Complicated Urinary Tract Infection in a Diabetic Woman

(See page 78 for Photo Quiz)

Figure 1. Plain x-ray film of the abdomen. Distended renal capsule (RC; solid arrow with RC) shows air within and surrounding the renal parenchyma.

Diagnosis: Emphysematous pyelonephritis.

A CT scan of the patient’s abdomen showed air in the renal parenchyma and perirenal tissues (figures 1 and 2). On the basis of this finding and of the patient’s clinical presentation, she was taken to the surgery unit, where a left nephrectomy was performed. At the time of admission to the hospital, the patient was receiving a fluoroquinolone antibiotic to manage the gram-negative rod infection noted on a Gram stain of a urine specimen. Cultures of blood, renal tissue, and urine samples subsequently yielded Enterobacter aerogenes, which was resistant to cephalosporins and penicillins and sensitive to fluoroquinolones. The patient spent several days in the surgical intensive care unit with pressor support and ventilatory support. She recovered and was discharged on day 8 after the operation with a serum creatinine level of 0.9 mg/dL.

Emphysematous pyelonephritis (EPN) is a life-threatening, necrotizing infection of renal parenchyma and perirenal tissues caused by gas-forming organisms [1]. More than 90% of cases of EPN occur in patients with diabetes [2, 3]. This is believed to be the result of a variety of factors, including high levels of glucose in the tissue of diabetic patients, which certain bacteria use for aerobic and anaerobic metabolism; decreased tissue perfusion; and defective immune response [4, 5]. In the nondiabetic population, EPN also occurs in immunocompromised patients, alcoholic individuals, and patients with ureteral obstruction, urinary tract infection, or hydroureteronephrosis [1]. The typical patient with EPN is female (ratio of female to male patients, 6:1) and has a mean age of 54 years [1, 5]. For unknown reasons, the left kidney is affected in more than one-half (67%) of all patients with EPN; bilateral disease is found in only 5%–10% of cases [5]. A triad of clinical manifestations of EPN (which consists of fever, pyuria, and abdominal, flank, or back pain) is usually present; however, shock, nausea, vomiting, and changes in mental status are also common signs and symptoms. Younger patients with EPN tend to have symptoms of acute pyelonephritis, whereas older patients may appear less...
critically ill and present with fever of undetermined origin or a urinary tract infection that is refractory to antibiotic treatment [1, 5, 6].

Once the diagnosis of EPN is made, surgical intervention that involves either percutaneous drainage (PCD) or nephrectomy is indicated in the majority of cases, but opinions differ regarding the preferred course of action. In 1996 and 1997, 2 studies [6, 7] were published that reviewed cases of EPN that occurred during a 10-year period; these studies arrived at different conclusions regarding optimal treatment strategies. In one study, patients who were treated with a combination of antibiotics, PCD, and/or nephrectomy had parenchymal destruction and mottled or streaky gas patterns on CT scan (type I EPN); the mortality rate was 96%. For patients who had perinephric or nephric fluid and loculated gas patterns visible on a CT scan (type II EPN), the mortality rate was 18%. The study concluded that patients with type I EPN require aggressive treatment involving emergent nephrectomy because of the high mortality rate associated with this condition [6, 8]. In the second study, patients who had either type I or type II EPN underwent CT-guided PCD and were treated with antibiotics. The mortality rate associated with type I EPN was 8.3%; for type II EPN, the rate was 7.7%. The authors concluded that PCD was an acceptable means of treating any patient with EPN, including patients who were too ill to undergo nephrectomy [7].

A recent study of EPN treatment divided cases into 4 grades, from grade I EPN, which is characterized by localized disease in the collecting system, to grade IV EPN, which is defined as bilateral disease. In addition, the presence of ≥2 risk factors, such as thrombocytopenia and acute renal failure, was documented. The mortality rate was 34% for patients who underwent PCD and who were treated with antibiotics. For patients who had mild disease (i.e., grades I or II), the mortality rate associated with PCD and antibiotics was 0%. For patients who had EPN of grades III or IV or ≥2 risk factors, the mortality rate was 92% [5].

The data from all 3 of these studies suggest that a large number of patients with EPN can be treated successfully with PCD and antibiotics. However, a significant number of patients will still require nephrectomy as initial treatment or after PCD failure. Even with optimal treatment, the mortality rate associated with EPN is 20%–40% [6, 9]. EPN is a life-threatening infection that should always be considered in the differential diagnosis for a diabetic patient with abdominal pain or suspected pyelonephritis.

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References