

경추 척수 손상 환자에서 발생한 *Providencia rettgeri* 패혈증 1예

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A Case of *Providencia rettgeri* Sepsis in a Patient with Cervical Cord Injury

Providencia rettgeri is a member of *Enterobacteriaceae* that is known to cause urinary tract infection (UTI), septicemia, and wound infections, especially in immunocompromised patients and in those with indwelling urinary catheters. We experienced a case of UTI sepsis by *Providencia rettgeri* in a patient with spinal cord injury. The patient had only high fever without urinary symptoms or signs after high dose intravenous methylprednisolone. The laboratory results showed leukocytosis (21,900/ μ L, segmented neutrophils 91.1%) and pyuria. Cefepime was given empirically and it was switched to oral trimethoprim-sulfamethoxazole because *P. rettgeri* was identified from blood and urine culture which was susceptible to TMP-SMX. The patient was improved clinically but *P. rettgeri* was not eradicated microbiologically. To the best of our knowledge, this is the first case report on sepsis caused by *Providencia rettgeri* in Korea.

Key Words: *Providencia rettgeri*, Sepsis, Urinary tract infection

Introduction

The genus *Providencia* is a member of the *Enterobacteriaceae* family which commonly dwells in soil, water, and sewage [1, 2]. *Providencia rettgeri* is one of five *Providencia* species that is known to cause various infections, especially the urinary tract infection (UTI) [3].

In Korea, there have been a few articles reporting *Providencia* species to be the etiologic pathogens of asymptomatic bacteriuria or pyelonephritis in patients with spinal cord injury [4] or bacteremia accompanied by UTI [5]. These articles, however, did not give clear account of each case or only showed *Providencia* in the list of microbiological identification statistics.

Recently, we experienced a case of UTI sepsis by *P. rettgeri* in a patient with spinal cord injury. To the best of our knowledge, this is the first case report on sepsis caused by *Providencia rettgeri* in Korea.

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Case Report

A 54-year-old Korean male was admitted to the Kangdong Sacred Heart Hospital because of paraplegia and motor weakness of upper extremities which developed after a slip down. He was diagnosed with cervical myelopathy and severe cord compression. Therefore, he received an operation for fixation of cervical spines and a high dose intravenous methylprednisolone. On the 18th hospital day, the patient became febrile. And his vital signs at the time were as follows: body temperature 38.0°C, pulse rate 112/min, respiratory rate 22/min, and blood pressure 110/70 mmHg. Except fever, he did not complain of any other symptoms but urine in his urinary catheter was found to be turbid. The laboratory results were as follows: white blood cell count, 21,900/ μ L (segmented neutrophils 91.1% and lymphocytes 5.3%); hemoglobin, 11.9 g/dL; platelet count, 149×10^3 / μ L; serum albumin, 2.5 g/ μ L. Other blood chemistry results were within the reference range. On urine analysis, white blood cell stick test was strongly positive and microscopic WBC count was 30–49/HPF. Since UTI was suspected, treatment with intravenous cefepime 2.0 g every 12 hours was initiated. Cefepime was chosen as the antibiotic because UTI in this patient was considered to be a nosocomial infection and the patient had been receiving second generation cephalosporin as prophylaxis after the operation. Gram-negative bacilli were isolated from the blood and urine cultures, and the organism was later identified as *P. rettgeri*. More than 10^5 CFU of *P. rettgeri* was present in the urine. The antimicrobial susceptibility test performed by the MicroScan Walkaway 96 plus system (Siemens Healthcare Diagnostics Inc., CA, USA) showed that *P. rettgeri* was susceptible to imipenem (minimal inhibitory concentration [MIC]; <4 mg/L), TMP-SMX (MIC; <2/38 mg/L), piperacillin-tazobactam (MIC; 16 mg/L) but resistant to ampicillin (MIC; 16 mg/L), ampicillin-sulbactam (MIC; 16 mg/L), amikacin (MIC; 32 mg/L), ciprofloxacin (MIC; 2 mg/L), cefazolin (MIC; 16 mg/L), cefuroxime (MIC; 16 mg/L), cefotaxime (MIC; 32 mg/L), ceftriaxone (MIC; 32 mg/L), cefepime (MIC; 16 mg/L), and aztreonam (MIC; 16 mg/L). Therefore, we decided to change the antibiotics from cefepime to imipenem, but since the patient refused further intravenous antibiotic therapy, oral TMP-SMX (trimethoprim component 15 mg bid) was given for 3 weeks, after which pyuria disappeared and the patient showed clinical improvement. Nevertheless, *P. rettgeri*, which showed the same antibiotic susceptibility with that of the previous isolates, was isolated again from the follow-up urine culture ($>10^5$ CFU), most likely due to the indwelling urinary catheter. The catheter could not be removed because of his bladder dysfunction. Antibiotic

therapy was considered to be failed microbiologically. However no further antibiotics were given to eradicate *P. rettgeri* by reasons of patient's stable condition without signs of infection and poor compliance to intravenous antibiotics.

