Emphysematous Pyelonephritis, Case Report and Review of the Literature

Abstract

Background: Urinary tract infections in immunosuppressed patients, especially Diabetic ones with poor control, can progress to a severe necrotizing infection called emphysematous pyelonephritis (EP), a diagnosis that must be highly suspected in these cases for the presentation as a simple urinary tract infection with poor response to medical management. Delayed diagnosis increases the already high morbidity and mortality.

Case: We present the case of a 47-year-old female admitted to emergency department for a 4 day disease characterized by fever, chills, adynamia, asthenia and right flank pain of moderate intensity. Past day she refers hematemesis in an occasion. She denied pathologic background. At physical examination with inflammatory response signs, right flank pain, positive Giordano sign and positive superior ureteral points, without signs of peritoneal irritation. Laboratories report white blood cells 13000/mm3, Hemoglobin 13.7 g/dL, Platelets 82000, Glucose 595 mg/dL, Cr 2 mg/dL. Gas Analysis report metabolic acidosis. Urinalysis report leucocytes >75μL, uncountable red blood cells, bacteria ++++, nitrites++, Glucose ++++, proteins +, ketones ++. Pyelonephritis and Diabetes mellitus 2 of recent diagnosis was established. After two days of medical treatment she presented septic shock with acute renal failure AKIN II, hematological and hepatic disfunction. Mechanic ventilatory support and use of norepinephrine were adhere to therapy. This case was present in a rural hospital and the unique auxiliary imaging available was an abdomen X-ray that shows an air bubble in the right perirenal space. The diagnosis of emphysematous pyelonephritis was settled down and urgent right nephrectomy performed after platelet transfusion. The surgery was successful and without complications finding a right kidney of 9x6x4 centimeters with multiple parenchymal abscesses. After 11 days patient was discharged uneventfully.

Conclusion: The diagnosis of EP must be highly suspected in Diabetes mellitus 2 patients with severe urinary tract infection and poor response to initial medical management. Medical management including parenteral antibiotics plus percutaneous catheter drainage or nephrectomy must be performed immediately according to the risk factors by the high morbidity and mortality associated with this disease.

Keywords: Sepsis; Emphysematous pyelonephritis; Nephrectomy; Percutaneous; Urinary tract; Leucocytes; Diabetic; EP; Ketoacidosis; Parenchymal; Morbidity; Mortality; Nephrectomized; Acute renal failure

Abbreviations: EP: Emphysematous pyelonephritis; DKA: Diabetic ketoacidosis; CT: Computed Tomography

Introduction

Emphysematous pyelonephritis (EP) is defined as a severe necrotizing infection with gas formation in the renal parenchyma or perirenal tissues. It is more common in females than males (3:1), left side involvement (60%) and is present as a complication of urinary infections in Diabetic patients in 90% of cases [1]. The diagnosis of this entity must be highly suspected in poor controlled Diabetic patients with urinary tract infection and poor response to medical treatment. In this moment imaging studies like TAC can be developed to discard this life threatening complication [2].

Case Presentation

We present the case of a 47-year-old female admitted to emergency department for a 4 day disease characterized by fever, chills, adynamia, asthenia and right flank pain of moderate intensity. Past day she refers hematemesis in an occasion. She denied pathologic background. At physical examination with inflammatory response signs, right flank pain, positive Giordano sign and positive superior ureteral points, without signs of peritoneal irritation. Laboratories report white blood cells 13000/mm3, neutrophils 92%, Hemoglobin 13.7 g/dL, Platelets 82000, Glucose 595 mg/dL, Cr 2 mg/dL. Gas Analysis report pH 7.28 HC03- 7 mmol/L, BE ecf -19.7 mmol/L, SO2 88%.
Urinalysis report leukocytes >75μL, uncountable red blood cells, bacteria ++++, nitrites ++++, glucose +++, proteins +, ketones ++. Pyelonephritis and Diabetes mellitus 2 of recent diagnosis was established. After two days of medical treatment she presented septic shock with acute renal failure AKIN II, hematological and hepatic dysfunction. Mechanic ventilatory support and use of norepinephrine were adhere to therapy. Laboratories report white blood cells 8400/mm 3, neutrophils 82%, Hemoglobin 9.5 g/dL, Platelets 57000, Glucose 595 mg/dL, Creatinine 2 mg/dL, total bilirubin 6.3 mg/dL, lactate dehydrogenase 572 U/L, alanine aminotransferase 352 U/L, total bilirubin 6.3 mg/dL, lactate dehydrogenase 572 U/L, alanine aminotransferase 352 U/L. This case was present in a rural hospital and the unique auxiliary imaging available was an abdomen X-ray that shows an air bubble in the right perirenal space (Figure 1). Emphysematous pyelonephritis was diagnosed and urgent right nephrectomy performed after platelet transfusion. The surgery was successful and without complications finding a right kidney of 9x6x4 centimeters with multiple parenchymal abscesses (Figure 2). After 6 days extubation was achieved by internal medicine service and after 5 days the patient was discharged uneventfully.

