Tohoku J. Exp. Med., 2025, **266**, 193-197

A Case of *V. vulnificus* Infection in Non-Coastal Area's Farmer

Chun-Li Lv,[1,3] Peng Xu,[2] Qing-Liang Liu,[1,3] Song Gao,[1,3] An-Lin Chen,[1,3] Wei-Qun Huang[3] and Xiao-min Wang[2,3]

[1]Department of Laboratory Medicine, Affiliated Hospital of Zunyi Medical University, Zunyi, Guizhou, China
[2]National Clinical Research Center for Infectious Diseases, The Third People's Hospital of Shenzhen, Shenzhen, Guangdong, China
[3]School of Laboratory Medicine, Zunyi Medical University, Zunyi, Guizhou, China

The infection of *Vibrio vulnificus* (*V. vulnificus*) can cause numerous clinical manifestations with high mortality. Aquatic products and sea water are typically the primary routes of infection. This article narrates a case of *V. vulnificus* infection in a farmer from an inland mountain area, who, unusually, contracted the infection through insect-borne transmission. The patient had a medical history of fatty liver disease and chronic alcohol consumption, which significantly increased the risk of *V. vulnificus* infection. He presented with swelling and pain in the lower left leg, along with scattered areas of skin necrosis and localized hemorrhagic bullae. His condition rapidly progressed to septic shock. Regrettably, the patient suffered a cardiac arrest during an emergency fasciotomy and passed away within 12 hours of admission. The retrospective analysis of this case aims to re-examine the way of infection of the disease, improve the understanding of clinicians in non-coastal areas of *V. vulnificus* infection, and achieve early diagnosis and treatment.

Keywords: diagnosis; infection; insect-borne transmission; *Vibrio vulnificus*
Tohoku J. Exp. Med., 2025 June, **266** (2), 193-197.
doi: 10.1620/tjem.2024.J121

Introduction

Vibrio vulnificus (*V. vulnificus*) is a zoonotic, environmental gram-negative bacterium, which associated with high mortality (Hwang et al. 2021; Liang et al. 2021). *V. vulnificus* infection can give rise to numerous clinical presentations, including the high fever, chills, gastroenteritis, necrotizing fasciitis, hemorrhagic necrotic skin lesions, and sepsis. Gastroenteritis is self-limited, whereas septicemia often is fatal, and as high as 50% of infected patients die from septic shock (Kang et al. 2020; Coerdt and Khachemoune 2021; Lee and Kim 2021; Liang et al. 2021). Early diagnosis and treatment are vital for prognosis of patients. The onset of symptoms and clinical outcome typically occur within 24 hours after ingestion or exposure to *V. vulnificus*, the mortality rate of patients can reach 33% with a 24-hours delay in antibiotic treatment and even reach 100% with a 72 hours delay (Coerdt and Khachemoune 2021; Liang et al. 2021). The occurrence of *V. vulnificus* infection is highly related to changes in the natural environment *V. vulnificus* increases propagation speed when the water temperature exceeds 18°C, and achieve optimum propagation speed at 26°C (Liang et al. 2021; Kim et al. 2022). The increasing sea surface temperatures caused by global warming have led to the expansion of *V. vulnificus*. This expansion poses health risks to previously unaffected populations (Dickerson et al. 2021; Choi and Choi 2022).

Case Presentation

A 53-year-old man came to the Affiliated Hospital of Zunyi Medical University in Guizhou Province, China, in July 2018. He reported that he felt grievous swelling and pain on left lower extremity, but due to hypotensive shock, was immediately transferred to the intensive care unit (ICU). He also reported that he drunk almost 250 g of Chinese Baijiu every day in the last 30 years and that he had been stung by an insect below his left knee joint three days ago. His vital signs were as follows: body temperature of 36.5°C (The patient's body temperature did not exceed 37°C during all treatments after admission.); blood pressure of 82/56 mmHg; respiratory rate of 22 breaths/min; and pulse rate of 130 beats per minute. Upon examination, he was cooperative but looked acutely ill, with mild pallor. Knee joint swelling, ecchymosis and multiple hemorrhagic

