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Case Report

Diabetes, Fever and Flank Pain: Is it Emphysematous Pyelonephritis?

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ABSTRACT

Fever and flank pain in a diabetic patient should raise the suspicion of emphysematous pyelonephritis (EPN). The clinical course of EPN can be severe and life threatening, if not recognized and treated promptly. Gas shadows in the renal or perirenal region on plain X-ray, ultrasound, or computed tomography (CT) scan of the abdomen are the radiological features of EPN. However, CT scan of the abdomen is *sine qua non* for classification, treatment options, and prognosis.

Keywords: CT scan, Diabetes mellitus, emphysematous pyelonephritis, fever, flank pain

Introduction

Emphysematous pyelonephritis (EPN) is defined as an acute, severe necrotizing infection of the renal parenchyma and perirenal tissue, which results in the presence of gas within the renal parenchyma, collecting system, or perinephric tissue.[1] EPN is a radiological diagnosis, as symptoms and signs are vague and nonspecific. Fever and flank pain in a diabetic patient should raise the suspicion of EPN.[2] X-ray and ultrasound abdomen are preliminary investigations but lack sensitivity and precision; hence, they cannot be always relied upon to visualize the kidney.[3] Computed tomography (CT) scan of the abdomen is the investigation of choice.[4] CT classifications are useful in the decision making regarding treatment and prognostication. This case is reported to highlight the importance of CT scan in the management of EPN, as treatment options have evolved over the years from an aggressive surgical approach to a more conservative approach of percutaneous drainage (PCD) and antibiotics.

Case Report

A sixty-four–year-old male, obese, diabetic, and hypertensive for five years presented with pain in the abdomen localized to the right flank, vomiting, and burning micturition with increased frequency of a seven-day duration. On examination, he was febrile and blood pressure was 160/100. Abdominal examination revealed tenderness over the right renal angle. Examination of the central nervous system revealed the presence of sensory motor neuropathy. Rest of the systemic examination was normal. On investigation, hemoglobin was 12 g/dL and peripheral smear revealed neutrophilic leukocytosis. Random blood glucose was 255 mg/dL and glycated hemoglobin (HbA1c) was 7.8%. Serum urea was 77 mg/dL and creatinine was 1.7 mg/dL. Liver functions, serum electrolytes, and arterial blood gases were normal. Urine examination showed numerous pus cells, 1+ albumin, and positive ketones. Plain X-ray of the abdomen revealed gas distributed over the right kidney [Figure 1]. Ultrasound of the abdomen was suggestive of EPN of the right kidney [Figure 2]. Noncontrast CT of the abdomen was characteristic of EPN of right kidney which showed renal and perirenal fluid collections with gas in the collecting system, intrarenal gas, and extension of gas into the perinephric space [Figure 3]. The left kidney was normal. The patient was managed by a combined medical treatment and PCD. Urine culture showed a growth of *Escherichia coli*. The patient improved and was followed up with serial ultrasound. Contrast enhanced CT scan at discharge revealed complete disappearance of the gas.

Discussion

EPN is a rare condition. The diagnosis is often delayed because symptoms and signs are vague and nonspecific. A high index of suspicion is important. Common modes of EPN presentations include fever, abdominal pain, nausea, vomiting,
Raina: Emphysematous pyelonephritis

with poor outcome, and definitive treatment is influenced by their presence. Diabetics comprise 95% of the patients with a higher frequency in females. Nondiabetic risk factors include obstructive uropathy, chronic renal failure, polycystic kidney, renal transplant, alcoholism, and AIDS.

EPN is caused by gas-producing coliform bacteria that are able to ferment glucose to lactate and carbon dioxide. *E. coli* is the commonest organism. The other organisms are *Klebsiella*, *Pseudomonas*, *Proteus mirabilis*, and mixed organisms. Rare organisms reported are *Clostridium*, *Candida* spp., *Entamoeba histolytica*, and *Aspergillus*. The factors that may be involved in the pathogenesis of EPN are a high level of tissue glucose, the presence of gas-forming bacteria, impaired tissue perfusion, and impaired host immunity with a defective host defense mechanism. It is postulated that the gas accumulates because the ischemic kidney cannot remove it. Histopathological examination of kidneys removed from patients with EPN reveals vasculopathy as the main feature.

Diagnostic sensitivities of plain X-ray of the abdomen and ultrasonography (USG) of the abdomen for the diagnosis of EPN are 33–47% and 80–85%, respectively. CT is the most reliable diagnostic tool with an accuracy of 100%. Based on CT scan findings, EPN is classified by Wan et al. (1996) as type I: Renal necrosis with the presence of gas but no fluid and type II: Parenchymal gas associated with fluid in renal parenchyma, perinephric space, or in the collecting system. Huang et al. classified EPN into:

- Class I: Gas in the collecting system only.
- Class II: Gas in renal parenchyma only.
- Class IIIa: Extension of gas or abscess to perinephric space.
- Class IIIb: Extension of gas or abscess to pararenal space.
- Class IV: bilateral EPN or solitary kidney with EPN.

These classifications are useful in decision making regarding treatment and prognostication.

Initial management involves care with fluid and electrolytes, hemodynamic status, diabetic control, and appropriate antibiotic therapy. The conventional treatment of EPN has historically been emergency nephrectomy and/or open surgical drainage along with antibiotic therapy with a mortality rate of 40–50%. Advances in catheter technology have made PCD feasible in the treatment of EPN. Increasingly, PCD is used for the treatment of EPN with a view to nephron preservation and recovery of renal function. Nephrectomy should be limited to the presence of a nonfunctioning kidney, presentation of gross renal parenchymal destruction, display of class IIIa or IIIb gas pattern, or the existence of two or more risk factors. Conservative medical treatment with antibiotics alone is not a recommended management approach for EPN. However, successful

**Figure 1:** X-ray of the abdomen showing gas distributed over right kidney region (arrow)

**Figure 2:** Ultrasound of right kidney showing high echogenic areas with dirty shadowing

**Figure 3:** CT of the abdomen showing gas in right renal parenchyma with perinephric extension

impaired consciousness level, shock, and acute renal failure. The most common finding on clinical examination is renal angle tenderness. Thrombocytopenia, acute renal failure, disturbed consciousness, and shock are the factors associated
conservative medical management is also rarely reported.\[11,12\] PCD is the treatment of choice for patients with bilateral disease and solitary kidney with EPN.

CT scan of the abdomen is the investigation of choice for the diagnosis, treatment options, and prognostication of EPN. A diabetic patient with fever, renal angle pain, and pyuria attending emergency should be subjected to immediate CT scan to rule out EPN. In hospitals where CT scan is not available, these patients should be subjected to X-ray KUB (KUB: kidney, ureters, and bladder)/USG, and if renal gas is detected, referred for a CT scan.\[9\]

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