Liver Abscess of Actinomyces israelii in a Hemodialysis Patient: Case Report and Review of the Literature

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Abstract

We had encountered a 74-year-old woman on hemodialysis therapy suffering from liver abscess of Actinomyces israelii. Percutaneous drainage of the abscess before starting antimicrobial therapy followed by correct microbiological identification and susceptibility test led us to determine long treatment with ampicillin and to a successful outcome. Periodontitis was thought to be a possible entry of actinomyces. Hepatic actinomycosis should be recognized as one of the important infectious diseases among patients of end-stage renal disease.

Key words: Actinomyces israelii, liver abscess, end-stage renal disease, hemodialysis therapy

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Introduction

Actinomyces species are some of the normal inhabitants of the oral cavity, colon and genital tract, and Actinomyces israelii is the commonest cause of actinomycosis. Abnormalities in host defenses probably facilitate development of the disease, but the detailed relationship remains unclear. Patients with end-stage renal disease on regular hemodialysis therapy are known to be in immunocompromised status; we had encountered a rare case with liver abscess of Actinomyces israelii in a patient on hemodialysis therapy.

Case Report

A 74-year-old Japanese woman was admitted to our hospital with a two-week history of mild pyrexia and worsening right upper abdominal pain. She had end-stage renal disease (ESRD) by unknown etiology and had been receiving hemodialysis therapy three times a week in a hemodialysis clinic for 12 years, but she did not have any other remarkable past medical history. On admission, her body temperature was 37.2°C. Physical examination showed rebound tenderness at right upper quadrant and pitting edema of bilateral lower legs. Laboratory examination revealed leukocytosis (white blood cell count 11.1x10^9/L), anemia (hemoglobin 11.1 g/dL), elevation of alkaline phosphatase (348 U/L; reference value: 117-335 U/L) and C-reactive protein (11.64 mg/dL).

Abdominal ultrasonogram revealed low-echoic mass lesion (4×9 cm) on the surface of S4 of the liver. The border of the mass was sharp, and seemed to have a capsule. The internal structure appeared to have two layers. Abdominal CT also showed a low-density cystic lesion on the surface of S4 of the liver, and low to iso-density fluid collection was found around the lesion (Fig. 1).

From these findings, liver abscess was highly suspected. Surgeons performed aspiration drainage and placed an indwelling catheter immediately. White-yellowish pus without odor was aspirated. Intravenous cefmetazole, 2 g every 12 hours, was started after drainage.

On the following day, Gram stain of aspirated pus demonstrated filamentous, beaded gram-positive rods with many leukocytes. No other microorganisms were found by Gram stain (Fig. 2). Sulfur granules were not found macroscopically or microscopically. Acid-fast stain was negative.

While waiting for the culture results, antimicrobials were
changed from cefmetazole to trimethoprim/sulfamethoxazole (800/160 mg orally once a day) and ampicillin/sulbactam (2/1 g intravenously every 24 hours) on the assumption of actinomycosis, nocardiosis and infection of other multiple microorganisms.

On the 10th day, the microorganism was detected as an *Actinomyces* species by VITEK II system (bioMérieux Clinical Diagnostics, France). VITEK II system could not confirm the bacterias’s species, so identification by rapid ID 32 A identification kit (bioMérieux Clinical Diagnostics) and 16S rRNA gene sequencing were performed from the isolated bacteria. *Actinomyces israelii* was detected by rapid ID 32 A kit (profile: 4536123100), but identification reliability was 78.0%. On the other hand, 16S rRNA gene sequence (1,446 base pairs) was completely identical to *Actinomyces israelii*. On the 13th day, antimicrobials were changed to ampicillin (2 g intravenously every 12 hours). No other bacteria grew from the aspirates and conventional blood cultures on admission. She became afebrile on the 10th day, and abdominal pain also disappeared. Periodontitis of left upper tooth was considered as one of the possible entry sites of infection, so extraction of the tooth was performed on the 22nd day.

Follow-up abdominal CT was performed on the 35th day. Fluid collection had almost disappeared, so the drainage tube was removed and antimicrobial therapy was changed to oral amoxicillin (500 mg once daily) on the 38th day. Oral amoxicillin was to be continued for 6 months, and she was discharged on the 51st day.

**Discussion**

The genus *Actinomyces* consists of several species of gram-positive, non-spore-forming bacteria, which grow as obligate or facultative anaerobes with a tendency to form branching filaments (1). They are part of the normal flora of the oral cavity and the first step in the actinomycosis is disruption of the mucosal barrier. Therefore, the anatomical distribution is about 60% cervicofacial, 15% thoracic, 20% abdominal, and 5% other types (2). In the present case, abdominal CT showed no abnormalities around the hepatobiliary tract and pancreas. So periodontitis was thought to be one of the possible entry sites of actinomyces even though the blood culture was negative. Colonoscopy was not performed during hospitalization.

A liver lesion is present in 5% of cases of actinomycosis and in 15% of abdominal cases (3, 4). Spread to the liver occurs via direct extension from abdominal focus or hematogenously from a distant lesion. Imaging study findings of liver actinomycosis have many variations. Lesions may be single or multiple, and they look like intrahepatic tumors, sometimes with necrosis, or abscesses (3). Cases with partial hepatectomy have been reported because lesions were recognized as hepatic tumors (5, 6). Hepatic lesions occasionally infiltrate the diaphragm and are complicated by pleural and lung lesions (7), make cutaneous fistula (8), and extend to the abdominal and pelvic organs (9). The present case had a cystic lesion with peripheral effusion and a capsule, so it was easy to recognize as an abscess. Infection with multiple microorganisms must be common in the cases of liver abscess. From the review published in 1993, 9 of 36 (25.0%) cases were reported to have mixed infection (10). We recognized that the present case had single infection of *Actinomyces* species because she had not received antimicrobial therapy before admission and no other microorganism was detected by pus culture aspirated before administering antimicrobials.