Received March 16, 2024; revised and accepted October 24, 2024; J-STAGE Advance online publication November 7, 2024
Correspondence: Xiao-min Wang, National Clinical Research Center for Infectious Diseases, The Third People's Hospital of Shenzhen, Shenzhen, Guangdong 518112, China. School of Laboratory Medicine, Zunyi Medical University, Zunyi, Guizhou 563006, China.
e-mail: wxm_zmu@163.com

bullae were observed on the left lower extremity. There was no extremity sensory disorder, and the dorsalis pedis artery could be touched. In addition, there was no abnormality in the right lower extremity.

Ethics approval and consent to participate (ethics ID: KLL-2023-268).

Diagnosis and Progression

A routine blood test showed white blood cell count of 0.75×10^9/L (reference range: 3.5-9.5$\times10^9$/L), with 76% neutrophils and 19% lymphocytes. The platelet count was 48×10^9/L (reference range: 100-300$\times10^9$/L), the hemoglobin was 90.0 g/L (reference range: 130-175 g/L). It is worth noting that a previous routine blood test conducted 5 hours ago showed a white blood cell count of 1.71×10^9/L, with 90% neutrophils and 8% lymphocytes. The concentrations of interleukin 6 (IL-6) showed a high level of > 5,000 pg/mL (reference range: 7.0 pg/mL) and serum procalcitonin (PCT) was 20.97 ng/mL (reference range: 0.05 ng/mL). Serum C-reactive protein concentration was 126.97 mg/L (reference range: 0.068-8.2 mg/L). The liver test reported: total bilirubin 101.4 mol/L (reference range: 5-21 mol/L), alanine aminotransferase 38 U/L (reference range: 9-50 U/L), aspartate aminotransferase 123 U/L (reference range: 15-40 U/L), and alkaline phosphatase 164 U/L (reference range: 45-125 U/L). The kidney function test showed: the concentration of serum cystatin C was 2.11 mg/L (reference range: 0.59-1.53 mg/L), Urea was 11.13 mmol/L (reference range: 2.8-7.2 mmol/L), creatinine was 253 mol/L (reference range: 41-109 mol/L). Fatty liver disease (marked by a dashed box) and a cystic lesion (marked by an arrow) in the right lobe of the liver were observed on abdominal computed tomography (CT) scans (Fig. 1). Computed tomography angiography (CTA) of arteriovenous showed left lower extremity thrombosis (Fig. 2). The CT results of left knee joint revealed that the density of soft tissue increased and the subcutaneous fat layer disappeared (Fig. 3, marked by an arrow).

The patient received continuous infusion of inotropic agents (dopamine), blood volume expansion therapy (hydroxyethyl starch), and antibiotic treatment with Imipenem, Cilastatin, and Vancomycin following a septic shock. However, soon, this patient developed septic shock, metabolic acidosis and lactic acidosis. Gram-negative bacteria were isolated from two vials of blood cultures obtained from the BD BACTEC FX blood culture system (Becton, Dickinson and Company, NJ, U.S.) (Fig. 4A). In addition, *V. vulnificus* was isolated from the wound surface secretion culture (Fig. 4B). Further identification testing was performed using the MALDI-TOF MS (BioMérieux, Marcy-l'Étoile, France) and the organism was identified as *V. vulnificus* with a 99.9% probability (Fig. 5). Regrettably, the patient suffered cardiac hemorrhage arrest while undergoing emergency fasciotomy, and the family made the difficult decision to forgo further treatment. Tragically, the patient passed away within 12 hours of being admitted.

Discussion

V. vulnificus is a gram-negative, halophilic bacterium found in marine and estuarine environments. It is known to cause high morbidity and mortality (Choi and Choi 2022).

