

## CASE REPORT

# Emphysematous Pyelonephritis in a Diabetic Patient With Pelvic-Ureteric Stone

A C Chan, MD\*, M J Rohan, FRCS, A Hamid, MS, A Azam, MS

\*Department of Surgery, Universiti Kebangsaan Malaysia, 56000, Kuala Lumpur, \*\*Department of Urology, Hospital Selayang, Lebuhraya Selayang-Kepong, 68100 Batu Caves, Selayang, Selangor

### SUMMARY

Emphysematous pyelonephritis is a rare but life threatening infection of kidney that is characterized by gas formation within or around the kidney. We describe a case of emphysematous pyelonephritis as a consequence of inadequately treated pelvic-ureteric stone in a diabetic man and complement this with a brief review of the literature pertaining in particular to the management of this condition.

### KEY WORDS:

*Emphysematous pyelonephritis, Nephrectomy*

### INTRODUCTION

Emphysematous pyelonephritis (EPN), first described in 1898, is an acute necrotizing infection of the kidney caused by the gas producing uro-pathogens. Commonly a unilateral disease, predilection is for diabetics (90%) and the females to male ratio is 2:1. The left kidney is far more commonly involved than the right kidney. Bilateral involvement was reported in approximately 5% of cases. Overall mortality rate is about 11%. High level of suspicion along with radiological imaging are essential for formulating a diagnosis.

### CASE REPORT

A 55-years old diabetic man with an obstructed left PUJ stone, presented with two days history of fever, left sided abdominal and flank pain. Diagnosis of pyelonephritis and renal impairment secondary to uncontrolled diabetes mellitus was made by the referring hospital. He was treated with analgesia, anti-biotic, insulin and peritoneal dialysis. However, this was not beneficial. CT scan of abdomen (Figure 1) was done at day-6 of admission and it revealed emphysematous pyelonephritis of the left kidney. Frank pus and foul-smelling gases were obtained when an open drainage was performed the following day. E.Coli was isolated from blood and urine cultures. In spite of antibiotics therapy, patient was still having fever. Hence, the patient was referred to us for further management.

On arrival, the patient was in sepsis with spiking temperature. Blood pressure was 150/80 mmHg and pulse 140/min. Abdomen was distended and tender over the left side. Pus was noted over the incision and drainage wound. Blood parameters showed hyperglycaemia (21.3mmol/l), leukocytosis and renal impairment (serum creatinine 375umol/l). Urine analysis showed albuminuria, haematuria and pyuria. Left nephrectomy was performed after the patient was optimized. Gross examination of the specimen



Fig. 1: CT scan shows features of Left Emphysematous Pyelonephritis; presence of air within the parenchyma but no extension of air outside the perirenal space. Right kidney is normal

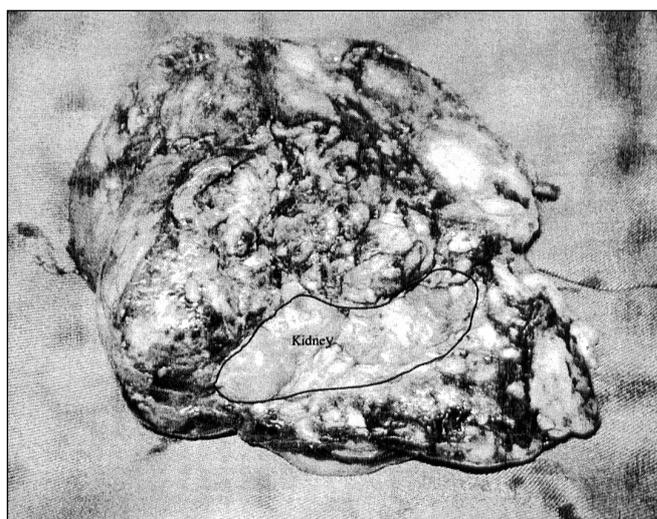


Fig. 2: Photograph of the nephrectomy specimen, the left kidney was full of necrotic tissue. The overlying gerota & perinephric fat were intact.

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Corresponding Author: Chan Ai Chen, Department of Surgery, Universiti Kebangsaan Malaysia, Cheras 56000, Kuala Lumpur

revealed a kidney which was full of necrotic tissue. The overlying gerota and perinephric fat were intact (Figure 2). Histopathology examinations defined a large area of liquefaction necrosis and aggregated of acute inflammatory cells in the kidney, consistent with the diagnosis of emphysematous pyelonephritis of left kidney. The patient recovered well after the surgery.

## DISCUSSION

Two predisposing factors of EPN are Diabetes Mellitus (DM) and urinary tract obstruction. Diabetics account for 70–90% of all cases<sup>1</sup>. *Escherichia coli* (69%) and *Klebsiella pneumonia* (29%) are the two most common bacteria resulting in EPN. *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Candida albicans* and recently *Aspergillus fumigatus* have also been found to be the responsible for this disease. Four factors appear to be involved in the pathogenesis of EPN: gas-forming bacteria, high tissue glucose, impaired tissue perfusion and a defective immune response. Mixed acid fermentation and alcoholic fermentation of glucose by gram negative facultative anaerobes is the major pathway of formation of gas which is mainly composed of nitrogen, carbon dioxide and hydrogen. The gas formation further compounds the septicemia by compression or destruction of the normal renal parenchyma.

