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BACTERAEMIA WITH HEPATIC ABSCESS DUE TO ACTINOMYCES ODONTOLYTICUS ASSOCIATED WITH GASTROINTESTINAL FOREIGN BODY

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ABSTRACT

Background: Hepatic actinomycosis is a rare intra-abdominal infection, particularly caused by *Actinomyces odontolyticus*. Liver abscess due to a perforating gastrointestinal foreign body is also extremely rare. We report the first case of bacteraemia with a liver abscess caused by *A. odontolyticus*, as evidenced by both positive blood culture and abscess fluid culture, associated with a perforating foreign body from a fish bone.

Case report: An 86-year-old male with dementia was admitted with a high fever of 39.5°C and right upper quadrant abdominal pain. Abdominal ultrasound revealed a right liver abscess. Both blood culture and abscess fluid culture identified *A. odontolyticus* by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry. After percutaneous drainage, the patient's abdominal pain increased. Contrast-enhanced computed tomography scan revealed a fish bone foreign body penetrating from the duodenum into the liver. The patient underwent laparoscopic surgery for foreign body removal and abscess drainage, followed by treatment with intravenous piperacillin/tazobactam for 21 days, then oral amoxicillin/clavulanate for 3 weeks. The patient was discharged in stable condition.

Conclusion: This case emphasizes the importance of computed tomography scan when a liver abscess does not respond to conventional treatment, especially in elderly patients with dementia at risk of foreign body ingestion. Actinomyces spp. should be considered in cases of liver abscess of unknown aetiology.

KEYWORDS

Actinomyces odontolyticus, liver abscess, gastrointestinal body foreign, bacteraemia, MALDI-TOF MS

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LEARNING POINTS

- Always consider gastrointestinal foreign bodies: In elderly patients with dementia presenting with liver abscesses that do not respond to conventional treatment, foreign body perforation should be suspected and actively investigated using a contrast-enhanced computed tomography scan.
- *Actinomyces spp.* should be considered: In cases of liver abscess of unknown aetiology, Actinomyces spp. should be considered - a slow-growing anaerobic bacterium requiring matrix-assisted laser desorption/ionization matrix-assisted laser desorption/Ionization time-of-flight mass spectrometry for accurate species identification and targeted antibiotic therapy guidance.
- Combined treatment is the key to success: Optimal management requires a combination of three elements - surgical removal of the foreign body, thorough abscess drainage, and prolonged beta-lactam antibiotics to prevent recurrence.

INTRODUCTION

Actinomycosis is an infection caused by *Actinomyces spp.*, a type of Gram-positive anaerobic bacterium commonly found in the oropharynx and gastrointestinal tract[1]. Hepatic actinomycosis accounts for approximately 15% of abdominal actinomycosis cases. It typically results from bacterial spread from the abdomen or hematogenous dissemination via the portal vein following mucosal damage from surgery or endoscopy, ulceration, foreign bodies, intra-abdominal infection, or immunosuppression[2,3]. *Actinomyces odontolyticus* is less commonly reported than *Actinomyces israelii*, with simultaneous positive blood culture and abscess fluid culture being scarce[2,4]. Gastrointestinal foreign body perforation leading to liver abscess accounts for <1% of cases and is difficult to diagnose due to non-specific symptoms[5,6]. We report a rare case of bacteraemia with a liver abscess caused by *A. odontolyticus*, as evidenced by both positive blood culture and abscess fluid culture, resulting from a perforated fish bone from the duodenum.

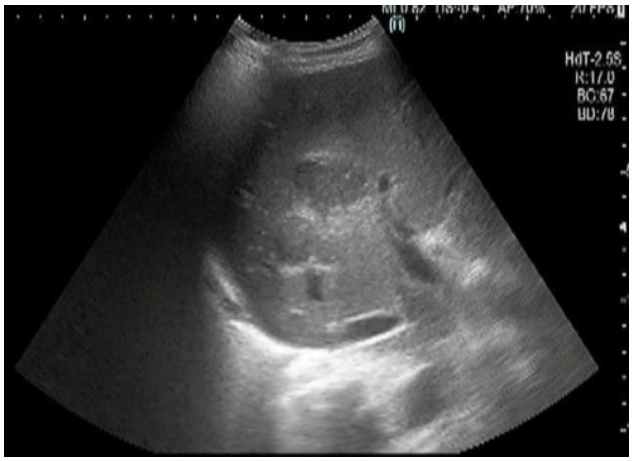


Figure 1. Abdominal ultrasound on day 1. Right liver showing a mixed echogenic mass measuring 52 × 41 mm consistent with liver abscess, no ascites.



