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Emphysematous Pyelonephritis in a Diabetic Patient with Remarkable Radiological Findings and Excellent Outcome without Surgical Intervention or Drainage

Authors' Contribution:

Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Patient: Male, 87-year-old
Final Diagnosis: Emphysematous pyelonephritis • pyelonephritis
Symptoms: Fever • pyelonephritis
Medication: —
Clinical Procedure: —
Specialty: Endocrinology and Metabolic • Infectious Diseases

Objective: Rare disease**Background:** Emphysematous pyelonephritis (EPN) is a life-threatening infection of the renal parenchyma. The purpose of this report is to present a case of EPN with distinctive imaging.**Case Report:** An 87-year-old man with a history of type 2 diabetes mellitus presented to the ER with fever and shivering, hypotension, and anuria, which is a clinical presentation of septic shock. He had recently been hospitalized at another hospital due to myocardial infarction and ischemic stroke, where a temporary urinary catheter was placed. Upon physical examination, he had right lateral abdominal pain with extension to the right renal region. Laboratory studies showed leucocytosis (WBC: 24 320/μl with 94.4% polymorphonuclear), elevated C-reactive protein 340 mg/l (NV <3.45), and acute renal failure (urea 155mg/dl NV <50 mg/dl, creatinine 4.4 mg/dl NV <1.2 mg/dl). A plain X-ray showed air was present peripheral to the right kidney, while the abdominal CT revealed air inside the right kidney and bilateral nephrolithiasis. The patient was initially put on aggressive hydration, vasoconstrictors, and hydrocortisone to treat the septic shock, and an advanced antibiotic treatment (meropenem) was initiated immediately. Blood culture grew *Escherichia coli*. After 3 days of treatment, he showed significant improvement in diuresis and renal function (urea 90 mg/dl, creatinine 1.0 mg/dl), with a concomitant decrease in inflammatory markers (CRP 36.7 mg/l). The antibiotic treatment was tapered to cefuroxime and metronidazole. The patient's condition improved, and he was discharged with per os antibiotic treatment. Subsequently, surgical assessment for the nephrolithiasis was suggested.**Conclusions:** Emphysematous pyelonephritis, although rare, should be included in the differential diagnosis of fever in a diabetic patient with renal pain.**MeSH Keywords:** Bacterial Infections • Diabetes Mellitus • Pyelonephritis**Full-text PDF:** <https://www.amjcaserep.com/abstract/index/idArt/922974>

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Background

The term emphysematous pyelonephritis (EPN) refers to a necrotizing gas-forming infection of the renal parenchyma, the urinary tract system, and perirenal tissue [1]. It is frequently present in patients with diabetes mellitus (DM). In EPN, early aggressive antibiotic therapy can prevent nephrectomy. In this report we present a case of EPN with distinctive imaging and an excellent outcome after early diagnosis, with supportive and antibiotic treatment only.

Case Report

An 87-year-old man presented to the ER with fever and shivering, hypotension, and anuria, which is a clinical presentation of septic shock. His medical history included diabetes mellitus type 2 and he had recently been hospitalized at another hospital due to myocardial infarction and ischemic stroke, where a temporary urinary catheter was placed. He had no history of alcohol, tobacco, or any other substance abuse. Upon physical examination, he had right lateral abdominal pain with extension to the right renal region. Laboratory studies showed leucocytosis (WBC: 24320/ μ l with 94.4% polymorphonuclear), elevated C-reactive protein 340 mg/l (NV <3.45), and acute renal failure (urea 155 mg/dl NV <50 mg/dl, creatinine 4.4 mg/dl NV <1.2 mg/dl). A plain X-ray (Figure 1) showed air was present peripheral to the right kidney, while the abdominal CT (Figure 2) revealed air inside the right kidney and bilateral nephrolithiasis. The patient was initially put on aggressive intravenous hydration, vasoconstrictors, and hydrocortisone to treat the septic shock, and advanced antibiotic treatment (meropenem iv, 1 g q12h) was initiated immediately due to his severe condition and his recent hospitalization. Blood and urinary cultures grew *Escherichia coli*. After 3 days of treatment, the patient was afebrile and hemodynamically stable. He showed significant improvement in diuresis and renal function (urea 90 mg/dl, creatinine 1.0 mg/dl), with a concomitant decrease in inflammatory markers (CRP 36.7 mg/l), so drainage was not considered necessary. Vasoconstrictors and cortisone were discontinued, and antibiotic treatment was tapered to cefuroxime (1.5 g \times 4) and metronidazole (500 mg \times 3), based on the antibiogram. The patient's condition improved, and he was discharged with per os antibiotic treatment (cefuroxime 500 mg \times 2 and metronidazole 500 mg \times 3), to complete a 2-week course. At 1-month follow-up, he was in good health. Surgical assessment for the nephrolithiasis was subsequently suggested.

