

Unmasking atypical emphysematous pyelonephritis: A rare diagnostic challenge

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ABSTRACT

Emphysematous pyelonephritis (EPN) is a severe, life-threatening renal infection primarily seen in diabetic patients, characterized by gas formation within the renal parenchyma. However, atypical presentations in non-diabetic individuals pose significant diagnostic challenges. This case report details a rare presentation of EPN in a 31-year-old non-diabetic female with retrovertebral abscess, a complication rarely associated with EPN. The patient initially presented with retrovertebral swelling without the typical symptoms of fever, flank pain, or dysuria. Imaging revealed gas within the pelvicalyceal system and retrovertebral space, confirming the diagnosis of advanced EPN (Huang-Tsuang stage 3B). Despite early management with percutaneous nephrostomy and broad-spectrum antibiotics, the patient progressed to septic shock, ultimately requiring nephrectomy due to non-functional renal tissue. This case highlights the need for a flexible diagnostic approach, especially in patients with atypical symptoms or absent classic risk factors such as diabetes. Advanced imaging, particularly non-contrast computed tomography, plays a pivotal role in detecting EPN, even in unusual presentations. Early recognition and aggressive intervention, including renal decompression and appropriate antibiotic therapy, are essential for improving patient outcomes. This case underscores the importance of considering EPN in the differential diagnosis of atypical infections, particularly when unusual abscesses are present.

Key words: Atypical presentation, Emphysematous pyelonephritis, Retrovertebral abscess


Emphysematous pyelonephritis (EPN) is a rare but severe, life-threatening infection of the renal parenchyma and perirenal tissues, marked by gas formation as a result of bacterial invasion. The condition is most commonly associated with poorly controlled diabetes mellitus, affecting approximately 1 in 2,000 hospitalized diabetic patients. However, recent studies suggest that EPN may also occur in non-diabetic individuals, challenging the traditional understanding of its etiology. This infection typically manifests with fever, flank pain, nausea, vomiting, dysuria, and pneumaturia, often leading to prompt diagnostic imaging. The hallmark of EPN is the presence of gas within or around the kidney, typically detectable on computed tomography (CT) scans, which indicates necrotic destruction of renal tissue. In terms of epidemiology, EPN occurs with a reported incidence of 1–2% among diabetic patients with urinary tract infections. The disease primarily affects individuals with a long history of diabetes or other underlying conditions such as urinary tract obstruction, immunosuppression, or vascular disease. However, the incidence of EPN in non-diabetic individuals remains relatively rare, with some studies reporting only 10–20%

of cases occurring in those without diabetes. The non-diabetic cases, though less common, are often more challenging to diagnose due to the absence of classic risk factors [1]. Several studies have demonstrated that the classic clinical presentation of EPN may not always be observed. In non-diabetic patients, the presentation can be more subtle, with symptoms being non-specific or even absent. This can significantly delay diagnosis and treatment, leading to poor outcomes. A few studies, including those by Liu *et al.* and Zhao *et al.*, have emphasized the need for clinicians to consider a broader differential diagnosis in patients with unusual presentations, particularly in those without traditional risk factors for EPN [2,3].

In this case, we present an atypical presentation of EPN in a young, non-diabetic woman complicated by a retrovertebral abscess. This case highlights the importance of maintaining a high index of suspicion for EPN, even in patients who do not exhibit the typical risk factors, such as diabetes mellitus or classic clinical symptoms.

CASE PRESENTATION

A 31-year-old non-diabetic female presented with a palpable, mildly discomforting swelling of 6×4 cm in the retrovertebral

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region for the last 5–6 days. The patient denied any fever, flank pain, nausea, vomiting, or dysuria.

The patient was hemodynamically stable on presentation. On examination, the swelling was fluctuant, tender with redness, and extended from the inferior scapular border to the posterior iliac crests. However, there were no other notable systemic signs.

Initial laboratory findings showed an elevated total leukocyte count of 13,000/mm³ and a serum creatinine level of 1.4 mg/dL. A needle aspiration of the swelling yielded frank pus, leading to incision and drainage. Despite these efforts, the patient's condition deteriorated, progressing to septic shock, necessitating inotropic support. An abdominal non-contrast CT (NCCT) scan was performed, which revealed a significantly bulky right kidney with marked perinephric fat stranding and a 10 mm calculus in the upper ureter. Air foci were detected within the pelvicalyceal system, extending into the retrovertebral space – consistent with advanced EPN (Huang-Tsuang stage 3B) (Figs. 1 and 2). Cultures of the pus and urine samples confirmed infection with *Escherichia coli*.

The patient was promptly treated with percutaneous nephrostomy (PCN) to decompress the obstructed renal unit, supplemented with drainage of the paranephric collection. Empiric broad-spectrum antibiotics were initiated and later adjusted according to culture sensitivities. Fluid management and strict monitoring of input-output were implemented, along with a high-protein diet to support recovery. Over time, the patient's inflammatory markers and renal function stabilized, enabling the withdrawal of inotropic support. However, a follow-up diethylenetriamine pentaacetate (DTPA) scan revealed that the right kidney had become non-functional, necessitating a nephrectomy.

DISCUSSION

EPN is a rare but severe necrotizing infection of the renal parenchyma and perirenal tissues, characterized by gas formation. While it predominantly affects diabetic individuals, this case of a young non-diabetic woman highlights the potential for EPN to present atypically, underscoring the necessity of a flexible diagnostic approach. The co-existence of a retrovertebral abscess with advanced EPN (Huang-Tsuang stage 3B) in this patient provides valuable insights into the complexities of atypical presentations, which can obscure timely diagnosis and management.