Figure 2. Upright abdominal X-ray on day 1 showing no air-fluid levels, no free air under the diaphragm.

CASE DESCRIPTION

An 86-year-old male patient with a 5-year history of dementia was admitted with a high fever of 39.5°C, chills, and right upper quadrant abdominal pain for 4 days.

April 11, 2024 (day 0): The patient developed a high fever of 39.5°C, chills, right upper quadrant abdominal pain, and nausea.

April 12, 2024 (day 1): The patient was admitted to our Department of Tropical Diseases. Physical examination: The patient was alert but occasionally confused. Pulse: 102 beats/minute. Blood pressure: 125/60 mmHg. Temperature: 39.30C. Tenderness was noted in the right upper quadrant. There were no peritoneal signs, hepatomegaly, or questionable liver fluctuation sign. No meningeal signs or focal neurological signs were observed. Laboratory tests revealed elevated inflammatory markers, including white blood cells at 26.9 $\times 10^9$/l, C-reactive protein (CRP) at 203 mg/l, and procalcitonin at 12.4 ng/ml. Abdominal ultrasound revealed a mixed echogenic mass in the right liver measuring 52 × 41 mm, suggestive of an abscess-abdominal and chest X-rays: regular *(Fig. 1 and 2)*. Initial diagnosis: Right liver abscess. Blood culture was obtained before antibiotic administration.

Treatment: The patient received empirical antibiotic therapy with intravenous ceftazidime 4 g/day, analgesia, and antipyretics.

April 13, 2024 (day 2): The patient underwent percutaneous drainage of the liver abscess, yielding thick yellow purulent fluid *(Fig. 3)*. Liver abscess fluid analysis showed: 1502 white blood cells (83% neutrophils), protein 32 g/l, and a positive



Figure 3. Liver abscess drainage fluid on day 1.

Rivalta test. A sample of abscess fluid was sent for culture.

April 14, 2024 (day 3): The patient experienced increased right upper quadrant and epigastric pain, nausea, and a fever of 38.5°C despite abscess drainage. The drainage catheter continued to drain 100 ml/day of yellow fluid. Physical examination: soft abdomen, tenderness in the epigastrium and right upper quadrant, suspected peritoneal signs.

The patient underwent contrast-enhanced abdominal computed tomography (CT) scan, showing a right liver abscess and a foreign body penetrating from the duodenum into the right liver *(Fig. 4)*.

Re-examination of patient history: The patient had consumed fish 4 days before admission. After consultation, the patient was scheduled for laparoscopic foreign body removal.

Surgery: Three-trocar laparoscopic surgery. The liver appeared dark with a smooth surface. The colon and duodenum were adherent to the inferior surface of the liver; upon separation, turbid fluid, pseudomembrane, and a fish bone foreign body penetrating from the duodenum into the parenchyma of segment VI of the right liver were found *(Fig. 5)*. Procedure: duodenotomy for foreign body removal, duodenal closure, irrigation, placement of subhepatic drain, and trocar site closure.

Postoperative diagnosis: Localized peritonitis - liver abscess due to a perforating gastrointestinal foreign body.

April 15, 2024 (day 4): The patient continued to have a fever of 38.3°C. Amikacin 1 g/day intravenously was added. Inflammatory markers: white blood cells 23 $\times 10^3$/µl, neutrophils 78%, CRP 198 mg/l, procalcitonin 10.9 ng/ml. A second blood culture was obtained.

April 16, 2024 (day 5): Blood culture results (from D1) resulted in *A. odontolyticus* identified by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) *(Fig. 6)*. Antibiotic susceptibility: sensitive to penicillin, amoxicillin/clavulanate, ampicillin/sulbactam, piperacillin/tazobactam, carbapenem, clindamycin, doxycycline; resistant to erythromycin, clarithromycin.

Abscess fluid culture: A. odontolyticus with similar antibiotic susceptibility pattern was isolated and identified by MALDI-TOF MS. Antibiotic therapy was adjusted to piperacillin/tazobactam 4.5 g administered intravenously four times daily. Amikacin and ceftazidime were discontinued.

