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【 CASE REPORT 】

Edwardsiella tarda Bacteremia with Psoas and Epidural Abscess as a Food-borne Infection: A Case Report and Literature Review

Kiyozumi Suzuki, Mitsuru Yanai, Yuta Hayashi, Hiromasa Otsuka, Kimitoshi Kato and Masayoshi Soma

Abstract:

Edwardsiella tarda is commonly isolated from aquatic environments and a variety of animals. We present the first case of *E. tarda* bacteremia with psoas and epidural abscess. The patient was a 65-year-old woman with recurrent gastric cancer who had frequently consumed raw fish and grilled eel. She was successfully treated with antimicrobials and surgery. We also review reports published in English regarding *E. tarda* bacteremia in Japan and the experience at our hospital. On the basis of this review, we conclude that the major underlying disease leading to *E. tarda* bacteremia is malignancy and that the gastrointestinal tract is the most commonly affected organ. The overall mortality rate due to *E. tarda* bacteremia in our review was 38.1% (8/21). Although *E. tarda* bacteremia is rare, clinicians should be aware of this fatal food-borne infection.

Key words: *Edwardsiella tarda* bacteremia, psoas abscess, spinal epidural abscess, vertebral osteomyelitis, urinary tract infection, food-borne infection

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Introduction

Edwardsiella tarda, a member of the family Enterobacteriaceae, is a motile, facultatively anaerobic, Gram-negative rod that has been isolated from fresh and brackish water environments and a variety of animals (reptiles, amphibians, and fish, including catfish and eels) (1, 2). In humans, *E. tarda* is a rare pathogen that mainly causes gastroenteritis as a food-borne infection (3). Extraintestinal *E. tarda* infections have also been reported infrequently. The risk factors for extraintestinal infections include hepatobiliary diseases, malignancy, and diabetes mellitus (4).

We describe the first case of *E. tarda* bacteremia with psoas abscess, vertebral osteomyelitis, and spinal epidural abscess. The patient had frequently eaten raw fish and grilled eel. She was simultaneously diagnosed with recurrent gastric cancer presenting as peritoneal dissemination. We also review the published English case reports of *E. tarda* bacteremia in Japan and the experience at our hospital.

Case Report

A 65-year-old Japanese woman was admitted to our hospital with a fever, lumbago, and right groin pain that had persisted for 2 weeks. The patient had undergone total gastrectomy with cholecystectomy and splenectomy for advanced gastric cancer (stage IIIC) three years earlier followed by oral chemotherapy for one year and had since been relapse-free. She had chronic diarrhea. She drank 360 mL of *sake* (Japanese rice wine) per day. A dietary history revealed that she had frequently eaten *sashimi* (sliced raw fish) and grilled eel, including within a few days prior to the onset of symptoms.

On a physical examination, the patient appeared ill, with a temperature of 36.7°C, pulse of 67 beats/min, blood pressure of 83/51 mmHg, and a respiratory rate of 18 breaths/min. The cardiovascular and respiratory findings were unremarkable. There was bilateral costovertebral angle tenderness and knocking pain of the lumbar spine. There was no

Division of General Medicine, Department of Internal Medicine, Nihon University School of Medicine, Japan
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Correspondence to Dr. Mitsuru Yanai, yanai.mitsuru@nihon-u.ac.jp

