

## Case Report

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*Aeromonas hydrophila* infection in acute myeloid leukemia: A case reportRui He, Siqi Zhong, Jinghua Fan 

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## ABSTRACT

**Rationale:** *Aeromonas hydrophila*, a bacterium commonly found in a variety of soils, aquatic habitats, and other natural environments, is known for causing infections and hemorrhagic diseases in both aquatic and terrestrial animals. Patients with leukemia, when infected by *Aeromonas hydrophila* following chemotherapy, face an increased risk of developing necrotizing fasciitis.

**Patient concerns:** A 48-year-old male with a history of acute myeloid leukemia presented with swelling and pain in his right hand after being stabbed by a grass carp two days ago. The injury occurred on the fifth day after his last chemotherapy session when he was accidentally punctured in the right thumb and ring finger by a carp while fishing. Two days following the injury, the skin surrounding the wound turned black immediately, while the rest of his hand was reddened, swollen, and bleeding.

**Diagnosis:** *Aeromonas hydrophila* infection in the soft tissue of the right hand.

**Interventions:** Intravenous antibiotics and local debridement.

**Outcomes:** The patient experienced an alleviation of systemic poisoning symptoms, effective control of the local wound infection.

**Lessons:** It is important for physicians to appreciate the potential for highly unusual and life-threatening infections in patients with acute myeloid leukemia. Early diagnosis and prompt treatment can prevent the development of necrotizing fasciitis and save patients' lives.

**KEYWORDS:** *Aeromonas hydrophila*; Soft tissue infection; Antibiotic therapy; Case report

## 1. Introduction

*Aeromonas (A.) hydrophila* is a ubiquitous bacterium found in

various water bodies, soils, and complex natural environments. This microorganism is responsible for causing infections and hemorrhagic diseases in both aquatic and terrestrial animals. Its resilience to low temperatures contributes to its significant presence in aquatic systems[1]. *A. hydrophila* can be found in almost all aquatic environments, where it exhibits rapid growth and metabolic versatility. It has the capacity to infect numerous aquatic species, including fish, crabs, and shrimp[2]. In this study, we present a male diagnosed with acute myeloid leukemia who developed an *A. hydrophila* infection in his right upper limb after injured by a grass carp on the fifth day following chemotherapy.

## 2. Ethical approval and participant consent

The patient provided informed consent for the publication of this case report, including any accompanying images, ensuring ethical compliance.

## 3. Case report

A 48-year-old male presented with two days of swelling and pain in his right hand following a grass carp stab injury. The patient was