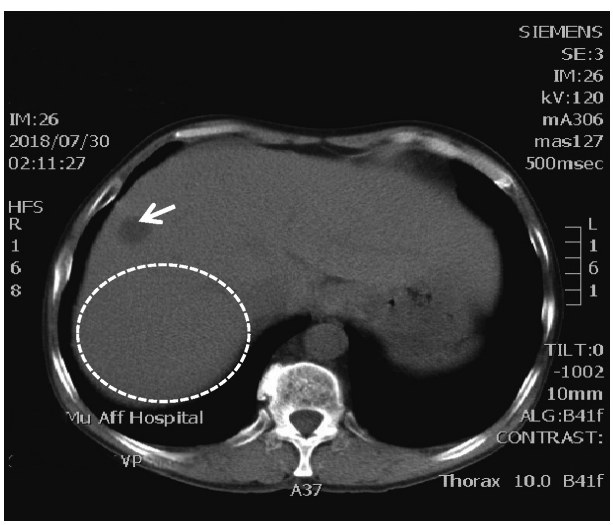


Fig. 1. Abdominal imaging findings.
Abdominal computed tomography (CT) scan showed a liver lobe cystic lesion (an arrow) and fatty liver disease (dashed box).

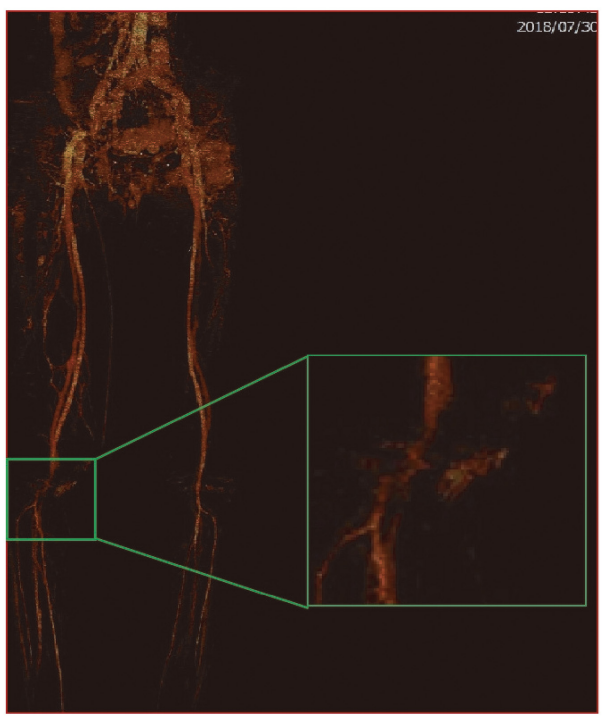


Fig. 2. CTA features of atherosclerotic stenosis and thrombosis in lower extremity vessels.
Computed tomography angiography (CTA) of arteriovenous of the left lower extremity. The imaging findings were characterized by stenosis in both the lumens of the popliteal vein and artery, irregularities in vessel wall morphology, and localized thrombotic occlusion.