Discussion

P. rettgeri is known as one of the urinary tract pathogens causing UTI that are most often associated with long-term (>30 day) catheterization [3]. Less common infectious syndromes, especially in immunocompromised patients, include surgical site infection, soft tissue infection (primarily involving decubitus and diabetic ulcers), burn site infection, pneumonia (particularly ventilator-associated), intravascular device infection, ocular infection, meningitis, and intra-abdominal infection [1–3, 6, 7]. Bacteremia is uncommon, but when it occurs, the most frequent source is the urinary tract followed by surgical sites and soft tissues [3]. Kim and his colleagues reviewed 132 cases of bacteremia due to the tribe *Proteeae* and 8 cases were caused by *Providencia* species: *P. rettgeri* in 3 cases and *P. stuartii* in 5 cases [5]. In these cases, 50% had indwelling urinary catheters but only 2 cases were clinically diagnosed as UTI; primary bacteremia in 3, biliary infection in 2, peritonitis in 1, polymicrobial bacteremia in 3 [5].

Providencia species may form a biofilm, which provides specific adherence characteristics allowing for its persistence in the catheterized urinary tract and catheter encrustation. This may cause catheter obstruction and the development of struvite bladder or renal stones, which in turn may lead to renal obstruction and later serve as foci for relapse [2, 3]. Our case, although the patient was treated with oral antibiotics, adherence characteristic by biofilm might have contributed to microbiological failure.

Providencia species can be extensively resistant to antibiotics [3]. Stock and Wiedemann, reported the natural antibiotic susceptibility of 4 *Providencia* species. *P. stuartii*, which is the most important and frequently identified species, was shown to be the least susceptible *Providencia* species that was naturally resistant to tetracycline, some penicillins, older cephalosporins, sulfamethoxazole, and fosfomycin [8]. *P. stuartii* was naturally sensitive to the modern penicillins and cephalosporins, carbapenems, and aztreonam, but its susceptibility to aminoglycosides and quinolones was difficult to assess [8]. In this report, *P. rettgeri* was also reported to be resistant to tetracyclines and fosfomycin, but more susceptible

to quinolones, aminoglycosides, fosfomycin and numerous beta-lactam antibiotics than *P. stuartii* [8]. The beta-lactamase inhibitor tazobactam has been shown to increase susceptibility to beta-lactam agents, but sulbactam and clavulanic acid have failed to do so [3]. Imipenem, amikacin, and cefepime are the most active agents for more than 90% of the isolates [3]. On the other hand, according to Kim et al., antimicrobial resistance rates of Korean isolates of *Providencia* species (n=8) were as follows: ampicillin 87.5%, ampicillin/sulbactam 83.3%, amikacin 12.5%, ciprofloxacin 50%, cefazolin 87.5%, cefuroxime 100%, cefotaxime 0%, aztreonam 12.5%, imipenem 0%, piperacillin 25%, and TMP-SMX 25% [5]. However, *P. rettgeri* in our case was only susceptible to TMP-SMX, piperacillin/tazobactam, and imipenem but resistant to modern penicillins, cephalosporins including cefepime, other beta-lactam antibiotics, aminoglycosides and quinolones. Recent investigations on antibiotic susceptibility of Enterobacteriaceae have reported that multidrug-resistant *Providencia* species have been isolated [5, 9–11]. *Providencia* species inducible AmpC beta-lactamase and derepression may be preexistent or may develop during therapy [3]. For these reasons, the susceptibility of isolated *Providencia* species needs to be monitored and specialized testing may be required [12].

P. rettgeri is an unusual pathogen of UTI and septicemia but it may cause urosepsis, as seen in our case. Due to its extensive natural resistance to antibiotics and recent isolation of multidrug resistant strains, special attention should be given to choosing antibiotic therapy for proper management.

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