

Conservative management of emphysematous pyelonephritis

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ABSTRACT

Emphysematous pyelonephritis, though uncommon, is a severe necrotizing kidney infection common in patients with diabetes. Surgical treatment has been advocated as the treatment of choice in most of the patients. We present the clinical course of an elderly lady who presented with emphysematous pyelonephritis and was successfully managed with medical treatment despite the presence of adverse prognostic factors like acute renal failure and thrombocytopenia.

Key words: Conservative treatment, diabetes, emphysematous pyelonephritis

INTRODUCTION

Emphysematous pyelonephritis (EPN) is a necrotizing infection characterized by the presence of gas within the kidney and perinephric tissue. The condition, usually occurring in diabetic patients, is rare and often life threatening.^[1,2] Mortality is high and urgent nephrectomy has been highly recommended.^[3,4] The enteric gram-negative bacilli such as *Escherichia coli*, *Enterobacter*, *Klebsiella*, and *Proteus* account for most of the reported cases, with *E. coli* accounting for 60%.^[2] Rarely, *Streptococcus* and *Candida* also have been reported to cause EPN.^[5] Gas formation in EPN is due to pathogenic bacteria causing mixed acid fermentation in a hyperglycemic environment in tissues that are ischemic. This results in tissue destruction and encourages purulent infection and inhibition of removal of locally produced gas.^[6] With advancements in imaging techniques and availability of newer antibiotics, medical

treatment with or without percutaneous drainage is becoming an acceptable alternative for radical surgery.^[7-9] Several cases have been reported where diabetic patients with EPN were managed successfully with medical treatment.^[10-12] Here, we report a newly detected diabetes patient with EPN who was successfully managed by non-surgical treatment.

CASE REPORT

A 70-year-old woman presented with 4-day history of fever, right flank pain, polyuria, and altered sensorium. She had been detected to have diabetes mellitus about a month back and was taking oral antidiabetic medication. The patient was ill looking, agitated, and talking irrelevant; she was febrile (temperature 100°F) and tachypnic (respiratory rate 34 per minute); her heart rate was 110 bpm and blood pressure was 90/60 mmHg. On systemic examination, air entry was reduced and crepitations were audible more on the right side; suprapubic and right renal angle tenderness was present and no abdominal mass was palpable. There was no neurodeficit or localizing sign. Initial laboratory evaluation included complete blood count (hemoglobin 9.9 g%, total leukocyte count 9500/μl with 86% neutrophils, and platelet count of 36,000/μl), kidney function tests (blood urea 95 mg/dl and serum creatinine 4.6 mg/dl), random blood glucose (408 mg/dl) and arterial blood gas analysis (pH

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DOI:
10.4103/2230-8210.93776

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7.37, SaO₂ 89.5%, PCO₂ 18.3 mmHg, PO₂ 56.4 mmHg, and HCO₃ 10.4 meq/l. Numerous pus cells were seen on urine microscopic examination while ketones were absent. Bilateral pleural effusion was evident on posteroanterior chest radiograph and electrocardiogram showed sinus tachycardia. USG abdomen revealed left kidney size of 11.1 × 4.4 cm with mild increased echo pattern. Right kidney was 11 × 4.7 cm, showing dense acoustic shadow. NCCT of brain was normal; cerebrospinal fluid examination, performed in view of altered sensorium, was normal. Repeated urine and blood culture samples taken during the hospital stay failed to grow any organism. Computed tomography (CT) of the abdomen revealed the presence of gas in the right pelvicalyceal system and renal parenchyma, with air and debris in dilated right ureter. Left kidney was normal [Figure 1a]. The diagnosis of EPN was made and the patient was managed with oxygen inhalation, intravenous fluids in the form of normal saline, and insulin infusion to achieve euglycemia. Empiric intravenous antibiotics in the form of piperacillin, tazobactam, and metronidazole were administered. Because of persistent fever, hypotension and worsening renal functions, the antibiotic spectrum was broadened in the form of addition of ciprofloxacin and vancomycin. Inotropic support with dopamine was also initiated after the 2nd day. The patient's clinical condition started improving around the 4th day of treatment and NCCT on the 5th day revealed marked improvement in the form of decrease in the size and extent of EPN [Figure 1b]. The patient made a remarkable recovery over the next 2 weeks. After 3 weeks, another NCCT abdomen revealed complete disappearance of features of EPN [Figure 1c]. After this, parenteral antibiotics were stopped and the patient was put on oral third-generation cephalosporin (cefepodoxime proxitel + clavulanate) and ciprofloxacin. She recovered completely [Table 1]. She was on oral diet and was discharged on two doses of premixed (30/70) insulin at the end of 4 weeks. When reviewed after two more weeks, the patient was asymptomatic and routine urine examination was normal. She was prescribed metformin 1 g/day with good glycemic control.

