ACG CASE REPORTS JOURNAL

CASE REPORT | LIVER

Spontaneous Bacterial Peritonitis Because of *Actinomyces*

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ABSTRACT

Actinomycosis is a rare chronic granulomatous disease that manifests with nonspecific symptoms of abdominal pain, anorexia, and weight loss. The disparity in the presentation of this condition presents a tremendous diagnostic challenge. There are few reports of *Actinomyces* species causing spontaneous bacterial peritonitis without previous localized masses or abscesses have been published. We provide a case of spontaneous bacterial peritonitis secondary to *Actinomyces* species in a 46-year-old woman with uterine fibroids and a lack of preceding abscess. Although rare, spontaneous bacterial peritonitis because of *Actinomyces* should be considered in differential in female patients without pre-existing liver disease presenting with spontaneous bacterial peritonitis.

KEYWORDS: abdominal actinomycosis; ascites; abdominal pain; spontaneous bacterial peritonitis; infection

INTRODUCTION

Actinomyces species are filamentous Gram-positive rods that are facultative anaerobes. *Actinomyces* are commensal flora in the oropharynx, urogenital, and gastrointestinal tract.[1–4] They can cause endogenous infection because of disruption of the epithelial surfaces secondary to trauma, foreign body, or surgical procedures called actinomycosis.[1–3,5,6] Actinomycosis is a chronic, slowly progressing granulomatous infection that can lead to abscess formation, necrosis, adhesions with surrounding structures, and/or sinus tract formation.[7] Because of the indolent nature of the infection and nonspecific symptoms, the diagnosis and treatment are often delayed. In addition, the clinical and radiologic features of abdominopelvic actinomycosis are highly variable and often mimicking other conditions, such as malignancy, diverticulitis, appendicitis, tuberculosis, pelvic inflammatory disease, and inflammatory bowel disease.[6,8]

Suspicion for actinomycosis should be high in the setting of abscesses or ongoing infection in the digestive tract. Although there have been reports of abdominal actinomycosis localized to abscesses, there have been only 3 cases of spontaneous bacterial peritonitis because of *Actinomyces*, to the best of our knowledge.[1,2,9] We describe a case of spontaneous bacterial peritonitis caused by *Actinomyces* species in a 46-year-old woman with uterine fibroids and a lack of preceding abscess.

CASE REPORT

A 46-year-old African American woman with a medical history of iron deficiency anemia, menorrhagia, and alcohol abuse presented to the hospital with a 1-month history of progressive fatigue, malaise, nausea/vomiting, and increasing abdominal pain and distension. She consumed a pint of vodka per day (~8.5 standard drinks) and endorsed marijuana use once per week. She had no history of ascites or known liver disease. Her abdominal pain was diffused but more prominent in the right upper quadrant. The patient denied hematochezia, melena, chest pain, and hematemesis.

ACG Case Rep J 2024;11:e01353. doi:10.14309/crj.0000000000001353. Published online: May 2, 2024

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On physical examination, the patient had a large, distended abdomen, mildly tender to palpation diffusely but without guarding or rebound tenderness. The patient had no edema, scleral icterus, or lymphadenopathy. Vital signs were within normal limits except for a 104-beats/min heart rate. An abdominal and pelvic computed tomography (CT) scan showed findings consistent with peritonitis with large-volume ascites and smooth peritoneal thickening with peripherally enhancing ascites (Figure 1). No pneumoperitoneum or definitive source was identified besides a normal-liver morphology with nondilated intrahepatic and extrahepatic bile ducts and patent hepatic vasculature. The patient was found to have multiple visible-size uterine fibroids, the largest measuring 9.8 × 9.7 × 11.1 cm.

Initial blood work was significant for white blood cells 32.1 thou/mcL (4.0–10.0) with neutrophils 91.3%, hemoglobin 8.3 g/dL (13.0–16.0), platelet 995 × 10^3/mL (150–450), alkaline phosphatase 153 U/L (35–130), aspartate aminotransferase (AST) 17 U/L (15–48), Alanine aminotransferase (ALT) 8 U/L (10–60), BUN 35 mg/dL (6–22), total bilirubin 1.1 mg/dL (0.2–1.1), direct bilirubin 0.4 mg/dL (≤0.2), total protein 8.5 g/dL (6.7–8.4), albumin 3.0 g/dL (3.2–5.5), and lactic acid 1.9 mmol/L (0.5–2.0). The hepatitis viral panel was negative. Her autoimmune markers were negative, including an antinuclear antibody, antismooth muscle antibody, and antimitochondrial antibody. The patient underwent diagnostic and therapeutic paracentesis that revealed thick, purulent ascitic fluid aspirate. Ascitic fluid analysis showed fluid white blood cells 316,809/mm^3 with 95% neutrophil, Serum ascites albumin gradient (SAAG) <1.1 with fluid protein 4.6 g/dL, fluid glucose 1 mg/dL, fluid Lactate dehydrogenase (LDH) 4,931 Intl U/L, and fluid amylase 53 U/L, suggestive of bacterial peritonitis. Fluid culture was negative for acid-fast bacilli and grew *Actinomyces turicensis*. Fluid cytology was negative for malignancy. The chest X-ray showed clear lungs, heart size, and pulmonary vasculature within normal limits. A transthoracic echocardiogram showed LVEF 60% with no valvular abnormalities or thrombus. A subsequent paracentesis and placement of an abdominal drain were performed to evacuate the multiloculated ascitic fluid. Repeat fluid culture obtained 3 days apart also grew A. *turicensis*.

