obstruction

Introduction

Pyonephrosis is an uncommon medical condition characterized by the accumulation of pus within the kidney, resulting from an obstructed urinary tract. This condition is considered rare and occurs infrequently in the general population. Pyonephrosis typically arises as a complication of untreated or recurrent urinary tract infections, kidney stones, or structural abnormalities within the urinary system.¹ GP is a rare and severe form of pyonephrosis characterized by a massive enlargement of the affected kidney due to the accumulation of infected fluid.² The exact definition of the fluid volume in giant pyonephrosis is not found in the literature. However, giant hydronephrosis was initially described by Stirling in 1939 as the accumulation of more than 1000 mL of fluid in the excretory system of the kidney,³ while through imaging, features of the hydronephrotic renal pelvis that meet or cross the midline, occupy the hemiabdomen, and extend along five or more vertebral lines.⁴ The specific epidemiology of pyonephrosis has not been found thus far. However, according to a study by Boeri et al., women are more commonly affected by pyonephrosis (56.5%)

compared to men (43.5%), with an average age of 58.5 years.⁵ The resulting urinary stasis leads to bacterial colonization of the obstructed system, which subsequently causes rapid progression causing urosepsis and septic shock. The mortality rate associated with septic shock can reach up to 50%.⁶ Treatment of GP relies on the kidney functional status and underlying etiology ranging from simple nephrostomy to nephrectomy.² Our patient with a unilateral GP underwent a right open nephrectomy through various considerations explained further. The purpose of this article is to present case reports of GP in adults and a review of the literature.

Case

A 51-year-old Javanese man came to the emergency department of Bhakti Asih Hospital with a chief complaint of rapid enlargement of the abdomen that started 2 weeks ago. Mild abdominal pain was also felt intermittently with gross hematuria. There were no complaints of either fatigue, fever, nausea, and vomiting. The patient also had no known prior surgery, kidney stone disease, hypertension, diabetes, or any other urological related diseases.

The patient's vital signs were stable (blood pressure 120/80 mmHg), respiratory rate of 16 respirations per minute, pulse rate of 83 beats per minute, and axillary temperature show

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Figure 1 Clinical Picture. (A) Front view; (B) Lateral View of the Supine Position

36.2°C. The total body weight was 62 kg, Clinical examination showed abdominal distension, dullness to percussion, and a palpable mass with solid consistency with tenderness on the right side across the midline with right costovertebral tenderness (Figure 1).

Laboratory investigations were in normal range hemoglobin 11.3 g/dL (12.0–18.0 g/dL), erythrocytes 3.92×10^6 /uL (4.0–55 10^6 /uL), platelets 750,000/uL (150.000–450.000 /uL) urea 33.8 mg/dL (15–40 mg/dL), creatinine 1.13 mg/dL (0.7–1.4 mg/dL) aside from

leukocytosis of 17,890 /uL (4.000–11.000 /uL). Chest X-ray examination revealed an elevation on the right diaphragm. A plain abdominal examination revealed multiple opaque lesions in the right kidney area, with the contour which appears enlarged. (Figure 2). Ultrasonographic examination showed grade 4 right hydronephrosis and hydroureter with a suspect of ureterolithiasis; Nephrolithiasis multiple mid and lower pole of the right kidney (with the biggest size of 2.03 cm) (Figure 3).

