

Case Report

Emphysematous Pyelonephritis Complicated by Sub Capsular Renal Hematoma: A Case Report

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Abstract: Emphysematous pyelonephritis is a rare and serious life-threatening condition due to a fulminant infection of the urinary tract. It is most often seen in diabetics and is defined by the presence of gas in the renal parenchyma secondary to bacterial infection. We highlight an unusual presentation (extensive renal sub capsular hematoma) of this condition and detail diagnostic and management considerations, including choice of imaging modalities. We present the case of a 63-year-old woman admitted to the emergency room for the management of severe sepsis secondary to an emphysematous pyelonephritis complicated by a large subcapsular hematoma of the kidney having extended into the omental bursa. To our knowledge, this complication is unique and never has been reported in the literature. Surgical treatment was necessary to control this severe infection. The medical and surgical management of emphysematous pyelonephritis must be aggressive and well-coordinated, early diagnosis, antibiotics and assessment for operative intervention are essential. Diabetes is the principal risk factor as well as immunodepression. The prognosis remains poor of this serious infection. Sub capsular hematoma is unusual and a good parameter to assess the severity of this infection. The presence of gas in the urinary tract is the sign of the presence of an active anaerobe infection.

Keywords: Emphysematous Pyelonephritis, Diabetes, Subcapsular Hematoma, Omental Bursa

1. Introduction

Emphysematous pyelonephritis is a rare condition with a poor prognosis. First described in 1898 [1], it is defined by the presence of gas in the renal parenchyma associated with fulminant infection. The illness occurs due to the proliferation of gas-forming anaerobic bacteria. Diabetes is the main risk factor. The occurrence of renal subcapsular hematoma as a complication with extension into the omental lesser sac is extremely rare. We describe here a case of emphysematous pyelonephritis complicated by subcapsular hematoma and its management.

2. Case Report

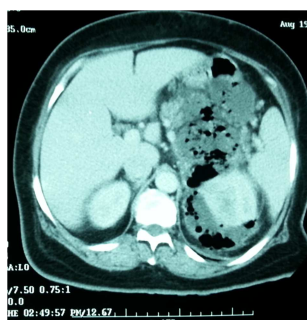
A 63-year-old female Arab patient with a history of type 2

diabetes for 12 years presented to the emergency department for left flank pain with fever lasting for 5 days. The day before arrival, the pain became unbearable with chills, nausea and vomiting. On physical examination, the patient was conscious, dehydrated, febrile at 39°C, blood pressure of 85/36mmHg, heart rate of 136 beats/min, respiratory rate of 24/min. She was pale, and appeared acutely ill; abdominal examination found tenderness in the left flank. Capillary blood glucose was 5 g/L, urine test strip did not show ketones.

Laboratory data showed a white blood cell count of 24000cells/ml, anemia with hemoglobin level at 7g/dl, platelets of 100,000/ml, C-Reactive Protein (CRP) of 168mg/L, renal function was normal and blood electrolytes showed hypokalemia of 3.2 Meq/ml and glucose was 4.3 g/L. Arterial blood gas analysis revealed a metabolic acidosis with a pH=7.31, and PaCO₂=34mmHg and PaO₂=68mmHg.

The patient was immediately given oxygen by mask at a flow of 6L/min, massive fluid resuscitation with 4L isotonic saline, insulin therapy and transfusion of two units of packed red blood cells with good response and stabilization of her hemodynamic status.

We performed an abdominal CT scan with injection of contrast medium (Figure 1a, Figure1b), which revealed a large heterogeneous subcapsular collection in the left renal pelvis associated with several air bubbles; it showed also a heterogeneous ipsilateral hypodense lesion in the left renal cortex (suspicious for abscess) without dilatation of the collecting system. The collection was leaking anteriorly into the omental lesser sac toward the front of the stomach and pancreas. The overall impression was of a superinfected subcapsular hematoma of the left kidney, complicating emphysematous pyelonephritis (Figure 2).



(a)



(b)

Figure 1. Abdominal CECT scan on transversal section showing the heterogeneous sub capsular collection of the left kidney and the hypo dense renal cortical focus.

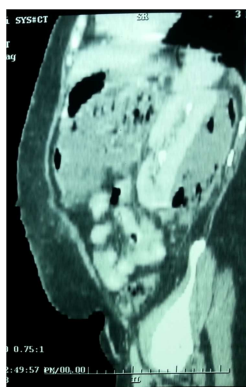


Figure 2. Abdominal CECT scan on sagittal cut showing the heterogeneous sub capsular collection of the left kidney seat of several air bubbles extending to the lesser sac.

The patient was given empiric antibiotic therapy and conservative treatment was elected, which consisted of percutaneous drainage of the collection after which the patient was admitted to the ICU. After 24 hours, the patient did not improve, and lab analysis showed C-reactive protein of 310mg/L, white blood cells count of 32400/mm³, after consideration of these facts, she was taken for nephrectomy. The culture of the drained fluid returned positive for *Escherichia coli* and the same bacterium was found in the patient's blood cultures. Antibiotic therapy was adapted to the antibiogram and the condition of the patient gradually started to improve.

3. Discussion

Emphysematous pyelonephritis is a rare disease; about 300 cases have been reported in the literature [1]. It is defined as a necrotizing kidney infection characterized by presence of gas bubbles within the renal parenchyma, collecting system (also known as emphysematous pyelitis), or the spaces surrounding the kidney [1]. It is a condition often seen in diabetics, associated with a high mortality rate. In fact, diabetes is the main risk factor for the occurrence of emphysematous pyelonephritis as demonstrated in a study by Wan et al [2].

