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Case Report

Severe hemolytic and emphysematous liver abscess in patient with sepsis due to *Edwardsiella tarda*

Sy Q Ton[1], Hai Q Nguyen[1], Minh K Vu[1]

[1] *Becamex International Hospital, Thuan An City, Binh Duong Province, Viet Nam*

Abstract

Introduction: *Edwardsiella tarda* is a Gram-negative facultative anaerobe commonly isolated from fish and reptiles. This bacterium infrequently causes disease in humans, but the mortality rate is very high when associated with sepsis.

Case presentation: This case report describes an 80-year-old female patient with *Edwardsiella tarda* infection who rapidly deteriorated, ultimately succumbing to infection within 9 hours after presenting to the emergency department. This patient was diagnosed with sepsis, hemolytic, emphysematous liver abscess.

Conclusions: This report underscores the potential fatality and rapid progression of *Edwardsiella tarda* infection, highlighting the importance of early recognition and intervention.

Key words: *Edwardsiella tarda*; hemolytic; emphysematous; sepsis; case report.

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Introduction

Edwardsiella tarda (*E. tarda*) is a Gram-negative bacterium belonging to the family Hafniaceae. It was first described by Ewing *et al*. in 1965 [1], and previously classified under the family Enterobacteriaceae. *E. tarda* has recently been reclassified into Hafniaceae based on genomic analyses [2]. The genus *Edwardsiella* comprises two main pathogenic groups, with *E. tarda* accounting for the vast majority of human infections, predominantly in subtropical regions; while *Edwardsiella ictaluri* and *Edwardsiella piscicida* primarily causing disease in fish [3]. *E. tarda* human infections are mainly present as gastroenteritis, and often resolve spontaneously. However, extraintestinal and systemic infections have been reported, particularly in immunocompromised hosts. Although *E. tarda* is susceptible to many antibiotics, a high mortality rate (approximately 44.6%) has been reported with sepsis [4]. We report a case of *E. tarda* infection that presented sepsis, severe hemolytic, emphysematous liver abscess in a previously healthy 80-year-old woman.

Case presentation

An 80-year-old woman was present at our hospital with a 3-day history of back pain and oliguria. The patient was admitted at the Emergency Department with abdominal pain around the navel, vomiting, and hemoglobinuria. The patient had a history of hypertension, with no documented evidence of chronic liver disease, diabetes, or immunodeficiency. According to her family, she consumed freshwater aquatic products approximately once a week, but had no habit of eating undercooked or raw aquatic animals or amphibians. She had no recent travel, no known contact with sick individuals, and no exposure to animals or aquatic environments.

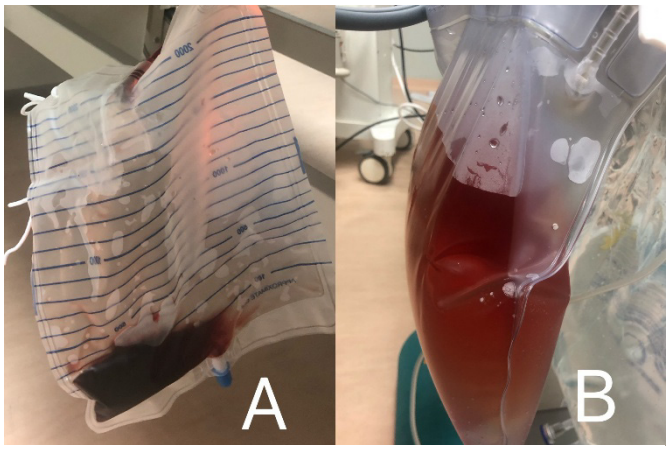
Upon presentation, she felt irritated and jaundiced. Her temperature was 37.5 °C, heart rate was 115 bpm and regular, blood pressure was 100/60 mmHg, breathing rate was 28 per minute, and oxygen saturation was 90% in room air. On examination, the patient showed signs of hypoperfusion with cold, clammy skin, slight pulse, and capillary refill time 3 seconds.

