



## Renal Calculus Obstruction with Emphysematous Pyelonephritis in a Diabetic Male: A Lethal Combo

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### Abstract

Emphysematous pyelonephritis is an acute infection of the kidney causing parenchymal destruction, caused by gas-forming organisms. If left undiagnosed or untreated, it will cause severe damage to renal function. While the prognosis in most patients is very poor, the outcome gets further worsened in the presence of urinary tract obstruction or active infection. Uncontrolled blood sugars and fungal septicemia further alters the prognosis. We report a case report of a middle aged male who presented to the emergency room with very high blood sugar level, altered sensorium and high fever, chills and rigor. On evaluation with Computed Tomography (CT) of abdomen, there was a 1.9 cm calculus at the uretero-pelvic junction, densely impacted and obstructing the drainage from right kidney and class 3b Emphysematous pyelonephritis extending to perinephric space and psoas sheath. Various prognostic factors and risk stratification strategies are documented by multiple authors that decide the final outcome in these patients. Our patient fell in the intermediate risk category, which necessitated a prompt glycemic control, correction of acid base imbalance, immediate disimpaction of stone and decompression of the pelvicalyceal system with percutaneous drainage of the perinephric and psoas collection. This case report illustrates the lethal combination of obstruction and uncontrolled blood sugar levels in patients with gas forming infection of the kidney. Physicians should be alert and be well aware of this fatal combo and ensure that a prompt diagnosis is made and triaged accordingly in order to salvage the kidney and safe the life of the individual.

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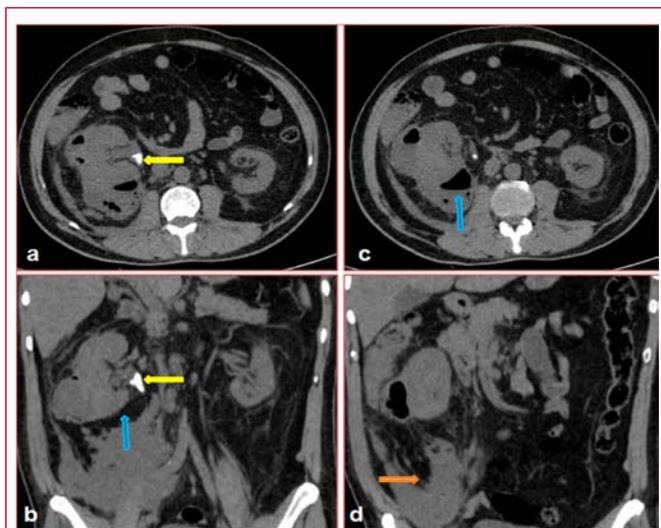
**Keywords:** Emphysematous pyelonephritis; Renal calculus; Hydronephrosis; Psoas abscess

### Introduction

Emphysematous Pyelonephritis (EPN) is a life-threatening severe infection of the kidney that leads to accumulation of gas within the renal parenchyma, collecting system and perinephric tissue. Most of these patients (up to 90%) have underlying uncontrolled diabetes mellitus [1]. In non-diabetic patients, the major associated pathology is urinary tract obstruction which is mostly due to the necrosed papilla or by ureteral calculi. Other contributing factors like renal failure, drug abuse immunosuppression, anatomic abnormalities, polycystic kidney disease, neurogenic bladder, alcoholism also can cause EPN [2-4]. Here, we present a case of EPN due to calculus obstruction at the Uretero Pelvic Junction (UPJ) in a diabetic male with uncontrolled sugar levels.

### Case Presentation

A 49-year-old male, diabetic and hypertensive for more than 15 years, presented to the Emergency Room (ER) with high-grade fever, chills and rigor for 3 weeks. His body mass index was 21. The spikes of temperature were associated with bilateral loin pain. On admission, he was febrile and mildly disoriented to time, place and person. The body temperature was 102°F. His serum creatinine was 265 µmol/L and the total count was  $19.8 \times 10^3/\mu\text{L}$ . He also had a blood pressure of 70 mmHg/40 mmHg with a heart rate of 126/min and a respiratory rate of 32/min. His blood sugar at ER was 29.16 mmol/L, with urine analysis showing abundant pus cells and positive for ketone bodies. The blood gas and biochemical analysis suggested severe metabolic acidosis, hypoalbuminemia (20 g/L) and hyponatremia (127 mmol/L). The platelet count was  $110 \times 10^9/\text{L}$  and the International Normalized Ratio (INR) was 1.1. On abdominal examination, the right kidney was palpable and tender, while there was tenderness on deep palpation on the left loin. The overall clinical picture suggested diabetic ketoacidosis with septic shock and a clinical diagnosis of bilateral acute pyelonephritis was considered. A bedside ultrasound of the abdomen revealed heterogeneity within the bulky right kidney. However, no stones were identified. Urine grew *E. coli*,