**Discussion**

Emphysematous pyelonephritis (EP) is more common among females than males (3:1) with left side involvement in 60% of cases [3]. It is a rare life-threatening infection producing abscess with intrarenal gas, vasculitis, intravascular hemolysis, thrombosis with infarction, papillary necrosis and glomerular sclerosis. It will presents with symptoms like fever, pain and pyuria in about 70% of cases. When septic shock was present it was associated with a mortality of 54.4% in some studies and it should be managed promptly with a multidisciplinary approach [3]. Mortality rate is about 18% and must be suspected in Diabetic patients with acute pyelonephritis and poor response to medical treatment, otherwise the clinical course may be life-threatening if not recognized [2]. The presentation of this entity in Diabetic patients is secondary to the hydrogen and carbon dioxide release through sugar fermentation by the higher glucose concentrations in tissues, which favors the growth of microorganisms [4] including E. coli in 51%, followed by Klebsiella 18% and Pseudomonas 13% [5]. Thrombocytopenia, acute renal failure, shock and conservative treatment have been identified as significant risk factors for mortality [5,6]. Diabetic ketoacidosis (DKA) is an uncommon presentation; only few cases of DKA and EP have been reported in the literature. The finding of gas within renal structures is pathognomonic of EP [7]. The clinical presentation and laboratory findings must represent an acute pyelonephritis and for this reason the diagnosis requires imaging studies. In X-ray images gas bubbles are observed on renal parenchyma or perirenal tissues, psoas muscle is effaced. Ultrasound must be inadequate to settle down EP diagnosis [4]. Computed Tomography (CT) scanning is the gold standard to diagnosis and classification; this last based on the extension of gas and location around the kidney [7] (Table 1).

**Table 1:** Huang and Tseng classification of EP CT scan findings (2000).

| Class 1 | Gas confined to the collecting system |
| Class 2 | Gas confined to the renal parenchyma alone |
| Class 3A | Perinephric extension of gas or abscesses |
| Class 3B | Extension of gas beyond the Gerota fascia |
| Class 4 | Bilateral EP or EP in a solitary kidney |

EP therapy is controversial. Evann off et al. reported mortality rates of 80% in patients treated with medical management, 60% in patients who undergo percutaneous drainage and 20% in nephrectomized patients [4]. Shokier et al. reported a series of 15 patients that were nephrectomized after stabilization with an overall mortality of 20% [4]. Several investigators have proposed nephrectomy as the main treatment of patients with this life threatening infection. Percutaneous drainage, relief of urinary tract obstruction, antimicrobial treatment and nephrectomy are possible therapeutic strategies according to the clinical course, whether benign or fulminant. Matthew E Falanga et al. [6] in agreement with Ahlering and Shokeir suggest that conservative treatment is a risk factor that increases mortality in patients with EP [6]. Percutaneous drainage and medical management were associated with significantly higher survival rates than nephrectomy in some series [3]. Tahsin Turunc [8] and Sang Hyun Park et al. [9] suggest percutaneous catheter drainage and interval nephrectomy as the gold standard treatment [8,9], but even with the great advances in minimally invasive surgery and renal preservation therapies, open nephrectomy has a valuable role in the EP management, especially in places without access to this treatment options [1,10].

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Conclusion

The diagnosis of EP must be highly suspected in Diabetes mellitus 2 patients with severe urinary tract infection with poor response to initial medical management. Imaging detection of gas in the renal or perirenal space must encourage aggressive multidisciplinary management including antibiotics and percutaneous drainage or nephrectomy according to the classification and risk factors mentioned, in order to diminish the high morbidity and mortality associated with this disease.

References