The patient was empirically treated with piperacillin-tazobactam and intravenous fluids. Notably, a CT scan a month before admission did not reveal any abscess or ascites in the abdomen of our patient. The patient saw the most clinical improvement after the abdominal drain, daily drain output decreased by <50 mL, and the abdominal drain was subsequently removed. There was some concern for primary peritoneal carcinoma, given the patient's condition for which we obtained unrevealing tumor markers: Carbohydrate antigen 19-9 (CA 19-9) 61 U/mL (0–35), carcinoembryonic antigen (CEA) <0.6 ng/mL (0.0–4.7), and CA-125 41 U/mL (0.0–38.1). The patient saw marked clinical improvement over the 10-day hospital stay, and she was discharged on oral amoxicillin-clavulanate for 6 months. She had a follow-up evaluation 4 weeks after discharge, which showed a complete resolution of her ascites.

DISCUSSION

Actinomycosis is a rare and insidious infection caused by Gram-positive, filamentous, and anaerobic bacteria with an incidence rate of 1:1:300,000. *Actinomyces israelii* is the most common organism causing actinomycosis.[1–4] They are commensal flora in the oropharynx, urogenital, and gastrointestinal tract. This infection usually spreads locally sluggishly, and it may take months to years before the onset of symptoms. The endogenous infection occurs because of disruption of the epithelial mucosal barrier surfaces secondary to trauma, foreign body or surgical procedures, immunosuppression, or a perforated bowel.[1–3,6] Rarely, the hematogenous spread of the infection to the liver and lungs can present as a nodule or mass on imaging and resemble malignancy.[10]

The 3 primary clinical forms of actinomycosis described are cervicofacial, thoracic, and abdominopelvic.[3,6] Abdominal actinomycosis accounts for 20%–30% of all actinomycosis infections.[11] The disease progresses slowly and can present with nonspecific symptoms such as lower abdominal pain, fatigue, fever, weight loss, and abdominal distension with ascites with or without a palpable mass. Our patient experienced symptoms of abdominal distention, fatigue, and malaise a month before appearing in the emergency department. It often mimics other conditions such as malignancy, tuberculosis, helminthic infestation, chronic appendicitis, diverticulosis, and inflammatory bowel disease.[8] The infrequency of actinomycosis along with the nonspecific features of disease leaves the diagnosis without consideration on admission.

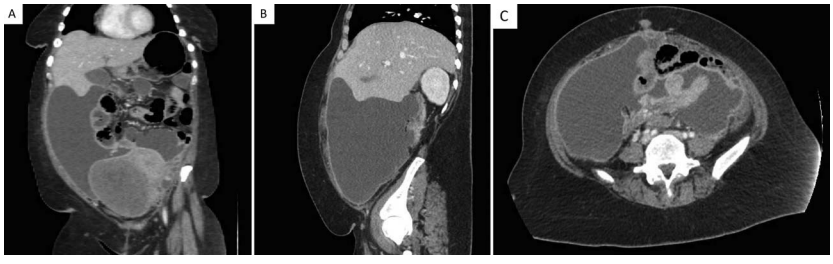

Figure 1. Abdominal and pelvic computed tomography (A) coronal, (B) sagittal, and (C) axial images showing large-volume ascites, smooth peritoneal thickening with peripheral hyperenhancement suggestive of peritonitis.

Table 1. Reported cases of spontaneous bacterial peritonitis because of *Actinomyces* species