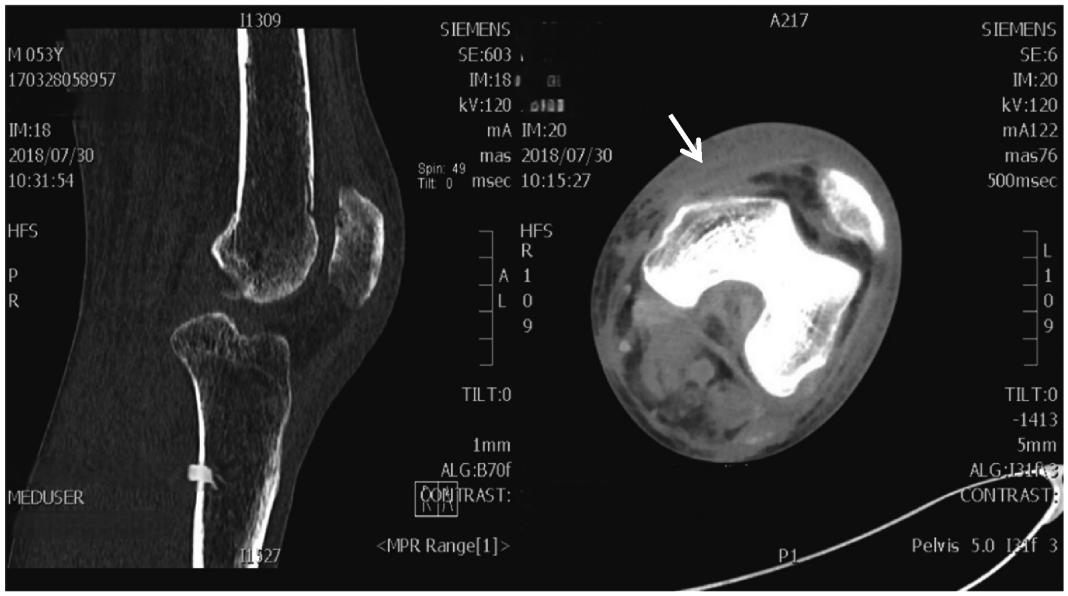


Fig. 3. Left knee CT scan showing soft tissue density increase and loss of subcutaneous fat.
The computed tomography (CT) scan of the left knee joint revealed an increase in soft tissue density and the subcutaneous fat layer was found to be absent (an arrow).

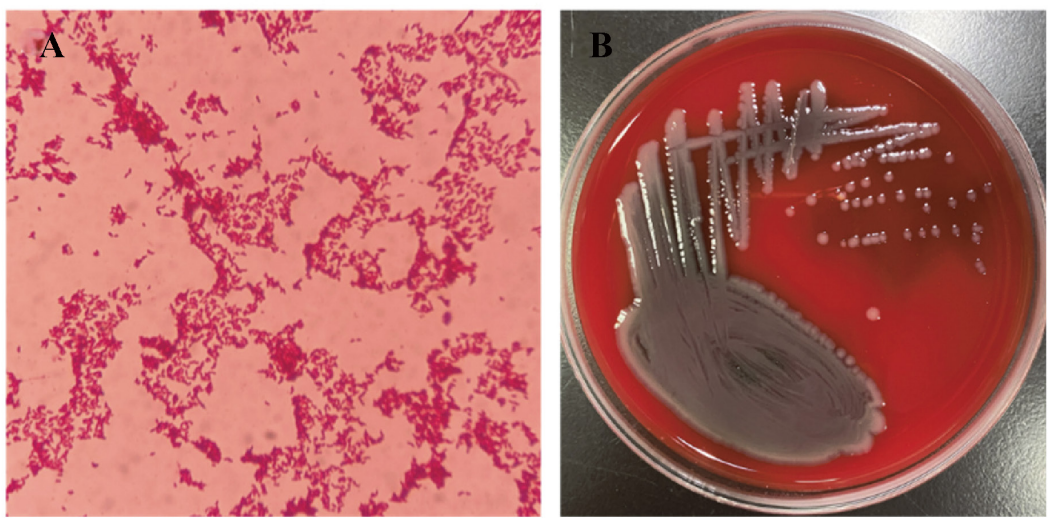
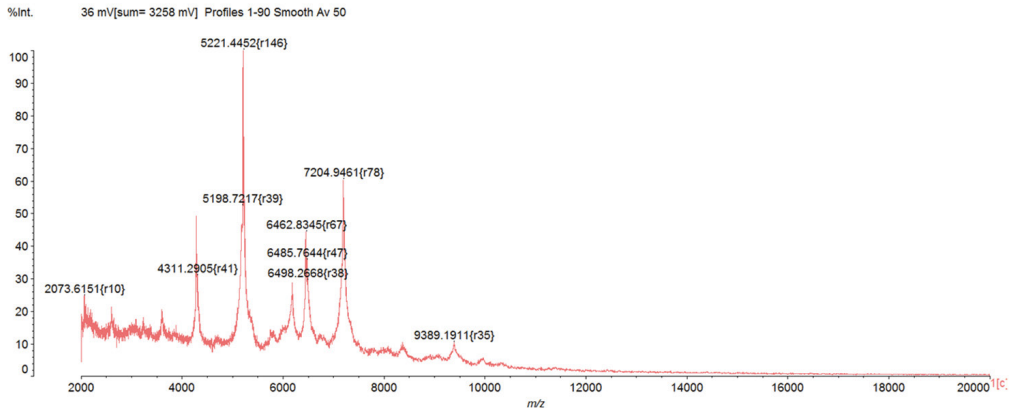


