Pyelonephritis and Urosepsis Caused by *Streptococcus pneumoniae*

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This report presents the case of a patient with a massive pyelonephritis and a urosepsis caused by *Streptococcus pneumoniae*. This case is unusual as the focus was distant from the respiratory tract, the usual primary site of infection caused by this organism. No other primary site of infection was documented.

**CASE REPORT**

An 82-year-old man was found unconscious in his bed and was admitted to the intensive care unit of Munich University Hospital. He had a medical history of chronic lymphatic leukemia and latent diabetes mellitus and no history of smoking or family history of any respiratory diseases. Physical examination revealed a male with reduced vigilance. His blood pressure was 130/70 mm Hg, his pulse rate was 130/min, and his temperature was 37.7°C. His heart rate was regular. Abdominal examination showed an absence of bowel sounds and a rigidity of the abdominal wall, with a referred tenderness to the left costovertebral angle. Physical examination did not point to any specific focus of infection.

Investigations revealed a significantly elevated leukocyte count of 198 × 10³/µl (91.5% polymorphonuclear cells), platelet count of 95 × 10³/µl, erythrocyte count of 2.7 × 10¹²/µl, hemoglobin level of 11.2 g/dl, hematocrit of 35%, and a markedly elevated C-reactive protein level of 354 mg/liter. Renal function tests were abnormal, with a creatinine level of 5.2 mg/dl and a creatinine clearance of 5.8 ml/min (normal level, 70 to 160 ml/min). Arterial blood gases showed acidosis (pH 7.31; pCO₂, 19 mm Hg; pO₂, 121 mm Hg; base excess, -15 mmol/liter). The serum lactate was 2.7 mmol/liter (normal, 0.7 to 2.0 mmol/liter) and a creatinine clearance of 5.8 ml/min (normal level, 70 to 160 ml/min). Articular blood gases showed acidosis (pH 7.31; pCO₂, 19 mm Hg; pO₂, 121 mm Hg; base excess, -15 mmol/liter). The serum lactate was 2.7 mmol/liter (normal, 0.7 to 2.0 mmol/liter) and the albumin was 1.3 g/dl (normal, 3.8 to 5.1 g/dl). Coagulation tests indicated an incipient disseminated intravascular coagulation with a fibrinogen level of 425 mg/dl (normal, 150 to 300 mg/dl), a D-dimer of 1.91 µg/ml (normal, <0.5 µg/ml), and an AT III of 32% (normal, 75 to 130%).

A chest X-ray showed no active infiltrates and was otherwise normal. The computer tomographic (CT) scan of the thorax showed no other focus of infection, while a CT scan of the abdomen revealed a heterogeneous hypodense mass, indicative of an extensive pyelonephritis of the left kidney (Fig. 1). The empyema was treated by installation of a double-J catheter in the left ureter and transurethral drainage. Twenty milliliters of purulent material was obtained from this drainage and subsequently sent for culture. Sputum samples and throat swabs were taken and revealed normal flora of the respiratory tract. Blood cultures were obtained, and the patient was initially treated with ciprofloxacin (400 mg twice a day). As both the Gram-stained smear of the drained material and the two sets of blood cultures demonstrated gram-positive cocci in pairs, treatment was shifted to clindamycin and penicillin. Despite the antimicrobial therapy, the patient developed a fulminant disseminated intravascular coagulation and suffered a cardiac arrest. Nevertheless, resuscitation efforts were successful. The reconvalescence following resuscitation was slow, a low-grade fever persisted, and the C-reactive protein failed to return to normal levels. Since the kidney was a continuous focus of infection, the patient underwent nephrectomy, whereupon his condition improved markedly, and he was able to be discharged in stable condition.

