A Patient with Infective Endocarditis Caused by Community-acquired *Pseudomonas aeruginosa* Infection

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**Abstract**

An 85-year-old woman complaining of nausea was admitted to our hospital after being found to have complete atrioventricular block. We diagnosed the patient with infective endocarditis after observing vegetation on transesophageal echocardiography (TEE) and detecting *Pseudomonas aeruginosa* in a blood culture. The patient had no history of intravenous drug use, instrumentation or valvular disease. Although sensitive antibiotics were administered intravenously, the second TEE performed on the 10th day demonstrated increased vegetation. The patient developed septic shock and died on the 14th day. To our knowledge, this is the first report of infective endocarditis caused by community-acquired *Pseudomonas aeruginosa* in Japan.

**Key words:** community-acquired *Pseudomonas aeruginosa*, infective endocarditis

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**Introduction**

We herein report the first case, to our knowledge, of infective endocarditis (IE) caused by community-acquired *Pseudomonas aeruginosa* in Japan. IE is a disease in which the causative pathogens adhere to the cardiac valves and endocardium, inducing inflammation and destruction of the native structures. The causative organisms are primarily *Streptococcus viridans*, *Streptococcus bovis*, bacteria of the HACEK group (*Haemophilus parainfluenzae*, *H. aphrophilus*, *H. paraphrophilus*, *H. influenzae*, *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corroden*, *Kingella kingae* and *K. denitrificans*), *Staphylococcus aureus* and *Enterococcus*. In contrast, IE caused by *Pseudomonas aeruginosa*, as in this report, is rare (1). Not only is this condition rare, more than 90% of IE cases caused by *Pseudomonas aeruginosa* reportedly occur in intravenous drug abusers (2) and nosocomial cases (3). In another study, it was reported that only 10% of 22 nosocomial IE patients in the ICU had infections caused by *Pseudomonas aeruginosa* (4). A recent report of four cases of *Pseudomonas aeruginosa* IE that also reviewed the English-language medical literature concluded that left-sided IE in patients without a history of injection drug use is rare and usually follows a history of instrumentation (5). The current patient presented with nausea and complete atrioventricular block, and the IE was caused by neither injection drug use nor instrumentation.

**Case Report**

The patient was an 85-year-old woman classified as independent with respect to activities of daily living (ADLs). She had a history of hypertension and diabetes without any recent dental care. One day prior to admission, she began to experience nausea, which brought her to her primary care doctor. She was found to have complete atrioventricular block (AVB) at a rate of 40 bpm on electrocardiogram (ECG) (Fig. 1) and low blood pressure; therefore, she was transferred to our hospital by ambulance. A physical examination performed on admission revealed a blood pressure of 122/58 mmHg under intravenous infusion of dopamine of 8 μg/kg/min, a regular heart rate of 86 bpm, a peripheral oxygen saturation of 100% under oxygen administration via a face mask and a body temperature of 36.2°C. A holosystolic murmur of grade III was present at the apex, and coarse crackles were detected bilaterally on chest auscultation.

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Slight pitting edema of the lower legs was observed bilaterally. On admission, the patient’s urine was clear and fecal occult blood was positive. The white blood cell count was 18,900/μL, and the C-reactive protein (CRP) level was elevated to 15.4 mg/dL. Microcytic anemia was present, as indicated by a hemoglobin level of 9.0 g/dL, a mean corpuscular volume (MCV) of 89.3 fL, an unsaturated iron binding capacity (UIBC) of 288 μg/dL, a serum iron level of 11 μg/dL and a ferritin level of 99.9 ng/dL. The platelet count was 237×10^3/μL. The level of blood urea nitrogen was 45 mg/dL, the level of creatinine was 1.4 mg/dL, the level of creatine phosphokinase (CK) was 240 IU/L, the level of brain natriuretic peptide (BNP) was 792 pg/mL and the level of troponin I was 0.80 ng/mL. The plasma glucose level was 374 mg/dL and the glycohemoglobin (HbA1c) level was 6.8% National Glycohemoglobin Standardization (NGSP).

We performed 12 sets of culture studies on the 1st, 2nd and 4th days of admission, and *Pseudomonas aeruginosa* was detected in four sets during the same period. Drug sensitivity was pansensitive. We initiated treatment with cefepime at a dose of 2 g administered intravenously every 12 hours on the 2nd day of admission. We performed TEE on the 4th day and found vegetation on the anterior leaflet (A3) of the mitral valve measuring 4x8 mm in size. Mitral valve regurgitation was moderate (Fig. 2).

