

Bilateral Emphysematous Pyelonephritis in a Patient with No Known Risk Factors

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Emphysematous pyelonephritis (EPN) is a rare life-threatening necrotizing infection of the kidney and perirenal space with gas formation. It is usually unilateral and affects patients with a risk factor such as diabetes or urinary obstruction. In the past, most patients required nephrectomy, and in bilateral cases long-term dialysis was inevitable. We present here the unusual case of a patient who developed bilateral EPN in the absence of any known risk factor. He was managed conservatively, required dialysis and bilateral nephrostomies, but eventually recovered completely.

Key words: emphysematous pyelonephritis ■ risk factors ■ treatment

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CASE REPORT

A 57-year-old man presented with five days of dysuria, fever with chills and two weeks of weight loss, abdominal pain and shortness of breath. His past medical history was only relevant in that he had been treated for two uncomplicated episodes of urinary tract infection seven and eight years ago. At presentation, the patient was lethargic and had a temperature of 99.1°F, heart rate of 117 beats/min, respiratory rate of 32/min. The blood pressure was 159/93 mmHg. He had marked bilateral costovertebral angle tenderness, but the kidneys were not palpable. The prostate was not enlarged or tender, but stool hemocult test was positive. Genitourinary examination showed normal penile shaft with a small meatus. Inferior to the meatus, a pit was observed suggestive of hypospadias. No urine or discharge was visualized at the meatus or pit.

Initial laboratory tests are summarized in Table 1. Urinalysis showed large blood, large leukocyte esterase and many bacteria. Initial management consisted of intravenous hydration with 0.9% normal saline and

empiric antimicrobial therapy with levofloxacin, but the patient deteriorated further becoming acidotic and hypoxic. A noncontrast abdominal CT scan showed multiple gas bubbles and complex fluid collection in the posterior aspects of both kidneys, with extension to the posterior perinephric spaces (Figure 1). These features were suggestive of bilateral emphysematous pyelonephritis (EPN). Vancomycin and amikacin were added to the levofloxacin; hemodialysis was started, and bilateral percutaneous nephrostomies were placed in consultation with urology. Blood and urine cultures grew *Escherichia coli* sensitive to levofloxacin on the second hospital day, and vancomycin and amikacin were discontinued. Human immunodeficiency virus (HIV)-1 antibody test by western blot was negative. The patient made a gradual recovery; hemodialysis was discontinued on the 10th hospital day, and he was discharged home after a 20-day stay in the hospital on oral levofloxacin and minimal drainage from the percutaneous nephrostomy. A few days after discharge, a repeat CT scan of the abdomen revealed an increasing subcapsular fluid collection in the left kidney, and the left percutaneous nephrostomy was repositioned. Oral levofloxacin was continued for another two weeks. At eight weeks, a contrast-enhanced CT scan of the abdomen showed interval resolution of the bilateral renal and perirenal gas bubbles, and fluid collection with residual perirenal and pararenal fat stranding (Figure 2).

DISCUSSION

First described by Kelly and MacCullum in 1898,¹ EPN is a necrotizing parenchymal and perirenal infection caused by *E. coli* (69%), *klebsiella pneumoniae* (29%) or a mixed infection of *E. coli* with *Proteus* or *Group-β streptococci* (2%); bacteremia occurs in more than half of the cases.² The disease is more frequent in women, is usually unilateral and affects more commonly the left kidney.^{2,3} Clinical manifestations are those of an upper urinary tract infection, but thrombocytopenia, renal failure, disturbance of consciousness and shock are found in severe cases or when diagnosis is delayed.² Most cases occur in the presence of an obvious risk fac-

tor, usually diabetes (78% of cases in a recent review),⁴ less commonly papillary necrosis, ureteral calculi, polycystic kidney disease and local extension of rectal cancer.⁵ In a 1997 study by Shokeir et al.,³ all nondiabetic patients had some degree of urinary obstruction, and about half of the diabetic patients had obstruction in the corresponding kidney, with moderate-to-severe hydronephrosis. In a more recent study, diabetes with poor glycemic control was the only host factor independently associated with EPN.⁶

In the past, the mortality from EPN was very high, especially in patients treated medically, so that early nephrectomy was advocated.^{7,8} Yet, early surgical intervention was associated with a high risk in hemodynamically unstable patients with fulminant infection⁹; hence, the more common practice of delaying nephrectomy, usually as a staged procedure, until the patient was more stable and not responding to conservative management.^{4,5,9}