**Figure 1:** Axial (1a,1c) and Coronal (1b,1d) sections of CT scan of the abdomen showing stone impaction in yellow arrows (1a), perinephric collection (1b) in blue arrows, air-fluid level (1c) and collection in the psoas major muscle (1d).

105 colony forming units per ml. Figure 1 illustrates the Computed Tomography (CT) of the abdomen in axial (1a, 1c) and coronal (1b, 1d) sections. A 1.9 cm impacted calculus at right PUJ (yellow arrow) was seen with moderate dilatation of the pelvicalyceal system (Figure 1a, 1b). The right kidney also showed air pockets with air-fluid level in the lower pole renal parenchyma (blue arrow) (Figure 1c). The left kidney was bulky and enlarged. A perinephric fluid collection of 200 ml with the fluid tracking superiorly up to right subdiaphragmatic space and inferiorly along the right psoas muscle (orange arrow) was noted (Figure 1d), corresponding to class 3b of Huang and Tseng classification [5]. A final diagnosis of Right Emphysematous Pyelonephritis and left acute Pyelonephritis was made. Prognostic scoring and risk stratification was done based on the Krishnamoorthy et al. [6] scoring system and the combined prognostic score in our patient was 19 out of 26 (intermediate risk). After triaging the patient under the intermediate risk category, he was started on culture-sensitive antibiotics. After optimizing glycemic and serum electrolyte levels, he underwent right percutaneous drainage of the collection, ureteroscopy and disimpaction of the stone with bilateral double J stenting. After 6 weeks, he underwent the right percutaneous nephrolithotomy. Both stents were removed 2 weeks later.

## Discussion

Emphysematous pyelonephritis is the presence of free gas within the collecting system in the absence of prior surgical intervention, gastrointestinal fistula, or urinary bladder catheterization. In 1898, Kelly and McCullum [7] reported the first case of gas-forming renal infection. Initially, EPN was described as renal emphysema and pyelonephritis. In 1962, Schultz and Klorfein [8] coined the term 'Emphysematous pyelonephritis', as it emphasizes the relationship between infective pathology and gas formation. If gas is in the collecting systems only, then it is termed as Emphysematous pyelitis. Emphysematous pyelitis has an excellent prognosis with medical management, whereas EPN deserves special attention because of its life-threatening potential with either medical management or surgical management. EPN is a severe form of pyelonephritis occurring mostly in diabetics caused most commonly by *E. coli* [9,10]. In

diabetics, elevated blood and tissue glucose levels may contribute to a conducive environment for the rapid multiplication of gas-forming bacteria. Diabetic microangiopathy causes a slowing down of transport and drainage of the catabolic waste products from the kidney, resulting in stasis or accumulation of such products within the renal parenchyma. This causes the accumulation of gas within the kidney and results in further deterioration [11]. In obstructed system, entrapment of the formed gas occurs. Infected matrix stones with obstruction make the prognosis even worse [12]. Obstruction to the urinary tract with infection is a deadly combination. Our patient has a calculus obstruction with superadded infection. EPN deserves special attention because of its life-threatening potential. The vital period of a window of curability is too short in such patients. Although cases of EPN are reported worldwide, Asians seem to be affected more, maybe because of a higher incidence of the diabetic population. However, Ubee et al. [13] correlates the higher number to the high number of published literature from Asia. The diagnosis of EPN is often delayed because the symptoms are often vague and nonspecific. Clinical features are often indistinguishable from severe APN. The onset of symptoms can be gradual and insidious over 2 to 3 weeks or may show a rapid deterioration. Patients whose initial presentation is shock, altered sensorium, hypoalbuminemia and coagulation abnormalities carry a poor prognosis. There should be a high index of alertness to make a prompt diagnosis, especially in non-resolving pyelonephritis. Axial imaging is mandatory to detect gas in the kidney, with a CT scan being one of the most reliable tools [14]. Until the late 1980s, the reported rate of mortality is 40% to 50% and emergency nephrectomy was the accepted treatment. Nowadays, improvements in diagnostic methods, increased awareness amongst the treating primary care physicians and availability of standardized protocols have largely tilted the management towards minimally invasive strategies like external and internal diversion of the kidney. Further, radiological classification by Huang et al. [5] prognostic scoring systems by Jain et al. and Prakash et al. [15] and risk stratification by Krishnamoorthy et al. [6] have greatly increased chances of renal salvage in most cases [15,16]. A combination of obstruction with infection in the setting of poor glycemic control makes this condition even more lethal and warrants immediate intervention.

