

CASE REPORT

Fatal Septic Shock Due to *Aeromonas Hydrophila* in a Cirrhotic Patient; a Case Report

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Abstract: *Aeromonas hydrophila* has been identified as a causative agent of necrotizing fasciitis and myonecrosis, with most reported cases having a connection to aquatic-related trauma. Cases without such trauma history are rare in existing literature. Here, we present the case of a 56-year-old cirrhotic patient who lacked any prior aquatic-related trauma and arrived at the emergency department in a state of septic shock. The suspected route of entry was through necrotizing fasciitis and myonecrosis in his left forearm. Unfortunately, the patient succumbed to multi-organ failure and passed away within 12 hours of admission to the emergency department.

Keywords: *Aeromonas hydrophila*; Fasciitis, necrotizing; Necrosis; Liver cirrhosis; Shock, septic; Case reports

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1. Introduction

Aeromonas hydrophila is a gram-negative bacteria associated with a wide spectrum of diseases, ranging from self-limiting gastroenteritis, and skin and soft tissue infections to life-threatening necrotizing fasciitis and myonecrosis (1). Most reported cases of *A. hydrophila* necrotizing soft-tissue infections occur following a history of trauma sustained in an aquatic environment (2). However, cases without history have also been reported in literature, the predisposing factors of these cases include immunosuppression, diabetes mellitus, cirrhosis, and end-stage kidney disease. Necrotizing soft tissue infections caused by *A. hydrophila* have an extremely high mortality rate, especially in cirrhotic patients. Despite the early intervention of amputation, debridement of the infected site, and appropriate usage of antibiotics, the mortality rate of cirrhotic patients could reach 100% (3-5). In this article, we present a case of necrotizing soft tissue infection leading to fatal septic shock in a cirrhotic patient.

2. Case presentation

A 56-year-old male farmer, with a 30-year history of alcohol addiction, regularly consuming approximately 150g of alcohol, had been diagnosed with alcoholic liver cirrhosis three years ago. Seven days before presenting to our department, he complained of increasing pain in the lateral aspect of his

left forearm, accompanied by redness but no swelling. Despite this, he maintained normal activities. Three days later, the pain intensified, and his left forearm became markedly red and swollen. Concurrently, he developed a fever and coughed up cloudy yellow sputum. He denied any history of aquatic related trauma.

Initially admitted to a local hospital, the patient's vital signs indicated a temperature of 38°C, respiratory rate of 24 breaths per minute, SpO₂ of 80% on room air, a heart rate of 120 beats per minute, and blood pressure of 80/50 mmHg. He was promptly started on a third-generation cephalosporin antibiotic and a second-generation quinolone, received mechanical ventilation, and was subsequently transferred to our Emergency Department at 108 hospital.

Upon arrival, the patient had Glasgow Coma Score of 4. He required intubation and mechanical ventilation, with crackles heard on both sides of the lung, a PaO₂/FiO₂ ratio of 200, tachycardia (120 beats per minute), and hypotension (85/50 mmHg, maintained with Noradrenalin at 0.15 mcg/kg/minute). He exhibited moderate ascites, anuria, a temperature of 39°C, and purple blister on the left lateral aspect of his chest, arm, and forearm (figure 1).

Laboratory tests conducted by our emergency physician revealed a total white blood cell count of 6300 per microliter (65.9% neutrophils), a red blood cell count of 3.27 million/mm³, hemoglobin of 101 g/dL, and a platelet count of 39000 per microliter. Procalcitonin was elevated at 5.64 ng/mL, partial thromboplastin was 22%, and activated partial thromboplastin time was elevated at 500s. Sodium levels were below the normal limit at 128 mmol/L, while urea

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Figure 1: Skin necrosis in a cirrhotic patient with necrotizing fasciitis due to *A. hydrophila*. X-ray reveal gas in the soft tissues.



Figure 2: *Aeromonas hydrophila* on blood agar.

nitrogen and creatinine were elevated at 19.26 mmol/L and 516 mcMol/L, respectively. Urinalysis showed tubular damage with urinary levels of liver-type fatty acid-binding protein (uL-FABP) at 160.6 mcg/L, Urinary L-FABP/Creatinin ratio at 198.2 mcg/g.

Liver function tests showed total bilirubin at 99.1 mmol/L, aspartate aminotransferase at 1512 U/L, alanine aminotransferase at 214 U/L, gamma glutamyl transferase at 352 U/L, total protein at 33.1 g/L, and albumin at 17.8 g/L. Arterial blood gas revealed severe metabolic acidosis with a pH of 6.52, HCO_3^- of 1.0 mmol/L, base excess of -37.2 mmol/L, and a lactate level beyond the upper limit at 15 mmol/L. X-ray results showed air between the layers of arm muscles, forearm, and chest wall, along with a heterogeneous infiltrate of the upper half of the left lung (figure 1). After his passing, the blood culture confirmed the presence of *Aeromonas hydrophila* (figure 2), sputum and bronchial fluid cultures were

negative.

