

Case Report

Necrotizing Fasciitis of Thoracic and Abdominal Wall with Emphysematous Pyelonephritis and Retroperitoneal Abscess

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ABSTRACT

Emphysematous pyelonephritis is a life-threatening severe form of pyelonephritis usually occurring in patients with diabetes mellitus with or without obstructive uropathies in whom there is necrotizing infection leading to the gas production of an unclear mechanism involving the renal parenchyma and the collecting system. Necrotizing fasciitis is characterized by progressive necrosis of fat and fascia due to deep-seated infection of subcutaneous tissue. It has a fulminant course with considerable mortality. Diabetes Mellitus is a common predisposing factor. The combined occurrence of emphysematous pyelonephritis and necrotizing fasciitis is extremely unusual. Early recognition and management is mandatory to avoid mortality. We report a case of a 53-year-old female, a known case of Type II diabetes mellitus, who presented with necrotizing fasciitis of thoracic and abdominal wall with emphysematous pyelonephritis in the left kidney with a retroperitoneal abscess.

KEYWORDS: *Diabetes mellitus, emphysematous pyelonephritis, lumbar triangle, necrotizing fasciitis, retroperitoneal abscess*

INTRODUCTION

Emphysematous pyelonephritis usually occurs in patients with diabetes mellitus due to infection by gas-forming organisms. Diabetes mellitus is also a predisposing factor of necrotizing fasciitis which is characterized by necrosis of fascia and fat. Necrotizing fasciitis can be presenting feature of emphysematous pyelonephritis, though their combined occurrence is rare. Early recognition of this entity is must to reduce mortality. Computed tomography (CT) is extremely useful in the detection of both.

CASE REPORT

A 53-year-old female patient who was a known case of Type II diabetes mellitus and hypertension for 8 years and on regular medication presented with breathlessness, pain in the left lower hemithorax and in the left lumbar region associated with fever and vomiting for 4 days. Ultrasonography of thorax, abdomen, and pelvis revealed mild bilateral basal pleural effusion, nonvisualization of the left kidney with normal morphology, and location of the right kidney and associated cholelithiasis.

Plain CT of the thorax revealed bilateral mild pleural effusion (right > left) with the extension of fluid along the right horizontal fissure. Plate-like atelectasis was noted in basal segments of the left lower lobe. Air foci were also noted in subcutaneous and intermuscular fat planes of anterior, left lateral, and posterior chest wall in the left mid and lower hemithorax extending into the left axilla [Figure 1].

Plain CT of the abdomen and pelvis revealed bulky left kidney measuring approximately 11.2 cm × 4.7 cm showing a well defined hypodense abscess of size 11.2 (length) cm × 3.5 (width) cm along anterolateral aspect of the left kidney with extension into perinephric space showing multiple air foci. Inflammatory thickening of left anterior, posterior, and lateroconal fascia

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was seen. Extension of the abscess was noted in the left anterior pararenal space, posterior to pancreatic body and tail. Inferiorly, the abscess was extending anterolateral to left psoas, anterior to left iliacus, posterior to left colon (which was compressed and displaced anteriorly) up to the left inguinal region. No radiopaque calculus or hydronephrosis or hydroureter was noted on either side. Multiple air foci were noted in retroperitoneum on the right side, anterolateral to right psoas muscle. Air foci were seen just beneath anterior abdominal wall on either side extending into intermuscular fat planes of abdominal wall muscles, in subcutaneous fat in anterior abdominal wall on the left side, extraperitoneally beneath anterior abdominal wall on either side, in perivesical fat, medial to bilateral obturator internus, between urinary bladder and uterus, and in subcutaneous fat in left posterior

upper abdominal wall. Mild ascites were noted in the pelvis. A lamellated radiopaque gallstone of size 11 mm × 10 mm was noted [Figures 2-5].

A diagnosis of emphysematous pyelonephritis of the left kidney with left renal and perinephric abscess with extension in retroperitoneum up to left inguinal region and necrotizing fasciitis of abdominal and thoracic wall was made.

Renal function tests were deranged (blood urea: 77 mg/dL and serum creatinine: 3.1 mg/dL). Urine routine and microscopy revealed abundant pus cells and sugar ++.