## References

1. Smitherman KO, Peacock JE. Infectious emergencies in patients with diabetes mellitus. *Med Clin North Am.* 1995;79(1):53-77.
2. Michaeli J, Mogle P, Perlberg S, Heiman S, Caine M. Emphysematous pyelonephritis. *J Urol.* 1984;131(2):203-8.
3. Godec CJ, Cass AS, Berkseth R. Emphysematous pyelonephritis in a solitary kidney. *J Urol.* 1980;124(1):119-21.
4. Morehouse HT, Weiner SN, Hoffman JC. Imaging in inflammatory disease of the kidney. *AJR Am J Roentgenol.* 1984;143(1):135-41.
5. Huang JJ, Tseng CC. Emphysematous pyelonephritis: Clinicoradiological classification, management, prognosis, and pathogenesis. *Arch Intern Med.* 2000;160(6):797-805.
6. Krishnamoorthy S, Zumla A, Sekar H, Muneer A, Thiruvengadam G, Kumaresan N. Prognostic scoring system and risk stratification in patients with emphysematous pyelonephritis: An 11-year prospective study at a tertiary referral centre. *BJU Int.* 2021;127(4):418-27.
7. Kelly HA, MacCALLUM WG. Pneumaturia. *JAMA.* 1898;XXXI(8):375-81.
8. Schultz EH, Klorfein EH. Emphysematous pyelonephritis. *J Urol.* 1962;87:762-6.

9. Tang HJ, Li CM, Yen MY, Chen YS, Wann SR, Lin HH, et al. Clinical characteristics of emphysematous pyelonephritis. *J Microbiol Immunol Infect.* 2001;34(2):125-30.
10. Khaira A, Gupta A, Rana DS, Gupta A, Bhalla A, Khullar D. Retrospective analysis of clinical profile prognostic factors and outcomes of 19 patients of emphysematous pyelonephritis. *Int Urol Nephrol.* 2009;41(4):959-66.
11. Pathapati D, Shinkar PG, Kumar SA, Dattatreya PS, Chigurupati N, Chigurupati MV, et al. Asymptomatic emphysematous pyelonephritis - positron emission tomography computerized tomography aided diagnostic and therapeutic elucidation. *Indian J Nucl Med.* 2017;32(1):42-5.
12. Okochi H, Iiyama T, Kasahara K, Moriki T, Inoue K, Shuin T. Renal matrix stones in an emphysematous pyelonephritis. *Int J Urol.* 2005;12(11):1001-4.
13. Ubee SS, McGlynn L, Fordham M. Emphysematous pyelonephritis. *BJU Int.* 2011;107(9):1474-8.
14. Fatima R, Jha R, Muthukrishnan J, Gude D, Nath V, Shekhar S, et al. Emphysematous pyelonephritis: A single center study. *Indian J Nephrol.* 2013;23(2):119-24.
15. Prakash JVS, Tamil Muthu M, Balaji AR, Vetrichandar S, Arasi KV, Paranjothi A, et al. A novel prognostic scoring system for emphysematous pyelonephritis. *J Urol Ren Dis.* 2019;4:1170.
16. Jain A, Manikandan R, Dorairajan LN, Sreenivasan SK, Bokka S. Emphysematous pyelonephritis: Does a standard management algorithm and a prognostic scoring model optimize patient outcomes? *Urol Ann.* 2019;11(4):414-20.