According to the Duke Criteria, this case included two major criteria and no minor criteria. Therefore, we diagnosed the patient as having infective endocarditis caused by *Pseudomonas aeruginosa*. We added intravenous tobramycin at a dose of 4 mg/kg/day starting on the 4th day. We recommended surgery; however, both the patient and her family members refused. We performed six sets of blood cultures on the 7th and 11th days, all of which were negative for any organisms. However, on the second TEE performed on the 10th day, several new areas of vegetation were observed on the mitral valve (Fig. 3). No perivalvular abscesses were observed around the aortic valve on any ultrasound tests at any point during the patient’s hospitalization. Although we changed the antibiotic regimen to 2 g/day of intravenous meropenem and 1,200 mg/day of linezolid to cover Methicillin-resistant *Staphylococcus aureus* (MRSA), the patient died from septic shock and multiple organ failure. The patient’s family did not consent to an autopsy.

**Discussion**

Community-acquired *Pseudomonas aeruginosa* bacteremia is rare. The risk factors for this disease are reported to include immunodeficiency due to neutropenia, malignancy or human immunodeficiency virus, an advanced age, pancreatico-biliary tract disease, severe burns, indwelling central venous or urinary catheters, antimicrobial therapy within the last 30
Figure 2. The first transesophageal echocardiography performed on the second day. Vegetation was observed on the anterior mitral leaflet (arrow) with moderate mitral regurgitation.

Figure 3. The second transesophageal echocardiography performed on the 10th day. The amount of vegetation had increased.

days and traumatic wounds that have been contaminated with fresh water (6-8). IE caused by *Pseudomonas aeruginosa* is even more rare than bacteremia and is primarily reported in injection drug users and patients with prosthetic heart valves or implantable pacemakers (9). As mentioned in the introduction, more than 90% of cases of IE due to *Pseudomonas aeruginosa* reportedly occur in injection drug users who tend to be abusers of pentazocine or tripelennamine. Infection in such cases is presumably caused by mixing drugs in contaminated water (2). In our case, the patient had never been hospitalized, had no prosthetic valves or implantable pacemakers and no history of any recent dental procedures, trauma or contact with contaminated water. To our knowledge, infective endocarditis caused by *Pseudomonas aeruginosa* in a case similar to the present case has never been reported in our country. The 2006 American College of Cardiology/American Heart Association (ACC/AHA) guidelines for the management of patients with valvular heart disease recommend surgery in IE patients with “difficult-to-treat pathogens,” such as *Pseudomonas aeruginosa*, *Brucella*, fungi, etc., as a grade 1C recommendation (10, 11). The early use of surgical procedures is recommended to treat IE caused by these particular pathogens, even in the absence of valvular heart disease; however, the patient did not consent to our recommendation.

IE can cause perivalvular abscesses of the aortic valve that lead to new-onset atrioventricular block (12). Although the sensitivity for detecting perivalvular abscesses on TEE is reportedly to be as high as 87% (13), no perivalvular abscesses were found in this case. Therefore, it is possible that this patient’s AVB was not related to her IE. One hypothesis is that this elderly woman with diabetes and hypertension had age-related diastolic dysfunction and possibly a coexisting mild cardiac conduction abnormality that led to an episode of congestive heart failure that induced bowel wall edema resulting in *Pseudomonas aeruginosa* bacteremia. Or, considering that fecal occult blood was positive, it is possible that an entry site for *Pseudomonas aeruginosa* was cancer of the gastrointestinal system.

We performed 12 sets of blood cultures on the 1st, 2nd and 4th days, four sets of which were positive for *Pseudomonas aeruginosa*. After antibiotics were initiated, six sets of blood cultures were performed on the 7th and 11th days, all of which were negative. Although the blood cultures turned negative after the initiation of antibiotic therapy, the area of vegetation increased in size, thus resulting in the patient’s death. For this reason, we believe that IE caused by *Pseudomonas aeruginosa* should be considered a surgical indication, even if the blood cultures have turned negative.

**Conclusion**

We experienced a very rare case of infective endocarditis caused by community-acquired *Pseudomonas aeruginosa*. Since IE due to *Pseudomonas aeruginosa* is difficult to treat with antimicrobial therapy alone, early surgery should be considered.

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

**References**

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