Emphysematous pyelonephritis and kidney transplant: A double trouble

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ABSTRACT

Emphysematous pyelonephritis is a rare condition characterized by the accumulation of gas resulting from necrosis of the renal parenchyma and/or adjacent urinary tract tissues. There are several well-established risk factors, the most frequent being diabetes. There are very few cases described in literature of emphysematous pyelonephritis in patients with kidney allograft. The management and treatment of this condition is still a challenge. Here we report a case of a 62-year-old man with history of kidney transplant and poor controlled diabetes admitted on the hospital for an emphysematous pyelonephritis with pyelitis and cystitis confirmed by renal computerized tomography. The patient initiated conservative treatment with antibiotic. However, escalation for a large spectrum antibiotic was needed due to clinical deterioration 48 hours after admission. After appropriate escalation of antibiotic therapy and close clinical monitoring, clinical and analytical improvement was achieved, without the need for invasive procedures. The patient was discharged on the 13th day of hospitalization with renal function within the baseline value.
This case report aims to highlight a rare entity, especially in patients who have previously undergone kidney transplantation, whose approach is controversial and not well established.

Keywords: Emphysematous pyelonephritis. Kidney transplant. Adult. Diabetes.

INTRODUCTION

Emphysematous pyelonephritis is a rare infectious condition characterized by the accumulation of gas resulting from necrosis of the renal parenchyma and/or adjacent urinary tract tissues and may be accompanied by emphysematous pyelitis and/or cystitis[1]. There are several well-established risk factors for this entity, the most frequent being diabetes, urinary tract obstruction and hypertension. The main microorganisms involved are gram-negative bacteria, most frequently *Escherichia coli*[2]. Rapid diagnosis and appropriate treatment with supportive therapy, antibiotic and possibly invasive procedures are predictors of survival in these patients[3]. Very rarely, this entity affects patients who underwent kidney transplantation[4].

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Here, the authors present a case of an adult male patient with this rare diagnosis of an emphysematous pyelonephritis in a renal allograft.

CASE REPORT

A 62-year-old Caucasian male patient with a personal history of chronic kidney disease secondary to diabetic nephropathy who underwent a living donor kidney transplant in 2015 and was undergoing triple immunosuppression (tacrolimus, mycophenolate mofetil and prednisone), type 2 diabetes with poor metabolic control and microvascular complications (diabetic retinopathy), benign prostatic hyperplasia, arterial hypertension and hypothyroidism. The patient presented to the hospital with nausea, vomiting and pain in the right iliac fossa, which had been progressively worsening for three days. On physical examination, was noted a blood pressure of 118/79 mmHg, heart rate of 79, mucous membranes dehydrated, febrile with tympanic temperature of 38.5 °C, pain and tenderness on palpation of the kidney graft in the right iliac fossa. Laboratory results showed leukocytosis, neutrophilia, C-reactive protein 203 mg/dL and worsening renal function with serum creatinine (Cr) 1.7 mg/dL and blood urea nitrogen 83 mg/dL. Urine analysis showed countless leukocytes, pyocytes and erythrocytes. The remaining analytic results are presented in table 1.

Table 1. Analytical results upon hospital admission

Blood analysis results	Reference value	
Hemoglobin (g/dL)	14.8	13.7–17.3
Hematocrit (%)	44.8	40.0–51.0
White blood cell count (10³/µL)	11.72	4.8–10.8
Platelets (10³/µL)	116.0	144.0–440.0
Creatinine (mg/dL)	1.7	0.70–1.20
Blood urea nitrogen (mg/dL)	83	16.6–48.5
Sodium (mmol/L)	139	136.0–145.0
Potassium (mmol/L)	3.7	3.50–5.10
Chloride (mmol/L)	104	98.0–107.0
Albumin (g/L)	30.9	35.0–62.0
C-reactive protein (mg/dL)	203	< 5

An abdominopelvic computed tomography (CT) scan showed a transplanted kidney in the right iliac fossa, globose, with a longest axis of 12.6 cm; dilatation of the excretory system and renal pelvis with a diameter of 28 mm; an exuberant amount of gas in the collecting system (four gas bubbles, the largest one with a diameter of 4 cm and 2.5 cm), calyxes, renal pelvis and on the bladder wall (Figure 1). The diagnosis of emphysematous pyelonephritis and acute kidney injury was therefore assumed, and empirical antibiotic therapy with cefuroxime and metronidazole was started.

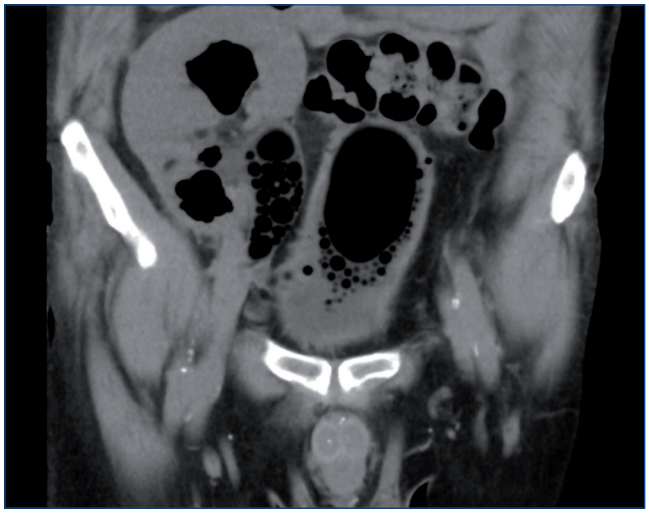

Figure 1. Renal CT scan performed on admission, coronal plane, revealing enlargement of the renal allograft, presence of multiple gas bubbles on the renal parenchyma, calyxes, renal pelvis and bladder.