The treatment plan initially involved

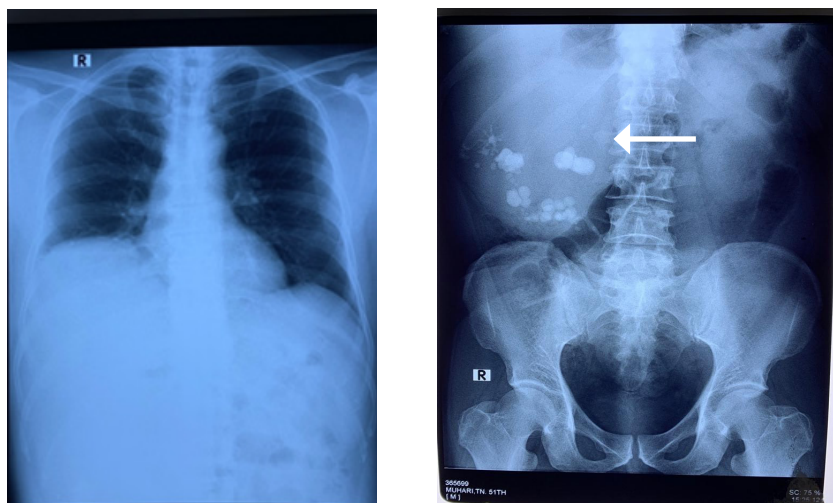


Figure 2 (Left) Chest X-ray; (Right) Plain Abdominal X-ray. (White arrow: Suggestive of a Semiopaque Stone in the Ureter)



Figure 3 Abdominal Ultrasound. (Indicative of a Ureteral Stone Causing Obstruction)

performing a nephrolithotomy to remove the stones. However, during the operation, the presence of pus indicated a prolonged infection that had caused damage to the kidney. Meanwhile, the left kidney was functioning normally. As a result, a total nephrectomy was then carried out with a duration of 2 hours. A total of approximately 1500 mL of cloudy and seropurulent fluid was aspirated and drained, along with taking several stones from the right kidney, one of which was located at the ureteropelvic junction (UPJ) and at the proximal ureter (Figure 4). After nephrectomy, the size of the right kidney measures 24x20x18 cm. A drain was inserted into the abdominal cavity and the fascia and skin were closed. The patient was discharged with improvement on the 3rd

postoperative day. Then, the patient was followed up 1 month later without any complaints and a routine blood tests and kidney function examination. The results of the routine blood tests showed Hb: 12 g/dL, leukocytes 8.000/uL, platelets 189.000 /uL, while the kidney function examination showed a slightly elevated urea of 38 mg/dL and creatinine 1.2 mg/dL.

Discussion

Pyonephrosis is a suppurative infection in the upper urinary tract and differs from infected hydronephrosis in the presence of pus.² This condition is commonly associated with parenchymal destruction of the kidney and a

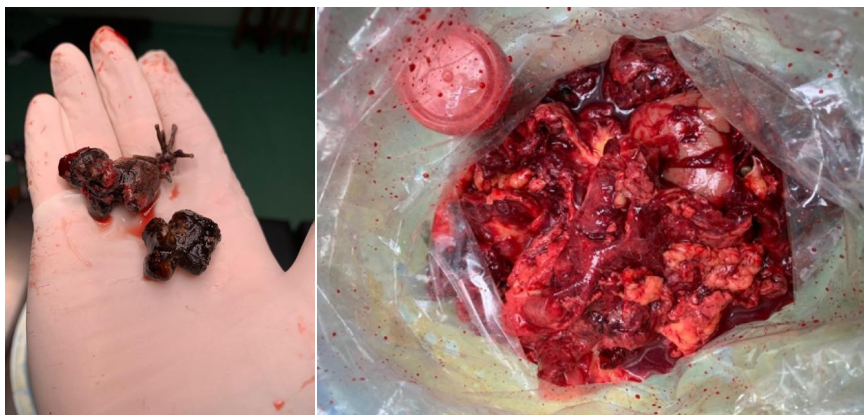


Figure 4 (Left) Kidney Stones Extracted During Nephrectomy; (Right) Macroscopic Specimen Shows Hydronephrosis of the Right Kidney

decline in kidney function.^{7,8}

The main anatomical factor in pyonephrosis is ureteral obstruction. Stones are the most common cause, accounting for more than 70% of cases, as seen in this particular case.^{5,7} The causes of obstruction can be categorized as intrinsic (stones, fungal balls, papillary necrosis, blood clots, UPJ obstruction, upper urinary tract malignancies) or extrinsic (bladder tumors, prostate cancer, retroperitoneal tumors or lymph nodes encroachment, compression by lower pole vessels). Intrinsic factors involve conditions that occur within the urinary tract itself, while extrinsic factors involve external structures or tumors compressing or obstructing the ureter. These obstructions disrupt the normal flow of urine, leading to urinary stasis, dilatation of the renal pelvis, and subsequent infection.⁷

