CASE REPORT

# **Emphysematous pyelonephritis in a diabetic patient** with obstructed kidney

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Piotr Kutwin 1st Department of Urology 113, Żeromskiego Street 90–549 Łódź, Poland phone: +48 42 63 93 531 kutwin1986@gmail.com Emphysematous pyelonephritis (EPN) is an acute, rare, inflammatory disease, which typically occurs in patients who suffer from diabetes mellitus. We report the case of a patient who was admitted to the Department of Urology with septic signs, in whom, after performing computed tomography, the diagnosis of EPN was established. The patient underwent organ–preserving treatment, which consisted of pyelolithotomy with nephrostomy, and the insertion of a double J catheter into the left ureter. The importance of the classification of EPN is also discussed. The need for individualized procedures is highlighted.

## Key Words: emphysematous pyelonephritis o urinary tract infection o treatment

# **CASE REPORT**

A 66-year-old man presented to the urological department in a septic state with signs of left-sided renal colic. He suffered from left flank pain, pollakiuria, dysuria, and nausea accompanied by vomiting. The patient had a history of cardiac infarction, hypertension and diabetes mellitus type 2. In addition, in the past, he underwent right-sided pyelolithotomy. On admission, the patient's average body temperature was 38.6 degrees Celsius. During physical examination, the most prominent sign was costover-tebral angle tenderness. Laboratory studies showed CRP 178.7 mg/dl, procalcitonin 7.48 ng/ml, WBC 14.6 thousand/µl, PLT 348 thousand/µl, creatinine level 122.0 mmol/l.

### Imaging

During hospitalisation, abdominal CT revealed a significantly increased left kidney, measuring  $15 \times 8.7 \times 7.7$  cm. Numerous gas bubbles and purulent infiltration were observed in both the collecting system of the kidney and the proximal part of the ure-

ter (Figure 1 and 2). Furthermore, in the proximal ureter there were a few calcified stones, of which the largest was up to 1.5 cm in diameter (Figure 3). Adipose tissue in the perirenal space revealed a heterogeneous inflammatory infiltrate

### Treatment

On the basis of these studies and observations, the patient was diagnosed with emphysematous pyelonephritis (EPN) of the left kidney. Since the inflammatory markers were increasing (CRP increased to 233.7 mg/dL) and no improvement had been observed after initial conservative treatment, the patient was qualified for urgent surgery. We made a revision of the left retroperitoneal space and pyelotitotomy, with the insertion of a double J (DJ) catheter into the left ureter. After incision of the renal pelvis, we obtained a turbid, purulent discharge. An intraoperative nephrostomy of the left kidney was installed. In the following weeks of hospitalization, antibiotic therapy (amoxicillin-clavulanate, meropenem, ceftazidime, metronidazole) was administered and the clinical condition of the patient gradually improved.



Figure 1. Two stones and gas bubbles in the left renal pelvis.

Inflammatory parameters decreased and serum creatinine returned to normal (80.0 mmol/l). After a 17 day hospitalization, the patient was discharged from the department in a good general condition and subjected to outpatient care. He was admitted to the hospital twice; first, to remove the nephrostomy tube, and two weeks later, the DJ catheter was removed from the left ureter.

# DISCUSSION

Emphysematous pyelonephritis is a rare infection of the kidney with a potentially fatal outcome. Its characteristic feature is the presence of gas in the urinary collecting system, renal parenchyma or perirenal tissue. [1] The first clinical description of the disease was reported by Kelly and MacCallum in 1898 [2]. However, the term emphysematous pyelonephritis was first used over half a century later by Schultz and Klorfein [1].

Factors predisposing to EPN are diabetes mellitus, found in as much as 94.3% of cases, age (mean 55 vears) and sex of the patient (according to various sources from 85 [3] to 94% of patients are women) [4]. In most cases, the disease is caused by the bacterium E. coli, which is isolated in 44 [5] - 57% of cases [1]. Other etiological factors include: Klebsiella, Enterobacter, Proteus. The disease is more common in the left kidney, which is affected in about 60% of cases [5]. The most common symptoms are: fever (97%), costovertebral angle tenderness (71%), nausea and vomiting (17%), acute renal failure (35%) and thrombocytopenia (46%) [3]. Most of these symptoms were presented by our patient. Nevertheless, EPN may rarely also appear as an asymptomatic disease [6]. Based on computed tomography imaging two classi-



**Figure 2.** Gas bubbles present only in collecting system of the kidney.



**Figure 3.** Gas bubbles above the stone which is the cause of obstructive uropathy.

fications of EPN were proposed. The first one elaborated by Wan divided EPN into two types:

- type I necrosis of the kidney with the presence of gas, but without any liquid
- type II presence of gas and fluid in the renal parenchyma, the peri–renal tissue and collecting system

The occurrence of type I is associated with a mortality rate of 69%. Most of these symptoms were presented by our patient. [7].

Also, Huan and Tseng proposed a classification based on computed tomography, dividing EPN into four classes:

- class I gas only in urinary collecting system
- class II gas only in renal parenchyma
- class IIIa gas is also present in peri–renal tissue

- class IIIb gas is also present in para–renal tissue
- class IV EPN in a solitary kidney or disease which occurs in both kidneys

The classification introduced by Huan and Tseng has gained wide acceptance because of its good prognostic value, and the possibility for optimized treatment. Patients in group I and II benefit most from the use of antibiotics and percutaneous drainage, while patients assigned to group III and IV should undergo conservative treatment, and in the case of deterioration of their general condition, or presence of at least two risk factors (thrombocytopenia. acute renal failure, confusion, shock), they ought to undergo nephrectomy [8]. In recent years, there has been a strong trend towards less invasive treatment of EPN. Changes, such as the characteristic presence of gas in EPN, observed in the tomographic images show no specificity in histopathology [9]. During the last few years, EPN-associated mortality has decreased to less than 25% [4]. It depends, among

others, upon the strategy of treatment, ranging from 50% for patients treated only conservatively, 25% among patients in whom nephrectomy was performed and reaching 13.5% in those treated with antibiotic therapy in association with the assumption of percutaneous drainage [10]. EPN is especially dangerous due to the imposition of the two pathological conditions that may lead to it. The combination of diabetes mellitus and obstruction of the outflow of urine is associated with mortality in up to 71% of cases [11]. Our patient was assigned to class I (Huan and Tseng). Nevertheless, and due to the coexistence of a ureteral stone and poor general condition of the patient, we qualified him for organ-conserving surgery, which in our opinion was the best option, allowing treatment of both conditions simultaneously. Successful treatment depends on early diagnosis of the disease and timely initiation of modern antibiotic therapy. The decision as to which type of therapy to undertake should be tailored to the severity of the patient's condition.

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