

## Case Report

# Emphysematous Pyelonephritis: Case Report

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Kuwait Medical Journal 2004, 36 (2): 134-136

### ABSTRACT

Emphysematous pyelonephritis (EPN) is a serious and often life threatening infection of the renal and perirenal tissues. The characteristic feature of this infection is the presence of gas within the kidney and perinephric tissues. The triad of symptoms of fever; flank pain and pyuria especially in a diabetic patient who does not respond promptly to conventional antibiotic therapy must raise the possibility of EPN. CT Scan is the investigation of choice not only to establish the diagnosis but also to plan the line of management. Renal

preservation must be the aim of management. This can be achieved to a great extent by aggressive antibiotic therapy in combination with percutaneous drainage of obstructed kidneys and abscesses. However nephrectomy is indicated in life threatening fulminant infection of the kidney. A case of EPN in a diabetic patient who was successfully managed by nephrectomy is presented. Review of literature and current concepts regarding the management of EPN are discussed.

KEYWORDS: nephrectomy, renal infection

### INTRODUCTION

Pneumatouria, a sign possibly due to gas forming bacterial infection of the kidney, was reported more than a century ago<sup>[1]</sup>. However, the term emphysematous pyelonephritis (EPN) was first used by Schultz *et al* in 1962 to describe the presence of renal parenchymal gas formation<sup>[2]</sup>. EPN is an acute necrotising infection of the renal parenchyma and perirenal tissue which results in the presence of gas within the renal parenchyma, collecting system or perinephric tissue. Infections which cause EPN are severe and life threatening. 70 to 90 % of reported cases are in patients with diabetes mellitus<sup>[3,4]</sup>. Obstruction to the affected reno-ureteral unit will be present in about 30% of the patients.

### CASE REPORT

A forty-five year old female patient was admitted to the medical ward with complaints of fever with chills and rigors, abdominal pain and dysuria of two days' duration. She is a known insulin dependent diabetic patient. Clinical evaluation revealed a very ill patient. She was conscious and alert. The temperature was 39°C, pulse rate 110 per minute, blood pressure was 100/80 mm Hg and the respiratory rate 24 per minute. Cardio-vascular and respiratory systems were within normal limits. Abdominal examination

revealed severe tenderness at the left upper abdomen and the left renal angle. There was no mass palpable, and the remainder of the physical examination was normal.

Laboratory investigations on admission showed a haemoglobin of 7 gm/L (normal range: 11.5 to 16.5 gm/L), total leukocyte count of  $18 \times 10^9/L$  (normal 4.0 to  $11.0 \times 10^9/L$ ) with 90 % neutrophils (normal 40 to 75 %). The platelet count was  $106 \times 10^9/L$  (normal 150 to  $400 \times 10^9/L$ ). The blood urea nitrogen was 12 mmol/L (normal range 2.5 to 8.2 mmol/L) and the serum creatinine 220 umol/L (normal range: 44 to 120 umol/L). The random blood sugar was 15 mmol/L (normal range 3.90 to 6.10 mmol/L). Urine microscopic examination revealed numerous pus cells, the urine was negative for acetone. Urine and blood cultures were sent and both grew *E. Coli* and the bacteria was sensitive to gentamycin, amikacin, cefotaxime, ceftazidime, ceftriaxone and ciprofloxacin.

A plain X-ray of the abdomen revealed kidney shaped gas in the left renal area (Fig. 1). Intravenous urography showed a normal right kidney and no excretion of contrast by the left kidney even in delayed films (Fig. 2). Ultrasound and computerised tomography of the abdomen confirmed the presence of gas in the renal and perirenal area with extensive renal parenchymal destruction (Fig. 3). The diagnosis of type 1 EPN

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Fig. 1: Plain X-ray of the abdomen showing kidney shaped gas in the left renal area.



Fig. 2: Intravenous urography showing normal right kidney and no excretion of contrast by the left kidney.

was established. The patient was initially treated with intravenous injection of cefotaxime 2 gm I.V. eight hourly and metranidazole 500 mgm I.V. eight hourly. But the patient's general condition deteriorated and she developed hypotension and signs of septic shock within twenty-four hours of the diagnosis. Decision to do an emergency nephrectomy was taken. The nephrectomy was performed through a left flank incision. The post-operative period was stormy and was complicated by severe wound infection. Twenty-eight days after surgery she was discharged from the hospital in a stable condition. Oral antibiotic therapy was continued for four weeks with ciprofloxacin 500 mgm twice daily. She was followed-up for eight weeks post nephrectomy and her urine had become sterile and renal function returned to normal level.