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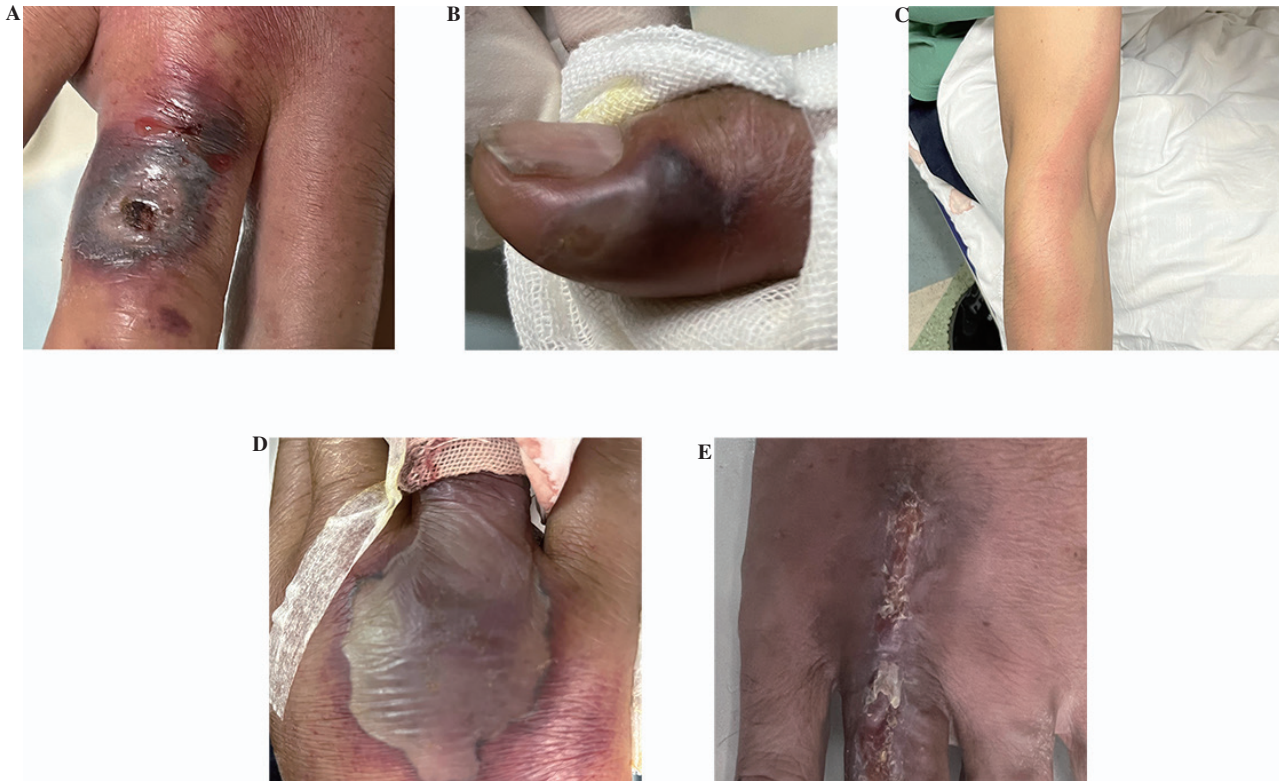
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**Figure 1.** Right ring finger (A), right thumb (B), and forearm (C) of a 48-year-old male presented with swelling and pain in his right hand following a grass carp stab injury. The condition of the patient's right hand during the fourth day of treatment (D). The patient's right hand fully healed following surgical intervention (E).

diagnosed with acute myeloid leukemia six months prior and had been receiving regular chemotherapy at our hospital. He received his last chemotherapy session ten days before the onset of symptoms, which consisting of a regimen of cytarabine (160 mg, days 1-5) and mitoxantrone (10 mg, days 1-3).

On the fifth day post-chemotherapy, the patient sustained puncture wounds to his right thumb and ring finger while fishing. He experienced bleeding and pain at the site of the wound, and he disinfected and treated with Yunnan Baiyao, a traditional Chinese medicine formulation to halt the bleeding. The following day, the patient noticed swelling in his right palm and forearm. He sought treatment at a hospital where he received a tetanus antitoxin injection and underwent local wound debridement. On the third day following the injury, the skin surrounding the puncture sites on the patient's right thumb and ring finger had turned black, and the escalating pain made him have difficulty in sleep. Consequently, he sought further treatment at our hospital for his infected right upper limb.

Physical examination revealed blackened skin on the right thumb

and ring finger (Figure 1A and 1B), significant edema in the right hand, ecchymosis on the dorsum of the hand, and lymphangitis in the right upper limb (Figure 1C). Surgical debridement was performed and sanguineous drainage from the wounds were collected for culture. Approximately four hours after debridement, the patient had a fever (body temperature 38.2 °C), and subsequent labs revealed neutropenia. Based on our clinical experience for treating neutropenic fever, we initiated treatment with imipenem and cilastatin sodium.

