



Emphysematous pyelonephritis complicated by septic shock treated with antibiotic therapy alone: a case report

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Introduction and importance: Emphysematous pyelonephritis (EPN) is a rare and serious complication of urinary tract infections that mainly occurs in diabetic patients. It results in the development of aerobic gas-forming bacteria¹. Diagnosis is based mainly on a computed tomography scanner. Therapeutic management is based on the patient's clinical condition and radiological classification.

Case presentation: We present a case of a 64-year-old female patient with type 2 diabetes under insulin and hypertension under amlodipine, who was admitted to the intensive care unit for a state of septic shock on EPN. The patient received resuscitation measures and antibiotic therapy, and the evolution was favorable. The patient was transferred to the urology unit after 10 days of hospitalization in the intensive care unit.

Discussion: EPN is frequently caused by gram-negative cocci and generally develops in diabetics. The clinical signs of EPN are not very specific and are essentially based on the signs of acute pyelonephritis, which responds badly to treatment.

Conclusions: It is essential to take preventive measures in diabetic patients to avoid this complication. Early diagnosis allows for avoiding surgery by preserving the kidney.

Keywords: antibiotic therapy, case report, emphysema, pyelonephritis

Introduction

Emphysematous pyelonephritis (EPN) is defined as an uncommon renal infection that outcomes in septic necrosis of the renal parenchyma associated with gas production in the urinary tract^[1]. This condition mainly occurs in diabetic patients^[2] and was initially described by Kelly and Mac Callum in 1898^[3]. It has received several names including Emphysematous pyelonephritis, introduced by Schultz and Klorfein in 1962^[4]. It is a serious life-threatening complication due to the rapid appearance of septic shock and organ failure. The diagnosis is suspected in the presence of pyelonephritis which responds poorly to medical treatment and is confirmed by a computed tomography (CT) scan that provides a classification with prognostic value on which therapeutic indications are based^[5]. Early diagnosis is essential despite the nonspecific symptoms, especially in diabetic subjects, to allow conservative treatment^[2].

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HIGHLIGHTS

- Emphysematous pyelonephritis is a rare and serious complication of urinary tract infections.
- Diagnosis is based mainly on a computed tomography scan.
- Therapeutic management is based on the patient's clinical condition and radiological classification.
- Treatment is currently more and more conservative with early diagnosis and good resuscitation.

In this article, we report a case of EPN in a diabetic patient complicated by septic shock whose evolution was favorable after dual antibiotic therapy.

Case presentation

A 64-year-old patient with a history of diabetes under insulin and hypertension under amlodipine, with no previous surgical history, was admitted to the intensive care unit due to septic shock with an initially undetermined cause of infection. The cytobacteriological examination of urine showed leukocyturia without individualized germs, and the chest X-ray and lumbar puncture were normal. On admission, the patient was somnolent, febrile at 38.5°C, desaturated at 90% at room air, hypotensive at 80/40 mmHg, and tachycardic at 110 bpm. The blood sugar level was 3 g/l with sugar in the urine without acetone. The biological assessment showed a positive inflammatory syndrome with 20 000/μl white blood cells and 270 mg/l of C-reactive protein, while the blood count showed platelets at 100 000/μl and normal renal function with creatinine at 9.97 mg/l and urea at 0.15 g/l.

An abdomino-pelvic CT scan was requested following the individualization of a painful infiltration with crepitus in the left iliac fossa, which objectified a destroyed left kidney replaced by a

well-limited oval cavity with hydrous content associated with an aerial collection in the left iliac fossa of 75 × 26 mm (Figs 1–3). The therapeutic conduct consisted of fluid resuscitation with ringer lactate (30 ml/kg), vasoactive drugs based on noradrenaline (the initial dose was 1 mg/h gradually decreased and weaned at day 3), glycemic control by insulin infusion, and empirical antibiotic therapy for 10 days based on imipenem (1 g/8 h) and fluoroquinolone: ciprofloxacin (200 mg/12 h). The clinical improvement of the patient allowed us to keep the medical treatment without moving to percutaneous drainage.

After 10 days of hospitalization in the intensive care unit, the patient was transferred to the urology department with a C-reactive protein of 60 mg/l and discharged from the hospital after 13 days of hospitalization without impairment of renal function.

The SCARE (Surgical CAse REport) guidelines were used in the writing of this paper⁶¹.

Discussion

EPN is a rare and severe form of necrotizing renal infection first described by Kelly and Mac Callum in 1898¹³¹. It is characterized by the presence of gas in the renal parenchyma, urinary tract, and perineal tissue¹⁷. This condition is often caused by gram-negative bacilli such as *Escherichia coli*, which is the germ most involved in this pathology; other causative organisms include *Klebsiella pneumoniae* and *Proteus mirabilis*, while gram-positive cocci are less frequently involved during EPN¹⁸¹. Strictly anaerobic organisms remain exceptional despite their known gas-generating potential¹⁹¹. EPN is generally associated with diabetes followed by excretory tract obstruction, pregnancy, and renal transplantation as the last cause^{15, 101}. The clinical signs of EPN are not specific, leading to a delay in diagnosis probably as a result of the symptomatological change of the diabetic; these are signs of severe pyelonephritis that responds poorly to medical treatment and evolves rapidly to septic shock and organ failure¹¹¹.

