

Olgu Sunumu/Case Report

## A Case of Emphysematous Pyelonephritis Improved with Medical Treatment

### Medical Tedavi ile Düzelen Amfizematöz Piyelonefrit Olgusu

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#### ÖZET

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Amfizematöz piyelonefrit renal parankim ve onu çevreleyen dokuların nekrotizan enfeksiyonu olup, renal parankim, kollektor sistem veya perinefritik dokuda gaz formasyonu ile karakterizedir. Olguların %90'ında predispozan faktör diyabetes mellitustur. Bu çalışmada, üriner sistem enfeksiyonu ön tanısıyla takip edilen, yapılan tetkikler sonucunda amfizematöz piyelonefrit tanısı konan ve cerrahi gereksinim olmadan anti-biyoterapi ile düzelen bir olgu sunulması amaçlandı.

**Anahtar Kelimeler:** Amfizematöz piyelonefrit, Piyelonefrit, Diabetes mellitus.

#### ABSTRACT

Emphysematous pyelonephritis is a necrotizing infection of the renal parenchyma and surrounding tissues and is characterized by gas formation in renal parenchyma, collector system, or perinephric tissue. Diabetes mellitus is a predisposing factor in 90% of cases. In this study, it was aimed to present a case who was followed up with a preliminary diagnosis of urinary system infection, was diagnosed with emphysematous pyelonephritis as a result of the tests performed and recovered with antibiotherapy without the need for surgery.

**Keywords:** Emphysematous pyelonephritis, Pyelonephritis, Diabetes mellitus.

## INTRODUCTION

Emphysematous pyelonephritis (EPN) is a suppurative and necrotizing kidney infection with high mortality, characterized by gas formation in perirenal or intrarenal region, usually patients have a diagnosis of diabetes mellitus (DM). EPN was first described by Kelly and MacCallum in 1898 (Kelly and MacCallum, 1898; Klein et al., 1986). DM is a predisposing factor in 90% of cases. Other underlying factors in EPN are urinary tract obstruction, urinary tract infection, renal infarction, and tumor embolism (Karslı, 2016). *E. coli* is the most common gas-forming organisms, while *Klebsiella*, *Clostridium*, *Candida*, *Aspergillus*, *Cryptococcus*, and *Amoeba* are among the other causative agents (Mohsin et al., 2009). Although it is a life-threatening disease, there is no clear consensus on its treatment. Basic ap

proaches in treatment; emergency nephrectomy, percutaneous drainage or medical treatment (Aboumarzouk et al., 2014). In this study, it was aimed to present a case who was followed up with a preliminary diagnosis of urinary system infection, was diagnosed with EPN as a result of the tests performed, and recovered with antibiotherapy without the need for surgery.

## Case report

A 68-year-old female patient presented to the emergency department with complaints of abdominal pain, nausea, vomiting, loss of appetite, weakness, chills, and shivering that had started the day before. She had no fever. She had previously known DM, chronic heart disease (CHD), and chronic renal failure. It was learned that coronary angiography was performed 6 months ago to the