April 17-19, 2024 (days 6-8): The patient became afebrile (36.5°C), and liver abscess drainage gradually decreased (5 ml/day). Subhepatic drain was removed on day 8. Second

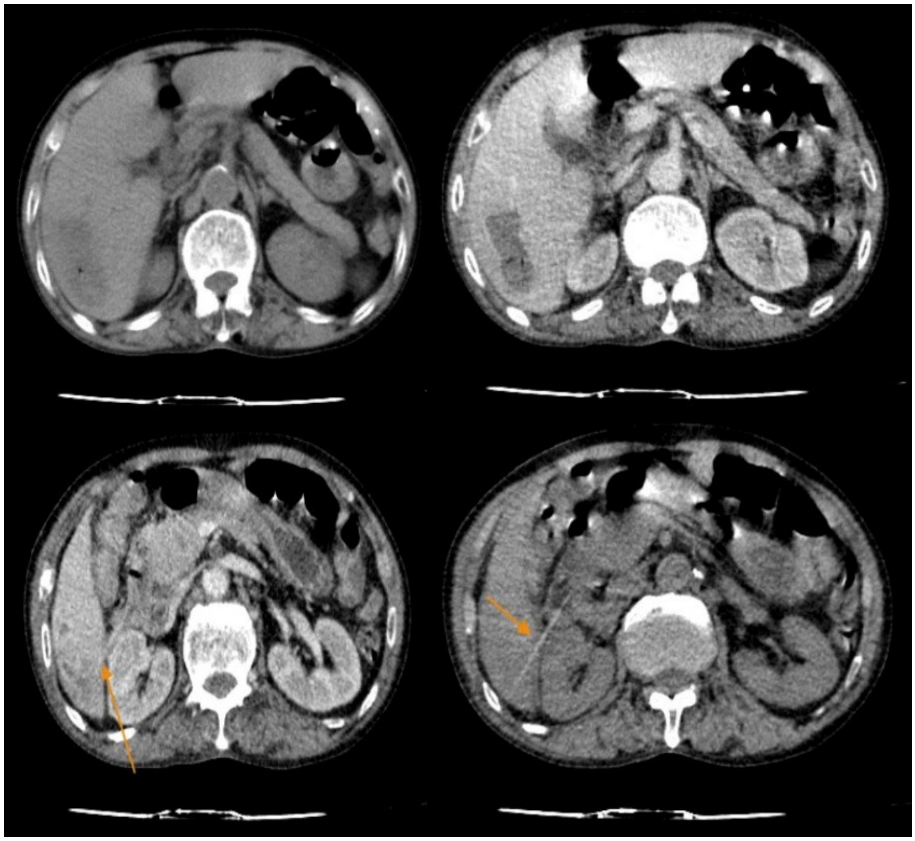


Figure 4. Abdominal computed tomography scan on day 3 showing a right liver abscess measuring 42 × 39 mm, with a foreign body penetrating from the small bowel into the right liver parenchyma.

blood culture result (day 4): negative.

April 20, 2024 (day 9): Temperature 37.2°C, liver abscess drainage ceased. The liver abscess drain was removed.

April 21-May 6, 2024 (days 10-25): Piperacillin/tazobactam was continued for a total of 21 days. Inflammatory markers progressively decreased, and white blood cells and CRP levels normalized.

The patient was discharged on day 25 in a stable condition. Prescription: amoxicillin/clavulanate 875/125 mg × 2 times/day for 3 weeks for outpatient follow-up.

DISCUSSION

A. odontolyticus is a Gram-positive anaerobic bacterium found in the oropharynx, gastrointestinal tract, and female genital tract[1]. Hepatic actinomycosis accounts for approximately 15% of abdominal actinomycosis cases and about 5% of all actinomycosis cases[2,3]. A 60-year literature review on hepatic actinomycosis by Maraki et al. (2022) revealed only 64 reported cases of hepatic actinomycosis, including 4 cases confirmed by liver tissue after death[2].

Bacteraemia due to *A. odontolyticus* is very rare. Ali et al. reported 15 cases of *A. odontolyticus* bacteraemia over a 5-year period (2016-2020) in Qatar[7]. Blood culture isolation of *Actinomyces spp.* is uncommon due to its anaerobic nature and slow growth. Our case is sporadic in the literature as both blood and abscess fluid cultures isolated *A. odontolyticus*, further confirming the causative bacterial pathogen of the liver abscess. Compared to the study by Kumar et al.[4] *(Table 1)*, our case is similar in terms of bacterial species and abscess location. However, it also involves foreign body perforation complications that require surgical intervention.

