Inflammation and infection

Emphysematous pyelitis in a solitary functioning kidney

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ABSTRACT

The present report describes the case of a 53-year-old male patient with solitary functioning right kidney admitted to the emergency room with acute abdominal pain, deranged blood sugar, and fever (38.5 °C). Laboratory investigations and computed tomography findings revealed urinary tract infection, deranged renal functions, raised inflammatory markers associated with the presence of gas in the collecting system, characterizing unilateral emphysematous pyelitis caused by Gram-negative bacteria. The present case report emphasizes the occurrence of this disease as a deranged blood glucose complication.

Introduction

Emphysematous pyelitis (EP) is a relatively benign disease characterized by gas production inside the collecting system of kidneys, secondary to acute bacterial infection. It needs accurate differentiation from the far more serious emphysematous pyelonephritis (EPN), which is gas production from an infection in the renal parenchyma rather than just in the collecting system. If not treated early, it may lead to EPN, fulminant sepsis and, therefore, carries a high mortality. Most of the cases are reported in diabetics, about 90% reported according to different series; obstructive uropathy is the other contributing factor in other cases. It is mostly unilateral but 10% is bilateral.1 EP carries a mortality rate of up to 20%, which is significantly lower than that of emphysematous pyelonephritis, which carries a mortality rate of approximately 50%.2

Typical clinical features of EP are the same as EPN, include the following fever, abdominal pain, nausea, vomiting, shortness of breath, acute renal impairment and shock. We present a case of emphysematous pyelitis in a solitary functioning right kidney with an evaluation of radiological features, prognostic factors, and current management of this disease.

Case report

A 53-year-old man with congenitally solitary functioning right kidney, known diabetic and hypertensive presented to the urology emergency clinic with complaints of pain right side upper abdomen, fever with chills and deranged blood sugar for the previous 3 days. The patient appeared alert and oriented, but dehydrated. Past history of the patient reveals right pyelolithotomy and ureterorenoscopy (URS) + Double-J-stenting three years back secondary to stones. Renal Scan (DTPA) at that time shows left markedly impaired functioning kidney (Fig. 1).

Laboratory investigations revealed hemoglobin; 8.6 g/dL, total leukocyte count (TLC); 16.0*10⁹/L, neutrophils 88%, C-reactive protein (CRP) 195 mg/l, random blood glucose: 467 mg/dL, serum urea: 41 mmol/l, creatinine: 761 mmol/l, serum Na+: 128 mmol/L, and K+: 6.6 mmol/L. The urinalysis showed plenty of pus cells with glycosuria. Urine culture grew E. coli with sensitivity to Cefoperazone/Sulbactam and levofloxacin. The ultrasonography demonstrated a heterogenous mass replacing the right kidney with the presence of strong focal echoes suggesting intraparenchymal gas, minimal fullness of pelvis + calyceal system and air has seen predominantly in perinephric space medially (Fig. 2).

Right percutaneous nephrostomy (PCN) was planned under ultrasonographic guidance. The ultrasonographic assessment showed minimal fullness of the pelvicalyceal system and the air is seen predominantly in perinephric space medially. Using 18G Chiba needle with local anesthesia, an attempt was made to access the pelvicalyceal system to drain the air and pus. No stones were seen on ultrasonography or CT Scan. A 10 French ureteral catheter was inserted and the patient was discharged on oral antibiotics.

Discussion

Emphysematous pyelitis is a recently recognized entity characterized by gas production in the urinary tract due to bacterial infection. It is a rare condition with an incidence of approximately 1 in 100,000 admissions to hospital.3 It is most commonly seen in diabetics and patients with urinary tract obstruction. The diagnosis of emphysematous pyelitis is typically established on clinical grounds, supported by radiological findings, and confirmed by the identification of gas in the urinary tract on imaging studies. The treatment of emphysematous pyelitis is supportive and often requires aggressive fluid resuscitation and diuresis. Antibiotics are directed at the causative organism, which is typically an Escherichia coli. The condition can be devastating if not treated promptly.

Conclusion

Emphysematous pyelitis is a rare condition that requires prompt recognition and treatment to avoid life-threatening complications. The case presented here highlights the importance of early diagnosis and appropriate management of patients with emphysematous pyelitis, particularly in those with underlying diabetes and urinary tract obstruction. Further studies are needed to better understand the epidemiology, risk factors, and optimal treatment strategies for emphysematous pyelitis.

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Fig. 1. DTPA Scan with markedly impaired functioning left kidney.

Fig. 2. Ultrasonography showing minimal fullness of system and intraparenchymal gas.

Fig. 3. CT KUB axial film shows the presence of air in the collecting system of kidneys. Coronal & sagittal films show the air extending to the psoas muscle and diaphragm area.
system in lower pole region. The patient was unable to hold his breath and blood pressure was persistently rising (190/110 mmHg) despite antihypertensive medications so PCN was postponed.

We contemplated Double-J stenting which shows pus, debris, and calculus in the right ureter. On the 1st postoperative day of DJ-stenting, the patient had sudden onset frank pyuria, which drained around 500 m/l of pus with the resolution of the abdominal pain, fever, and serum creatinine: 405 μmol/l. After nephrology consultation, the patient had 3 sessions of hemodialysis on 1st, 2nd and 5th day of admission only. He was continued on conservative management with oral Levofoxacin after 7 days of parenteral therapy, and his blood sugar and blood pressure were controlled. His renal function tests improved to serum urea 7.2mmol/l, creatinine 184mmol/l and inflammatory markers CRP 18.2 mg/l and TLC count 8.2*10^9/L. No other invasive form of treatment was needed.

The patient was discharged with follow-up in Urology Outpatient department. Ureterorenoscopy for right ureteric stone and removal of Double-J-stenting was planned after 6 weeks.

Discussion

Emphysematous pyelitis, if not approached aggressively has a high mortality rate. An early suspicion should be raised when a patient is thought to have uncomplicated pyelonephritis with deranged blood sugar and poor response to antibiotic therapy. Urgent laboratory and imaging studies should be performed, and surgery should be considered early in patients who are at high risk of mortality.

Common organism isolated from the culture of urine, blood or aspirate material in patients with EP includes Escherichia coli (most common), Klebsiella pneumonia, Proteus mirabilis, Enterococcus species, and P. aeruginosa. Management includes intensive resuscitation in case of shock followed by the initiation of broad-spectrum antibiotics and immediate surgical consultation and intervention if needed. Surgical measures include percutaneous catheter drainage, incision, and drainage or nephrectomy depending on the condition of the patient, extent of disease and comorbidities.

EP may progress to EPN which is a uniformly fatal illness if left untreated. Patients who are treated medically have a higher mortality rate than those treated surgically, 70% vs. 30%. Most cases are associated with uncontrolled diabetes mellitus, around 90% in different series, obstructive uropathy is the other predisposing factor.3,4 Factors which are related to high mortality are systolic blood pressure < 90 mmHg, altered mental status, increase in serum creatinine, thrombocytopenia, bilateral disease and the treatment of disease only with antibiotics. Mortality due to septic complications may be as high as 21%.5

Other conditions in which a patient presents with air in and around the kidney include the perinephric abscess with gas around the kidney, intrarenal abscess in which gas is localized to the abscess cavity inside the kidney and emphysematous pyelonephritis with gas throughout the renal parenchyma with a very high mortality rate.

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