On the fourth day of hospitalization (the seventh day post-injury), vesicles appeared on the dorsum of the patient's right hand, and the swelling became more pronounced (Figure 1D). Wound cultures revealed infection of *A. hydrophila*, and the antibiotic susceptibility tests reveal that *Aeromonas hydrophila* is sensitive to ceftazidime, ceftriaxone, cefuroxime, cefepime, levofloxacin, sulperazon, puromycin, tigecycline, piperacillin sodium/tazobactam sodium, amikacin, cefoxitin. Based on the patient's medical history, physical examination findings, and wound culture results, the diagnosis was determined to be a skin and soft tissue infection of the right hand

caused by *A. hydrophila*.

The patient's mental status normalized one day after levofloxacin discontinuation. Based on the antibiotic susceptibility test, the patient was administered intravenous ceftazidime, (1 g every 12 hours). On the 20th day of treatment, the infection in his hand was notably controlled, and ceftazidime was discontinued. The patient was discharged and continued to undergo surgical debridement as an outpatient. Four months after treatment, the patient's hand wound was healed (Figure 1E).

#### 4. Discussion

*A. hydrophila* is a Gram-negative, facultative anaerobic bacillus frequently responsible for gastroenteritis due to food contamination and occasionally, extraintestinal infections such as sepsis or necrotizing fasciitis[3]. The pathogenesis of necrotizing fasciitis induced by *A. hydrophila* involves its hemolytic activity, protein degradation activity, and notably, its elastic degradation activity. The bacterium actively produces elastolytic metalloproteinases, which cause extensive tissue necrosis[4]. Clinical manifestations of necrotizing fasciitis include fever, severe localized pain, skin erythema and swelling, skin necrosis, persistent ecchymosis, ischemic skin lesions, and vesicles or bullae. A study reported that the crude in-hospital mortality rate for patients with hematological malignancies infected solely with *A. hydrophila* was 30.8%[5]. Given the high morbidity and mortality of necrotizing fasciitis, particularly in patients with malignant tumors, diabetes, or cirrhosis, the prognosis may remain poor despite appropriate pharmacologic intervention[6]. Thus, upon diagnosing *A. hydrophila* infection in the skin and soft tissue of the patient's right hand, we promptly reviewed the literature and initiated intravenous antibiotic treatment and surgical debridement in order to preserve the patient's limb from more severe outcomes, such as amputation or death. Based on the antibiotic susceptibility testing and *The Sanford Guide to Antimicrobial Therapy 2018*, we chose levofloxacin for anti-infection treatment. On the fifth day of hospitalization, the patient received intravenous levofloxacin (0.4 g/day), which alleviated the local soft tissue swelling and pain. However, on the fifth day of levofloxacin treatment, the patient started exhibiting psychiatric symptoms, including delusions of persecution. A psychiatric consultation attributed these symptoms to levofloxacin and advised its discontinuation.

The pathophysiology of levofloxacin-associated encephalopathy

relates to the disruption of gamma-aminobutyric acid-ergic interneurons, which inhibits the binding of gamma-aminobutyric acid receptors in a concentration-dependent manner and subsequently affecting the central nervous system[7].

In light of these findings, it is important to consider other studies that have demonstrated resistance rates of *A. hydrophila* to quinolones ranging from 6.98% to 100%, to tetracyclines from 23.36% to 92.31%, and to  $\beta$ -lactams from 61.54% to 100%[8]. These drug resistance challenges are associated with antibiotic overuse in aquaculture, prompting the question of how to treat *A. hydrophila* infections more effectively. By presenting this case and the results of the patient's antibiotic susceptibility testing, we aim to provide a reference for drug selection. Ultimately, this highlights the life-saving potential of timely and targeted antimicrobial interventions.

#### Conflict of interest statement

The authors declare that they have no conflict of interest.

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The authors received no extramural funding for the study.

#### Authors' contributions

HR performed concepts, design, definition of intellectual content, literature search, manuscript preparation, manuscript editing and manuscript review. ZSQ performed concepts, definition of intellectual content manuscript preparation and manuscript review. FJH contributed to the manuscript preparation, manuscript editing and review and is designated as 'guarantor'.

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