## DISCUSSION

EPN has been generally regarded as a rare renal infection. However with the increased awareness and the routine use of the diagnostic modalities like abdominal ultrasound and computed tomography in the evaluation of patients with symptoms and signs of sepsis due to urinary tract infection, more and more cases of EPN are being reported.

EPN predominantly affects females. The female to male ratio is 3:1. The left kidney is more frequently involved than the right (60% Vs 35%). Both the kidneys are involved in about 5% of the



Fig. 3: Computerised tomography of the abdomen showing the presence of gas in the renal and perirenal area with extensive renal parenchymal destruction

reported series. 90% of the reported cases have occurred in diabetic patients. EPN has also been reported in debilitated (alcoholic) and immunocompromised patients<sup>[5]</sup>.

The most common bacteria causing EPN is *E. coli*, which accounts for 60% of the cases. The enteric gram negative bacilli such as *Enterobacter*, *Klebsiella* and *Proteus* account for majority of the other reported cases<sup>[6]</sup>. EPN caused by *Streptococcus* and *Candida* also have been reported<sup>[7]</sup>. The exact mechanism of gas formation in EPN is not known. Gas formation is believed to be due to pathogenic bacteria capable of mixed acid

fermentation acting in a hyperglycaemic environment on tissues that are ischaemic. This results in tissue destruction, and encourages purulent infection and inhibition of the removal of locally produced gas<sup>[8]</sup>.

Diagnosis of EPN rests on the clinical awareness and confirming it by appropriate investigations. The triad of symptoms of fever, flank pain and pyuria especially in diabetic patients who do not respond promptly to antibiotic treatment must raise the possibility of EPN<sup>[4]</sup>. These patients require to be investigated and treated aggressively. The diagnosis of EPN is classically made by demonstrating gas in the renal or peri-renal tissue by plain abdominal X-ray. In our case, the plain X-ray clearly demonstrated gas in the renal tissue and the diagnosis was easily made. However gas can be demonstrated only in 33% of plain abdominal radiographs in patients with EPN<sup>[5]</sup>. Even by abdominal ultrasonography it may be technically difficult to distinguish the renal gas filled area from gas in the bowel. On the other hand, CT scan not only can confirm the diagnosis, but also show the extent of the disease. Abdominal CT scan is recommended for all patients in whom EPN is suspected.

EPN can be classified into two types as per the CT Scan findings<sup>[9]</sup>. Type 1 tends to have a fulminant course with mortality of 69%. It is characterized by renal parenchymal destruction with either absence of fluid collection or presence of streaky or mottled gas. Type 2 has a mortality of 18% and is characterized by either renal or peri-nephric fluid collection with bubbly or loculated gas or gas in the collecting system.

Several studies have been done to correlate clinical features of EPN with the treatment outcome<sup>[9, 10]</sup>. These showed that age, sex, site of infection, blood urea nitrogen level and blood glucose level were not prognostic factors. But patients initially seen with thrombocytopenia, acute renal function impairment, disturbance of consciousness and shock were associated with very high mortality<sup>[10]</sup>. The classical teaching is that nephrectomy is the treatment of choice in EPN. Mortality for surgically treated patients is 20% compared to 80% for patients treated medically<sup>[11,12]</sup>. Recently many cases of EPN treated successfully with CT-guided percutaneous nephrostomy drainage combined with antibiotics have been reported. They advocated a wide bore 14 Fr Malecots catheter inserted under CT guidance for adequate drainage of purulent material<sup>[13]</sup>.

Nephron sparing management has a definite place in selected patients with EPN. However nephrectomy can provide the best management outcome for type 1 EPN. In our patient, the CT diagnosis was type 1 EPN at the time of diagnosis. The rapidly deteriorating general condition of the patient and the onset of septicaemic shock prompted us to go ahead with nephrectomy rather than adopt a more conservative line of management.

## CONCLUSION

EPN is a severe and often life threatening infection. CT Scan is the investigation of choice for not only making a proper diagnosis but also in planning the treatment option. Renal preservation must be the aim of treatment, but this must not be at the cost of patient's life. One should not hesitate to resort to nephrectomy as and when indicated.

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