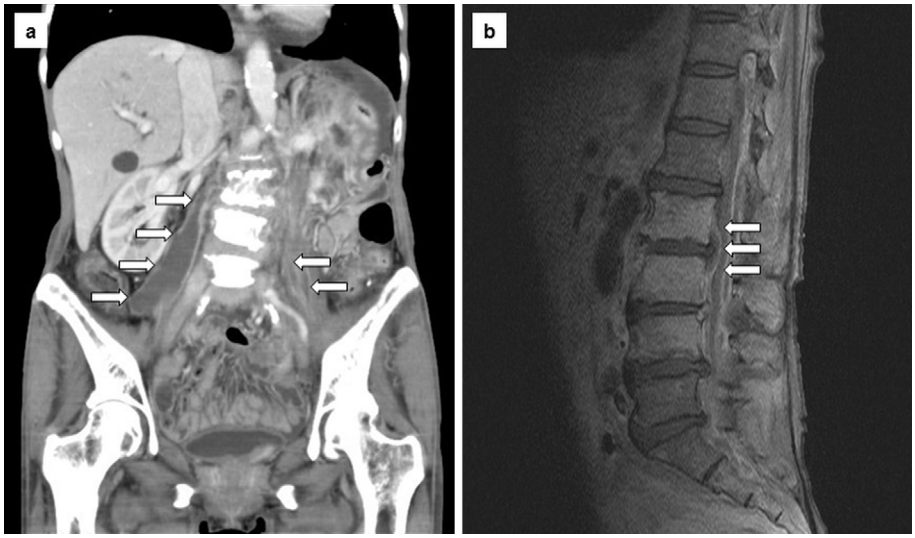

Figure. **(a) A coronal contrast-enhanced computed tomography scan of the abdomen on admission showing a large, fluid-containing lesion with rim enhancement in the right psoas muscle and similar small lesions in the left psoas muscle (arrows). (b) T1-weighted magnetic resonance imaging of the lumbar spine with gadolinium enhancement on day 10 showing high intensity at the L2 to L4 vertebrae and epidural lesion with rim enhancement (arrows).**

abdominal tenderness. An initial hematological investigation revealed a white blood cell count of 13.7×10^3/μL with 86% neutrophils, hemoglobin 9.9 g/dL, urea nitrogen 30.2 mg/dL, creatinine 0.91 mg/dL, albumin 1.7 g/dL, and C-reactive protein 19.8 mg/dL. Liver enzyme levels were normal. Urinary sediment revealed a white blood cell count of >100/high-powered field (HPF) and a red blood cell count of 10 to 19/HPF.

Abdominal contrast-enhanced computed tomography (CT) revealed bilateral renal enlargement with perinephric stranding and a bilateral psoas abscess (Figure a). Magnetic resonance imaging (MRI) of the lumbar spine revealed vertebral osteomyelitis on the L2 to L4 vertebral bodies and disk space.

Empiric antimicrobial therapy with intravenous ceftriaxone (2 g every 24 hours) was started for urinary tract infection, psoas abscess, and vertebral osteomyelitis. Surgical drainage was not initially performed because of the high risk of postoperative complications due to hypoalbuminemia. The next day, the blood cultures became positive for a Gram-negative rod identified as *Edwardsiella tarda* by the RAISUS (Nissui Pharmaceutical, Tokyo, Japan) with susceptibility to ampicillin/sulbactam (minimum inhibitory concentration ≤4 μg/mL), piperacillin/tazobactam (≤8 μg/mL), cefazoline (≤2 μg/mL), cefmetazole (≤8 μg/mL), cefotaxime (≤1 μg/mL), cefepime (≤1 μg/mL), aztreonam (≤4 μg/mL), meropenem (≤1 μg/mL), amikacin (≤8 μg/mL), and levofloxacin (≤1 μg/mL) and resistance to gentamicin (>8 μg/mL) and trimethoprim/sulfamethoxazole (>80 μg/mL). The organism was also isolated from urine culture on the day of admission but not from stool culture.

On day 5, based on the susceptibility testing, treatment with ceftriaxone was changed to intravenous cefmetazole (1 g every 6 hours). On day 24, the patient underwent surgical drainage and discectomy because the bilateral psoas abscess was gradually increasing in size and a spinal epidural abscess appeared (Figure b). No organisms grew from the abscess cultures. On day 38, she developed right lower abdominal pain. Abdominal CT revealed ileocecal diverticulitis, and cefmetazole was changed to meropenem (1 g every 8 hours). She underwent a barium enema and colonoscopy, which revealed multiple colon strictures. The pathological tissue revealed malignant cells in the membrane of the rectum above the peritoneal reflection, which were considered to be due to peritoneal dissemination of recurrent gastric cancer. Treatment with meropenem was continued, and her symptoms gradually improved. On day 85, she was discharged after 12 weeks of intravenous antimicrobial therapy.

