Dialister pneumosintes Bacteremia Caused by Dental Caries and Sinusitis

Mariko Kogure¹, Hiromichi Suzuki², Shingo Ishiguro³, Atsuo Ueda⁴, Tsuyoshi Nakahara⁵, Kiyoko Tamai⁵, Shigeyuki Notake⁵, Seiji Shiotani⁶, Takeshi Umemoto⁴, Isamu Morishima¹ and Ei Ueno¹

Abstract

A 62-year-old Japanese woman was hospitalized at the Department of Senology for positive signals on two sets of blood cultures obtained in the Emergency Department. The initial physical examination with enhanced computed tomography of the chest and abdomen did not identify the infectious source. Dialister pneumosintes was identified on 16S rRNA sequencing, and dental caries with sinusitis were subsequently diagnosed based on a dental examination and magnetic resonance imaging. History taking with respect to dental hygiene and oral examinations should be performed in daily clinical practice, especially in immunosuppressed patients.

Key words: Dialister pneumosintes, Bacteroides pneumosintes, breast cancer, oral hygiene, dental caries, sinusitis


Introduction

Identifying the source of systemic bacterial infections is essential for providing effective treatment (1) and assists in determining the appropriate length of antimicrobial therapy and need for surgical intervention. Unawareness of the source(s) of infection may result in the administration of an inadequate duration of antimicrobial therapy with persistent infection (2) and/or the recurrence of bacteremia (3) as well as delays in the use of appropriate invasive procedures, with a subsequent poor prognosis (4).

The oral cavity is recognized to be a major source of bacterial infection. For example, poor oral hygiene is a risk factor for infective endocarditis (5), and oral microbes have frequently been identified as causative pathogens in such cases (6). Odontogenic infections are also associated with other systemic infections, such as brain abscesses (7), cavernous sinus thrombosis (8) and vertebral osteomyelitis (9). Odontogenic infections may also cause sinusitis, and providing antimicrobial therapy for an adequate duration in association with dental treatment is recommended (10).

We herein report a case of Dialister pneumosintes bacteremia in a patient with breast cancer who initially presented with symptoms of severe sepsis without any apparent sources of infection.

Case Report

A 62-year-old Japanese woman visited our emergency department with a three-day history of fever and anorexia. The fever had begun in the evening two days prior to admission, without any apparent focal symptoms. The patient had been self-supported until the onset of the fever. She had no history of smoking. However, her medical history was significant with respect to left breast cancer; she had undergone mastectomy and radiotherapy nine years previously followed by chemotherapy for subsequent recurrence.
The initial evaluation revealed a body temperature of 39.0°C, pulse rate of 116 beats/min, blood pressure of 113/53 mmHg and respiratory rate of 16 breaths/min. A chest examination revealed no murmurs, and the patient’s heart and respiratory sounds were clearly auscultated bilaterally. No rigidity or rebound tenderness of the abdomen were noted. A laboratory examination demonstrated leukocytosis (white blood cell count, 34,400/μL), thrombocytopenia (platelet count, 73,000/μL) and an elevated C-reactive protein level (16.0 mg/dL). The alkaline phosphatase and total bilirubin levels were also elevated at 1,265 IU/L and 3.5 mg/dL, respectively, while the aspartate aminotransferase and alanine aminotransferase levels were unremarkable. Chest and abdominal enhanced computed tomography (CT) showed no specific findings, including intestinal edema or cholecystitis. The patient was therefore discharged under treatment with oral amoxicillin-clavulanate and ciprofloxacin after obtaining blood for two sets of cultures. Two days after blood culture incubation using the BacT/Alert 3D system (Sysmex bioMérieux, Tokyo, Japan), positive signals were obtained from both anaerobic bottles (36 and 41 hours). The alkaline phosphatase and total bilirubin levels were also elevated at 1,265 IU/L and 3.5 mg/dL, respectively, while the aspartate aminotransferase and alanine aminotransferase levels were unremarkable. Chest and abdominal enhanced computed tomography (CT) showed no specific findings, including intestinal edema or cholecystitis. The patient was therefore discharged under treatment with oral amoxicillin-clavulanate and ciprofloxacin after obtaining blood for two sets of cultures. Two days after blood culture incubation using the BacT/Alert 3D system (Sysmex bioMérieux, Tokyo, Japan), positive signals were obtained from both anaerobic bottles (36 and 41 hours). The patient was subsequently hospitalized for a further evaluation and treatment with intravenous antimicrobial therapy. A microscopic examination of the blood culture with Gram staining was unable to identify the bacteria, and cefepime was empirically administered. She again developed a fever on day 10 after hospitalization, and levofloxacin was added to the cefepime regimen. Repeated blood cultures obtained on day 10 were negative, and transthoracic echocardiography showed no cardiac vegetation.