Discussion

In patients with DM, infections are the main cause of morbidity and mortality [2]. Emphysematous pyelonephritis (EPN) is

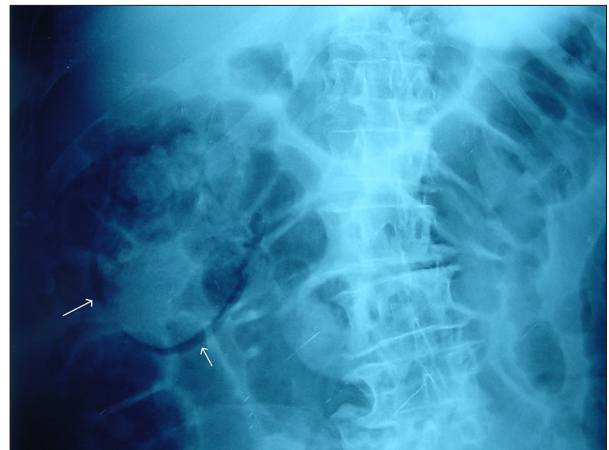


Figure 1. Plain X-ray showing air present peripheral to the right kidney (arrows).

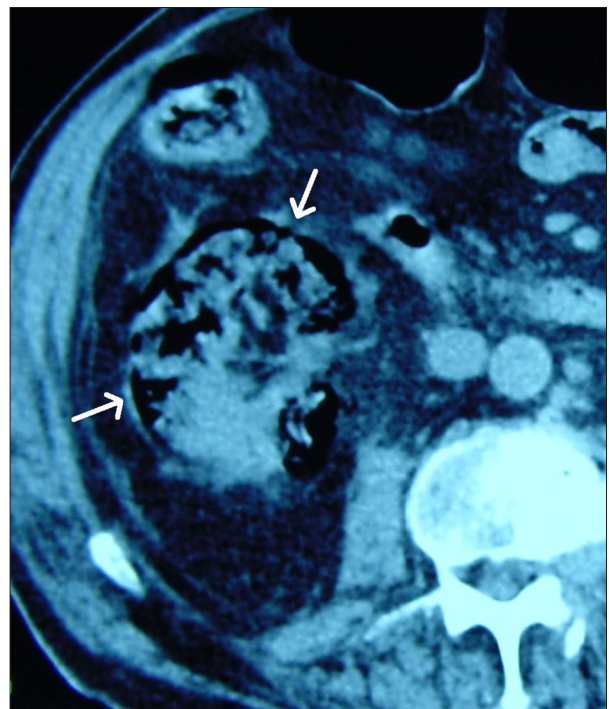


Figure 2. Abdominal CT scan showing air inside and peripheral to the right kidney (arrows) and nephrolithiasis.

an uncommon necrotizing gas-forming infection of the renal parenchyma and perirenal tissue [3,4]. The first case of EPN was reported by Kelly and MacCallum in 1898 [5]. EPN mostly occurs in patients with diabetes mellitus [6,7]. EPN has a female: male ratio of 3: 1 [8]. The most common microorganism responsible is *E. coli*. Other commonly involved microorganisms are *Proteus mirabilis*, *Klebsiella pneumoniae*, Enterococcus species, and *Pseudomonas aeruginosa* [9–11]. There are no specific signs or symptoms of this condition other than the common presentation of acute pyelonephritis; the majority of patients present with fever, lumbar pain, and urinary symptoms [12].

In the literature, the reported sensitivity for diagnosing EPN is 65% with plain X-ray, 69% with ultrasound, and 100% with CT scan [13]. Conclusively, the criterion standard for diagnosis of EPN is CT scanning [14]. In the past, the treatment of choice in EPN was early nephrectomy [15,16]. However, surgery is usually not an option due to the poor hemodynamic status of the patients. Kapoor et al. found that early nephrectomy had higher mortality rates than an early conservative approach [17]. In 1996, Chen et al. reported that antibiotic therapy along with CT-guided percutaneous drainage (PCD) was an alternative to surgery [18]. The first steps in treating a patient with EPN are fluid and electrolyte restoration, acid base balance, glucose control, and early administration of antibiotic [19]. Empiric antibiotic treatment should be broad-spectrum and individualized, taking into consideration the severity of the infection and patient frailness [20,21]. The best option in treating patients with EPN is usually a third-generation cephalosporin with or without PCD. The empiric antibiotic of choice in patients with recent hospitalization or antibiotic use is carbapenem [22].

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In the present case, there was a successful outcome with supportive therapy and antibiotics only, and no further intervention such as nephrectomy or drainage was necessary.

Conclusions

Diabetes mellitus is the most frequent predisposing factor of urinary tract infections among hospitalized patients [23]. Because there are no specific signs or symptoms to EPN, if a patient with DM and a urinary tract infection shows poor response to the antibiotic treatment, an early CT scan should be performed to diagnose EPN as early as possible and to select the appropriate treatment.

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Conflict of interest

None.