Discussion

To our knowledge, this is the first case of *E. tarda* bacteremia with psoas abscess, vertebral osteomyelitis, and spinal epidural abscess. In humans, *E. tarda* infections can be divided into two broad categories: gastrointestinal and extraintestinal. In >80% of all cases reported, *E. tarda* is cultured from fecal specimens from patients in either the symptomatic or the asymptomatic carrier state (2). However, severe extraintestinal infections have also been reported, including bacteremia, wound infection, necrotizing fasciitis, hepatobiliary infection (liver abscess, cholecystitis), meningitis, osteomyelitis, urinary tract infection, endocarditis, tubo-ovarian abscess, salpingitis, brain abscess, and empyema (1-10). Historically, this organism is commonly found in both fresh and brackish water environments and in a variety of animals (reptiles, amphibians, and fish, includ-

Table. **Summary of the 21 Cases of *Edwardsiella tarda* Bacteremia Reported in Japan: 16 Cases Reported in English and 5 Cases from Our Hospital over the Past 9 Years.**

Case no.	Age (y), Sex	Symptoms	Underlying disease	Complication/Focus	Other sources of isolation	Treatment	Surgery	Outcome	Reference no. or our hospital case
1	69, F	Fatigue, generalized edema	Uterine cancer (intraurethral stent)	Urosepsis	Urine	Cefoperazone	No	Died	6
2	56, F	Fever, diarrhea, vomiting, abdominal pain	Acute myeloid leukemia, (chemotherapy), rectal cancer	Gastroenteritis	Stool	Cefmetazole and gentamicin	No	Recovered	14
3	85, F	Fever, nausea, diarrhea	Thyroid cancer (thyroidectomy), diabetes mellitus	Gastroenteritis, liver abscess	Stool, pus	Meropenem, levofloxacin, cefoperazone/sulbactam, cefcapene pivoxil	Yes; percutaneous drainage	Recovered	15
4	77, M	NR	Cerebral infarction	Unclear	NR	NR	NR	Recovered	15
5	79, M	NR	NR	Liver abscess	NR	NR	NR	Recovered	15
6	70, F	NR	NR	Cholecystitis	NR	NR	NR	Recovered	15
7	89, F	NR	Advanced colon cancer	Unclear	NR	NR	NR	Recovered	15
8	61, M	NR	NR	Colon diverticulitis	NR	NR	NR	Recovered	15
9	87, M	NR	Liver cancer	Unclear	NR	NR	NR	Died	15
10	62, M	NR	Abscess around the subscapularis muscle	Infected aneurysm	NR	NR	NR	Died	15
11	92, M	NR	Advanced colon cancer	Unclear	NR	NR	NR	Died	15
12	88, F	NR	Cholangiocarcinoma	Unclear	NR	NR	NR	Died	15
13	75, F	NR	NR	Cholecystitis	NR	NR	NR	Recovered	15
14	101, F	NR	Bile duct stone	Acute cholangitis	NR	NR	NR	Recovered	15
15	58, M	NR	Gallbladder cancer	Gallbladder	NR	NR	NR	Died	15
16	78, M	Fever, chill	Gastric cancer (pancreatoduodenectomy)	Cholangitis	None	Cefmetazole	No	Recovered	16
17	73, F	Abdominal pain	Malignant lymphoma of small intestine	Peritonitis associated with small-intestinal perforation	None	Cefmetazole and amikacin	No (inoperable)	Died	Our hospital
18	80, M	Fever, nausea, right hypochondralgia	Choledocholith, hepatitis C	Cholecystitis	None	Meropenem, cefotaxime	No	Recovered	Our hospital
19[a]	71, M	Fever	Gastric cancer with liver metastasis (gastrectomy, chemotherapy)	Unclear	None	Cefmetazole	No	Recovered	Our hospital
20[b]	69, M	Fever, abdominal pain	Biliary cancer (stenting, chemotherapy)	Cholangitis	Bile[c]	Cefotaxime and vancomycin, meropenem and vancomycin	Yes; endoscopic nasobiliary drainage, percutaneous transhepatic gallbladder drainage	Died	Our hospital
21	65, F	Fever, chills, lumbago, chronic diarrhea	Gastric cancer (gastrectomy, cholecystectomy, splenectomy, chemotherapy), alcoholism	Psoas and epidural abscess, vertebral osteomyelitis, urosepsis	Urine	Ceftriaxone, cefmetazole, meropenem	Yes; surgical drainage, discectomy	Recovered	Our hospital (present case)

[a]α-*Streptococcus* was isolated concurrently with *E. tarda*. [b]*Klebsiella pneumoniae* was isolated concurrently with *E. tarda*. [c]*Escherichia coli*, *K. pneumoniae*, *Enterococcus faecium*, and *Candida glabratawere* isolated concurrently with *E. tarda*.

