CAPD Peritonitis Caused by Co-Infection with
Cellulosimicrobium cellulans (Oerskovia xanthineolytica) and
Enterobacter cloacae: A Case Report and Literature Review

Jin Sug Kim1, Tae Won Lee1, Chun Gyoo Ihm1, Yu Jin Kim1, Song Mi Moon1,
Hee Joo Lee2 and Kyung Hwan Jeong1

Abstract

A 50-year-old woman with end-stage renal disease on continuous ambulatory peritoneal dialysis was admitted with abdominal pain, fever and cloudy peritoneal fluid. The diagnosis was peritonitis, and the causative bacteria were Cellulosimicrobium cellulans and Enterobacter cloacae. She was subsequently treated with the administration of intraperitoneal antibiotics and removal of the infected indwelling catheter. We herein report a case of Cellulosimicrobium cellulans and Enterobacter cloacae co-infection in a patient with peritonitis and review the relevant literature.

Key words: Oerskovia xanthineolytica, Cellulosimicrobium cellulans, Enterobacter cloacae, continuous ambulatory peritoneal dialysis, peritonitis, vancomycin

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Introduction

Cellulosimicrobium cellulans (C. cellulans), formerly known as Oerskovia xanthineolytica, is a Gram-positive filamentous rod found primarily in soil and water. Infection with C. cellulans in humans is rare (1), with only approximately 30 such case reports. These infections are more common in patients with a compromised immune function and/or implanted medical devices, such as catheters, and few cases have been reported as an uncommon cause of continuous ambulatory peritoneal dialysis (CAPD) peritonitis.

In this paper, we describe the case of a patient with end-stage renal disease (ESRD) who developed peritonitis caused by C. cellulans and Enterobacter cloacae (E. cloacae) due to an infected indwelling peritoneal dialysis catheter. We also review the literature for other cases of Oerskovia infection; and describe the common clinical features of these infections as well as implications for therapy.

Case Report

A 50-year-old woman with ESRD secondary to diabetes mellitus was admitted to Kyung Hee University Medical Center, Seoul, South Korea via the emergency room due to abdominal pain. She had been undergoing CAPD for 15 months and was on a regimen of 2-L exchanges three times per day. Her blood pressure was 160/90 mmHg, her heart rate was 80 beats/min, her respiratory rate was 20 breaths/min and; her temperature was 38.0°C. The peritoneal catheter exit site was to the left of the midline and appeared normal. A laboratory investigation revealed the following findings: hemoglobin (Hb) =9.2 g/dL; hematocrit (Hct) =24.8%; white blood cell count (WBC) =8,860/mm3 with a normal differential; C-reactive protein (CRP) =9.7 mg/dL; and normal liver enzymes (aspartate aminotransferase: 15 U/L, alanine aminotransferase: 11 U/L). A physical examination revealed a remarkable level of abdominal tenderness. The effluent peritoneal fluid was cloudy, with a WBC count of 12,500/mm3 (predominantly polymorphonuclear cells).
After performing a peritoneal fluid culture, the patient was treated with intraperitoneal antibiotics, specifically cef-tazidime and cefazolin. Two days after the start of antibiotic therapy, the patient’s abdominal pain subsided and the perito-neal fluid became clear. On hospital day 4, a culture of the peritoneal fluid obtained on admission day revealed E. cloacae, which was sensitive to cefazidime, ciprofloxacin and tobramycin and resistant to cefazolin. As a result, the antibiotic regimen was switched to intraperitoneal ceftaz-idime and tobramycin. However, after 13 days of vancomycin (hospital day 25), C. cellulans re-appeared on a peritoneal culture. The trough level of vancomycin was 17.3 mg/mL, which satisfied the International Society of Peritoneal Dialysis guideline. Although the peritoneal WBC count did not increase, we considered the antibiotic treatment to have failed due to bacterial colonization of the surface of the peritoneal Tenckhoff catheter. Therefore, we decided to remove the catheter on day 27 hospitalization, and switch the treatment regimen to hemodialysis. Consequently, a culture for bacteria on the peritoneal catheter revealed C. cellulans, thus confirming catheter infection to be the cause of the peritonitis.

The intraperitoneal antibiotics were discontinued and vancomycin was administered intravenously for an additional two weeks, while the patient continued to remain asympto-

Figure 1. The API CORYNE system (bioMérieux, Lyon, France) identified the bacterium as Oers-skovia sp. The API Coryne biochemical strip keyed out the number 7572727, an excellent match for “Oerskovia xanthineolytica,” now known as Cellulosimicrobium cellulans.

Figure 2. Cellulosimicrobium cellulans Gram staining of a colony isolated on sheep blood agar.
Figure 3. Brief summary of the patient’s clinical course and disease progression from admission.