patient who was using exenatide, clopidogrel, and furosemide for DM and CHD. In her physical examination, there was tenderness in the abdomen and there was no additional finding. In addition, her blood pressure was: 114/62 mm/hg, beats per minute (BPM): 102/minute, body temperature (BT) 37.4 °C, SpO<sub>2</sub>:91. In her laboratory tests, white blood cell was: 12.000 mm<sup>3</sup>, hemoglobin: 10.3 g/dl, platelet count: 228,000/UL, C-reactive protein (CRP): 12 mg/dl (ref. range: 0-0.5), procalcitonin: 1.1 ng/ml (ref. range: 0-0.12), blood urea nitrogen: 42.5 mg/dl, creatinine level: 2.5 mg/dl, sodium: 129 mmol/L, potassium: 6 mmol/L, alanine aminotransferase (ALT): 8 U/L, aspartate aminotransferase (AST): 12 U/L, blood sugar: 372 mg/dl, troponin I: 0.013 µg/dl, CK-MB: 9.1. Her arterial blood gases were PH: 7.31, PCO<sub>2</sub>: 40.1, HCO<sub>3</sub>: 20.5, and lactate: 3.5. In her complete urinalysis, there were 415 leukocytes, 13 leukocyte clusters, and 34 erythrocytes. Piperacillin/tazobactam was started at a dose of 4x2.25 gr/day to the patient who was evaluated as complicated urinary tract infection and hospitalized. On abdominal ultrasonography (USG), grade 1 hydronephrosis was observed in the right kidney, and the echo of the right renal parenchyma was reported as grade 2 increased. Due to the increase in laboratory tests on the 5<sup>th</sup> day of her hospitalization (CRP: 22 mg/dl, creatinine level: 3.2 mg/dl, procalcitonin: 1.7 ng/ml), her treatment was revised to meropenem 2x1 gr/day. When hemoglobin decreased to 7.5 g/dl, erythrocyte suspension was given. Abdominal computed tomography (CT) scan without contrast was taken. Air in the proximal ureter, renal pelvis, and calyces on the right, grade 2 hydronephrosis on the right, and dirty right perirenal fat planes were observed. The findings were evaluated in favor of emphysematous pyelonephritis (Figure 1). At the end of the 72nd hour of the meropenem treatment, laboratory tests began to decrease. There was no growth in blood and urine cultures taken. Abdominal CT was repeated on the 14<sup>th</sup> day of her hospitalization and findings were regressed (Figure 2). In laboratory tests, white blood

cell was: 4000 mm<sup>3</sup>, hemoglobin: 10.8 g/dl, platelet count: 277.000/UL, CRP: 0.49 mg/dl, creatinine: 1.9 mg/dl. The patient never had a fever in her follow-up. The patient, whose general condition and laboratory tests improved, and pathological findings on CT regressed, was discharged on the 14<sup>th</sup> day of her hospitalization.

Note: Informed consent form signed by the patient

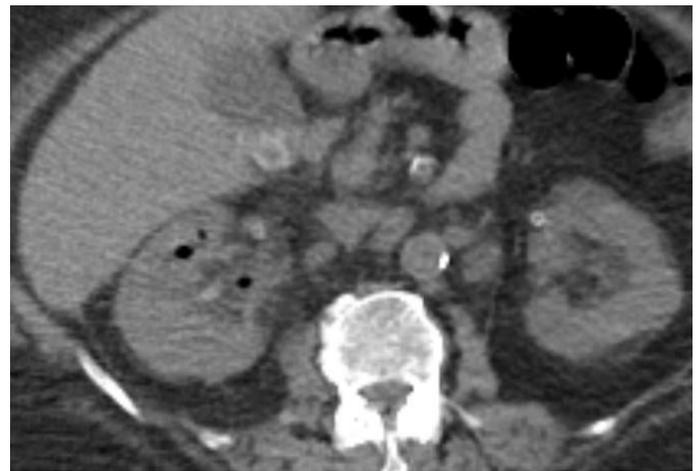


Figure 1: First abdominal CT scan of the patient



Figure 2: Abdominal CT scan of the patient 14 day of hospitalization

## DISCUSSION

EPN is a necrotizing infection of the renal parenchyma and surrounding tissues and is characterized by gas formation in the renal parenchyma, collector system, or perinephric tissue. More than 90% of patients are diabetic and it is 6 times more common in women than men (Reşorlu et al., 2006). Many

factors can cause pyelonephritis to turn into an emphysematous form. Some of these factors are; the presence of gas-forming microorganisms, impaired host response, secondary vascular changes in ischemia or infarction. Fermentation of glucose by enterobacteria is the most important mechanism of gas formation (Huang and Tseng, 2000). Our patient was an old female with a diagnosis of DM who was hospitalized with the diagnosis of unregulated blood sugar and complicated urinary system infection.