Author, year [ref]	Geographic region	No. of cases	Age (y)	Sex	Presenting symptoms	Unique factors (precipitating factors)	Intervention	Length of stay/outcome	Final diagnosis
Flores-Franco et al, 2007[6]	Mexico	1	38	Female	2-mo history of abdominal distention and pain progressing to fever, jaundice, nausea, and vomiting	History of alcohol abuse	Piperacillin-tazobactam for 2 wk and then amoxicillin for unspecified "long course"	2 wk/ asymptomatic on 6-mo follow-up	Spontaneous peritonitis caused by actinomycetes
Eenhuis et al, 2016[5]	Netherlands	1	42	Female	Several weeks of abdominal distension and pain, intermenstrual bleeding, nausea, and fever	Intrauterine contraceptive device	Explorative laparotomy with purulent drainage; subsequent ceftriaxone, gentamicin, and metronidazole therapy; 2 therapeutic paracenteses	6 wk/oral antibiotics for 6 mo	Spontaneous pelvic-abdominal peritonitis because of *Actinomyces*
Xu et al, 2021 [9]	United States	1	51	Female	Chronic abdominal pain with worsening ascites. Afebrile/ stable vitals	Alcoholic cirrhosis, previous ascites, and previous SBP	Paracentesis with ascetic peritoneal fluid analysis; treatment with oral amoxicillin	Unspecified/ amoxicillin 1 g TID for 6 mo	Spontaneous bacterial peritonitis because of *Actinomyces*
Everett et al, 2023 [present case]	United States	1	46	Female	1 month of progressive fatigue, malaise, nausea, vomiting, and increasing abdominal pain and distension	Alcohol use and uterine fibroids	Piperacillin-tazobactam for 10 d; therapeutic paracentesis with placement of 3-d abdominal drain; 6-mo treatment with amoxicillin-clavulanate	10 d/oral antibiotics for 6 mo	Spontaneous bacterial peritonitis because of *Actinomyces*

Imaging studies such as contrast-enhanced CT scan or magnetic resonance imaging of the abdomen and pelvis may aid in diagnosing the abdominopelvic actinomycosis. On imaging, it may present with infiltrative abdominal mass with heterogeneous contrast enhancement with thickened peritoneum and bowel wall can suggest actinomycosis, especially in female patients presenting with fever, leukocytosis, and history of intrauterine contraceptive devices use.[8,12] However, these imaging findings lack specificity and can mimic inflammatory bowel disease, intestinal tuberculosis, or intra-abdominal malignancy.[12,13] The diagnosis was challenging in our case as our patient was afebrile without any intra-abdominal or pelvic mass.

The gold standard test for abdominal actinomycosis is the microbial culture by CT-guided aspiration of the fluid collection with or without a core biopsy of mass.[14] On histopathology, it will show sulfur granules with multiple Gram-positive branching hyphae supporting the diagnosis of abdominal actinomycosis.[14] The culture of the intra-abdominal fluid aspiration is challenging because it requires fresh samples that are transported in anaerobic containers and processed immediately. It may need prolonged incubation time and still have a negative result 76% of the time.[8,14,15] Gram staining of the infected tissue or pus is more sensitive than the culture.[13] The presence of sulfur granules is consistent with actinomycosis but only seen in 50% of the cases.[13,14] In our case, ascitic fluid culture grew *Actinomyces* twice on specimens collected 4 days apart.

On review of records, 3 cases of actinomycosis presented as spontaneous bacterial peritonitis[1,2,9] (Table 1). All the cases were female. Two patients have a history of alcohol abuse such as in our case, and 1 patient had a history of intrauterine device use and abnormal vaginal discharge and presented with spontaneous bacterial peritonitis. Interestingly, our case differs from previous cases because of uterine fibroids without an intrauterine device as a possible nidus of the infection. Therefore, a bulky uterus, whether because of fibroids or long-term use of intrauterine devices, may be the basis for the pathological mechanism by which *Actinomyces* is enabled to spread and invade tissue.

Successful treatment of abdominopelvic actinomycosis with long-term intravenous penicillin G followed by oral penicillin V

for 4–6 months or oral amoxicillin has been reported in the literature.[8] Concurrent drainage of abscess(es) or the fluid collection or resection of infected necrotic tissue reduces the bacterial burden, improves antibiotic efficacy, shortens treatment duration, and reduces the chances of recurrence and future complications.[8,16,17] Patients with sizeable intra-abdominal abscesses with complications causing clinical decline may need exploratory surgery in addition to intravenous antibiotics to improve outcomes. Our patient benefited from a 3-day percutaneous catheter drainage, which facilitated the drainage of infected peritoneal fluid and allowed time for loculations to degrade, along with the action of intravenous antibiotic therapy. Our case supports that short-term percutaneous drainage should be encouraged to reduce bacterial burden, enhance antibiotic activity, decrease recurrence rates, and shorten antibiotic therapy duration.[18–20]

In conclusion, abdominal actinomycosis should be included as a differential diagnosis when a young female presents with spontaneous bacterial peritonitis without any underlying chronic liver disease. Assertive removal of necrotic tissue and surgical drainage in case of a thick intra-abdominal abdominal fluid collection with long-term antibiotics is crucial to minimize the risk of recurrence and further complications.

DISCLOSURES

Author contributions: M. Everett and A. Kheraj: drafted the case report and acquired available literature; J. Redfield and A. Kumar: cared for the patient and reviewed the case report; NS Ahmed: reviewed the case report; JP Kothadia: drafted the case report and critically reviewed it for important intellectual content and is the article guarantor.

Financial disclosure: None to report.

Informed consent was obtained for this case report.

Received January 22, 2024; Accepted March 28, 2024

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