Bilateral Emphysematous Pyelonephritis with a Splenic Abscess

Hiroshi Morioka, Naoki Yanagisawa, Akihiko Suganuma, Akifumi Imamura and Atsushi Ajisawa

Abstract

The case of a 66-year-old woman with untreated diabetes mellitus who was admitted to our hospital with a fever, hypotension and an altered mental status is herein reported. Computed tomography revealed bilateral emphysematous pyelonephritis along with a splenic abscess. Blood and urine cultures grew *Escherichia coli*. Treatment with systemic antibiotics combined with the insertion of percutaneous and renoureteral catheters was successful. The patient was discharged and completed treatment without developing any subsequent complications.

Key words: bilateral emphysematous pyelonephritis, splenic abscess


Introduction

Urinary tract infections are relatively common among women; however the clinical course of an infection may be complicated by the development of emphysematous pyelonephritis (EPN) or splenic abscesses, especially in patients with diabetes mellitus (DM). Although both EPN and splenic abscesses are considered rare, they require special attention due to their high mortality rates. The mortality rate of patients with EPN is reported to range from 11% to 20%, while that of patients with bilateral EPN can be as high as 33% (1-3). Likewise, the mortality rate of patients with splenic abscesses ranges between 4.9% and 16.7% (4, 5) and increases drastically if the condition is left untreated (6).

We herein report a case of bilateral EPN with a splenic abscess that was successfully treated with systemic antibiotics along with percutaneous and renoureteral catheter drainage.

Case Report

A 66-year-old woman was admitted to our hospital with a two-day history of a high-grade fever and altered mental status. She had been previously diagnosed with hypertension and DM. An angiotensin conversion enzyme inhibitor had been prescribed to treat the hypertension. Although the DM was untreated, the patient denied any urinary symptoms suggestive of a neurogenic bladder. On admission, her vital signs were as follows: blood pressure, 82/57 mmHg; heart rate, 100 beats/min; respiratory rate, 20 breaths/min; temperature, 40°C; and oxygen saturation, 99% (ambient air). Her consciousness was impaired, with a score of 11 points (E4V3M4) on the Glasgow Coma Scale (GCS). A physical examination revealed percussion tenderness in the left costovertebral angle. Table 1 shows the laboratory findings obtained on admission. Blood tests revealed leucocytosis, thrombocytopenia, renal dysfunction and a high glucose level. A urinalysis showed pyuria, and a Gram stain revealed a Gram-negative rod compatible with *Escherichia coli*. Chest and abdominal radiography showed no abnormalities. A lumbar puncture was performed, which showed no evidence of meningitis. The physical examination findings and laboratory data were compatible with a diagnosis of severe sepsis possibly caused by acute pyelonephritis. After obtaining two sets of blood cultures, the patient was empirically administered treatment with ceftriaxone at a dose of 4 g/day along with substantial intravenous fluids and insulin therapy.

On day 2, the patient’s consciousness improved slightly, with a score of 13 points (E4V3M6) on the GCS. Her blood pressure was maintained without the use of vasopressors.
Table 1. Laboratory Data on Admission

<table>
<thead>
<tr>
<th>Hematology</th>
<th>Biochemistry</th>
<th>Coagulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC 10,400 /μL</td>
<td>TP 6.4 g/dL</td>
<td>PT 55 %</td>
</tr>
<tr>
<td>Neu 95.4 %</td>
<td>Cre 1.7 mg/dL</td>
<td>APTT 34.2 sec</td>
</tr>
<tr>
<td>Lym 4.6 %</td>
<td>T-Bil 0.5 mg/dL</td>
<td>Fibrinogen 673 mg/dL</td>
</tr>
<tr>
<td>Mono 0.0 %</td>
<td>AST 35 IU/L</td>
<td>FDP 48.3 μg/mL</td>
</tr>
<tr>
<td>Eos 0.0 %</td>
<td>ALT 11 IU/L</td>
<td>Urinalysis</td>
</tr>
<tr>
<td>RBC 368 × 10^6/μL</td>
<td>ALP 1,479 IU/L</td>
<td>pH 5.0</td>
</tr>
<tr>
<td>Hb 10.3 g/dL</td>
<td>LDH 653 IU/L</td>
<td>Protein 2+</td>
</tr>
<tr>
<td>MCV 84 fl</td>
<td>CRP 22.1 mg/dL</td>
<td>Glu 4+</td>
</tr>
<tr>
<td>Plt 6.8 × 10^5/μL</td>
<td>Glu 286 mg/dL</td>
<td>Occult blood (-)</td>
</tr>
<tr>
<td>HbA1c 13.1 %</td>
<td>WBC</td>
<td></td>
</tr>
</tbody>
</table>

However, the serum creatinine level and the white blood cell count increased to 3.3 mg/dL and 29,300/μL, respectively. In addition, the platelet count decreased to 26,000/μL. Due to the patient’s renal dysfunction, a non-contrast abdominal computed tomography (CT) scan was performed, which revealed air within both renal parenchyma and hydroureteritis in the left kidney without evidence of papillary necrosis or ureteral calculi. In addition, a low density area (LDA) in the spleen compatible with a splenic abscess was detected (Fig. 1A, B). Transthoracic echocardiography did not reveal any vegetation on the aortic or mitral valves. Based on these findings, the diagnoses of bilateral EPN and a splenic abscess were confirmed, and the urology department was immediately consulted. The urologists initially attempted to insert renoureteral catheters in both kidneys; however, the attempts were successful in the right kidney only. Subsequently, percutaneous catheter drainage (PCD) was performed in the left kidney to drain the pus from the renal pelvis. Since the presence of extended-spectrum β-lactamase-producing enterobacteriaceae or anaerobes as a causative organism remained a possibility the antibiotic therapy was changed to meropenem at a dose of 0.5 g/day adjusted for the patient’s renal function.

