

Emphysematous pyelonephritis (class IIIa) managed with antibiotics alone

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ABSTRACT

A 54-year-old male with long-standing diabetes presented with vague left flank pain for 5 days with uncontrolled blood glucose. The patient was commenced on insulin and injectable ceftriaxone empirically, for possibly acute pyelonephritis. Ultrasound examination revealed extensive emphysematous pyelonephritis of upper half of left kidney with involvement of perinephric space. Computed tomography of abdomen confirmed the diagnosis of emphysematous pyelonephritis which was categorised as class IIIa. The recommended treatment for class IIIa emphysematous pyelonephritis is nephrectomy but the patient refused to give consent for surgery or even percutaneous drainage. Thus, the patient was continued on medical management alone and surprisingly showed marked recovery over the next few days. There were no new complications, and the patient was discharged after

2 weeks of antibiotics with 2 more weeks of oral antibiotics. After 4 months, the ultrasound showed normal kidneys. We present this case because it adds to the little existing evidence that conservative management can successfully cure patients with class IIIa emphysematous pyelonephritis, although supplementation with percutaneous drainage would have been better in this case.

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Introduction

Emphysematous pyelonephritis (EPN) is a complication seen in patients with long-standing diabetes and is characterised by formation of gas in the renal parenchyma.¹ Such gas may extend into the peri-nephric or para-renal spaces and additionally in advanced case, there may be bilateral and extensive involvement.¹ The primary cause of EPN is urinary tract infection caused by either Gram-negative organisms or anaerobes in some cases. The diagnosis of EPN is confirmed by non-contrast computed tomography (CT) and treatment is usually based on the CT classification. In the case of class IIIa EPN, the current recommended treatment of choice is nephrectomy or percutaneous drainage. Herein, however, we managed our patient with class IIIa EPN conservatively with only medical management, without percutaneous drainage or even haemodialysis.

Case report

In August 2010, a 54-year-old male with diabetes for the past 20 years presented to the Dr Rajendra Prasad Government Medical College in Himachal Pradesh, India. His chief complaints were pain in left flank for 5 days and fever for 1 day. The symptom of pain was gradually progressive, continuous type

localised in left flank. The patient developed fever on the fourth day which was recorded as 102°F (38.9°C). He was given ornidazole and ofloxacin tablets orally at a primary health centre and was then referred to our medical department because of uncontrolled blood glucose. He reported a history suggestive of osmotic symptoms and burning micturition for 5 days, and there were no other significant present or past complaints. The vital signs showed blood pressure of 90/60 mm Hg at presentation, pulse rate of 106 beats/min, respiratory rate of 16 breaths/min, and temperature of 103°F (39.4°C) was recorded. On examination, the patient was conscious, oriented, and there was tenderness in the left renal angle, but all the other systems were normal. The biochemistry results showed a haemoglobin level of 101 g/L (reference range, 120-150 g/L), total leukocyte count of 17 700/mm³, neutrophils of 88%, and erythrocyte sedimentation rate of 68 mm/h (reference range, 0-22 mm/h), with normal platelet counts and liver functions. Metabolic control was very poor with glycated haemoglobin level of 12.8%, urea of 19.27 mmol/L (reference range, 4-8.3 mmol/L), and serum creatinine of 132.6 μmol/L (reference range, 50-110 μmol/L). Urine examination showed no albumin, traces of sugar, while urine microscopy showed 15 to 20 pus cells per high-power field, and therefore urine culture and sensitivity was ordered. However,

單用抗生素治理肺氣腫腎盂腎炎（IIIa級）

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一名長期患有糖尿病的54歲男性因左腰疼痛併發不受控的血糖水平而求診。為預防急性腎盂腎炎，我們為病人進行胰島素及頭孢曲松注射。超聲檢查發現其左腎上半部分與圍繞腎周圍的空間有廣泛肺氣腫腎盂腎炎。電腦斷層掃描亦證實肺氣腫腎盂腎炎並診斷為IIIa級。一般來說，針對肺氣腫腎盂腎炎的治療是腎切除術，但由於病人拒絕進行手術甚至不願意接受經皮穿刺引流，因此只能用藥處理。令人驚訝的是病人在幾天後的病情明顯改善，亦未有出現併發症。病人接受兩週的抗生素治療後出院，並繼續接受兩週口服抗生素療程。四個月後，超聲檢查顯示病人的腎臟正常。雖然我們認為經皮穿刺引流可能會對治療此病更有幫助，但以保守治療成功處理肺氣腫腎盂腎炎的文獻甚少，特提出此病例報告。

the urine and blood culture reports later turned out to be sterile.

The patient was managed for uncontrolled blood glucose and a possible diagnosis of acute pyelonephritis of the left kidney was made clinically. He was started on human mixed insulin along with ceftriaxone (1 g administered intravenously every 12 hours). Chest X-ray showed raised left dome of diaphragm. Ultrasound examination of abdomen revealed EPN of left kidney with destruction of upper portion and extending into the perinephric space near the upper pole. The treatment given was continued and the abdominal CT scan revealed evidence of a small renal calculus on the left side with extensive EPN of the left kidney and the presence of small amount of fluid in the left perinephric space (Fig). In this patient, the CT classification was class



FIG. Contrast computed tomographic scan of abdomen showing left renal calculus with left emphysematous pyelonephritis and presence of small amount of fluid in the left perinephric space (arrows)

IIIa EPN.