Radiologic studies are now routinely used to guide treatment and determine prognosis, with CT scanning more reliable than ultrasound and providing a more accurate assessment of the anatomy, better visualization, easy drainage and more reliable follow-up.⁹ In this regard, the classification of Huang et al.² has been most widely used. Patients in class 1 and 2 are usually adequately treated by percutaneous nephrostomy and antibiotics. In class 3, nephrostomy and antibiotics have been successful in only 64% of cases, and in class 4 nephrectomy is usually required but is delayed in hemodynamically unstable patients and carried out in a staged procedure. Factors that predict poor response to percutaneous drainage combined with antimicrobial therapy are thrombocytopenia (platelet count <120,000), acute renal failure, shock and stupor or coma.²

Our patient, whose clinical features would place in class 4 and who would most likely have required nephrectomy (in a staged procedure), was treated only

by nephrostomy, antibiotics and hemodialysis and recovered fully. He was also unusual in that he had bilateral EPN occurring in the absence of any known risk factors. By contrast, in our review of the literature we found that of the 32 cases of bilateral EPN reported since 1941,¹⁰ all 31 adult patients were diabetics, three had concomitant urinary tract obstruction and two had adult polycystic kidney disease (ADPKD). The only pediatric patient was a six-week-old neonate with bilateral pelviureteral junction obstruction who was treated with antibiotics and surgery and survived. Of 31 adult patients who had bilateral disease and therefore fall into the class-4 group, 12 were treated medically with antibiotics therapy, intravenous fluids and inotropic support and had 25% mortality. Three had percutaneous drainage only, and two survived. The other 16 patients were treated surgically by incision and drainage with or without unilateral or bilateral nephrectomy, and mortality was the same (25%).

Diabetes was not found in this patient, the initial hyperglycemia was most likely secondary to sepsis, and he became normoglycemic with fasting blood glucose of 98 mg/dl at eight weeks (Table 1). Additionally, urinary obstruction was ruled out by passing a Foley catheter with ease, and his CT scans had a normal-appearing renal pelvis with no evidence of hydronephrosis or hydroureter. The patient was successfully managed with percutaneous nephrostomy, antibiotics and hemodialysis, and made a complete recovery. In the past, the accepted treatment for bilateral EPN has been antimicrobial therapy with subsequent nephrectomy. This may no longer be applicable to this subset of patients, and, in general, the treatment needs to be individualized, with antibiotics and percutaneous nephrostomy being the mainstay of treatment and every attempt being made to preserve kidney function.

Table 1. Initial and subsequent laboratory results

	Day 1	Day 2	Day 10	Day 14	Post Hospital (Week 8)
Sodium (meq/l)	135	136	145	136	142
Potassium (meq/l)	6.5	4.1	4.3	4.4	4.3
Chloride (meq/l)	95	101	98	105	108
Bicarbonate (meq/l)	10	14	23	21	26
Blood urea nitrogen (mg/dl)	270	137	163	105	17
Creatinine (mg/dl)	22.9	11.1	12.3	6.0	1.7
White blood cells (k)	49.8	35	10.7	10.1	11.5
Hemoglobin (g/dl)	11.5	10.6	10.7	11.8	8.6
Platelets (k)	357	262	170	470	486
Hematocrit	34.1	31.4	35.2	34.9	26.8
Prothrombin time (sec)	19.2	18.8	15.9	12.2	-
Partial thromboplastin time (sec)	37.2	29.0	24.8	29.7	-
International normalized ratio	1.66	1.62	1.29	1.0	-
Blood glucose (mg/dl)	150	207	145	152	98*

* Fasting blood glucose

Figure 1. Noncontrast-enhanced abdominal CT shows multiple gas bubbles (large arrows) and complex fluid collection in the posterior aspect of both kidneys (small arrows), with extension to the posterior perinephric spaces; larger on the left. There is associated bilateral perinephric fat stranding and thickening of the Gerota's fascia.

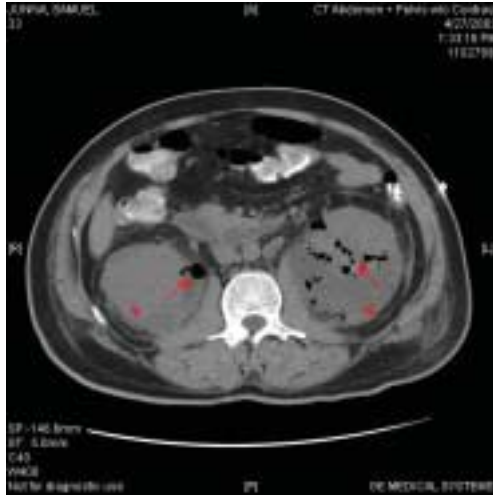


Figure 2. Contrast-enhanced abdominal CT shows interval resolution of the bilateral renal and perirenal gas bubbles and fluid collections. There is residual left posterior perirenal and pararenal fat stranding (small arrows).



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