NR: not reported

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ing catfish and eels), and it can also cause disease in these animals (1-3). *E. tarda* has been isolated from 72% of farm-cultured eels in the Republic of Korea (11). In contrast, *E. tarda* is not a member of the normal human flora, being isolated from only 0.0073% of fecal specimens from healthy Japanese (12). Therefore, *E. tarda* infection is considered to be food-borne, transmitted to humans by ingestion of contaminated food such as raw seafood (3).

Risk factors for *E. tarda* infection are wounding in aquatic environments, exposure to infected animals, dietary habits, and chronic underlying conditions (2). *Aeromonas* species (such as *Aeromonas hydrophila*) and *Vibrio vulnificus* are also known as aquatic pathogens. *Aeromonas* spp. are most commonly isolated from warm fresh and brackish waters, whereas *V. vulnificus* is most commonly isolated from brackish and marine environments (13). In humans, these pathogens can cause serious infections, such as bacteremia and necrotizing fasciitis, following ingestion of raw seafood or aquatic injury or exposure. Most patients infected with these pathogens are immunocompromised hosts, notably those with liver cirrhosis. Therefore, the clinical characteristics of *E. tarda* human infections and the environmental risks are similar to those of *Aeromonas* spp. and *V. vulnificus*.

In our patient, *E. tarda* was isolated from both blood and urine cultures. The patient did not have close contact with domestic or wild animals or any marine exposure prior to the onset of infection. However, she had frequently eaten *sashimi* and grilled eel. Therefore, the organism may have caused gastrointestinal colonization through the patient's ingestion of raw fish and grilled eels and may have resulted in retrograde urinary tract infection (6), although a stool culture was negative for the pathogen.

In previous reports, the major underlying conditions in *E. tarda* bacteremia were hepatobiliary diseases (liver cirrhosis, gallbladder stones, and ethanol abuse), malignancy (hepatobiliary and gastrointestinal tract), and iron overload states (sickle cell disease, leukemia, and neonatal state) (2, 3). Although *E. tarda* bacteremia is a rare complication (<5%), the mortality rate is high, at nearly 50% (1-3). *E. tarda* is usually susceptible to most antimicrobials for Gram-negative bacteria except colistin and polymyxin B (1, 2). The most frequently reported geographical area of *E. tarda* bacteremia cases is Japan, followed by the United States and the Republic of China (3). Japan has one of the world's highest rates of seafood consumption. We reviewed all case reports of *E. tarda* bacteremia in Japan published in English using PubMed. To date, 16 such cases have been reported (6, 14-16). In addition, our hospital encountered five cases of *E. tarda* bacteremia from 2008 to 2016 (Table). The median age of the 21 patients with *E. tarda* bacteremia was 75 years (range, 56-101 years), and 11 patients were men (52.4%). Almost all patients with *E. tarda* bacteremia have significant underlying diseases; the major underlying disease was malignancy [13 of 17 (76.5%)], and the gastrointestinal tract was the most commonly affected organ [7 of 13 (53.8%)], followed by the hepatobiliary tract [4 of 13 (30.8%)]. Three patients required surgical treatment (one case was inoperable), and the overall mortality in our review was 38.1% (8 of 21 cases). Three patients (cases 16, 19, and 21 in Table) had previously undergone gastrectomy. We speculate that gastrectomy may increase the risk of *E. tarda* bacteremia, as it increases the risk of typhoid fever, due to a reduction of gastric acid secretion (17). In our patient, post-gastrectomy state and the undiagnosed recurrent gastric cancer presenting as peritoneal dissemination probably contributed to the development of *E. tarda* bacteremia, and chronic alcohol consumption may also have contributed. Consequently, clinicians should consider underlying immunosuppressive conditions, including recurrent cancer, in patients with *E. tarda* bacteremia.

In conclusion, we have described the first case of *E. tarda* bacteremia with psoas abscess, vertebral osteomyelitis, and spinal epidural abscess, which was successfully treated with antimicrobials and surgery. Although *E. tarda* is a rare pathogen, it can cause fatal infections, like those caused by *Aeromonas* spp. and *Vibrio vulnificus*. Avoidance of consumption of raw or undercooked food is a simple measure to prevent fatal food-borne infections, and it is prudent for clinicians to emphasize the importance of this, especially in patients at high risk.

The authors state that they have no Conflict of Interest (COI).

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