The patient’s clinical symptoms and laboratory data gradually improved over time. By day 4, the patient was alert and oriented and her vital signs were stable. At that point, initial blood and urine cultures grew *Escherichia coli* which was sensitive to cephalosporins and fluoroquinolones (Table 2). Based on the susceptibility testing, the antibiotic therapy was de-escalated to ceftriaxone. On day 5, the serum creatinine level decreased to 0.9 mg/dL. On day 10, left pyelofluoroscopy was performed, which revealed a left tortuous and slightly open urinary duct (Fig. 2). The PCD tube was removed because no drainage of pus was observed. A CT scan with contrast enhancement performed on day 14 showed an absence of air within both renal parenchyma, however the LDA in the spleen remained. The patient was discharged on day 15, and the antibiotics were switched from intravenous ceftriaxone to oral levofloxacin at a dose of 500 mg/day to treat the splenic abscess. The right renoureteral catheter was removed on day 21, and a follow-up CT scan performed after a total of 56-day course of antibiotic treatment showed that the LDA of the spleen had disappeared.

**Discussion**

To the best of our knowledge, this is the first case of bilateral EPN with a splenic abscess treated successfully with systemic antibiotics along with percutaneous and renoureteral catheter drainage, without the use of nephrectomy, splenectomy or splenic drainage. Our case highlights the importance of taking into consideration lethal complications that may accompany acute
pyelonephritis. EPN, a disease primarily occurring in women with a mean age of approximately 60 years, is a type of necrotizing infection characterized by the presence of gas in the renal parenchyma collection system or surrounding tissue. Escherichia coli and Klebsiella pneumoniae are the most common causative pathogens (1-3). The incidence of EPN is rare; Takahashi et al. reported only three cases (2.5%) of EPN among 120 cases of severe renal infection (7). However, EPN is known for its high mortality rate (8). Clinicians are often challenged to make an accurate diagnosis of EPN because its clinical findings are indistinguishable from those of severe acute pyelonephritis. Likewise, splenic abscesses are also uncommon, with an incidence of 0.2% to 0.7% in one autopsy series (9, 10). Typical clinical manifestations include left upper quadrant pain and fever that may be recurrent or persistent despite the administration of antimicrobial therapy. However, some patients lack these classic features, which leads to a delay of diagnosis and a higher mortality rate (4-6). Splenic abscesses typically result from infective endocarditis, although urinary tract infections can also be a predisposing condition (11, 12). It is reasonable to hypothesize that the splenic abscesses observed in the present case was caused by the bacteria originating from the urinary tract since transthoracic echocardiography did not reveal any vegetation.

Clinicians need to be on high alert when a patient with baseline uncontrolled DM demonstrates symptoms of acute pyelonephritis since DM is a major risk factor for both EPN and splenic abscesses. Regarding EPN, previous studies have reported that DM is present in more than 80% of affected patients (1-3). Another risk factor for EPN is urinary tract obstruction, which may coexist with DM. It is noteworthy that, in two reports, urinary obstruction was present in all patients without DM (1). The present patient is typical: a 66-year-old woman with uncontrolled DM. The tortuous urinary duct may have played a role in the urinary obstruction. However, in a report by Chen et al., the main causes of obstruction were reported to be papillary necrosis and ureteral calculi (13), findings that were not present in this case.

CT scanning is the cornerstone for both EPN and splenic abscess diagnosis (1, 14). In this case, CT scans identified a small amount of gas in the kidneys that was undetectable on abdominal radiography. Aggressive CT scanning may reveal the presence of EPN and splenic abscesses, which may enable the early intervention necessary for patient recovery. In addition to its usefulness as a diagnostic tool, CT scanning provides prognostic information and guides therapy. Huang et al. proposed a classification system divided into four prognostic classes based on CT scan findings. Class 4, defined as bilateral EPN or a solitary functioning kidney with EPN, is considered the most severe (1). The treatment recommendation for Class 4 EPN includes antibiotics and bilateral PCD with relief of urinary obstruction if present (1). The current patient, diagnosed with Class 4 disease, was treated successfully according to this recommendation in addition to the use of a renoureteral catheter, which has also been reported to be effective (15). Nephrectomy is considered the last option and was not required in the present case.

Several risk factors for the occurrence of adverse outcomes associated with EPN have been previously reported. In patients with Class 3 or 4 EPN, thrombocytopenia, acute renal failure, impaired consciousness and shock are the major factors associated with poor outcomes (1-3). Huang et al. reported that the success rate is only 8% in patients with two or more risk factors, compared to 85% in patients with no or only one risk factor (1). In this case, all four risk factors were present on initial presentation. In addition, the present case was complicated with a splenic abscess. The mainstay of treatment is antibiotics; however, splenectomy may be needed to achieve a cure. Despite the presence of risk factors, the following elements were considered to have had a positive impact on the outcome observed in the present case: 1) bilateral, but only slight, parenchymal destruction of the kidneys; 2) early effective and substantial antibiotic treatment; 3) immediate insertion of percutaneous and renoureteral catheters; and 4) the relatively small size of the splenic abscess.

In this report, a case of bilateral EPN with a splenic abscess was described. Physicians must be aware of the fact...
that symptoms of acute pyelonephritis can indicate EPN in DM patients, and splenic abscesses can also complicate a patient’s clinical course. Lowering the threshold to obtain a CT scan may be warranted in order to rule out these diseases with high mortalities.

The authors state that they have no Conflict of Interest (COI).

Acknowledgement
The authors would like to thank Dr. Jun Kamei and Dr. Ryoko Sekiya for their invaluable help and support in carrying out this study.

References