Blood examination showed the following: hemoglobin level of 7.1 g/dL, white blood cell count of 22.9×10^9/L with 88.5% neutrophils, and platelet count of 104×10^9/L. Infection markers included C-reactive protein 117.98 mg/L and procalcitonin 61.55 ng/mL. Laboratory tests suggested intravascular hemolysis including hyperbilirubinemia of 2.9 mg/dL (predominance of direct bilirubin 2.6 mg/dL), hyperkalemia 7.5 mmol/L, and lactate dehydrogenase (LDH) 7167 U/L). Peripheral blood smear showed very sparse red blood cells, inconsistent in size, and many red blood cell fragments were observed. Her blood urea nitrogen was at 20.5 mmol/L, serum creatinine was 165 µmol/L, alanine aminotransferase was 301 IU/L,

aspartate aminotransferase was 1108 IU/L, international normalized ratio (INR) was 1.43, activated partial thromboplastin time (APTT) was 30.5 seconds, and serum lactate was at 7.03 mmol/L. An abdominal computed tomographic (CT) scan with contrast showed liver subsegment VII with a gas forming lesion in the right hepatic lobe measuring 41 × 29 mm (Figure 1); a finding consistent with emphysematous liver abscess.

The patient developed severe respiratory failure, and was intubated, and admitted to the intensive care unit (ICU) accordingly. Upon ICU admission, the patient was treated empirically with 1 g of meropenem intravenously (IV) every 12 hours, given 1 L of crystalloid and 1 g of IV calcium chloride over 10 minutes, and furosemide 20 mg IV for severe hyperkalemia. After 3 hours of monitoring, hemoglobinuria persisted and urine output remained low, at approximately 50 mL. Blood tests showed hemoglobin level decreased to 4.9 g/dL, platelet count decreased to 36 × 10^9/L, INR 2.2, APTT 50.9 seconds, and the Coombs test was negative. The patient was transfused with two units of packed red blood cells, two units of fresh plasma, and one unit of platelets. It was decided to perform low-dose continuous renal replacement therapy (CRRT) for acute kidney injury with severe hyperkalemia and sepsis. Red CRRT effluent suggested severe intravascular hemolysis (Figure 2). At hour 8 in the ICU, the patient appeared hypotensive, the cardiac chambers were hypo-dynamic on ultrasound with an ejection fraction (EF) of about 25%, and arterial blood gas showed severe metabolic acidosis with pH 6.96, bicarbonate 4.4 mmol/L, anion gap 34.1 mmol/L, and serum lactate at 18.29 mmol/L. The patient was treated with 500 mL of 4.2% sodium bicarbonate and vasopressors and inotropes were used.

Figure 2. Hemoglobinuria and red continuous renal replacement therapy (CRRT) effluent suggest severe hemolysis.



A: Patient's urine; B: CRRT effluent.

Figure 1. Abdominal computed tomographic scan with contrast.

A gas forming lesion in the right hepatic lobe; a finding consistent with emphysematous liver abscess due to *Edwardsiella tarda*.

About 1 hour later, she continued to deteriorate, went into cardiac arrest, and passed away.

Two blood culture sets were obtained from the patient in the emergency department for microbiology. The blood culture samples were processed using the BacT/Alert system (Sysmex bioMérieux Co. Ltd., Tokyo, Japan). Species identification of *E. tarda* was confirmed after 3 days using the autoSCAN-4 ID/AST system (version 5.00, Beckman Coulter, Brea, CA, USA). Antimicrobial susceptibility testing was performed using the same system, and the results were interpreted according to clinical breakpoints established by the Clinical and Laboratory Standards Institute (CLSI) [5]. The antimicrobial susceptibility testing revealed that the isolate was sensitive to all tested antibiotics, including ampicillin, ceftazidime, piperacillin-tazobactam, ciprofloxacin, meropenem, and gentamicin.