The symptoms and signs of EPN are nonspecific, and may present with fever, vomiting, abdominal pain, confusion, pyuria, renal function impairment, thrombocytopenia or shock. Wan YL *et al.* characterized EPN into two categories: Type I EPN was characterized by parenchyma destruction with either absence of fluid or presence of streaky or mottled gas; and type II EPN was characterized with either renal or perirenal fluid collection with bubbly, loculated gas or gas in the collecting system<sup>2</sup>. The histopathological features of the type II EPN show only inflammation and abscess formation of the kidney and those of type I EPN reveal some degree of vascular thrombosis and wedge infarction (impaired tissue perfusion) in addition to inflammation. Patients with radiological type I EPN tend to have a more fulminate course with a significantly shorter interval from clinical onset to death and were with significantly higher mortality than those with type II EPN.

The diagnosis of EPN is established based on radiography findings. Retrospective imaging review by Kuo YT *et al.* showed the sensitivity of KUB and abdominal sonography to detect abnormal renal or perirenal gas collection is 66% and 88%, respectively<sup>3</sup>. CT scan is the most sensitive tool and is the preferred diagnostic technique because it not only helps to quantify the gas but also gives an idea of extent of renal parenchyma involvement. Huang JJ *et al.* classified EPN to four groups according to the extent of the disease on CT scan --- class 1: showing gas in collecting system only; class 2: showing gas in the renal parenchyma without extension to extrarenal space; class 3A: showing extension of gas or abscess to perirenal space, and class 3B: showing extension of gas or abscess to pararenal space; class 4: showing bilateral EPN or solitary kidney with EPN<sup>1</sup>. The mortality rate exceed 80% when gas is extends outside the kidney; 60% when gas is confined to kidney. This classification offers a practical principle for the treatment planning of EPN.

The treatment of EPN depends on the patient's clinical status but control of blood sugar, and relief of urinary tract obstruction are mandatory. There are different combinations of methods for treating EPN, including: long term antibiotics, percutaneous drainage of abscess (PCD) and gas, surgical drainage or nephrectomy. Traditionally, it is thought that antibiotic therapy alone is usually ineffective and nephrectomy is necessary. Current literatures show some EPNs were treated by successfully with antibiotics alone. Goldsmith, Kondo, Labussiere, Punnose, Jain, and Best all have described individual cases of EPN treated successfully with antibiotics alone. Angulo, Grozel, Shimizu and Tahir *et al.* each reported cases of bilateral EPN that were successfully treated with antibiotics alone, thus obviating the need for renal replacement therapy which would have been needed if they were treated with bilateral nephrectomies.

The role of PCD in the management of EPN has been emphasized in a reports by Huang JJ *et al.*<sup>1</sup>. All the patients with class 1 and 2 of EPN who were treated with PCD or ureteral catheterization combined with antibiotics survived. In extensive EPN (class 3 and class 4), 85% of the patients with less than two risk factors (thrombocytopenia, acute renal function impairment, disturbance of consciousness or shock) was successfully treated using PCD combined with antibiotics. The patients with two or more risk factors had a significantly high rate of treatment failure and prompt nephrectomy is required. Chen *et al* described their 10-year experience with 25 EPN patients which 80% of the cases required antibiotics plus PCD; 12% underwent nephrectomy and 8% died<sup>4</sup>. Shokeir reviewed his 15-year experience of 20 patients with EPN in Egypt. He emphasized that the importance of immediate nephrectomy as soon as the patient is medically stable<sup>5</sup>.

In our case, a type II, class 3A EPN with two risk factors (acute renal impairment and DM) which fail to response to aggressive antibiotic treatment or simple open drainage, nephrectomy is the choice.

In conclusion, antibiotic combined with drainage is the treatment of choice for the initial management of EPN. Nephrectomy is indicated if clinical outcome is not satisfactory or in the presence of initial fulminate course of EPN. There should be high index of suspicious of EPN in case of non resolving pyelonephritis and early referral to appropriate centre for further management.

## REFERENCES

1. Huang JJ, Tseng CC. Emphysematous pyelonephritis: clinicoradiological classification, management, prognosis, and pathogenesis. *Arch Intern Med* 2000; 160: 797-805.
2. Wan YL, Lee TY, Bullard MJ, *et al.* Acute gasproducing bacterial renal infection: Correlation between imaging findings and clinical outcome. *Radiology*. 1996; 198: 433-38.
3. Kuo YT, Chen MT, Liu GC, *et al.* Emphysematous pyelonephritis: imaging, diagnosis, and follow up. *Kaohsiung Journal of Medical Sciences* 1999; 15: 159-70.
4. Chen MT, Huang CN, Chou YH, *et al.* Percutaneous drainage in the treatment of emphysematous pyelonephritis: 10-year experience. *J Urol* 1997; 157: 1569-573.
5. Shokeir AA, El-Azab M, Mohsen T, El-Diasty T. Emphysematous pyelonephritis: A 15-year experience with 20 cases. *Urology* 1997; 49: 343-46.