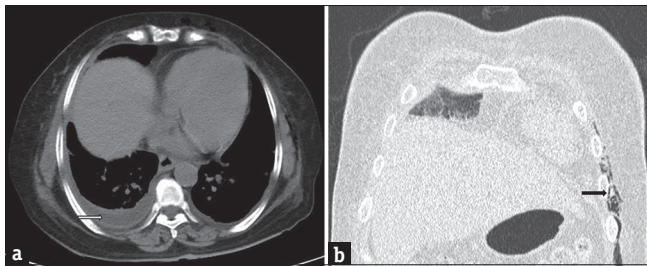


Figure 1: A 53-year-old female patient with emphysematous pyelonephritis with necrotizing fasciitis presented with breathlessness, pain in left lower hemithorax and in the left lumbar region. (a) Noncontrast axial computed tomography thorax in mediastinal window showing bilateral pleural effusion (white arrow), (b) Coronal high-resolution computed tomography window showing necrotizing fasciitis in the left lateral chest wall (black arrow).

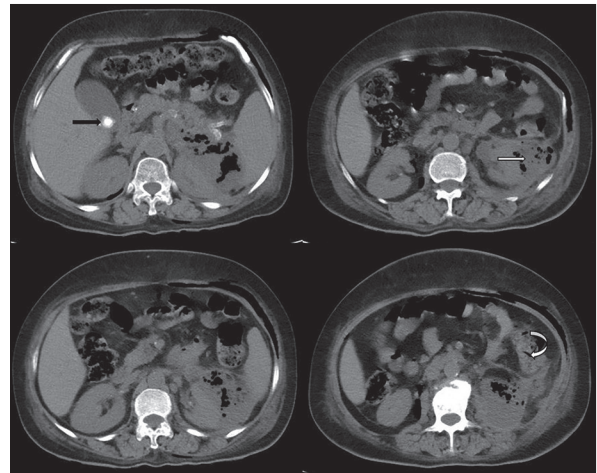


Figure 2: A 53-year-old female patient with emphysematous pyelonephritis with necrotizing fasciitis presented with breathlessness, pain in left lower hemithorax and in the left lumbar region. Axial noncontrast computed tomography abdomen showing a well-defined hypodense abscess along anterolateral aspect of the left kidney (white arrow) with extension into perinephric space with multiple air foci within, extension of the abscess in left anterior pararenal space (curved white arrow), posterior to pancreatic body and tail, and a radio-opaque gallstone (black arrow).

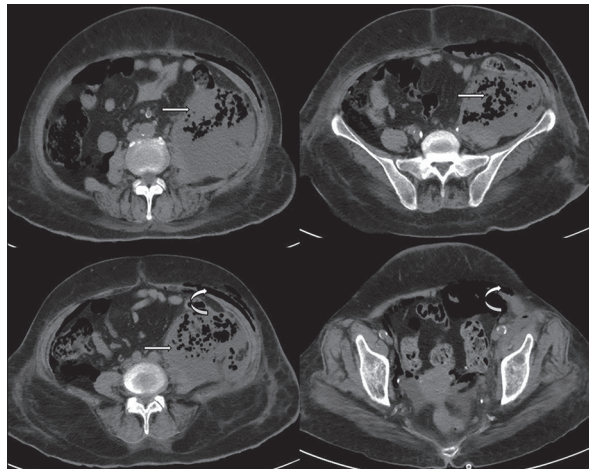


Figure 3: A 53-year-old female patient with emphysematous pyelonephritis with necrotizing fasciitis presented with breathlessness, pain in left lower hemithorax and in the left lumbar region. Axial noncontrast computed tomography abdomen showing retroperitoneal abscess extending anterolateral to left psoas, anterior to left iliacus, extending up to left inguinal region with multiple air foci (white arrows). Multiple air foci just beneath anterior abdominal wall on either side, in intermuscular fat planes of abdominal wall muscles and in subcutaneous fat in anterior abdominal wall on the left side (curved white arrows).

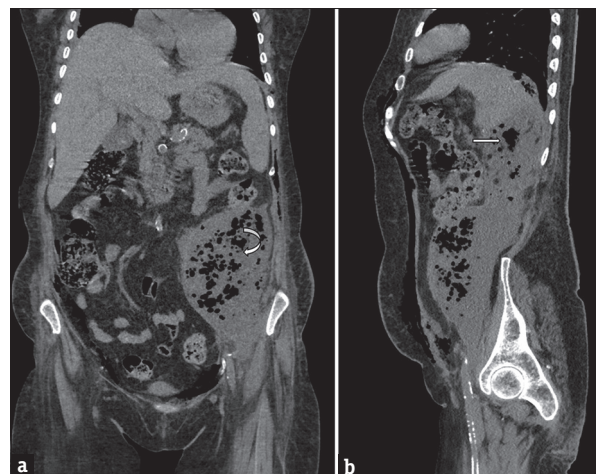


Figure 4: A 53-year-old female patient with emphysematous pyelonephritis with necrotizing fasciitis presented with breathlessness, pain in left lower hemithorax and in the left lumbar region. Noncontrast computed tomography abdomen and pelvis (a: coronal and b: sagittal) showing left renal (white arrow) and retroperitoneal abscess with air foci (curved white arrow).

