Spontaneous bacterial peritonitis caused by *Aeromonas Caviae* in a patient with cirrhosis

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**ABSTRACT**

Spontaneous bacterial peritonitis (SBP) is a common complication of cirrhosis. Based on our current understanding of SBP, the most common etiologies for SBP in cirrhosis are Enterobacter and Streptococcal species. The Aeromonas species are ubiquitous in fresh or sea water. *Aeromonas Caviae* is never identified as etiology in cases of SBP. A patient, who had a history of liver cirrhosis related to chronic hepatitis B virus infection for 1 year, presented with diarrhea. He had diarrhea 1 week later returned from coastal city. He was hospitalized and treated with norfloxacin after 7 days of severe symptoms, including fever, abdominal distention, and diarrhea. Analysis of the ascitic specimen revealed a white-cell count of $4.42 \times 10^9$ cells/L with 88% neutrophils. Analysis of stool specimen showed a white-cell count of 60 cells per high-power field. The patient started the injection of ceftriaxone at a dose of 4 g/d. However, the situation was not improved. Three days later, stool and ascitic fluid culture showed positive for *Aeromonas Caviae*. Antibiotic susceptibility testing revealed that imipenem, meropenem, amikacin, and cefoperazone-sulbactam were highly sensitive to the *Aeromonas Caviae*. However, the bacilli resisted to ceftriaxone, ceftazidime, ampicillin-sulbactam, levofloxacin, and sulfamethoxazole. Ceftriaxone was then switched to imipenem. The patient was fully recovered 14 days later. *Aeromonas Caviae* is a rare pathogen of SBP in cirrhosis. It resists to third-generation of cephalosporin and fluoroquinolone, which are of frequently used dependent on clinical experience. It needs a special attention.

**KEY WORDS**

*Aeromonas Caviae*; cirrhosis; spontaneous bacterial peritonitis
【摘要】自发性细菌性腹膜炎(spontaneous bacterial peritonitis, SBP)是肝硬化的常见并发症。目前多认为SBP的常见病原菌是肠杆菌属和链球菌属细菌。气单胞属菌广泛存在淡水和海水中，但是导致SBP的病原菌中尚未发现豚鼠气单胞菌。一位既往有乙肝肝硬化史1年的患者因腹泻就诊。患者2周前到过海滨城市，其后1周后开始腹泻，给予诺氟沙星治疗7 d，症状恶化，出现发热、腹胀、腹泻加重后，住院治疗。腹水化验白细胞计数4.42×10^9 L^−1中，中性粒细胞占88%。大便化验显示每高倍镜视野60个白细胞。立即经验性地给予头孢曲松钠4 g/d静脉输注治疗，但症状无缓解。3 d后，大便和腹水培养结果显示豚鼠气单胞菌，药物敏感试验示对亚胺培南、美罗培南、阿米卡星、头孢哌酮-舒巴坦敏感，而对头孢曲松、头孢他定、氨苄西林舒巴坦钠、左氧氟沙星和磺胺甲恶唑耐药。遂将头孢曲松换成亚胺培南。14 d后患者痊愈。豚鼠气单胞菌作为SBP的少见病原菌，可能对临床常用的头孢菌素及氟喹诺酮耐药，应引起临床医师的注意。

【关键词】豚鼠气单胞菌；肝硬化；自发性细菌性腹膜炎

Based on our current understanding of spontaneous bacterial peritonitis (SBP), the most common etiologies for SBP in cirrhosis are Enterobacter and Streptococcal species[1]. Aeromonas Caviae is never identified as etiology in cases of SBP. The Aeromonas species, which are oxidase-positive, facultative anaerobic, gram-negative bacilli, are ubiquitous in fresh or sea water. Although the gastrointestinal tract is the most common site of infections caused by Aeromonas spp[2-3], Aeromonas species can cause various infections such as bacteremia, gastroenteritis, cholangitis, pneumonia, wound infections, as well as skin and soft-tissue infections[2-8]. In the Republic of Korea, Aeromonas species are the third most common organism causing SBP[9]. Among the patients with SBP induced by Aeromonas species, a majority of patients were infected with Aeromonas hydrophila and only a minority patients were infected with Aeromonas sorba[10]. Aeromonas Caviae was the most frequent causative pathogen of Aeromonas bacteremia in Japan[11]. There has been no report on Aeromonas Caviae-related SBP. We report a patient, with a history of liver cirrhosis, whose stool and ascitic fluid culture showing positive for Aeromonas Caviae.

