Case Report

Case of an Exotic Skin and Soft Tissue Infection Associated with Cyclone Ockhi

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Abstract

*Vibrio vulnificus* is a halophilic marine gram-negative bacillus that is known to cause fulminant primary septicemia and complicated skin and soft tissue infections in humans. *Vibrio vulnificus* is referred to as flesh-eating bacteria. In the absence of timely detection and treatment, it results in sepsis with mortality of 50% and septic shock with mortality as high as 100%. Primary septicemia occurs following ingestion of contaminated seafood, and wound infections are acquired following exposure of open wounds to contaminated seawater. Early clinical suspicion and initiation of the appropriate antibiotics is essential to ensure good clinical outcome in case of *Vibrio vulnificus* septicemia. Here we report the case of a fisherman injured in cyclone Ockhi admitted to our hospital with lower limb cellulitis, who was diagnosed as *Vibrio vulnificus* wound infection. This case emphasizes the importance of history and clinical examination in antibiotic stewardship.

Keywords

Barnacles, gram-negative rod septic shock, halophilic vibrio, *Vibrio vulnificus*, wound infections

Introduction

*Vibrio vulnificus* is a halophilic, free-living, motile gram-negative bacillus that thrives in natural marine environments. *Vibrio vulnificus* is a highly virulent organism that typically manifests as either primary septicemia or as fulminant wound infection. *Vibrio vulnificus* infection is extremely invasive such that the case-fatality rate is 30% to 40%.1 When septic shock occurs, the mortality reaches approximately 92%.2 Wound infections are seen after injury and exposure of skin in a marine environment or from exposure of preexisting wounds to seawater. Because of the high mortality associated with *Vibrio vulnificus* infections, early diagnosis including preventive measures and treatment is essential to improve patient outcomes.2 They can be managed with aggressive appropriate antibiotic therapy, supportive care, and in the case of wound infections, aggressive debridement.1

Case Report

During the cyclone Ockhi, which wreaked havoc on the southern coast of Kerala, Tamil Nadu, and Lakshadweep in November 2017, several fishermen got admitted to our medical college. Among these, a 45-year-old fisherman, who was rescued from the sea, presented to us with excruciating pain and swelling of both legs in 3-day duration. He gave a history of accompanying high-grade fever and vomiting.

The pain was described as an intense burning sensation extending from both feet up to the thighs. He had no significant medical past history. He was a chronic alcoholic and smoker for the past 15 years.

During the cyclone, he had been stranded at sea for 4 days before being rescued by the Indian Navy. On further enquiry, he recollected that he, along with other fishermen, had tied themselves using ropes to the side of their boat to avoid getting thrown overboard by the monstrous waves. They had sustained injuries because of the constant rubbing of their legs against the boat.

On examination, the patient was conscious, oriented, well-built, and nourished. He was febrile with a temperature of 101°F. His pulse rate was 110 beats/min and his blood pressure was 90/60 mmHg. His respiratory rate was 24 per minute and had an oxygen saturation of 94% in room air. Both legs had abrasions and were swollen and tender with hemorrhagic bullae extending from both feet to upper thighs (Figure 1). Peripheral pulsations...
of both lower limbs were felt equal and normal. Mild abrasions were present on the anterior aspects of the shins (Figure 2).

Laboratory studies revealed hemoglobin 13, total white blood cell count of 15,500 per mm³ with 80% neutrophils, 8% lymphocytes, and platelet count of 60,000 per mm³. Peripheral blood smear showed the presence of neutrophilic leukocytosis with toxic granules. His blood urea was 54 mg/dL, creatinine was 2.4 mg/dL, serum sodium was 130 mmol/L, and potassium was 4.1 mmol/L. Total bilirubin was 2.1 mg/dL, direct bilirubin was 0.37 mg/dL, aspartate aminotransferase was 108 IU/L, alanine aminotransferase was 76 IU/L, and alkaline phosphatase was 134 IU/L. His prothrombin time-international normalized ratio (PT-INR) value was 2.5. Chest radiograph and electrocardiogram were normal. The patient’s D-dimer was elevated with low fibrinogen levels. His abdominal ultrasound was normal and bilateral venous duplex doppler ultrasound of legs did not show evidence of deep vein thrombosis. Based on clinical and laboratory findings, he was diagnosed to have complicated skin and soft tissue infection, septic shock, disseminated intravascular coagulation, and multiorgan dysfunction syndrome. Blood and bleb fluid were sent for culture and sensitivity and he was initiated on meropenem and vancomycin in view of septic shock.

