

CASE REPORT

EMPHYSEMATOUS PYELONEPHRITIS CAUSED BY *CANDIDA* INFECTION

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Abstract. We present an interesting and rare case of a diabetic patient who developed extensive unilateral emphysematous pyelonephritis (EPN) which was caused by fungal infection. The diagnosis was confirmed on computed tomography (CT) scan of the abdomen. Repeated urine cultures grew *Candida albicans* but no other organisms were isolated. The patient remained febrile and unwell despite parenteral broad spectrum antibiotics and antifungal treatment. She underwent nephrectomy and then made a good clinical recovery.

INTRODUCTION

Emphysematous pyelonephritis (EPN) is a rare, but severe, suppurative infection of the renal parenchyma characterized by gas formation in intra-renal and perirenal tissues by fermenting organisms (Stein *et al*, 1996). The predisposing factors for these infections are diabetes mellitus (almost exclusively) and obstructive uropathy (Huang and Tseng, 2000). Gas-forming coliform bacteria, such as *Eseherichia coli*, are the most common causative agents, accounting for 58-69% of the cases (Wan *et al*, 1996; Huang and Tseng, 2000). Other organisms that have been implicated include *Klebsiella pneumoniae*, group B *Streptococcus* and *Proteus* (Wan *et al*, 1996; Huang and Tseng, 2000). Although rare report of *Candida* species as the etiology for EPN were available and includes *Candida tropicalis* and *C. albicans* (Seidenfeld *et al*, 1982; Hildebrand *et al*, 1999).

EPN is a life threatening condition with a high mortality rate. Although the rate has declined recently with the introduction of more potent antibiotics and better understanding of the disease, the reported mortality rates continue to be high (8-69%) (Wan *et al*, 1996; Chen *et al*, 1997; Huang and Tseng, 2000). We report a case of EPN caused by *Candida albicans* occurring in a diabetic patient who failed to respond to medical

therapy. Nephrectomy had to be performed subsequently with a good clinical outcome.

CASE REPORT

A 43-year-old Malay lady with a 10-year history of type 2 diabetes mellitus presented to the Hospital Universiti Sains Malaysia with a 3-day history of severe pain in the left lumbar region associated with high grade fever, chills and rigors. She also complained of nausea, vomiting and anorexia, but denied having dysuria or hematuria. On admission the patient was dehydrated, toxic looking and was in severe pain. Her body temperature was 38°C, pulse rate 110/minutes, and blood pressure 150/100 mmHg. On abdominal examination there was tenderness over the left lumbar region with a ballotable left kidney.

Laboratory investigations showed a hemoglobin of 10.5 g/dl, leukocytes of 11,200/mm³, platelets were 129,000/mm³ and the full blood picture showed neutrophilia. The erythrocyte sedimentation rate (ESR) was elevated at 126 mm/hour. Serum chemistry values were: blood urea 13.3 mmol/l, serum creatinine 119 µmol/l, sodium 133 mmol/l, potassium 4.5 mmol/l, chloride 101 mmol/l, calcium 1.88 mmol/l, and phosphate 0.75 mmol/l. The random blood sugar on admission was 15.2 mmol/l and the glycosylated hemoglobin (HBA1c) was 14%. Urine microscopy revealed abundant pus and yeast cells.

The patient was initially treated as acute pyelonephritis of the left kidney. Abdominal radiographs revealed an enlarged left kidney with

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a surrounding rim of air (Fig 1) which suggested the diagnosis of emphysematous pyelonephritis (EPN). Computed tomography (CT) scan of the abdomen confirmed the diagnosis of EPN with multiple air loculations occupying almost the whole of the left kidney, leaving minimal renal tissue (Fig 2). Retroperitoneal gas was also noted predominantly in the pararectal region.

The patient was treated with parenteral analgesia, an insulin infusion and intravenous antibiotics (ceftazidime 2 g twice a day and cloxacillin 500 mg four times a day). However, fever persisted despite 5 days of intravenous antibiotics. Her white cell count increased to $13,000/\text{mm}^3$ and her platelet count decreased to $74,000/\text{mm}^3$. Urine cultures showed the presence of *Candida albicans* twice on the third and fifth day of admission. There was no bacteriuria and blood cultures were repeatedly negative. Intravenous fluconazole 200 mg daily was subsequently added. A DTPA scan with frusemide showed a non-functioning left kidney. Because of severe infection and the non-functioning left kidney, she was referred to the surgical team for nephrectomy rather than percutaneous nephrostomy. Nephrectomy was performed on day 10 of hospitalization (as consent for earlier surgery was not given), following which the platelet count and renal function returned to normal. However, she developed wound breakdown and secondary skin infection following her operation. She was eventually discharged after four weeks of hospitalization on subcutaneous insulin therapy, and continued to take oral antibiotics and anti-fungal treatment for a total duration of six weeks.

