*Olgu Sunumu (Case Report)*

# Tek Başına Paranteral Antibiyotik ile Tedavi Edilen Amfizematöz Piyelonefrit

## *Emphysematous Pyelonephritis Treated with Only Parenteral Antimicrobial Therapy*

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**Özet**

Amfizematöz piyelonefrit renal parankim içinde veya perirenal bölgede gaz oluşumu ile karakterize, mortalitesi yüksek akut nekrotizan bir enfeksiyondur. Nadir görülmekte olup daha çok diabetes mellitus tanılı hastalarda görülmektedir. Etiyolojisinde en sık Escherichia coli görülür, birçok diğer olası organizmalar rol oynayabilir. Tanısında klinik, laboratuvar ve radyolojik bulgular yer almaktadır. Antibiyoterapi, perkütan drenaj ya da nefrektomi ile tedavi edilebilir. Tek başına medikal tedavi ile başarıyla tedavi edilen az sayıda olgu bildirilmiştir. Bu yazımızda nefrektomi olmaksızın tek başına parenteral antibiyotik tedavisi ile klinik, laboratuvar ve radyolojik bulgularında düzelme gözlenen evre 3A amfizematöz piyelonefritli olguyu sunmak istedik.

**Anahtar kelimeler:** Amfizematöz piyelonefrit, diabetes mellitus, antibiyoterapi, tedavi

**Abstract**

Emphysematous pyelonephritis is a highly mortal, acute necrotizing disease charactarized by gas formation in either renal parenchyma or perirenal area. Although it is seen quite rare; it usually diagnosed in patients with diabetes mellitus. Predominantly it is caused by microorganism Escherichia coli, many other possible microorganism can play a role. In diagnosis clinic, laboratory and radiological signs exists. It can be treated with parenteral antibiotic therapy, percutaneous drainage or nephrectomy. A small proportion of cases whom only can be treated with antibiotic treatment were presented. In this case report, we will discuss a case with stage 3A emphysematous pyelonephritis whom received only antibiotic treatment and showed improvement in clinical, laboratory and radiological signs.

**Keywords:** Emphysematous pyelonephritis, diabetes mellitus, antibiotherapy, treatment

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## INTRODUCTION

Emphysematous pyelonephritis (EP) is an acute severe necrotizing infection of the renal parenchyma and its surrounding tissues that results in the presence of gas in the renal parenchyma, collecting system or perinephric tissue. The first case of gas-forming renal infection was reported by Kelly and MacCullum in 1898 (1). EP is commonly associated with diabetes mellitus especially in females, debilitated immune-deficient individuals, and patients harbouring obstructed urinary system with infective nidus. *Escherichia coli*is the most commonly encountered organism, others being *Klebsiella*, *Proteus*, *Pseudomonas*, *Clostridium*, *Streptococcus*, *Candida*, *Aspergillus* and *Cryptococcus* species and sometimes polymicrobial infections (2,3).

The clinical course of EP is usually sudden onset and poor. Symptoms such as side pain, confusion, nausea, vomiting, fever and abdominal pain are common. Symptoms of septicemia and acute renal failure may occur soon after symptoms. Diagnosis is made by clinical, laboratory and radiological evaluation. Laboratory results usually include leukocytosis, hyperglycemia, elevated serum creatinine, and pyouri in complete urinalysis. Microbial agents may be detected in hemoculture and urine culture studies, but these tests are takes longer time to give results. Imaging methods include direct urinary system radiography, ultrasonography (US) and computed tomography (CT). CT is the most sensitive imaging method to show the gas in the renal parenchyma, to determine its localization and to determine its limits. CT can be examined with or without intravenous contrast material depending on the patient's condition (4). Several classification methods for EP exist for both plain radiograph and CT. Stage I describes gas in the renal parenchyma or perinephric tissue; stage II describes gas in the kidney and its surroundings; and stage III indicates extension of gas through fascia or bilateral disease. Wan et al$_5$ classify EP based on CT scanning into two different types: Type I shows either renal necrosis with presence of gas but no fluid, or streaky mottled gas patterns, indicating a worse prognosis. Type II, meanwhile, is defined by parenchymal gas associated with fluid in the renal parenchyma, perinephric space or collecting system and the absence of streaky or mottled gas pattern. It has a more favorable prognosis than Type I (5,6).