The classical symptoms of EPN, such as fever, flank pain, and dysuria, are often absent in atypical cases, as observed in this patient. Instead, the clinical presentation may include vague or misleading features such as retrovertebral swelling, which initially appeared unrelated to renal pathology. This phenomenon has been documented in prior studies, such as Carvey and Roehrs, which reported atypical manifestations in non-diabetic individuals, complicating clinical recognition. The presence of retrovertebral swelling highlights the need to broaden the diagnostic horizon, particularly in anatomically adjacent regions, as these may represent sequelae of an underlying renal infection [1].

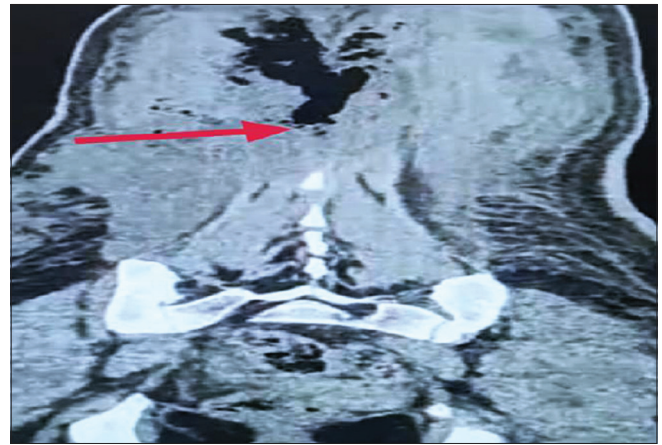


Figure 1: Non-contrast computed tomography abdomen axial image scan shows gas in the retrovertebral space (red arrow)

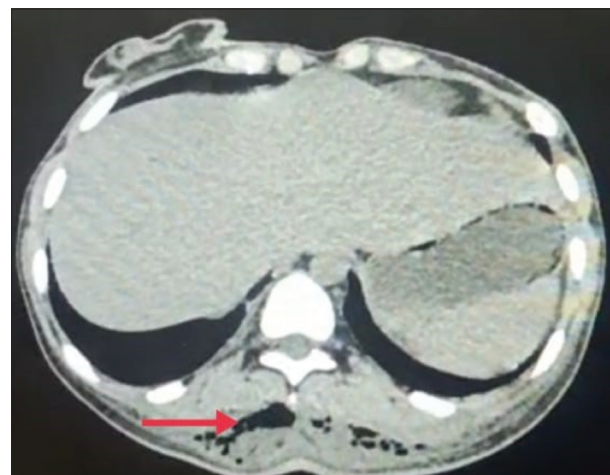


Figure 2: Non-contrast computed tomography abdomen axial image scan shows gas in the right pelvicalyceal system (red arrow)

Flexible diagnostic strategies rely on maintaining a high index of suspicion for atypical cases, even when classical risk factors such as diabetes mellitus are absent. In this patient, initial symptoms were localized to the retrovertebral region, which delayed the consideration of EPN until an abdominal NCCT scan revealed characteristic findings. This reinforces the critical role of imaging modalities in identifying concealed infections.

NCCT is the gold standard for diagnosing EPN, providing detailed visualization of gas in renal and perirenal tissues. In this case, it revealed air foci in the pelvicalyceal system extending into the retrovertebral space, confirming the diagnosis of EPN. This aligns with studies by Shokeir *et al.* [4] and Tseng *et al.* [5], which emphasize the sensitivity of CT imaging in detecting early and atypical cases. Timely imaging allows clinicians to delineate the extent of the disease, plan targeted interventions, and anticipate complications, such as retrovertebral abscesses.

The occurrence of abscesses in atypical locations, as seen here, suggests the need for clinicians to evaluate systemic and adjacent anatomical areas when confronted with unusual swellings. Although retrovertebral abscesses are rarely reported in EPN, their presence should prompt further investigation to rule out underlying renal pathology [6].

The progression to septic shock in this patient underscores the aggressive nature of EPN. Prompt intervention, including PCN for renal decompression and drainage of the paranephric collection, proved lifesaving. Empiric broad-spectrum antibiotics, guided by culture sensitivities, were pivotal in managing the *E. coli* infection. This treatment approach is consistent with evidence from Somani *et al.*, which advocates PCN as a cornerstone in the management of advanced EPN [7]. Despite the initial recovery, the follow-up DTPA scan revealed the non-functionality of the affected kidney, necessitating nephrectomy. This highlights the irreversible damage that EPN can cause, reinforcing the importance of early diagnosis and aggressive management to preserve renal function.

This case illustrates the necessity of a flexible diagnostic approach in managing atypical presentations of infections such as EPN. Clinicians must maintain a high degree of suspicion for EPN when encountering abscesses in unusual locations, as these may represent hidden foci of infection. The integration of advanced imaging techniques, coupled with prompt and multidisciplinary intervention, is essential to improving outcomes. By broadening diagnostic considerations and acting decisively, the morbidity and mortality associated with such complex cases can be significantly reduced.

CONCLUSION

This case underscores the necessity for a thorough diagnostic approach when confronted with atypical or non-specific presentations of infection. Clinicians should maintain a high index of suspicion for EPN in patients presenting with unusual

abscesses, particularly in anatomically adjacent regions such as the retrovertebral space. Early and aggressive intervention, including appropriate imaging and multidisciplinary care, is essential to improving outcomes in such complex cases.

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