First described by both Kelly and MacCallum [3] in 1898, its incidence has risen in recent years, due to increasing access to more effective diagnostic methods, but also to the continuing increase in diabetes incidence worldwide. The bacteria involved are generally facultative anaerobes; the majorities are Gram-negative bacilli from the Enterobacteriaceae family. *Escherichia coli* are the most common causative pathogen, nearly 69% of the cases followed by *Klebsiella* (29%) [4, 5].

In 60 to 70% of cases, *Escherichia coli* was isolated in the urine or blood cultures, of the same strains encountered in typical pyelonephritis [6]. This was the case for our patient in whom we found, both in urine and blood cultures, an *Escherichia coli* strain sensitive to conventional antibiotics (third generation cephalosporins).

Two types of emphysematous pyelonephritis have been described:

Type I is characterized by extensive parenchymal necrosis, and the presence of both hemorrhagic infarcts and necrosis; the kidney is fragile, spongy and riddled with honeycomb-like pockets of air. Microscopic analysis reveals extensive necrosis, vasculitis, infarcts and microscopic abscesses. The presentation is typically hyperacute, and type I is the more common as well as the more deadly of the two.

Type II shows a diffuse infiltration by inflammatory cells (leukocytes), accompanied by formation of exudates, abscess, and necrosis [7].

It has been theorized that immunosuppression secondary to diabetes explains the absence of local inflammatory response and exudate in type I, whereas the pus formation in type II reflects a more robust immune response, thus explaining the poor prognosis of Type I relative to Type II [7].

Clinically, emphysematous pyelonephritis is a daunting

condition; indeed, it results in 100% mortality in the absence of treatment [7]. The reason for presentation can be a decompensation of diabetes, acute abdominal or flank pain or septic shock in 30% of cases. Fever and chills are present in 56-79% of cases and abdominal or flank pain in 48-71% of cases, nausea or vomiting are found in 16% of cases [8]. More specific but rare physical findings include crepitus over the flank area, or pneumaturia in cases associated with emphysematous cystitis. Laboratory tests may demonstrate multi-organ failure, diabetic ketoacidosis, and elevated markers of systemic inflammation and ischemia. Monitoring such markers can help to determine the response to treatment.

Creatinine levels greater than 120mmol/L and thrombocytopenia lower than 60,000/mm³ correlate with high risk of mortality, with a probability of 92 and 53% respectively of mortality for type I and II emphysematous pyelonephritis, while the risks are respectively 27 and 4% when creatinine levels and platelet counts are better than these values [7].

In our case, the disease manifested as a fulminant infection, presenting with severe sepsis and flank pain. A high index of suspicion for pathology beyond typical pyelonephritis prompted us to obtain abdominal computed tomography (CT) scan with IV contrast, which allowed us to establish the diagnosis within an hour of the patient's arrival.

However, CT is not required in order to diagnose this entity: Abdominal X-ray can show a compression syndrome, a dark shadow of gas projected over the kidney area (which may be mistaken for bowel gas), a gas border outlining the limits of the kidney, retro pneumoperitoneum or an air-fluid level [9]. Bedside ultrasound can help rapidly diagnose this entity by revealing a characteristic pattern of echogenic gas with "dirty acoustic shadowing." [10].

CT is the gold standard; if available it can be performed after identification of abnormalities on ultrasonography or plain films. It confirms the diagnosis of pyelonephritis by the presence of hypodense renal cortical lesions, gas in the renal parenchyma and/or perinephric spaces; it reveals also the exact extensions of the lesions [11]. The contrast medium injection helps identify non-functional infarcted areas, and can illustrate the secretory function of the kidney.

According to Wang, there is a radio-anatomic correlation: in type I the gas may take on a linear or mottled appearance due to parenchymal destruction, whereas in type 2, the gas forms bubbles [5]. The Huang CT classification of the disease guides the treatment because of its prognostic value [8].

The occurrence of subcapsular hematoma is a rare complication of emphysematous pyelonephritis, only a few cases have been reported in the literature [12, 13]. The fragility of the wall of the vessels observed in type I can explain the spontaneous bleeding. In our case the subcapsular hematoma is a key component of the pathology because of its size, and its expansion in the omental bursa. Such expansion can be explained by the intimate relationship of the kidney and this cavity, extension of the emphysematous pyelonephritis to neighboring structures and their fragility [1]. Bilateral pyelonephritis has been described in 10% of cases [14, 15].

Like in any serious case of severe sepsis, the cornerstone of the treatment is the use of antibiotic therapy in intensive care unit before and after surgical drainage. Nephrectomy is the standard treatment because it only allows the complete drainage of extra renal extensive forms [1]. In our case, we tried to be as conservative as possible but despite per cutaneous drainage, the use of an appropriate empiric antibiotic therapy, and intensive resuscitation of severe sepsis, the patient showed no clinical or biological signs of improvement and we were forced to perform nephrectomy.

4. Conclusion

As is clear from review of this clinical case, emphysematous pyelonephritis is a rapidly progressive and potentially fatal condition requiring a multidisciplinary and aggressive treatment plan, as well as a high index of suspicion in patients with a suggestive history and risk factors for the disease. Rapid diagnosis can be made in such cases, aided by bedside emergency ultrasound, or plain radiographs if ultrasound is not available. CT scan can help confirm the findings and the extent of the disease, to assist with planning how aggressively to manage a given case. Supportive medical treatment and use of antibiotics are the cornerstones of management but sometimes only surgery can provide definitive control of the infection.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review.

Abbreviations

CECT: Contrast enhanced computed tomography
CT: Computed tomography.

Competing Interest

The authors declare that they have no competing interests.

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