Two sets of blood cultures grew gram-positive cocci in BACTEC 6A aerobic and anaerobic bottles (Becton Dickinson BD Biosciences, Heidelberg, Germany), and in addition, the sample of abscess fluid revealed gram-positive cocci in pairs and chains, some of which were lancet shaped. The organisms of both the blood culture and the kidney abscess grew well on 5% sheep blood agar and chocolate plates (Becton Dickinson) at 37°C in ambient air. The colonies were faint alpha-hemolytic on the sheep blood agar and nonmucoid, catalase negative, and susceptible to ethylhydrocuprein (optochin, >14 mm; Oxoid, Wesel, Germany). In addition, the Wellcogen Bacterial Antigen kit (Murex Diagnostica GmbH, Burgwedel, Germany) and the SlideX Pneumo-Kit agglutination test for the identification of *Streptococcus pneumoniae* (bioMérieux, Nürtingen, Germany) were performed and confirmed both the isolates from the blood cultures and the pyelonephritogenic abscess to be *S. pneumoniae*. The biochemical profiles generated by the API 32 Strep system (bioMérieux) identified the isolate as *S. pneumoniae* with only a 34.9% probability. Thus, the nucleotide sequences of 16S ribosomal DNA of the isolates were determined, revealing a 100% nucleotide identity to the respective sequence of a *S. pneumoniae* strain (GenBank accession no. AE007481), providing further confirming that the isolates were indeed *S. pneumoniae* strains. The strains were serotyped by Neufeld’s Quellung reaction, using type and factor sera provided by the Statens Serum Institut, Copenhagen, Denmark, and showed pneumococcal serotype 6A. For both isolates, MICs were determined by the E-test (Viva Diagnostik, Cologne, Germany). The MICs for both isolates were identical, and both were sensitive to penicillin (MIC, <0.016 µg/ml), vancomycin (<0.38 µg/ml), ciprofloxacin (0.75 µg/ml), moxifloxacin (0.25 µg/ml), and clindamycin (<0.047 µg/ml) accord-
uring to the National Committee for Clinical Laboratory Standards criteria.

The patient, who had recovered from septicemia, died 6 weeks after being discharged from hospital without any signs of infection.

*S. pneumoniae* is a major cause of community-acquired pneumonia, otitis media, paranasal sinusitis, bacteremia, meningitis (7, 11), as well as osteomyelitis (8). However, infections of the urinary tract due to *S. pneumoniae* are exceptionally rare. Miller and colleagues found that pneumococcusuria in children probably reflects contamination of urine specimens with *S. pneumoniae* from perineal colonization (6). In most cases, *S. pneumoniae* isolated from the urinary tract generally originates from distant sites of infection, e.g., the respiratory tract. Shahin and Lerner reported on an immunocompetent patient with *S. pneumoniae* pneumonia and concomitant bacteriuria, who presented abscesses in multiple soft tissue sites (10). A study conducted in Taiwan characterized 89 isolates of *S. pneumoniae*, eight of which were sampled form the urinary tract. However, none of the patients presented signs of a pyelonephritis (1). Green and Selinger reported a patient who presented a urinary tract infection and soft tissue abscess caused by *S. pneumoniae* without any further focus of infection in the respiratory tract (2). Most reported cases of *S. pneumoniae* soft tissue infection have involved cellulites that arose by direct inoculation from trauma (3, 4, 9). Surgical interventions may be predisposing factors, as reported by Wickre and colleagues for a patient who developed a perinephric abscess caused by *S. pneumoniae* at the site of a renal biopsy (12). Other predisposing factors for infections due to *S. pneumoniae* include immunosuppression and asplenia, which may also favor renal infections. Michael and Cannon reported on an asplenic patient with pneumococcal abscesses in multiple organs.

They concluded that asplenia may have made patients more susceptible to transient *S. pneumoniae* bacteremia in the absence of pneumonia or trauma (5).

In contrast to previous reports, the patient described here presented the full clinical picture of pyelonephritis, a perinephritic abscess, and urosepsis caused by *S. pneumoniae*. He did not have any antecedent history indicating an initial focus of pneumococcal infection. The patient neither reported a trauma nor underwent any surgical intervention. However, the presence of chronic lymphatic leukemia and latent diabetes mellitus may have led to a certain immunosuppression that was sufficient to predispose this patient to infection with *S. pneumoniae*. Although *S. pneumoniae* is only an exceptional cause of infections of the urinary tract, this bacterium should be considered as a possible cause of urinary tract infections and perinephritic abscesses.

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