Liver abscess due to a perforating foreign body is extremely rare (<1%)[5,6]. Sharp objects, such as fish bones, needles, and toothpicks, can perforate the gastrointestinal mucosa, commonly in the stomach, duodenum, ileocecal region, or sigmoid colon[8,9]. In patients with dementia or elderly individuals, obtaining a history of foreign body ingestion is very difficult, making the diagnosis easily overlooked.



Figure 5. Fish bone foreign body after surgery on day 3.

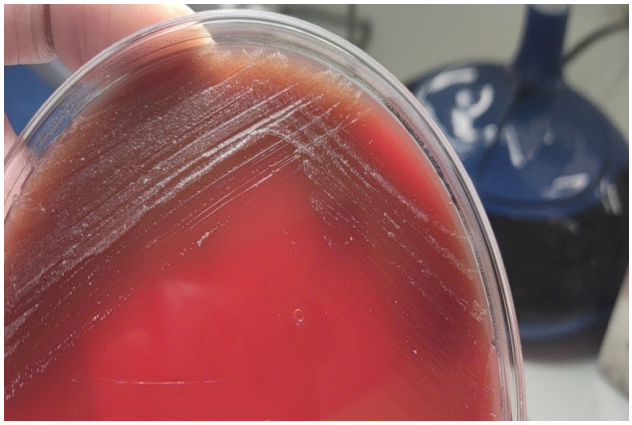


Figure 6. Colony morphology of Actinomyces odontolyticus on blood agar. Small, dry, greyish-white colonies with rough, irregular surface.

Bacteria can invade the liver through the following mechanisms: direct spread from the abdomen (as in our case), or hematogenous spread via the portal vein following mucosal damage[3]. The right liver is the most common site of involvement (62.5%), with abscess-type lesions (56.1%)[2], which is consistent with this case.

Abdominal ultrasound has limitations in detecting penetrating foreign bodies. Abdominal CT scan is superior, as it shows bone as hyperdense and the trajectory of the foreign body[10]. This case illustrates the important role of CT imaging when:

Liver abscess with clinical symptoms not responding after drainage.

Feature	Kumar et al.	Our case
Abdominal pain	Yes	Yes
Fever	Yes	Yes
Peritoneal signs	No	Yes
Intra-abdominal foreign body	No	Fish bone penetrating duodenum
Liver lesion	Right liver abscess. Portal vein thrombosis	Right liver abscess
Blood culture	*A. odontolyticus*	*A. odontolyticus*
Liver abscess fluid culture	*A. odontolyticus*	*A. odontolyticus*
White blood cells (G/l)	31	26.9
CRP (mg/l)	107	203
Treatment	Piperacillin/tazobactam, penicillin, abscess drainage	Piperacillin/tazobactam, abscess drainage, surgical foreign body removal

Table 1. Comparison of this case with Kumar et al.'s case[4].

Patient develops new surgical abdominal symptoms.

Clinical suspicion of foreign body (history of fish consumption, dementia).

Actinomyces spp. are sensitive to penicillin and beta-lactams. Treatment includes intravenous antibiotics for 2-6 weeks, followed by prolonged oral maintenance for 6-12 months[2,3]. However, in cases involving foreign bodies, surgical removal of the foreign body is mandatory to achieve optimal therapeutic efficacy. Abscess drainage plays an important role, but it cannot remove the foreign body.

This patient received intravenous piperacillin/tazobactam for 21 days, followed by oral amoxicillin/clavulanate for 3 weeks. The treatment duration was shortened compared to previous recommendations and studies because: (1) the foreign body was removed entirely, (2) thorough drainage was achieved, and (3) a good clinical response was achieved. However, such cases still require long-term follow-up to detect recurrence.

Clinical recommendations:

In elderly patients with dementia presenting with a liver abscess of unknown aetiology or not responding after drainage, a gastrointestinal foreign body should be considered.

Abdominal CT scan plays a crucial role in detecting foreign bodies and guiding surgical treatment.

When *Actinomyces spp.* is isolated from blood or abscess fluid, MALDI-TOF MS or 16S ribosomal ribonucleic acid should be used for accurate species identification.

Treatment should be combined: foreign body removal (if present), abscess drainage, and prolonged antibiotics.

CONCLUSION

This is a rare case of bacteraemia with a liver abscess caused by *A. odontolyticus*, as evidenced by both positive blood culture and abscess fluid culture, resulting from a perforating fish bone foreign body. The case highlights the importance of CT imaging in diagnosing gastrointestinal foreign bodies, particularly in patients with risk factors who do not respond to treatment and develop a liver abscess. Successful treatment requires the combined removal of surgical foreign bodies, drainage, and prolonged antibiotics.

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