EPN clinically presents with nonspecific features of upper urinary tract infection including fever, flank pain, nausea, vomiting, shock, acute renal failure, and disseminated intravascular coagulation. Costovertebral angle tenderness is the most common physical examination finding (Ergün et al., 2020). Huang et al. (Huang and Tseng, 2000) found that thrombocytopenia (46%), acute kidney dysfunction (35%), shock (29%), and impaired consciousness (19%) may be the first symptoms of the disease. Our patient presented with complaints of abdominal pain, nausea, vomiting, loss of appetite, weakness, chills, and shivering, but she had no fever. In her physical examination, there was tenderness in the abdomen. Acute renal failure developed on the background of previously known chronic renal failure. In laboratory examinations; she had leukocytosis, anemia, elevated CRP, and procalcitonin levels, pyuria, and blood gas examination was consistent with metabolic acidosis. Although she was hypotensive, no shock was observed. It was first evaluated as a complicated urinary system infection and the approach was directed towards this.

The diagnosis of EPN is made by radiological methods and CT is used as the most definitive diagnostic imaging. Ultrasonography and abdominal X-ray are the other diagnostic methods. Contrast-enhanced CT scan is better as it gives an idea about the functional state of kidney units as well as it facilitates the description of the intraparenchymal gas. However, non-contrast CT imaging may be sufficient in patients with impaired

renal parameters. The staging of EPN is made radiologically according to the extent of gas in the kidney parenchyma and surrounding tissues (Sharma et al., 2013). The gas collection was classified as Type I or Type II according to CT imaging by Wan et al., 1996.

Type I: Renal necrosis with the presence of gas without fluid.

Type II: Parenchymal gas associated with fluid in the renal parenchyma collecting system, or perinephric space (Wan et al., 1996). In the radiological imaging, the patient who was first performed abdominal USG had no pathological findings except grade 1 hydronephrosis in the right kidney and echo of the right kidney parenchyma increased. Abdominal CT was performed without contrast administration due to an impaired renal function test. In CT imaging; air in the right ureter proximal, renal pelvis and calyces, grade 2 hydronephrosis in the right kidney, and dirty right perirenal fat planes were observed, and the findings were evaluated in favor of emphysematous pyelonephritis. According to CT imaging, EPN was classified as Type I.

Approaches in the treatment of emphysematous pyelonephritis; prevention and treatment of shock, maintaining fluid and electrolyte balance, DM control, underlying renal obstruction includes removing it if any. Broad-spectrum antibiotic therapy should be initiated after blood and urine cultures are taken. If there is no bacteriological and clinical response after 48 hours, the antibiotic should be changed. Antimicrobial therapy should be continued for at least 14 days (Reşorlu et al., 2006). Treatment includes intensive medical treatment alone or intensive medical treatment with percutaneous catheter drainage (PCD) or intensive medical treatment with emergency nephrectomy (Huang and Tseng, 2000; Reşorlu et al., 2006). 40-50% of the mortality rate is reported with this type of management. Percutaneous catheters, first shown by Hudson et al. with advanced technology, have been the desirable treatment option. Currently, neph-

ron-sparing approach with PCD with or without elective nephrectomy at a later stage is the main treatment of choice for EPN and the mortality rate is significantly low in this type of management (Balagobi et al., 2020). Piperacillin/tazobactam treatment is first given to our patient for complicated urinary tract infections. Since there was no improvement in clinical response and laboratory tests, her treatment was revised as meropenem. The patient, whose clinical response was achieved with antibiotic therapy and laboratory tests improved, was discharged on the 14<sup>th</sup> day of hospitalization. Clinical improvement was achieved without percutaneous drainage and nephrectomy. Clinical improvement in the patient was achieved with only antibiotic therapy without percutaneous drainage and nephrectomy.

### Conclusion

Emphysematous pyelonephritis is an infection with high mortality and morbidity especially seen in patients with DM. Clinical differential diagnosis is difficult as it progresses with classical complicated urinary system infection findings. Diagnosis can be made, especially with CT imaging, in patients whose blood sugar regulation cannot be achieved, renal function tests deteriorate, and patients with sepsis clinic but who do not show early improvement with empirical antibiotic therapy. As seen in our case, rapid recovery can be achieved without the need for surgical intervention when early diagnosis and appropriate antibiotic therapy are given.

### Conflict of interest

Authors declare no conflict of interest.

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