Histopathological findings for the nephrectomized tissue showed a focal area of renal infarction rimmed by hemorrhage, with a medium sized vessel showing organizing thrombus. In the deeper renal parenchyma multiple foci of suppurative were noted with typical features of chronic pyelonephritis seen elsewhere. A focus of ill-defined granuloma composed of multinucleated giant cells, lymphocytes and plasma cells were noted. The suppuration extended downwards to involve the ureter as well. Focal nodular glomerulosclerosis was also noted in several glomeruli in different sections.

DISCUSSION

Emphysematous pyelonephritis (EPN) is a



Fig 1—AXR showing an enlarged left kidney with a surrounding rim of air.



Fig 2—CT scan of the abdomen showing multiple air loculations occupying almost the whole of the left kidney leaving minimal renal tissue. Minimal perinephric collection with thickening of the Gerota and Zuckerlandl fascia. Retroperitoneal gas also noted predominantly in the pararectal region.

potentially fatal complication of acute pyelonephritis seen in diabetics (Stein *et al*, 1996; Huang and Tseng, 2000). It is a renal infection caused predominantly by gram-negative rods which are capable of fermenting glucose in an anaerobic environment. It has been postulated that high glucose tissue levels and impaired tissue perfusion in diabetic individuals provides an optimal

environment for the metabolism and growth of facultative anaerobes. These organisms ferment glucose and lactate to produce carbon dioxide, utilizing ischemic and necrotic tissues as substrate (Patel *et al*, 1992). Diabetic microangiopathy may compound tissue damage by retarding the transport of catabolic end products away from necrotic tissue, resulting in the accumulation of gas in tissues.

The incidence of EPN is much higher in females, seen in 85% of the cases (Huang and Tseng, 2000). This female predominance was also seen in another series reflecting the overall higher incidence of urinary tract infections in women (Wan *et al*, 1996; Stein *et al*, 1996). Patients often present with a clinical picture suggestive of severe acute pyelonephritis (as reported here) or occasionally as fever of unknown origin. Prompt radiological evaluation is most useful in making a definitive diagnosis of EPN. Plain abdominal radiographs may only demonstrate the presence of air in the renal parenchyma in a limited number of EPN cases. CT scan is currently the radiographic method of choice both for diagnosing EPN and demonstrating the extent of the disease. In this patient, the findings on abdominal CT scan had influenced the overall management. *Candida* was implicated as the etiology of EPN in this case because of the repeated positive cultures in the urine at an early phase of the illness. Furthermore, both the urine and blood cultures failed to grow any bacteria.

EPN has been prognosticated based on its radiological findings (Wan *et al*, 1996; Huang and Tseng, 2000). This patient had extensive EPN based on CT scan findings of parenchymal destruction and extension of gas into the perinephric space. Clinical criteria were also studied to stratify prognosis. Thrombocytopenia, acute renal function impairment, disturbance of consciousness, and shock on admission were 4 risk factors found to be significantly associated with higher mortality (Huang and Tseng, 2000).

The management of EPN consists of both medical and surgical treatment. Because of the considerable potential for morbidity and mortality, nephrectomy should be considered early in selected cases. Recent studies are in favor of renal conservation, Chen and colleagues reported a low (8%) mortality with CT guided percutaneous drainage combined with antibiotics and supportive therapy (Chen *et al*, 1997). Anti-

biotic therapy should be maintained for about 4 or more weeks if conservative therapy is employed (Best *et al*, 1999).

In addition to the extensive EPN on radiological imaging, the patient also had 2 risk factors associated with high mortality (thrombocytopenia and acute renal impairment). There was not much evidence of clinical improvement following parenteral antibiotics and anti-fungal therapy. The patient only made significant clinical recovery after the nephrectomy. In conclusion, EPN is a rare but potentially life threatening complication of acute pyelonephritis seen amongst diabetic patients. Nephrectomy should be promptly attempted in patients with extensive disease on CT scan in the presence of 2 or more poor prognostic factors.

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