Fig. 4. Vibrio vulnificus: Gram stain and colony features.
(A) The gram-negative bacteria was isolated from blood culture bottles. Following Gram staining, the bacteria that had been isolated from the blood culture bottle were examined under an optical microscope (×100 magnification). The organism identified was a rod-shaped, gram-negative bacterium. (B) Colony morphology was observed on Blood agar using cultures obtained from wound surface secretions.

With most cases of *V. vulnificus* infection being reported in the southeast coast, it poses a risk to individuals who consume raw seafood (Pan et al. 2013; Liang et al. 2021). This bacterium can lead to various health issues, including wound infections, gastroenteritis, necrotizing fasciitis, and fatal sepsis, particularly in patients with underlying chronic conditions such as alcoholic liver disease, immunosuppression, hemochromatosis, or diabetes mellitus. Through infected aquatic products and insect bites, *V. vulnificus* can infect human beings and even severe life-threatening infections (Ramos et al. 2021). The patient, from a remote village in Renhuai City, Guizhou Province, China, presented with tingling below the left knee joint while working in the field three days ago. His condition worsened, and he was hospitalized with septic shock. The challenging aspect of his diagnosis is the absence of previous seafood exposure and consumption, as well as the distance of his residence from coastal areas, which makes it difficult to identify *V. vulnificus* infection as the cause of his illness. The patient's alcoholic liver disease and cystic lesion of the right lobe of the liver may be considered as risk factors for his *V. vulnificus* infection (Sun et al. 2023). The patient reported a sudden

A



B

Identification resuits	
Accession ID	180730046-1
Method Name / Host(s)	VITEK® MS / VITEKMSACQ01
Organism Name	Vibrio vuinificus 99.9 %
Date/Time Detemmined	18-7-31 AM10:26

Fig. 5. Identification of the isolated strain.
(A) Mass spectrum of the isolated strain. (B) The results of the identification of the isolated strain. The organism was identified as *V. vulnificus* with a 99.9% probability.

onset of pain while passing through a farmland, accompanied by slight redness and swelling. The symptoms were suspected to be caused by insect bites; however, the specific type of insects was not observed. The transmission of *V. vulnificus* infection through insect bites is an exceptionally uncommon occurrence, with only a limited number of cases documented globally (Liang et al. 2021). Diagnosis of *V. vulnificus* infection is based on clinical signs, patient history, and local epidemiological findings, and is confirmed through wound surface secretion and blood culture (Coerdt and Khachemoune 2021; Ramos et al. 2021). Septic shock resulting from *V. vulnificus* infection can lead to a patient mortality rate as high as 92%, with the fatality rate increasing with treatment delay (Kuo et al. 2007; Heng et al. 2017; Coerdt and Khachemoune 2021). Early diagnosis and prompt antibiotic treatment are essential for patient survival. Unfortunately, the patient was admitted three days after the onset of symptoms, and the condition had rapidly deteriorated. As a result, the optimal window for treatment was missed, ultimately leading to the patient's demise due to cardiac arrest during surgery. This emphasizes the critical importance of early identification and comprehensive treatment planning.

In summary, patients with *V. vulnificus* sepsis experience a sudden onset of symptoms, rapid disease progression, and high mortality rates. In regions with low incidence rates, it is crucial to raise awareness about disease prevention and provide education to doctors regarding the clinical characteristics of the disease in order to minimize misdiagnosis.