The first step in management should be correction of the bad glycemic status. Conservative approach should be performed with appropriate amount of hydration and antibiotic treatment. Treatments such percutaneous catheter drainage (PCD) or nephrectomy should be considered in refractory patients and high mortality (7).

## CASE REPORT

A 46-year-old female patient presented to our outpatient clinic with complaints of abdominal pain, nausea and fever. her complaints had been present for about a week and had been have a fever for the last three days. She had a history of cholecystectomy, type 2 DM for 20 years, hypertension for 15 years, and stage 3A chronic renal failure for 1 year. There was no significant feature in the family history. On physical examination, her general condition was moderate, body temperature was 38.5˚C, confused and dehydrated. There were no pathological findings in the patient except bilateral basal rales, tenderness with abdominal palpation in the left lumbar quadrant and left costovertebral angle tenderness. There was no history of invasive interventional procedures or trauma. In laboratory results, leukocyte (WBC): 25.000 / mm3, hemoglobin (Hgb): 9.4 g/dL, hematocrit (Hct): 23.3%, platelet (Plt): 195.000/mm3, glucose: 261 g/dL, urea: 89 mg/dL, creatinine 2.31 mg/dL, alanine aminotransferase (ALT): 11 U/L, aspartate aminotransferase (AST): 17 U/L, sodium (Na): 126 mmol/L, potassium (K): 3.0 mmol/L, lactate dehydrogenase (LDH): 265 U/L, amylase: 31 U/L, C reactive protein (CRP): 156 mg/L, sedimentation 73 mm/h, leukocyte: 151, erythrocyte on microscopic examination of complete urinalysis, glucose: +3, protein: +3 were detected. There was no significant feature on direct urinary system radiography. In the abdominal US examination, no additional pathologic findings were observed except for heterogeneity and edema in the upper and middle zone of the left kidney, mild fluid localization in the perirenal area. Intravenous Meropenem treatment was initiated with a preliminary diagnosis of acute pyelonephritis. In the clinical follow-up, the patient underwent abdominal CT and were detected to irregularities in the upper and middle poles of the left kidney, revealed gas formation in the renal parenchyma, irregularities in the perirenal fat planes and contamination **(Figure 1A, 1B)**.

Clinical and radiological findings were consistent with stage 3A EP. No drainage or nephrectomy was recommended to the patient who was consulted by the Urology department. Insulin dose titration was performed for uncontrolled DM and appropriate amount of hydration was achieved. There was no growth in hemoculture and urine culture samples. After 3 weeks of intravenous Meropenem treatment, a significant regression of the lesion was observed on control CT imaging **(Figure 2A, 2B)**. Clinical, radiological and laboratory findings improved **(Table 1)**. Thus, the patient was treated with antibiotherapy alone without nephrectomy and no pathological findings were found in the control outpatient clinic examinations. The patient signed a conset form to allow us share her personel data.