With regard to further management, we gave an option of nephrectomy to the patient, but he refused to give consent for any surgical intervention. The patient refused even for percutaneous nephrostomy, so we continued with medical management alone. To our surprise, throughout the hospital stay, the patient remained afebrile and fully conscious. He showed a steady recovery in clinical and laboratory parameters without any new complaints or complications. After 1 week of insulin and antibiotic (ceftriaxone) treatment, his renal functions remained normal with a serum creatinine of 106.1 $\mu\text{mol/L}$ and blood glucose was adequately controlled with human mixed insulin injections over the next few days. The patient was started on intravenous ceftriaxone empirically on admission and this was continued for a total of 2 weeks. During this period, the patient became fully active and mobile. Due to absence of any complications or features of sepsis after 2 weeks of treatment, the patient was discharged on oral antibiotics for a further 2 weeks. After 4 months, ultrasound examination showed normal kidneys and even the small calculus had disappeared.

Discussion

Emphysematous pyelonephritis is a well-known condition which mainly affects the diabetic population (90%) and seen in patients with chronic diabetes.¹ Some interesting facts about EPN are that it has a strong female preponderance with female-to-male ratio of 5:1, mean age of occurrence is around the fifth decade, and most often it involves left kidney in almost 60% of cases.¹ The gas contains carbon dioxide mainly because of bacterial fermentation of glucose along with some hydrogen and nitrogen. Presentation is often vague with non-specific abdominal pain, fever, and tenderness in the renal angle.¹

Since most cases are sporadic and spread over time, it is not easy to formulate definitive guidelines for all cases of EPN. The best evidence available for EPN is dependent on a few large prominent studies by Huang and Tseng² in 2000 with 48 patients and a review by Pontin and Barnes¹ in 2009 with 52 patients. Such studies serve as a good guide for the rest of the world, but may suffer from bias from the treating physicians and surgeons. So it is prudent to report all cases of EPN with details of presentation, extent of involvement, line of management, and outcomes.

The medical management of EPN was proposed a long time ago when it was first described by Schultz and Klorfein in 1962.³ In fact, in their report it was stated that "Vigorous treatment of uncontrolled diabetes and the use of appropriate antibiotics, avoiding anaesthesia and surgery seems a more rational approach."³

TABLE. Emphysematous pyelonephritis (EPN) classification by Huang and Tseng²

Class	Description
Class I	Gas in collecting system only
Class II	Parenchymal gas only
Class IIIa	Extension of gas into perinephric space
Class IIIb	Extension of gas into paranephric space
Class IV	EPN in solitary kidney, or bilateral disease

The current management recommendations are based on the CT-based classification used by Huang and Tseng² in which they divide EPN into classes I, II, IIIa, IIIb, and IV (Table).

Class I and II EPN can be managed by medical therapy alone or combined with percutaneous drainage. Huang and Tseng² found that class IIIa EPN showed a 71% failure rate following percutaneous drainage with a 29% mortality rate, and those belonging to class IIIb had a 30% failure rate with a 19% mortality rate. Thus surgery became the norm for extensive disease except where there was a single kidney or bilateral involvement. Unilateral nephrectomy can be done with a low mortality risk in most centres.¹

The most recent updates, however, recommend a more conservative approach. Recently, reports of successful management using percutaneous drainage and medical management alone have started coming from across the world even with bilateral and extensive disease.⁴⁻⁶ A recent case series describes eight cases of EPN with medical management alone.⁶ Of these eight cases, four were class IV EPN, five cases required haemodialysis, whereas four needed percutaneous drainage. The authors successfully used injections of imipenem for 10 days in five patients, cefoperazone + sulbactam for 14 days in two patients, and piperacillin + tazobactam for 14 days in one patient.⁶ Antibiotics that are effective in treating EPN include quinolones, beta-lactamase inhibitors, cephalosporins, and aminoglycosides, alone or in combinations mainly to cover Gram-negative bacteria like *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus* spp, *Streptococcus* spp, *Pseudomonas* spp, and anaerobes like *Bacteroides fragilis*, and *Clostridium septicum*.^{7,8}

The reason for successful shift in management is probably because nowadays EPN gets picked up early on CT showing very small air pockets. Such patients are therefore more likely to respond to conservative management. Even for larger EPN, percutaneous drainage rather than nephrectomy can be the standard of care in a majority of patients.¹

Since India is one of the epicentres of diabetes epidemic, we wish to emphasise that systematic reporting of all EPN cases from this region can aid in formulating guidelines, especially for poor resource settings like ours. Most of our cases go unreported due to lack of proper record maintenance. Our patient had received ciprofloxacin tablets for 5 days before presenting to our hospital. Early initiation of antibiotics may have limited the progress of EPN in this patient and may have also been responsible for the sterile cultures that were reported. The patient had long-standing diabetes and also had a renal calculus, both of which can predispose to infection and subsequently lead to EPN. The patient was categorised as class IIIa EPN, who responded exceptionally well to antibiotics alone and had complete resolution of EPN on follow-up.

In conclusion, this is a rare case report because our patient recovered without drainage, surgery, or even haemodialysis. There have been reports that in class IIIa EPN that medical management alone with percutaneous drainage has a 92% failure rate.² We wish to emphasise sensitisation of treating physicians regarding early investigations using contrast CT scan in diabetes patients with fever, renal angle tenderness, and vague abdominal pain. We do not recommend medical treatment for all such cases, but follow-up should be based upon patient's response to the initial treatment.

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