The abdominal CT scan allows for confirming the diagnosis and puts a prognostic classification through the type and extent of the lesion to establish a therapeutic decision¹⁵¹. A meta-analysis made by Aboumarzouk *et al.*¹²² showed that in EPN the left side is the most affected (52% of patients had a left involvement



Figure 1. Cross-section showing left emphysematous pyelonephritis.

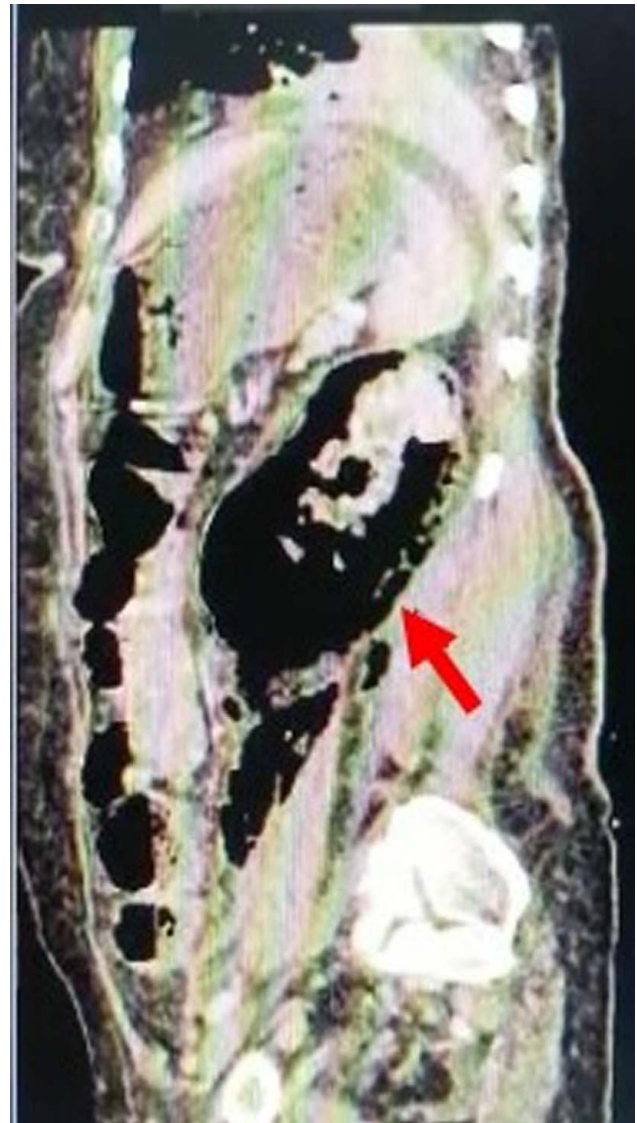


Figure 2. Sagittal section showing stage 3B left emphysematous pyelonephritis (Huang and Tseng classification).

compared to 37.7% on the right and 10.2% bilaterally). The study by Zaghbib *et al.*¹³¹ conducted between 2010 and 2019 on 31 patients showed that surgical intervention was related to situations of advanced stage EPN while conservative treatment has proved its worth even in front of clinical and biological signs of severity thanks to the development of resuscitation, which was also the case for our patient.

Wu *et al.* article discusses the treatment of severe infections, which should begin with aggressive resuscitation and the use of broad-spectrum antibiotics that are effective against common bacteria such as *E. coli*, *K. pneumoniae*, and *P. mirabilis*. Third or fourth-generation cephalosporins and carbapenems are recommended as a preferred single-agent therapy for EPN. Combination therapy may be an alternative strategy. Gentamicin should not be used. The duration of antimicrobial treatment is an important issue. In general, a treatment of 7–14 days is recommended for EPN, but the duration should be related to the



Figure 3. Frontal section showing stage 3B left emphysematous pyelonephritis (Huang and Tseng classification).

treatment of the underlying disease. Continuous use of antibiotics for 2 weeks is recommended for the treatment of severe EPN^[14].

According to a recent study by Misgar *et al.*, early and aggressive medical treatment suggest that nephrectomy should only be indicated in case of worsening despite conservative treatment^[15,16].

Our patient was satisfied with our medical care.

This case report emphasizes the importance of antibiotic therapy in EPN and that medical treatment is the first therapeutic step in the majority of cases but should not delay a possible rescue nephrectomy.

Conclusion

To avoid EPN, especially in diabetic patients, it is important to take preventive measures by controlling their blood sugar and treating urinary tract infections promptly. A CT scan is used to diagnose this condition, and its treatment is becoming increasingly conservative with early diagnosis and good resuscitation.

Ethical approval

For the article type (case report), ethical approval was not necessary.

Consent

Written informed consent was obtained from the patient for the publication of this case report and accompanying images. A copy of

the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

M.M.: corresponding author; G.E.A.: supervision; H.B.: supervision; B.H.: validation.

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There are no conflicts of interest.

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