Immunosuppressive status is known as a risk factor of invasive actinomycosis (11-14). It is also well known that patients receiving hemodialysis therapy due to ESRD had altered immune response. Especially, reduced T-cell function, diminished antibody production, and compromised neutrophil and dendritic function were proved in vitro and in
Table 1.  Actinomycosis among End-stage Renal Disease Patients

<table>
<thead>
<tr>
<th>Published year</th>
<th>Age</th>
<th>Sex</th>
<th>Treatment of ESRD</th>
<th>Cause of ESRD</th>
<th>Complications, Past history</th>
<th>Clinical Picture</th>
<th>Co-infected microorganisms</th>
<th>Treatment</th>
<th>Alex</th>
<th>Total duration of Alex treatment</th>
<th>Prognosis</th>
<th>Reference No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1976</td>
<td>15</td>
<td>F</td>
<td>PD</td>
<td>Chronic pyelonephritis</td>
<td>ND</td>
<td>Peritonitis</td>
<td><em>E. coli</em></td>
<td>Removal of PD catheter, SD, Abx (iv, po)</td>
<td>PCG, TC, SML, TOB, CFX</td>
<td>9 weeks</td>
<td>Alive 18</td>
<td></td>
</tr>
<tr>
<td>2 1986</td>
<td>24</td>
<td>M</td>
<td>Bilateral renal hypophasia</td>
<td>Repeated bacterial peritonitis for a year</td>
<td>ND</td>
<td>Peritonitis</td>
<td><em>E. coli</em></td>
<td>Removal of PD catheter</td>
<td>ND</td>
<td>ND</td>
<td>Alive 18</td>
<td></td>
</tr>
<tr>
<td>3 2004</td>
<td>60</td>
<td>M</td>
<td>PD</td>
<td>Fabrey's disease</td>
<td>ND</td>
<td>Peritonitis</td>
<td><em>E. coli</em></td>
<td>Removal of PD catheter, Abx (iv, mg)</td>
<td>VCM, CLDM</td>
<td>6 weeks</td>
<td>Alive 19</td>
<td></td>
</tr>
<tr>
<td>4 2006</td>
<td>56</td>
<td>F</td>
<td>PD</td>
<td>Repeated Tenckhoff catheter exit-site infection</td>
<td>Subcutaneous abscess of exit-site</td>
<td>ND</td>
<td>SD, Abx (iv, pol)</td>
<td>PCG, AMPC</td>
<td>30 weeks</td>
<td>Alive 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 2007</td>
<td>78</td>
<td>M</td>
<td>HD</td>
<td>Alcohol abuse, Chronic pancreatitis, Pancreaticojunostomy for pancreatic pseudocyst</td>
<td>Multiple liver mass</td>
<td><em>Bacteroides</em> species</td>
<td>Abx (iv)</td>
<td>ABPC</td>
<td>2 days</td>
<td>Died 21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Footnote:

ESRD, end-stage renal disease; PD, peritoneal dialysis; HD, hemodialysis; ND, not described; SD, surgical debridement; Abxs, antimicrobials; iv, intravenous injection; ip, intraperitoneal injection; po, oral administration; PCG, penicillin G; TC, tetracycline; SM, streptomycin; TOB, tobramycin; CFX, cefoxitin; VCM, vancomycin; CLDM, clindamycin; AMPC, amoxicillin; ABPC, amoxicillin.

vivo (15, 16). The present case did not have any other immunosuppressive factors, including diabetes, history of autoimmune diseases, receiving immunosuppressive therapy or chemotherapy.

The previous case reports of invasive actinomycosis among patients with ESRD are shown in Table 1. There were only 5 reports previously (17-21), and these cases had no prescription of immunosuppressive medication. Four reports described actinomycosis among patients receiving continuous ambulatory peritoneal dialysis. Three cases had peritonitis (17-19) and one case had exit-site infection (20). Dialysis catheter could not be preserved in all cases, and the duration of antibiotic therapy was long, but no patient died. Even though the prevalence of peritoneal dialysis patients was higher, a case of ESRD on hemodialysis with actinomycosis (17-19) and one case had exit-site infection (20). Duration of antibiotic therapy was long, but no patient died.

Actinomyces species are generally susceptible to penicillin G and amoxicillin but resistant to ciprofloxacin (22). In the present case, the cultured strain showed excellent susceptibility to many kinds of antimicrobials except for ciprofloxacin and metronidazole, similar to results of the past report. Penicillin G is the most frequently used antimicrobial to treat actinomycosis, but we chose ampicillin injection as an initial treatment. High-dose penicillin G contains a large quantity of potassium (for example, 16 million units of penicillin G contains 28.8 mEq of potassium) and it is not acceptable for anuric chronic dialysis patients, thus we avoided using penicillin G for our case. The ampicillin injection could be changed to oral amoxicillin treatment about 8 weeks after admission and it was continued for a long period without any adverse effects. Actinomycosis needs long antimicrobial administration for successful treatment even though it is not a common pathogen of liver abscesses and susceptible to many kinds of β-lactam antimicrobials. It is very important to taking a sample from the lesion before the start of antimicrobial therapy in order to determine the long-term treatment with a narrow-spectrum antimicrobial agent.

In conclusion, Actinomyces israelii is one of the important infective pathogens among patients of ESRD. For liver abscess, defining Actinomyces before administration of antimicrobials, the combination of surgical drainage and long-term treatment with ampicillin based on correct identification and susceptibility test lead to a successful outcome.

References

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