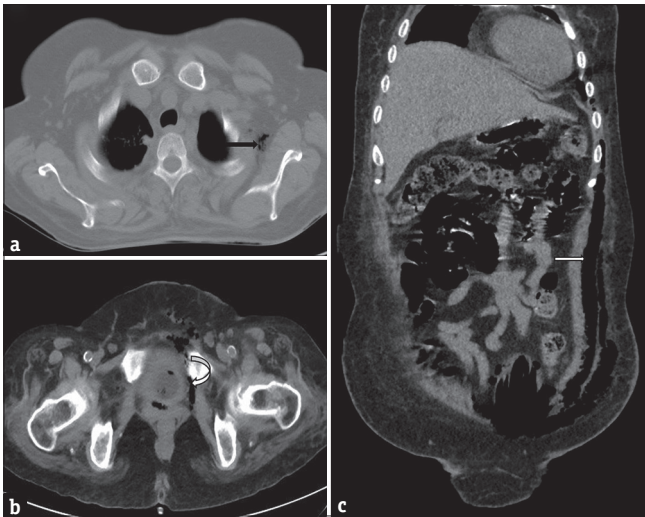


Figure 5: A 53-year-old female patient with emphysematous pyelonephritis with necrotizing fasciitis presented with breathlessness, pain in left lower hemithorax and in the left lumbar region. Noncontrast computed tomography thorax and abdomen with pelvis (a and b: mediastinal window - axial, c: coronal) showing necrotizing fasciitis in the left lateral chest wall up to left axilla (black arrow), along left lateral abdominal wall (white arrow) reaching up to perivesical fat (curved white arrow).

Drainage of the abscess with pigtail catheter revealed *Klebsiella pneumoniae* on culture studies [Figure 6]. The patient was managed conservatively with antibiotics and antidiabetics.

DISCUSSION

Emphysematous pyelonephritis is a life-threatening severe form of pyelonephritis usually occurring in patients with diabetes mellitus with or without obstructive uropathies in whom there is necrotizing infection leading to gas production of unclear mechanism involving the renal parenchyma and the collecting system. Nonspecific clinical symptoms of fever, nausea, vomiting, flank pain and generalized malaise in emphysematous pyelonephritis lead to delay in diagnosis with resultant high mortality rate. On the basis of their extension, they are categorized into two types: (a) type 1 – there is extensive renal parenchymal destruction with the presence of mottle gas within and (b) Type 2 – there is nephric or perinephric fluid collection with the presence of mottle gas within the collecting system.^[1] Wan et al. documented that mortality of patients with type I was higher than type II (69% vs. 18%).^[2]

Due to its more fulminant character, type I emphysematous pyelonephritis is difficult to control medically and thus requires surgical interventions such as nephrectomy. With the advent of new and more aggressive antibiotics, patients with type II emphysematous pyelonephritis can be managed without surgical intervention.^[3,4]

The presence of intraparenchymal gas within the solid organs or walls of hollow viscera may be due to

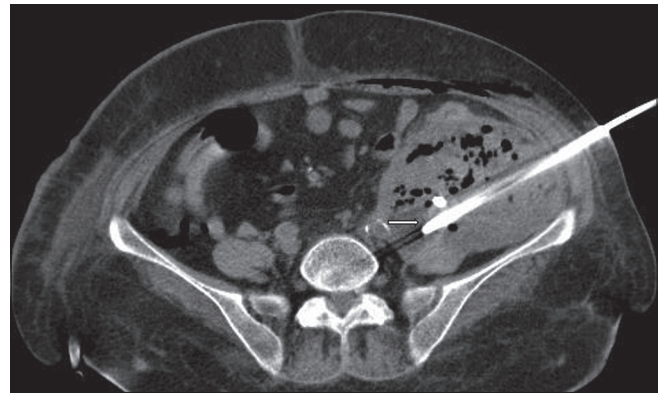


Figure 6: A 53-year-old female patient with emphysematous pyelonephritis with necrotizing fasciitis presented with breathlessness, pain in left lower hemithorax and in the left lumbar region. Noncontrast computed tomography abdomen and pelvis showing pigtail catheterization in a retroperitoneal abscess (white arrow).

infection by gas-forming bacteria, the formation of enteric fistula, or bland tissue infarction and necrosis. This gas should be differentiated from the atmospheric gas collection which may be introduced postsurgery or during diagnostic procedures. Carbon dioxide and nitrogen are the common gases found in infections. Factors such as poor glycolysis, depressed cell-mediated immune response, tissue necrosis, and arteriosclerosis are the contributing factors leading to increased production or delayed excretion of gas.^[5,6]