DISCUSSION

First described in 1898, EPN is an acute necrotizing parenchymal and peri-renal infection caused by gas forming uropathogens. Four factors have been proposed to have a role in the development of EPN: gas forming bacteria, high blood glucose, damaged tissue perfusion, and impaired immune response.^[1,4] The disease predominantly affects women, with the left kidney being more frequently involved whereas both kidneys are involved in about 5–10% of the reported series.^[5,13-15] Though 90% of the reported cases have occurred in diabetic patients,



Figure 1: (a) Non-contrast CT (NCCT) of abdomen at admission revealing gas in the right pelvicalyceal system and renal parenchyma, with air and debris in dilated right ureter suggestive of EPN; (b) NCCT on the 5th day revealing decrease in the size and extent of EPN; (c) NCCT after 3 weeks revealing complete disappearance of features of EPN

Table 1: Lab parameters of the patient during hospital stay

Parameter	Admission	Day 3	Day 15
Hb (g%)	9.9	10.9	11.5
TLC (mm ³)	9500	8800	8000
Platelets/mm ³	36,000	68,000	82,000
Glucose (mg/dl)	408	365	162
Urea (mg/dl)	95	120	60
Creatinine (mg/dl)	4.6	2.5	1.2
Na (meq/l)	120	145	144
K (meq/l)	3.8	3.37	4.2
pH	7.37	7.35	7.35
PCO ₂ (mmHg)	18.3	24	40
HCO ₃ (meq/l)	10.4	13.1	19
PO ₂ (mmHg)	56.4	66	76
SaO ₂ (%)	89.5	90	99

EPN has also been reported in debilitated, alcoholic, and immunocompromised patients.^[2] Most patients with EPN are severely ill with fever, chills, flank pain, lethargy, confusion associated with medical problems. similar to the clinical presentation of our patient. Diagnosis is based on clinical history and imaging. A typical feature of EPN seen on conventional radiography is the presence of gas outlining ureters and pelvicalyceal system. The rate of diagnosis with plain radiography is low because of overlying intestinal gases.^[3] Ultrasound findings include high-amplitude shadowing along the non-dependent surfaces, causing obscuration of the posterior structures. The posterior shadowing is typically “dirty” as opposed to the “clean” shadowing caused by calculus. Kiris *et al.* reported ultrasound findings that were different from the typical appearances. The gas appeared as a hypoechoic area surrounded by an echogenic (calcific) rim and more echogenic central stone, thus giving the appearance of a target sign.^[16] CT scan is the investigation of choice for not only making a proper diagnosis but also planning the treatment option.^[2] The Classification scheme proposed by Wan *et al.*, based on CT appearance, divides EPN into two types with different prognostic significance.^[17] Type 1 is characterized by parenchymal destruction with streaky or mottled gas collection but no fluid collection. Reduced immune response limits the formation of pus collection and this leads to the spread of the inflammation

culminating in a fulminant course of the disease; it carries a high mortality of around 70%. Type 2 is characterized by bubbly or loculated gas within the parenchyma or collecting system with associated renal or peri-renal fluid collection. A better immune response results in the formation of pus in the kidney, leading to a slower course of the disease and better prognosis with a mortality of around 16%.^[13] A more detailed staging has been put forward by Haung *et al.* as follows: class 1 – gas in the collecting system; class 2 – gas in parenchyma without extension into the extrarenal space; class 3A – extension of gas to perinephric space; class 3B – extension of gas to paranephric space; and class 4 – bilateral EPN or single kidney EPN.^[13] Our case is considered to be of group 2 according to either classification because the gas in the renal pelvis was confined to the kidney itself. Patients initially presenting with thrombocytopenia, acute renal function impairment, disturbance of consciousness, and shock have very high mortality.^[2] Our patient had all these adverse features at presentation, but responded well to conservative treatment. Traditionally, the consensus is that mere medical treatment may not be effective and prompt nephrectomy is necessary because the mortality rate in patients treated with antibiotics alone is around 40%. Success of treatment is 66% in those treated with percutaneous nephrostomy and 90% in those treated with nephrectomy.^[13] With the availability of CT and better antibiotics, a combination of better antibiotics and image-guided drainage has been put forward as an initial mode of treatment.^[7] There are growing reports of successful medical treatment of EPN. Asgari reported the case of a 45-year-old diabetic woman on oral hypoglycemic agents who had presented with EPN.^[4] Similarly, many individual cases have been described where a conservative treatment has been found successful with a combination of good metabolic control and antibiotics.^[8,9] We managed the present case conservatively with aggressive medical treatment including good and rapid control of glucose, hypoxia, sepsis, and renal failure, and the patient had a favorable outcome. We thus believe that nephrectomy is not the preferred treatment anymore for all cases of EPN. EPN should be classified into grades of severity and treatment planned accordingly.

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Cite this article as: Laway BA, Bhat MA, Bashir MI, Ganie MA, Mir SA, Daga RA. Conservative management of emphysematous pyelonephritis. *Indian J Endocr Metab* 2012;16:303-5.

Source of Support: Nil, **Conflict of Interest:** None declared.