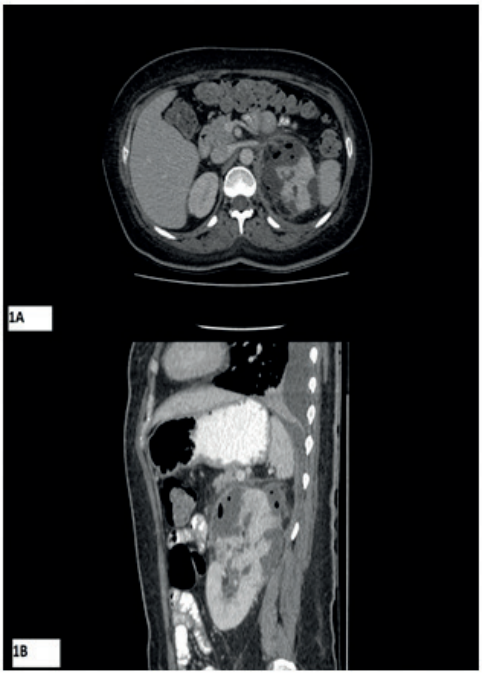


**Figure 1A, 1.B** Axial and sagittal CT images of upper abdomen obtained before the treatment shows swollen left kidney with upper parenchymal destruction and renal fluid collection containing gas bubbles in the upper half. These imaging findings are consisted with type 2 emphysematous pyelonephritis.

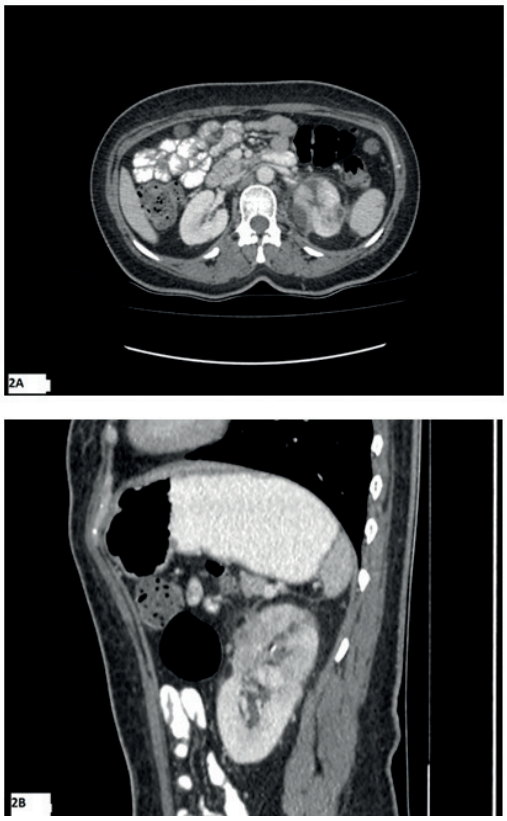


**Figure 2A, 2.B** Axial and sagittal CT images of upper abdomen obtained after the treatment shows significant improvement of imaging findings compared to the images obtained before the treatment.

**Table 1. Laboratory data of the patient**
**Abbreviations:**

| DATE | WBC (/ mm3) | Hgb (g/ dL) | Plt (/ mm3) | Glucose (g) | Urea (mg/ dL) | Cr (mg/ dL) | Na (mmol/L) | K (mmol/dL) | CRP (mg/L) |
|---|---|---|---|---|---|---|---|---|---|
| 1.day | 25.000 | 9.4 | 195.000 | 261 | 89 | 2.31 | 126 | 3.0 | 156 |
| 9. day | 17.000 | 9.8 | 363.000 | 180 | 76 | 1.80 | 128 | 4.0 | 64.5 |
| 13. day | 13.000 | 10.2 | 370.000 | 165 | 47 | 1.35 | 131 | 5.1 | 39.2 |
| 17. day | 7.000 | 10.5 | 390.000 | 168 | 45 | 1.40 | 132 | 4.7 | 25.7 |
| 21. day | 7.300 | 11.4 | 340.000 | 140 | 48 | 1.30 | 134 | 5.2 | 12.9 |
| 28. day | 6.500 | 10.8 | 380.000 | 143 | 46 | 1.40 | 132 | 5.1 | <3.2 |

WBC: Leukocyte, Hgb: Hemoglobin, Plt: Plateler, Cr: Creatinine, Na: Sodium, K: Potassium, CRP: C reactive protein.