The laboratory results indicated that the patient was experiencing multiorgan failure, as reflected in a Sequential Organ Failure Assessment (SOFA) score of 19, predicting a 95.2% mortality rate. The manifestation of shock, necessitating vasopressors to maintain a mean arterial pressure (MAP) > 65mmHG, fulfilled the criteria for septic shock. The suspected primary source of infection was traced back to a lesion on the patient's left forearm. This suspicion was based on the chronological development of symptoms, with the initial sign being a painful lesion on the forearm, followed by the onset of high fever and a productive cough. The diagnosis of necrotizing fasciitis was established based on the presence of purple blisters on the forearm and the observation of air between the layers of the forearm extending to the chest wall in the X-ray.

The diagnosis of necrotizing fasciitis-induced septic shock was made. Despite immediate and intensive resuscitation and antibiotic treatment, the patient's clinical condition deteriorated, leading to his demise 12 hours after admission to our department.

3. Discussion

In summary, a 56-year-old man with cirrhosis developed septic shock due to the gradual progression of Necrotizing Fasciitis in his left forearm, caused by *A. hydrophila*. The infection advanced over the course of 7 days, resulting in delayed hospital admission and treatment. Unfortunately, this led to fulminant septic shock and ultimately resulted in his demise. *Aeromonas* spp, a Gram-negative bacillus, naturally resides in aquatic environments and has been detected in various water sources, such as surface, underground, potable, bottled, residual, and irrigation waters as well as seawater. These bacteria constitute an emerging pathogen, contributing to a diverse spectrum of diseases in humans, including gastroenteritis, septicemia, and wound infections. *Aeromonas* can infect individuals across the immunocompromised and immunocompetent spectrum. Necrotizing soft tissue infection caused by *Aeromonas hydrophila* infection are rare but

are associated with very high mortality, reportedly between 60 and 75% in immunocompromised hosts (1, 2). Invasive *Aeromonas* infections have been reported in patients with underlying hematological conditions, diabetes, end-stage kidney disease, and cirrhosis as well as immunocompromise patients (6).

Like our case, the majority of previously documented cases of Necrotizing Fasciitis caused by *A. hydrophila* in individuals with cirrhosis have been linked to fatal outcomes, including septic shock and multi-organ failure, despite early and aggressive surgical debridement and antibiotic intervention (3-5). Approximately 20–30% of patients experiencing *Aeromonas*-related sepsis or Necrotizing Soft Tissue Infections (NSTI) do not have a history of preceding trauma or water exposure. A suggested hypothesis posits bacterial translocation in the gut, resulting in secondary endogenous bacteremia, followed by the seeding of soft tissue, leading to the development of necrotizing fasciitis (2).

A combination of medical and surgical therapy is most often required for the successful management of *Aeromonas* soft tissue infection. Despite the tendency of *Aeromonas* to produce at least three β -lactamases, these microorganisms generally exhibit susceptibility to the majority of antibiotics effective against Gram-negative bacilli. Nevertheless, there is an observed increase in antimicrobial resistance among *Aeromonas* species, influenced by factors such as species, source, and country of isolation. Despite this, many strains remain sensitive to trimethoprim-sulfamethoxazole (TMP-SMX), fluoroquinolones, second and third-generation cephalosporins, aminoglycosides, carbapenems, chloramphenicol, and tetracyclines (7, 8).

In general, necrotizing fasciitis (NF) is an insidious rapidly progressing infection leading to necrosis of fascial layer. Due to anatomical borders the infection spreads along the fascial planes. During the initial phase NF may be mistaken for cellulitis but prompt diagnosis is warranted. Necrotizing soft tissue infection caused by *Aeromonas* spp. is infrequent, but it can lead to significant morbidity and mortality, particularly when there is a delay in diagnosis and the organism proves to be highly virulent. Improved education for clinicians and microbiologists is essential to enhance patient outcomes. Clinicians must be vigilant regarding the potential of this organism to induce severe necrotizing skin and soft tissue infections, particularly in immunocompromised individuals or in otherwise healthy individuals following traumatic injuries. Invasive NF infections attributed to *Aeromonas* spp. necessitate aggressive treatment involving surgical debridement and the administration of broad-spectrum antibiotics, the selection of which should be guided by laboratory testing confirming documented susceptibility and clinical efficacy.

4. Conclusions

Necrotizing fasciitis is associated with an exceptionally high morbidity and mortality rate, particularly when patients exhibit multiple unfavorable prognostic factors like malignan-

cies, diabetes mellitus, or liver cirrhosis. Timely identification and the implementation of vigorous medical and surgical interventions are crucial in managing severe infections. Despite appropriate medical therapy, the prognosis can still be unfavorable. Emergency physicians need to maintain a high level of vigilance in recognizing necrotizing fasciitis, especially in immunocompromised patients.

5. Declarations

5.1. Ethics approval

The study was approved by 108 Military Center Hospital's committee of ethics in biomedical research.

5.2. Informed consent

Written informed consent was obtained from the patient's relatives for publication of this case report.

5.3. Author contribution statement

All authors listed have significantly contributed to the investigation, development, and writing of this article.

- Conceptualization: Duong Le Xuan, Duc Vu Anh, Hoa Do Thanh, Ghi Nguyen Hai
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- Writing – review & editing: Duong Le Xuan, Hoa Do Thanh, Ghi Nguyen Hai
- Read and approved the final version of manuscript: all authors

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5.5. Data availability statement

Data will be made available on request.

5.6. Declaration of competing interest

The authors declare no conflict of interest.

5.7. Using artificial intelligence chatbots

None.

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