

Emphysematous pyelonephritis: a case report

Rafailidis V¹, Karadimou V¹, Liouliakis C¹, Kougioumtzoglou D²

¹Radiology Department

²Internal Medicine Department

General Hospital of Katerini, Katerini, Greece

Abstract

Background/aim: Emphysematous pyelonephritis (EP) is an acute necrotic infection of the kidney which is characterized by the presence of gas. Uncontrolled diabetes mellitus and obstruction of the urinary tract are the main predisposing factors and *Escherichia Coli* is the most frequent causative pathogen.

Case Report: We herein report a case of a patient with undiagnosed diabetes mellitus who was admitted to the emergency department with symptoms of pyelonephritis. Imaging revealed the gas in the renal parenchyma establishing the diagnosis and the patient was treated successfully with antibiotics.

Conclusion: EP is a medical emergency and once diagnosed, attention must be paid to the selection of treatment to avoid high mortality rates. Hippokratia 2013; 17 (4): 373-375.

Keywords: Kidney, pyelonephritis, CT Scan, X-Ray

Corresponding author: Rafailidis Vasileios, Dr, Viziis Vizantos 24, 54636, Thessaloniki, Greece, tel: 2310213070, e-mail: billraf@hotmail.com

Introduction

Emphysematous pyelonephritis (EP) constitutes an emergency with a 6 to 1 male-female ratio¹⁻³. EP is an acute necrotic infection of the kidney which results in the formation of gas within the renal parenchyma, the collecting system, the perinephric tissues and rarely the spermatic cord and the scrotum¹. It is different from “emphysematous pyelitis” which represents the existence of gas only within the collecting system and which is caused usually by iatrogenic interventions, reflux of gas from the urinary bladder or fistulas⁴. 95% of patients with EP have uncontrolled diabetes mellitus¹. Other risk factors are urinary tract obstruction, drug overuse, neurogenic bladder, alcoholism and anatomic deformities of the urinary system.

Case Report

A patient was admitted to the emergency department complaining of malaise, tremor and anorexia which had started 3 days before. He reported a long-term alcohol drinking. The only clinical finding was mild fever whereas laboratory examination revealed hyponatraemia, decrease in renal function, hyperglycemia and thrombocytopenia (as shown in Table 1). Kidneys, Ureters, and Bladder radiograph (KUB radiograph) showed gas in the left kidney (Figure 1) whereas ultrasonography (US) could not depict the left kidney adequately (Figure 2). The patient was referred for abdomen computed tomography (CT) which revealed enlargement of the left kidney with the presence of gas inside the renal parenchyma, peri- and paranephric space, along the retroperitoneal space as well as inflamma-

tion of the aforementioned spaces (Figure 3). The patient was successfully treated with piperacillin-tazobactam in combination with ciprofloxacin along with diuretics, rapid acting insulin and electrolyte imbalance correction. No other invasive form of treatment was needed.

Table 1: The patient's abnormal laboratory results.

Laboratory test	Patient's result	Normal values
Glucose	243 (mg/dl)	70-110 (mg/dl)
Urea	130 (mg/dl)	15-45 (mg/dl)
Creatinine	2.17 (mg/dl)	0.81-1.45 (mg/dl)
Sodium	128 (mmol/l)	135-150 (mmol/l)
SGOT	73 (IU/L)	<40 (IU/L)
SGPT	48 (IU/L)	5-40 (IU/L)
LDH	554 (IU/L)	<248 (IU/L)
White Blood Cells	12.03 (10 ³ /μL)	4-10 (10 ³ /μL)
Neutrophils %	83.4%	40-70%
Lymphocytes %	6.7%	20-45%
Monocytes %	9.5%	2-9%
Eosinophils %	0.3%	1-6%
Basophils %	0.1%	0-2%
Platelets	14 (10 ³ /μL)	150-400 (10 ³ /μL)
Erythrocyte Sedimentation Rate	83 (mm/hr)	
Urine microscopy	many white and red blood cells	

Discussion

The causative pathogen of EP is usually *E. Coli* (70%), *Proteus mirabilis*, *Klebsiella pneumoniae*, *Streptococcus* Group D, *Staphylococcus coagulase (-)* and more rarely anaerobes like *Clostridium septicum*, *Candida albicans*, *Cryptococcus neoformans* and *Pneumocystis jiroveci*¹.

Factors which are related to high mortality are systolic blood pressure <90 mmHg, altered mental status, increase in serum creatinine, thrombocytopenia, bilateral disease and the treatment of disease only with antibiotics. Mortality due to septic complications may be as high as 21%¹.

Patients with EP usually complain of symptoms of a typical pyelonephritis. In more severe conditions, an acute renal failure or a septic shock can occur. Laboratory examination usually shows increased white blood cells and thrombocytopenia while blood glucose may be high due to coexisting diabetes mellitus¹. Imaging is necessary for the diagnosis of EP as the clinical and laboratory findings indicate only a septic condition of renal