He was shifted to the intensive care unit. He was initiated on oxygen therapy and intravenous crystalloids. Detailed history revealed that the patient had abrasions in his lower limbs because of the constant rubbing of his legs against the side of the boat. During cyclone Ockhi he had tied himself to the side of the boat to prevent himself from getting washed away to the sea. Crustaceans like barnacles are seen attached to the side and bottom surface of boats (Figure 3). Because halophilic vibrios are concentrated in ocean filter feeders like barnacles, the possibility of barnacle brush injury leading to cellulitis with sepsis because of wound infection by halophilic vibrio was considered. Gram stain of the bleb fluid showed a curved, gram-negative rod, and based on that vancomycin was stopped. Culture from bleb fluid and blood culture yielded *Vibrio vulnificus* and based on that meropenem was stopped and switched over to intravenous doxycycline and ciprofloxacin. Following antibiotic optimization and frequent surgical debridement, the patient clinically improved and was discharged on day 10 of admission.

Early clinical suspicion of *Vibrio vulnificus* septicemia and the prompt initiation of the right antibiotics led to excellent clinical outcome in this patient. This case is being presented to highlight the importance of clinical history and examination in antibiotic stewardship.

**Discussion**

*Vibrio vulnificus* is a halophilic, motile, gram-negative bacillus that belongs to the family Vibrionaceae found worldwide in warm coastal areas. The word “vulnificus” is derived from Latin, meaning “to wound.” Most cases of *Vibrio vulnificus* infection are usually found in tropical or subtropical regions. *Vibrio vulnificus* septicemia can occur following barnacle brush injury or by consumption of contaminated seafood. In Europe, 3.5% to 8% of seafood samples (mainly mussels and oysters) examined contain *Vibrio vulnificus*. Similarly, 2.4% of shrimp from Southeast Asia contained *Vibrio vulnificus*. In India, 75% of freshly harvested oysters contained *Vibrio vulnificus*. *Vibrio vulnificus* usually thrives in natural marine environments and is more concentrated in ocean filter feeders.
such as molluscs, clams, and barnacles. Barnacles are crustaceans that attach to the surface of boats and hence barnacle brush injuries might result in *Vibrio vulnificus* skin and soft tissue infections (SSTI) and septicemia. The chance of barnacle brush injury is high during cyclones as fishermen tie themselves to sides of the boat to prevent themselves being washed away into the sea. In such circumstances, the possibility of SSTI because of *Vibrio vulnificus* should be considered to initiate appropriate antibiotics at the earliest.

Three biotypes of *Vibrio vulnificus* are known to cause severe human diseases. Biotype 1 is found worldwide in salt or brackish water and is the most common strain responsible for the entire spectrum of illness, including the primary sepsis. Biotype 2 is usually a serious pathogen of eels, but on rare occasions may cause wound infections in humans. Biotype 3 can cause severe soft-tissue infections, but the mortality rate appears to be less than 8%.7

*Vibrio vulnificus* infection can be fatal particularly when it results in primary septicemia and necrotizing fasciitis. Patients with underlying diseases like chronic liver disease or immunosuppression have an increased risk of *Vibrio vulnificus* infection. Primary septicemia can occur even without an apparent focus of infection. *Vibrio vulnificus* can be acquired through the gastrointestinal tract after ingestion of seafood contaminated by this organism. It typically begins with abrupt fever, chills, and gastrointestinal symptoms such as abdominal pain and vomiting; progressively secondary cutaneous lesions such as maculopapular rash, cellulitis, bullae, and ecchymoses begin to appear on the patient’s extremities. Skin lesions can progress to ulcers, necrotizing fasciitis, or myonecrosis. Primary septicemia by itself has a very bad prognosis and septicemic shock is associated with 92% mortality.2