## DISCUSSION

EP has been considered as a constellation of necrotizing infection of renal parenchyma, gas in renal system and poor glycaemic control. Predisposing factors encompass urinary tract obstruction, end-stage renal disease, immunosuppression and rarely polycystic renal disease. Pathogenesis of EP is under evaluation. Four key factors have been proposed including uncontrolled tissue glucose level favouring bacterial growth, renal tissue ischemia and necrosis secondary to compromised renal perfusion, immunodeficiency and diabetic neuropathy (8,9). Clinically EP presents with nonspecific features of upper urinary tract infection including fever, flank pain, nausea, vomiting, altered sensorium, shock, acute renal failure and disseminated intravascular coagulation. Costovertebral angle tenderness is considered the commonest physical finding. Abdominal X-ray and US have limited role in the diagnosis of EP. Gas can be demonstrated in only 33% of plain abdominal radiograms.CT scan is the most definitive modality demonstrating the presence of gas, presence, extent, and prognosis of the disease (10).

Type I EP is a form of renal parenchymal injury with gas formation, fulminant course and often requiring urgent nephrectomy. Type II EP is the presence of renal or perirenal fluid and gas in the collecting canal. Generally, the mortality rate of type I is 70% and type II EP is 18%.Huang and Tseng's classification has four different classes. Stage 1 indicates gas in the collecting system only. Patients with stage 1 EP have the best prognosis and can be managed medically with parenteral antibiotics and fluid, electrolytes and glucose control. Stage 2 represents gas in the renal parenchyma; management of patients in this class consists of antibiotics plus PCD and if present, relief of any obstruction in the urinary tract. Stage 3 is divided into two sub-categories, A and B. Stage 3A describes gas or abscess to perinephric space and stage 3B describes gas or abscess extending beyond the kidney. Management of stage 3 EP depends on the patient's risk factors, which include thrombocytopenia, acute renal failure, disturbance of consciousness and shock. If patients have no or one risk factor, they can initially be managed medically with antibiotics and PCD. If patients have 2 or more risk factors, nephrectomy is indicated and will help the prognosis. Stage 4 indicates either bilateral or solitary kidney involvement; stage 4 management of bilateral renal involvement calls for bilateral PCD with medical antibiotics. If that fails, nephrectomy is indicated. Stage 4 management of patients with a solitary kidney also initially calls for PCD with antibiotics, with nephrectomy indicated on failure of that treatment (11).

A small number of cases of EP treated with antibiotherapy alone have been reported in the literature. Schultz and Klorfein reported the first case series of EP, although the term "emphysematous pyelonephritis" was first applied by Schultz and Klorfein in 1962. It occurs most frequently in female diabetic patients (70–90%) and carries a mortality rate of up to 80%, if patients are only treated medically (12). Timely initiation of suitable antibiotics and PCD are of utmost importance as treatment. To maximize nephron sparing, PCD has been widely adopted and in conjunction with medical treatment has succeeded in lowering the mortality rate to 13.5%. The first step in managing a patient with EP is fluid and electrolyte resuscitation, acid base balance, diabetic control, and an antibiotic regimen. A spectrum of management strategies for EP has evolved over the years, ranging from invasive surgery to more conservative measures, including PCD or placement of a double-J catheter. Timely administration of appropriate antibiotics and early PCD are of paramount importance. There are also reports indicating that medical treatment alone plays an effective role, especially in patients with focal involvement in imaging (13). In our case with Stage 3A EP, clinical improvement was not seen very often with medical treatment alone without nephrectomy.

As a conclusion; Management of EP requires multidisciplinary collaboration including hydration and electrolyte management, broad spectrum antibiotics, strict glycaemic control, effective urinary drainage and lastly may require emergency nephrectomy as salvage procedure. In this case report, we wanted to emphasize the clinicoradiological classification of EP and the importance of only antibiotherapy in treatment.

**Compliance with ethical standards**

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**Conflict of interests**

The authors have no conflict of interests to declare.

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