Anaerobic bottles of the blood samples were subcultured on 5% sheep blood agar and chocolate agar plates under aerobic (5% CO₂ supplementation) and anaerobic conditions in an anaerobic chamber at 35°C. Tiny colonies were seen after 48 hours of incubation, with small (1-mm) transparent colonies identified on the 5% sheep blood agar and chocolate agar plates in the anaerobic culture after 96 hours of incubation; no colonies were obtained from the aerobic culture. We attempted to identify the bacteria using the BBL Crystal Anaerobe Identification System (Becton, Dickinson and Company, Tokyo, Japan) and API 20A Anaerobic Bacteria Identification Test Kit (Sysmex bioMérieux, Tokyo, Japan); however, we were unable to determine the isolate phenotypically, and genotypic identification was performed using a DNA sequence analysis of the 16S rRNA genes (873 bp) with the ABI PRISM BigDye Terminator Cycle Sequencing Kit v3.1 (Applied Biosystems, Foster City, USA). The consensus sequence had the highest similarity (99.8% match) to *D. pneumosintes* (GenBank accession number HM 596297).

After diagnosing the patient with *D. pneumosintes* bacteremia, we repeated the history taking and physical examination, focusing on her dental and oral hygiene. She subsequently reported that she had terminated treatment for dental caries 10 months previously and had difficulty opening her mouth. A physical examination by a dentist revealed dental caries in the right upper teeth and exposure of the maxilla secondary to severe periodontal disease. Magnetic resonance imaging of this region was subsequently performed, and right maxillary sinusitis with osteonecrosis of the posterior region of the right maxillary sinus floor was identified (Fig. 1, 2). Based on these findings, we considered that the dental caries complicated with osteonecrosis and sinusitis had thus caused the severe sepsis in this case.

The patient’s clinical course was favorable, with antimicrobial therapy comprising cefepime and levofloxacin (Fig. 3). She was discharged on hospital day 22, and oral hygiene with continuous dental therapy was thereafter performed by a dentist. She underwent chemotherapy again two months later without recurrence of bacteremia.

The minimum inhibitory concentration (MIC) for the current strain was measured after discharge using the Epsilonometer test, according to the manufacturer’s instructions. The MIC values are shown in Table. The degree of susceptibility...
Clinical course of the current patient, a 62-year-old woman who presented with symptoms of severe sepsis without an apparent source of infection.

**Table.** MICs for *Dialister pneumosintes* Isolated from the Patient in the Current Case

<table>
<thead>
<tr>
<th>Antimicrobial agent</th>
<th>MIC (mg/L)</th>
<th>Susceptibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>1</td>
<td>I</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>0.25</td>
<td>S</td>
</tr>
<tr>
<td>Cefepime</td>
<td>0.5</td>
<td>NA(^a)</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>0.125</td>
<td>S</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>2</td>
<td>S</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>0.094</td>
<td>NA(^a)</td>
</tr>
</tbody>
</table>

S: susceptible, R: resistant, NA: not available

\(^a\) Interpretive criteria for cefepime and ciprofloxacin in cases of anaerobes have not been issued by the Clinical and Laboratory Standards Institute

Discussion

In the present case, we initially were unable to identify the source of infection despite conducting several physical examinations, obtaining enhanced trunk computed tomography scans and performing echocardiography. The patient’s dental caries and sinusitis were subsequently detected after confirming the presence of *D. pneumosintes* bacteremia. We are unable to confirm the causative pathogen associated with the dental caries and/or sinusitis as being *D. pneumosintes*, as we did not aspirate or cultivate the exudate in the right maxillary region, although the association between infection and this microorganism was considered to be strong based on the absence of other infectious sites and the characteristics of *D. pneumosintes*. Identifying the infectious source prevented further recurrence of bacteremia and enabled the patient to continue systemic chemotherapy for breast cancer.

*D. pneumosintes*, formerly *Bacteroides pneumosintes*, is an obligatory anaerobic Gram-negative rod with recently established morphological and molecular features (12). It is an oral microbe and is more frequently isolated from smokers (13, 14). Recent investigations have suggested an association between *D. pneumosintes* and periodontitis (15). Sakamoto et al. reported that *D. pneumosintes* is exclusively isolated from patients with symptomatic endodontic infections as opposed to asymptomatic endodontic infections (16). *D. pneumosintes* is also known to be a causative pathogen of extraoral infections; however, its virulence is unclear due to the difficulty of isolating the bacteria using conventional methods. Sinusitis (17) and pneumonia (18) have also been reported to be possible sources of infection, both of which can be identified using molecular analyses. Meanwhile, invasive *D. pneumosintes* infection has rarely been described, and its clinical characteristics remain unknown.

To date, two published case reports in the English-language literature have described invasive *D. pneumosintes* infection. Lepargneur et al. reported *D. pneumosintes* bacteremia in a young woman with suppurative thrombosis of the ovarian veins. In addition, Rousee et al. described two cases of central nervous system infection caused by *D. pneumosintes* (19). The first case involved a young man with a subdural abscess adjacent to the right frontal lobe in whom *D. pneumosintes* infection was diagnosed on a blood culture. The second case involved an elderly man with an abscess in a left posterior frontal lesion of the brain. *D. pneumosintes* was subsequently isolated from the pus aspirated from the brain abscess. Both patients were successfully treated with antimicrobial therapy with or without drainage, and invasive *D. pneumosintes* infection was confirmed in
We are indebted to Professor Hitomi Shigemi of the University of Tsukuba, Tsukuba, Japan for determining the MICs for the current strain.

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References