*Vibrio vulnificus* can also present as wound infections that occur when *Vibrio vulnificus* is introduced into soft tissue through acute or preexisting wounds. Such exposure occurs following the exposure of wounds directly to seawater or from handling contaminated seafood or indirectly through accidents in a marine environment (e.g., injuries incurred while fishing or cleaning shellfish). Exposed wounds can quickly be colonized by the bacilli, causing intense pain and swelling, followed by cellulitis with blistering bullae. Untreated, this may progress rapidly from skin lesion to necrotizing fasciitis with myonecrosis, and finally to overwhelming sepsis.8

*Vibrio vulnificus* infection is suspected based on clinical and epidemiological findings and is confirmed by bacteriological culture. Routine blood cultures should be performed when *Vibrio vulnificus* infection is suspected. Stool cultures are occasionally useful, requiring thiosulfate-citrate-bile salts–sucrose agar for isolation. Gram stain and culture of a specimen obtained from skin lesions such as abscess or bullae can help in rapid diagnosis and antibiotic stewardship as in this case. Turn around time of cultures can be reduced by performing pathogen-specific polymerase chain reaction which can identify *Vibrio vulnificus* infection, even in patients previously treated with antibiotics.13

In a case study done by the Florida Department of Health and Rehabilitative Services, in 62 patients with *Vibrio vulnificus* infection,2 it was observed that the case-fatality rates in patients with septicemia increased in proportion to the delay between the onset of illness and initiation of appropriate antibiotics thereby highlighting the importance of early diagnosis. The Centers for Disease Control and Prevention (CDC) recommends doxycycline 100 mg intravenously or orally twice a day plus cefazidime (or any other third-generation cephalosporin) 1 to 2 g intravenously every 8 h for the treatment of *Vibrio vulnificus* infection.14 Infectious Diseases Society of America suggests doxycycline with ceftriaxone or cefotaxime as the first-line antimicrobial agent in adults with *Vibrio vulnificus* infections.15 Intra-venous ciprofloxacin, in combination with IV doxycycline or IV tigecycline, has also been used with success.16

In addition to antibiotics, many patients may need aggressive supportive care in the intensive care setting. Aggressive and prompt wound care should be provided. Wound debridement, incision and drainage of any abscesses present, and, sometimes, amputation have been shown to reduce mortality and shorten hospitalization.17 Patients presenting with painful, rapidly progressive hemorrhagic bullae should receive prompt surgical evaluation for possible debridement.17

Certain preventive measures have been recommended for reducing the risk of *Vibrio vulnificus*.18 Limiting consumption of raw oysters or shellfish especially those harvested from warm salt and brackish water can reduce the risk of *Vibrio vulnificus* associated with primary septicemia. To prevent wound infection associated with *Vibrio vulnificus*, exposure of open wounds or broken skin to salt or brackish water should be avoided. Always wear protective clothing (gloves) when handling raw shellfish, and wear protective footwear (wading shoes) while wading in warm salt or brackish water.18

**Conclusion**

This case highlights the importance of maintaining a high index of clinical suspicion for diagnosing *Vibrio vulnificus* SSTI following barnacle brush injury. Early diagnosis is essential to initiate appropriate antibiotics at the right time without which the disease might progress to septic shock and multiorgan dysfunction syndrome. Skin and soft tissue infections caused by halophilic vibrios should be considered in all patients whose wounds get exposed to saltwater which is more likely to occur in fishermen during cyclones.

**Author Contribution**

Conceptualization, design, writing—original draft preparation: SS; design, writing—reviewing and editing, supervision: AR; writing—reviewing and editing: AG; writing—reviewing and editing: KVS; design, writing—original draft preparation: SPN. All authors read and approved the final manuscript.
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