Discussion

E. tarda is a Gram-negative facultative anaerobic bacterium that exists widely in nature. *E. tarda* is a dangerous pathogen in aquaculture that can cause Edwardsiellosis and systemic hemorrhagic sepsis in fish, reptiles, amphibians, etc. [6]. *E. tarda* can be transmitted from animal reservoirs to humans through five main routes: ingestion of contaminated products or raw food naturally harboring *E. tarda* (fish and

shellfish), exposure to contaminated water sources (freshwater or marine environments), penetrating injuries involving contaminated wounds, animal or zoonotic exposure (handling, trauma), and occupational exposure [3]. Gastroenteritis is the most common manifestation associated with this pathogen, which amounts to 83% of reported cases and often resolves without antibiotic treatment [6]. Several case reports have further described extraintestinal *E. tarda* infections, including liver abscesses, acute cholecystitis, peritonitis, necrotizing fasciitis, intrauterine infection, meningitis, and sepsis [4,7–13]. Sepsis due to *E. tarda* is rare. It has a rapid course and a reported mortality rate of about 44.6% [4].

Although *E. tarda* produces beta-lactamase, it has very low minimal inhibitory concentration (MIC) for ampicillin and cefotaxime, and has not been shown to confer resistance to beta-lactams. In vitro, *E. tarda* is sensitive to most antibiotics that are commonly used against Gram-negative bacteria, except polymycin B and colistin [3]. Our patient was started on meropenem, a broad-spectrum empirical treatment, given her medical complexity, after appropriate blood cultures were collected.

E. tarda is a facultatively anaerobic bacterium that can produce hydrogen sulfide in laboratory environments. However, gas-forming infections caused by *E. tarda* are very unusual in clinical practice. Some cases of gas-forming abscesses in the liver and pleural have been reported [14,15]. The mortality rate of emphysematous liver abscess is higher than that of non-emphysematous abscess, and it remains unclear how percutaneous drainage may impact clinical outcomes and reduce mortality associated with gas-forming pyogenic liver abscess [16]. Percutaneous drainage was not performed in our patient because the abscess location was difficult to reach and the effectiveness was unclear.

Among the virulence factors studied in *E. tarda*, hemolysis was found to be the main cause of mortality in infected fish [17]. Most strains of *E. tarda* (> 80%) produce and release an exotoxin called hemolysin. Hemolysin is capable of lysing red blood cells and breaking down released hemoglobin. The hemolytic activity of *E. tarda* is cell-associated and releases extracellular hemolysin in iron-deficient environments, suggesting that iron plays a role in *E. tarda* growth [18]. Eha is a newly discovered protein found in *E. tarda* that plays an important positive regulatory role in the hemolytic properties of *E. tarda* [19]. Based on the described hemolytic mechanisms of *E. tarda*, a negative Coombs test was reasonable. An acute hemolytic condition was observed in our patient, with complications including severe metabolic acidosis, hyperkalemia, anemia, and thrombocytopenia. The mainstay of treatment focuses on sepsis and addressing the consequences of hemolysis. A few cases of severe sepsis caused by *E. tarda* have been treated with CRRT [20,21]; other methods such as hemodialysis adsorption or plasma exchange have not been reported. Although hemolysis and necrosis of organs are very clear signs of Edwardsiellosis, it is difficult to diagnose the infection in the early stages or when the infection is mild.

Conclusions

Sepsis caused by *Edwardsiella tarda* is uncommon, especially in healthy patients. The high mortality rate underscores the need for early recognition and prompt intervention to effectively manage serious complications. Based on our case, consideration of an *Edwardsiella tarda* infection should be taken when patients exhibit symptoms such as sepsis, emphysematous liver abscess, and especially severe hemolysis.

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Corresponding author

Sy Quan Ton, MD.
Becamex International Hospital, 681 Binh Duong Boulevard, Lai Thieu Ward,
Thuan An City, Binh Duong Province, Vietnam.
Tel: +84376315719
Email: tonsyquan0912@gmail.com

Conflict of interest

No conflict of interest is declared.

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