Author Contributions

Chunli Lv, Qing-Liang Liu, Song Gao, An-Lin Chen, Wei-Qun Huang collected and analyzed the data. Xiaomin Wang wrote the manuscript. Peng Xu reviewed this manuscript. All authors read and approved the final manuscript.

Funding

Funding for this study was provided by the National Nature Science Foundation of China (grant number 32260883); Guizhou Provincial Science and the Technology Foundation (grant number Qiankehe jichu [2021]-079, Qiankehe chengguo-LC [2024]-059).

Conflict of Interest

The authors declare no conflict of Interest.

References

Choi, G. & Choi, S.H. (2022) Complex regulatory networks of virulence factors in Vibrio vulnificus. *Trends Microbiol.*, **30**, 1205-1216.

Coerdt, K.M. & Khachemoune, A. (2021) Vibrio vulnificus: Review of Mild to Life-threatening Skin Infections. *Cutis*, **107**, E12-E17.

Dickerson, J. Jr., Gooch-Moore, J., Jacobs, J.M. & Mott, J.B. (2021) Characteristics of Vibrio vulnificus isolates from clinical and environmental sources. *Mol. Cell. Probes*, **56**, 101695.

Heng, S.P., Letchumanan, V., Deng, C.Y., Ab Mutalib, N.S., Khan, T.M., Chuah, L.H., Chan, K.G., Goh, B.H., Pusparajah, P. & Lee, L.H. (2017) Vibrio vulnificus: An Environmental and Clinical Burden. *Front. Microbiol.*, **8**, 997.

Hwang, S., Kim, Y., Jung, H., Chang, H.H., Kim, S.J., Park, H.K., Lee, J.M., Kim, H.I. & Kim, S.W. (2021) A Fatal Case of Bacteremia Caused by Vibrio cholerae Non-O1/O139. *Infect. Chemother.*, **53**, 384-390.

Kang, S.J., Jung, S.I. & Peck, K.R. (2020) Historical and Clinical Perspective of Vibrio vulnificus Infections in Korea. *Infect. Chemother.*, **52**, 245-251.

Kim, J.S., Lee, E.G. & Chun, B.C. (2022) Epidemiologic Characteristics and Case Fatality Rate of Vibrio vulnificus Infection: Analysis of 761 Cases From 2003 to 2016 in Korea. *J. Korean Med. Sci.*, **37**, e79.

Kuo, Y.L., Shieh, S.J., Chiu, H.Y. & Lee, J.W. (2007) Necrotizing fasciitis caused by Vibrio vulnificus: epidemiology, clinical findings, treatment and prevention. *Eur. J. Clin. Microbiol. Infect. Dis.*, **26**, 785-792.

Lee, Y.W. & Kim, J.H. (2021) A Case of Vibrio Vulnificus Infection Presenting with Fatal Bacterial Encephalitis. *J. Clin. Neurol.*, **17**, 128-130.

Liang, J.H., Liang, W.H., Deng, Y.Q., Fu, Z.G., Deng, J.L. & Chen, Y.H. (2021) Vibrio vulnificus infection attributed to bee sting: a case report. *Emerg. Microbes Infect.*, **10**, 1890-1895.

Pan, J., Zhang, Y., Jin, D., Ding, G., Luo, Y., Zhang, J., Mei, L. & Zhu, M. (2013) Molecular characterization and antibiotic susceptibility of Vibrio vulnificus in retail shrimps in Hangzhou, People's Republic of China. *J. Food Prot.*, **76**, 2063-2068.

Ramos, L.B., Darwin, L.C. & de-Leon, A.P. (2021) A fatal case of Vibrio vulnificus septicemia in an end-stage liver disease patient. *Enferm. Infecc. Microbiol. Clin.* (*Engl. Ed.*), **39**, 352-354.

Sun, Y., Lin, Y.Z. & Chen, Z.G. (2023) An Uncommon Case of Necrotizing Fasciitis and Septic Shock Caused by Vibrio vulnificus Infection-Related Freshwater Shrimp Stung. *Int. J. Low. Extrem. Wounds*, **22**, 152-155.