Common clinical manifestations of pyonephrosis typically include flank pain, nausea, vomiting, fever, and general weakness.^{7,9} Hematuria and abdominal masses are considered atypical presentations. Approximately 15% of patients may remain asymptomatic. In our case, a mass was identified in the midline of the right abdomen.²

The diagnosis of pyonephrosis is established based on clinical presentation, urine analysis, and radiological imaging.² Ultrasonography is known to be highly effective in diagnosing pyonephrosis, with a sensitivity of 90% and specificity of 97% in differentiating it from hydronephrosis.¹⁰ Ultrasonographic findings indicative of pyonephrosis including the presence of hydronephrosis associated with signs of hyperechoic debris within the collecting system. These findings are fairly specific, as their absence rules out pyonephrosis with high accuracy.¹⁰ CT scan is often performed in cases of pyonephrosis, with or without intravenous contrast administration, depending on kidney function. CT findings of pyonephrosis may reveal thickening of the renal pelvis wall (>2 mm), inflammatory changes in the parenchyma or perinephric area, dilation and obstruction of the collecting system, and the presence of gas-fluid or fluid levels within the intrarenal collecting system. It is often challenging to differentiate simple hydronephrosis from pyonephrosis based on fluid attenuation measurements, although recent studies suggest that patients with pyonephrosis may exhibit higher Hounsfield Unit (HU) values.¹⁰ In this case the diagnosis was made based on clinical symptoms, abdominal x-ray, and abdominal ultrasonography. All considered differential diagnoses are abnormal

ascites, intra-abdominal cysts, and adrenal cysts.^{11,12}

The treatment options for pyonephrosis include nephrostomy, retrograde ureteral stents, pyeloplasty in cases of UPJ obstruction, and nephrectomy.^{5,13,14} Antibiotic treatment has shown limited effectiveness in managing pyonephrosis, thus making surgical intervention necessary for proper management.¹³ Percutaneous nephrostomy is the initial management for pyonephrosis, aiming to drain pus from the renal cavity. Another alternative is to perform a retrograde ureteral stent.⁶ Nephrectomy is typically considered for patients with a non-functioning kidney, which often occurs in cases of long-standing pyonephrosis, while the contralateral kidney remains healthy.^{2,7} In our case, nephrectomy was deemed necessary due to prolonged obstruction, resulting in non-functioning of the right kidney, while the contralateral kidney remained healthy.

Therefore, reducing the risk of kidney infection remains the best modality in a preventive measures including drinking a lot of fluids distinctly water, urinating when needed, and emptying the bladder after sexual intercourse may help preventing an upward bacteria infection from the urethra.⁶

This research did not incorporate computed tomography (CT) scans and urine cultures due to the unavailability of requisite hospital resources, thereby introducing potential hazards associated with anatomical variations during surgical interventions and the targeted administration of antibiotic treatments.

In conclusion, GP is a rare and life-threatening condition. Stone is a common cause. Obstruction results in urinary stasis, causing dilation of the renal pelvis and leading to infection. This can ultimately lead to sepsis and septic shock, which have the potential to be fatal. Prompt and accurate diagnosis is crucial for reducing mortality rates. Management options include percutaneous nephrostomy, retrograde ureteral stent placement, pyeloplasty for cases of UPJ obstruction, and nephrectomy. Nephrectomy is recommended when kidney function is impaired, and the infection persists to the point where it poses a life-threatening risk.

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