WBC: white blood cell count, CRP: C-reactive protein, HD: hospital day, E. cloacae: Enterobacter cloacae, IP: intraperitoneal, IV: intravenous

Figure 4. Growth of Cellulosimicrobium cellulans on a 5% sheep blood agar plate after 48 hours at 35°C under aerobic conditions. The cultures on blood agar revealed yellow colonies within 24 hours of incubation. This pigment is an important diagnostic characteristic.

No recurrence of abdominal signs or symptoms was noted during the subsequent 12 months of follow-up. Fig. 3 provides a brief summary of the patient’s clinical course and disease progression from the time of admission.

Discussion

The genus Cellulosimicrobium belongs to the suborder Micrococccineae, order Actinomycetales, class Actinobacteria. It is composed of three species, namely, C. cellulans, C. funkei and C. terreum (3, 4). These species are aerobic actinomycetes that appear as pleomorphic Gram-positive rods with rudimentary branching and exist naturally in soil, water and decaying plant material (5). They may be easily mistaken for Corynebacterium spp., common skin flora that may be considered contaminants on blood and other sterile body site cultures. Isolates from clinical specimens, -such as blood and cerebrospinal fluid- found to be catalase-positive, oxidase-negative and motile, producing a bright-yellow pigment, should be presumptively identified as Oerskovia spp., as the yellow pigment is a distinguishing characteristic of this species (Fig. 4).

C. cellulans has been reported to be an uncommon cause of human infection, with only approximately 30 previous case reports, including three of peritonitis (Table). The three previous cases of peritonitis caused by C. cellulans involved a 59-year-old diabetic woman, 70-year-old man and 13-year-old girl (6-8). All three patients were treated with intraperitoneal vancomycin, while the 59-year-old woman also received intramuscular tobramycin and oral doxycycline (6) and the man also received intramuscular gentamicin followed by the same antibiotics delivered intravenously upon
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catheter removal (7), whereas the 13-year-old girl’s symptoms resolved completely with vancomycin alone. (8)

Although C. cellulans was not cultured on early admission in the present study, we believe that the patient had been co-infected with E. cloacae. Infection with a relatively small number of C. cellulans organisms may delay the diagnosis. Although most case of CAPD peritonitis may be attributed to a single organism, multiple organisms are sometimes identified, referred to as poly-microbial peritonitis. In previous studies, the prevalence of poly-microbial peritonitis in CAPD patients has been reported to be 10-16% (9). Poly-microbial peritonitis usually has a poor outcome with a significantly high frequency of hospitalization, catheter loss and permanent hemodialysis transfer (10). However, recent large-scale studies have revealed that most patients with poly-microbial peritonitis exhibit a good response to antibiotics (11). Poly-microbial peritonitis resulting from contamination generally resolves with antibiotic therapy without catheter removal, unless the catheter is the source of the infection (12).

Although the present patient was asymptomatic following the initial treatment and received intraperitoneal vancomycin continuously, C. cellulans was identified in the peritoneal fluid collected after many days of hospitalization. We believed the catheter to be the source of the infection, and removal of the Tenckhoff catheter was consequently required in order to resolve the infection.

With the increase in the number of immunocompromised patients and the popularity of long-term indwelling catheters and prostheses, the potential for infections with opportunistic pathogens deserves further attention. In patients in whom C. cellulans is isolated, we recommend the administration of vancomycin therapy and removal of infected indwelling devices, if possible, in order to achieve a complete recovery.

### Table. Oerskovia xanthineolytica CAPD Peritonitis Reported in the Medical Literature

<table>
<thead>
<tr>
<th>Reference</th>
<th>Age</th>
<th>Sex</th>
<th>Underlying conditions</th>
<th>Site of infection</th>
<th>Treatment</th>
<th>Foreign body Removed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(6)</td>
<td>59</td>
<td>F</td>
<td>DM, ESRD</td>
<td>Peritonitis</td>
<td>IP Vanco, IM TOB, Oral DOX</td>
<td>No</td>
</tr>
<tr>
<td>(7)</td>
<td>70</td>
<td>M</td>
<td>ESRD</td>
<td>Peritonitis</td>
<td>IP Vanco, IM GM</td>
<td>Yes</td>
</tr>
<tr>
<td>(8)</td>
<td>13</td>
<td>F</td>
<td>DM, ESRD</td>
<td>Peritonitis</td>
<td>IP Vanco</td>
<td>No</td>
</tr>
<tr>
<td>Current case</td>
<td>50</td>
<td>F</td>
<td>ESRD</td>
<td>Peritonitis</td>
<td>IP CFZ, IP TOB, IP &amp; IV Vanco</td>
<td>Yes</td>
</tr>
</tbody>
</table>


### References