As documented in the literature, in 75% of patients with emphysematous pyelonephritis, *Escherichia coli* is the causative agent followed by *K. pneumoniae*, *Enterobacter aerogenes*, *Proteus mirabilis*, *Pseudomonas* species, anaerobic streptococci, and *Candida* and other fungi.^[7]

CT findings in emphysematous pyelonephritis (EPN) are categorized into the following four classes (class 1 being the mildest).^[8]

- Class 1: gas in the collecting system only (emphysematous pyelitis)
- Class 2: gas in the renal parenchyma without extension to extrarenal space
- Class 3a: extension of gas or abscess to the perinephric space
- Class 3b: extension of gas or abscess to the paranephric space
- Class 4: bilateral EPN or solitary kidney EPN.

Bleeding and necrotizing fasciitis associated with emphysematous pyelonephritis are rare complications.^[9] Necrotizing fasciitis is characterized by progressive necrosis of fat and fascia due to deep-seated infection of subcutaneous tissue with sparing of skin with microvascular thrombosis. It has a fulminant course with considerable mortality of 40%.^[10] Diabetes mellitus is a

common predisposing factor. It usually shows the rapid progression from an in apparent process to extensive destruction of subcutaneous tissue with signs of systemic toxicity. Early recognition and management is hence mandatory. The combined occurrence of emphysematous pyelonephritis and necrotizing fasciitis is extremely unusual. They are life-threatening conditions which require prompt medical and surgical intervention.^[1]

Extension of infection from emphysematous pyelonephritis to the adjacent subcutaneous tissue has been proposed.^[11] Due to the absence of external muscular layer, the superior and inferior lumbar triangles are two sites of anatomical weakness in the abdominal wall in the flank. Traumatic lumbar hernia and Grey Turner's sign (subcutaneous discoloration in flank) are seen in acute pancreatitis and are developed through the lumbar triangle.^[12]

The superior lumbar triangle is bounded by the internal oblique muscle anteriorly, the quadratus lumborum muscle posteriorly, and 12th rib superiorly. Through this triangle, retroperitoneal infections such as ruptured retroperitoneal appendicitis can spread to the abdominal wall. The inferior triangle is bounded by the external oblique muscle anteriorly, the latissimus dorsi muscle posteriorly, and the iliac crest inferiorly. Through this triangle, necrotizing fasciitis in flank can occur from emphysematous pyelonephritis.^[13] There was extension of infection from the left kidney to retroperitoneum and subsequently to abdominal wall through lumbar triangles in our case.

Necrotizing fasciitis may be the presenting feature of emphysematous pyelonephritis.

Types of necrotizing fasciitis on clinical characterization are:

1. Type 1: It is seen in diabetes mellitus and peripheral vascular disease. It has mixed infection of aerobic as well as anaerobic bacteria
2. Type 2: Monomicrobial infection (Group A *Streptococcus*) and methicillin-resistant *Staphylococcus aureus*.

Clinical features of necrotizing fasciitis are tenderness over the affected area, alteration in skin color, palpable crepitus, and fever.^[13] Ultrasound findings in necrotizing fasciitis are subcutaneous thickening, air, and fascial fluid.^[14] CT is diagnostic of necrotizing fasciitis. Presence of gas in soft tissues of abdominal wall and in fascial planes is the hallmark. CT scan establishes the diagnosis of necrotizing fasciitis and differentiates gas from fluid, soft tissues, and calcification. It also helps in detecting disease extent and severity.^[13] Treatment of necrotizing fasciitis is by a combination of appropriate

antibiotics, optimal oxygenation of infected tissue, and surgical debridement if necessary.^[1]

Early diagnosis and treatment is essential to reduce mortality. Treatment of EPN is antibiotic therapy followed by nephrectomy if necessary. Percutaneous drainage is a kidney-saving procedure which is an alternative to nephrectomy. In cases of bilateral EPN, solitary kidney patients, and inoperable patients, transurethral retrograde drainage with stent placement can also be done for the management.^[7]

CONCLUSION

Emphysematous pyelonephritis complicated with necrotizing fasciitis is extremely rare. Both can be seen in diabetes mellitus. Necrotizing fasciitis can be presenting feature of emphysematous pyelonephritis. One should be aware of this condition as necrotizing fasciitis of abdominal wall and thigh can be presenting feature of emphysematous pyelonephritis. CT is diagnostic of both necrotizing fasciitis and emphysematous pyelonephritis by detecting the presence of air in fascial planes and subcutaneous fat and presence of air in renal parenchyma and/or pelvicalyceal system, respectively. Early detection of these entities helps in reducing morbidity and mortality.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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