1 Case report

A 42-year-old man was admitted to the hospital with presentations of diarrhea. The patient had a history of liver cirrhosis related to chronic hepatitis B virus infection for 1 year, which was complicated with oesophageal varices. He had led an otherwise uneventful life without episodes of variceal bleeding, SBP, or hepatic encephalopathy in the 1 year of follow-up at an outside hospital. He had gone to coastal city 2 weeks ago and had eaten seafood. One week later, he had diarrhea and was treated with norfloxacin. After 7 days of severe symptoms, including fever (37.8 ℃), abdominal distention, and diarrhea, he was hospitalized.

Physical examination was remarkable for jaundice and icteric sclera and distended abdomen with shifting dullness. No abdominal tenderness or rebound tenderness was found while pitting oedema was noted up to the mid-tibial region without skin lesions.

Laboratory examinations revealed a WBC count of 13.41×10^9 cells/L, with 85% neutrophils; aspartic transaminase was 128 U/L; lanine transaminase was 156 U/L; dilirubin was 4.2 mg/dL; and total/direct dilirubin was 4.2/2.8; albumin was 31 g/dL. Stool routine test revealed a WBC count of 45 per high-power field(hp), with a pus cell count of 30 per hp. Based on the findings of physical and laboratory examinations, his stage of cirrhosis was classified as Child-Pugh class C on admission. A diagnostic paracentesis was performed on the day of admission and analysis of the ascitic specimen revealed a WBC count of 4.42×10^9 cells/L with 88% neutrophils. In our hospital, the culture of blood, stool, urine, and ascites specimens were performed prior to initiation of antibiotic therapy. The patient was started on intravenous ceftriaxone 4 g daily, diuretics and intravenous albumin. However, the patient was no improvement. Three days later, stool culture showed positive for Aeromonas Caviae. Antibiotic susceptibility testing revealed that imipenem, meropenem, amikacin, and cefoperazone-sulbactam had the highest activity against the Aeromonas Caviae. However, the bacilli resisted to ceftriaxon, ceftazidime, ampicillin-sulbactam, levofloxaxin, and sulfamethoxazole. In addition, the results of the ascitic fluid culture and antibiotic susceptibility testing also resembled the results of the stool tests. Culture results of blood and urine specimen were negative. Aeromonas Caviae was isolated and identified by standard biochemical testing. Antimicrobial susceptibility test of Aeromonas Caviae was performed using the MicroScan (Dade Behring) system at the hospital microbiological laboratory. The MicroScan criteria of drug susceptibility breakpoints for Aeromonas species conformed to those of Clinical and Laboratory
Standards Institute for Enterobacteriaceae species\cite{12}. Ceftriaxone was then switched to imipenem. The patient experienced an uneventful recovery 14 days later.

2 Discussion

The Aeromonas species have also been isolated from chlorinated tap water which was supplied by the municipal, or hospital sewage water\cite{13-14}. The Aeromonas species have been the potential infection agent resulting in disease which transmits via drinking water or by water used in food preparation. The Aeromonas species are found in a variety of foods including raw meats, fish, packaged ready-to-eat meats, sea foods, etc\cite{15-16}. Aeromonas species can enter the body through the food contaminated by it. In addition, some previous reports on Aeromonas species-related SBP were related to acute diarrhea\cite{10}. Bacterial translocation has been identified to play a significant role in the pathogenesis of SBP\cite{17}.

In the case presented in this paper, the patient had diarrhea before SBP. The combination of this and the fact that he was at an advanced stage of cirrhosis of the liver leads us to presume that Aeromonas Caviae probably entered the body through ingestion, followed by translocation through the intestinal mucosa. The liver’s impaired ability to contain and eradicate the infection finally resulted in bacteremia and peritonitis in the patient.

Aeromonas species produce a β-lactamase which makes them resistant to ampicillin and first- and second-generation cephalosporins\cite{18}. Because Aeromonas Caviae is seldom etiology, we didn’t have the test kit to prove whether Aeromonas Caviae produced extended-spectrum beta-lactamases. In recent study\cite{19}, clinical Aeromonas isolated have also shown increasing resistance to third-generation cephalosporins. As a result, third-generation cephalosporins which are often administered rely on clinical experience, is worthy of special attention. In particular, in cases where Aeromonas Caviae is isolated from sterile blood or ascitic fluid cultures in patients with SBP cirrhosis, doctors should be aware of its resistance to usual agents of treating SBP, and an alternative course of treatment should be pursued.

Conflicts of interest

The authors report that there are no conflicts of interests.

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