The case was discussed with the urology team, who opted for conservative therapy. Due to clinical and analytical deterioration after 48 hours, antibiotic therapy was changed to meropenem. Initially, urine and blood cultures were taken, which were positive for *Escherichia coli* sensitive to piperacillin/tazobactam, ciprofloxacin and gentamicin and resistant to ampicillin, amoxicillin/clavulanic acid and cefuroxime. The escalation to meropenem occur before the results of culture test were available. Subsequently, after 72 hours of meropenem, was noted clinical and imaging improvement. Abdominopelvic CT scan was repeated with resolution of the excretory system dilatation and partial reabsorption of the pre-existing gas (Figure 2). He underwent ten days of targeted antibiotic therapy with meropenem, progressed well, without the need for percutaneous or surgical intervention and was discharged on the 13th day of hospitalization with renal function within the baseline value (Cr 1.1 mg/dl).

DISCUSSION AND CONCLUSION

Emphysematous pyelonephritis is a rare, serious and potentially fatal condition with an untreated mortality rate of up to 80%[2]. The pathogenesis is not well understood and there are only a few cases described in the literature of emphysematous pyelonephritis in patients who have previously undergone kidney transplantation[4].

In this entity, during the course of the infectious process, there is significant inflammation with destruction and necrosis of the renal parenchyma and consequent gas formation, most often affecting renal function and contributing to an increased risk of developing chronic kidney disease[2]. The occurrence of this entity in patients with kidney grafts is very frightening because of the risk of renal allograft failure[5].

The most commonly described risk factor is diabetes, especially in patients who are not compliant or in patients whose diabetes medication is not optimized[6]. It is believed that hyperglycemia may be involved in the pathogenesis of this disease, providing a favorable substrate for microorganisms, contributing to necrosis and gas formation. The patient portrayed in this case was not complying adequately with the medication for diabetes and showed poor compliance. Equally important, should be noted the presence of benign prostatic hyperplasia and hypertension as personal antecedents, which are implicated too in the increased risk of EP. In general, women are more affected, but in patients with a kidney allograft, men are more predisposed[7].

The most common clinical presentation of this entity includes the presence of pyuria, fever (80%) and abdominal pain (70%), with acute kidney injury and/or septic shock occurring in one third of the cases[8]. The diagnosis is confirmed by a renal computed tomography scan, which shows the extent of the infection and allows the best therapeutic approach to be defined.

The challenge of this entity relies on the approach, especially when we are dealing with a kidney transplant patient, since the available data is based only on retrospective studies and a few

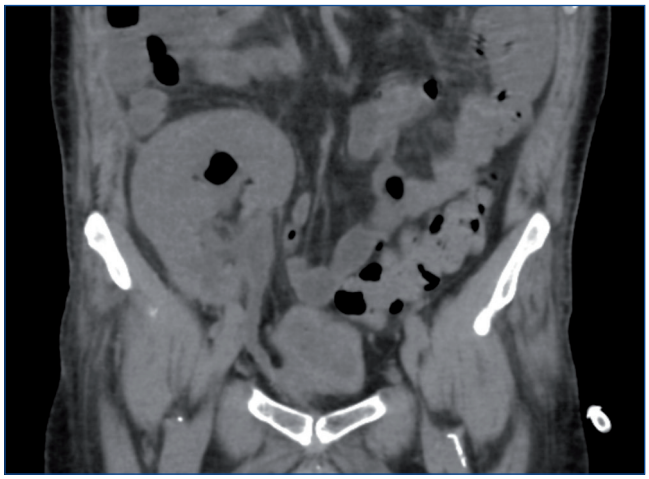

Figure 2. Revaluation renal CT scan, coronal plane, revealing substantial improvement with resolution of the excretory system dilatation and partial reabsorption of the pre-existing gas.

case reports. Initially, the combination of early nephrectomy and antibiotic therapy were the treatment of choice; however, the percutaneous approach guided by imaging techniques has gained a great deal of attention and, together with antibiotic therapy, is currently the preferred approach.

In a systematic review with 10 retrospective studies, including 210 patients with emphysematous pyelonephritis, the mortality rate was 25% in patients undergoing emergent nephrectomy plus medical treatment, 50% for medical treatment alone and 13% for percutaneous drainage plus medical treatment[7]. In critically ill patients and/or those with emphysematous pyelonephritis and extensive disease, there is a consensus that percutaneous drainage should be performed together with antibiotic therapy. However, it is essential to remember that if the clinical condition worsens, nephrectomy should be considered and never postponed, as there is a serious risk of death. The prognosis of this entity varies according to the severity of the disease. It is known that the presence of thrombocytopenia, acute kidney injury, bacteremia and septic shock are associated with higher mortality rates[9].

Concluding, this case demonstrates the importance of medical decision-making in the approach to patients with emphysematous pyelonephritis. In kidney transplanted patients, this is a challenging situation, as we are dealing with a patient with only one viable kidney, which could make the kidney graft definitively unviable. Therefore, the appropriate approach to EP must always take the patient's personal history and clinical severity into account and must always be an individualized decision. In this clinical case, it's important to highlight some poor prognostic factors such as the presence of bacteremia, acute kidney injury, significant extension of the emphysematous process and the presence of urethrohydronephrosis on the CT scan, which could have led to a different outcome. In this clinical case, after appropriate escalation of antibiotic therapy and close clinical monitoring, clinical and analytical improvement was achieved in 48 to 72 hours, without the need for invasive procedures. Hence, the patient evolved favorably with resolution of the clinical condition and recovery of renal function to the baseline value.

Disclosure of potential conflicts of interest

The authors have no conflict of interest to declare. This case report has not received any contribution, grant or scholarship. The authors declare that they have followed the protocols of their work center on the publication of data from patients. The patient agreed with the submission of this case report.

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