origin. KUB radiograph shows bubbles of gas or a diffusely punctate kidney with gas along the renal pyramids. Additionally, a meniscus of gas may be visible within Gerota's fascia, something which is indicative of severe renal necrosis and extension of gas in the perirenal space. Intravenous pyelogram shows prolonged nephrogram on the affected side due to delayed excretion of the contrast medium. Ipsilateral psoas shadow may be blurred and renal calculi may be present. Ultrasound shows an enlarged kidney with hyperechoic reflections inside the renal parenchyma with posterior dirty acoustic shadow¹. CT designates better the amount of gas, the destruction of renal parenchyma, the presence of fluid collections and fluid-gas levels as well as the underlying cause of urinary tract obstruction. After the injection of contrast medium, asymmetry in the enhancement of the two kidneys can be seen and delay of the excretion of the contrast medium. During the nephrographic phase, focal necrosis or abscess may be seen. The differential diagnosis of EP includes renal abscess, iatrogenic presence of gas, post-traumatic infarction and hollow organ perforation⁴⁻⁶. EP is classified according to Huang and Tseng into 5 categories⁷. In type 1 gas is confined in the pyelocalyceal system only. In type 2 gas is found in the renal parenchyma. In type 3A gas extends into the perinephric space and in type 3B into the paranephric space. Finally, in type 4 EP affects a solitary kidney or the infection is bilateral. Treatment includes general support with oxygen, intravenous fluid administration, correction of the acid-base balance, glucose control and antibiotics. The latter must be chosen



Figure 1: Kidneys, Ureters, and Bladder radiograph showing gas in the area of left kidney. Contrast medium can be seen in small and large intestine due to the preceding computed tomography.

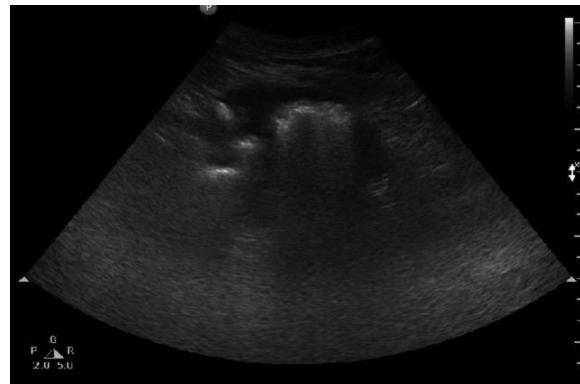


Figure 2: Ultrasound shows intense reflections with dirty acoustic shadows in the left kidney, indicative of the presence of gas.

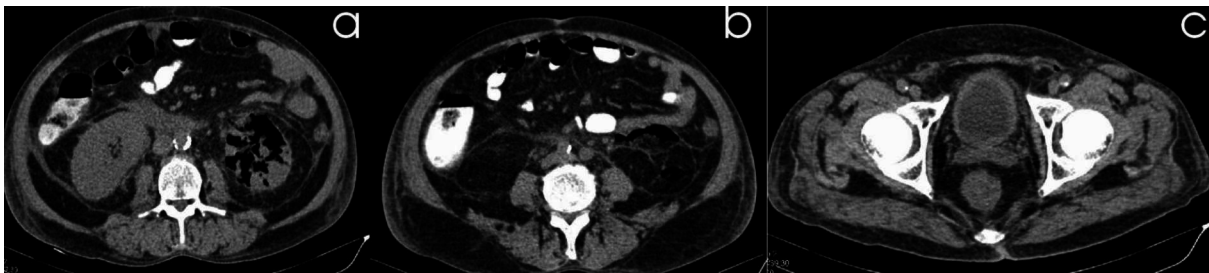


Figure 3: Abdomen computed tomography shows gas into the renal parenchyma (a) and into the perirenal space on the left (b). Gas can be seen into the left spermatic cord as well (c).

according to the antibiogram. We usually opt for aminoglycosides, b-lactamase inhibitors, cephalosporins and quinolones. Alternatively, percutaneous drainage of the kidney may be done with pigtail catheters with a diameter of at least 14 Fr under the guidance of CT or US. The catheter can be removed when CT shows a remission of the inflammation. In more extreme cases, nephrectomy may be needed. The combination of antibiotics and percutaneous drainage is considered to be the best choice as it shows the lowest mortality rate⁸.

Conflict of interest

There is no conflict of interest and no funding was received.

References

1. Ubee SS, McGlynn L, Fordham M. Emphysematous pyelonephritis. *BJU Int.* 2011; 107: 1474-1478.
2. Cherif M, Kerkeni W, Bouzouita A, Selmi MS, Derouiche A, Ben Slama MR, et al. [Emphysematous pyelonephritis. Epidemiological, clinical, biological, bacteriological, radiological, therapeutic and prognostic features. Retrospective study of 30 cases]. *Tunis Med.* 2012; 90: 725-729.
3. Grayson DE, Abbott RM, Levy AD, Sherman PM. Emphysematous infections of the abdomen and pelvis: a pictorial review. *Radiographics.* 2002; 22: 543-561.
4. Schaefer-Prokop C, Prokop M. The Kidneys. Prokop M, Galanski M (eds). *Spiral and Multislice Computed Tomography of the Body*, Thieme, Stuttgart, 2003, 672-673.
5. Hsu CF, Chang H, Hu SC, Tsai MJ. Emphysematous pyelonephritis mimicking hollow organ perforation. *Intern Med.* 2012; 51: 2671.
6. Liu KL, Lee WJ, Huang KH, Chen SJ. Right perirenal air: emphysematous pyelonephritis or duodenal perforation? *Kidney Int.* 2007; 72: 773-774.
7. Huang JJ, Tseng CC. Emphysematous pyelonephritis: clinical radiological classification, management, prognosis and pathogenesis. *Arch Intern Med.* 2000; 160: 797-805.
8. Somani BK, Nabi G, Thorpe P, Hussey J, Cook J, N'Dow J; ABACUS Research Group. Is percutaneous drainage the new gold standard in the management of emphysematous pyelonephritis? Evidence from a systematic review. *J Urol.* 2008; 179: 1844-1849.