

An uncommon cause of soft tissue and knee infection after penetrating injury in a non-immunocompromised adolescent male

SAGE Open Medical Case Reports
Volume 9: 1–3
© The Author(s) 2021
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/2050313X211034683
journals.sagepub.com/home/sco



Travis Bryant¹, Savannah Ellenwood², Olivia Butters³
and Frances M Saccoccio⁴

Abstract

Non-cholerae *Vibrio* species and *Shewanella* species are organisms that rarely infect humans. Symptoms can range from gastroenteritis to wound infections to septicemia. In addition, these infections can lead to multiple poor outcomes ranging from amputations to death. We present a case of an 11-year-old male with prepatellar bursitis of the right knee due to *Vibrio parahaemolyticus* and *Shewanella algae* following an open wound in the Gulf of Mexico complicated by retained oyster shell fragments. He completely recovered after removal of the foreign bodies and organism-directed antimicrobial therapy with ciprofloxacin and doxycycline.

Keywords

Vibrio parahaemolyticus, *Shewanella*, aquatic organisms, foreign bodies

Date received: 7 June 2021; accepted: 6 July 2021

Introduction

Gram-negative water borne bacteria can cause a variety of disease manifestations. When an injury occurs in fresh, salt, or brackish water, empiric therapy should include coverage for these organisms. Therefore, an accurate history of the mechanism of injury is key to determine potential microbiological exposures in patients with laceration or open wound injuries with or without known foreign bodies. Both fresh and saltwater exposures should heighten the urgency to obtain cultures, clean any wounds, and begin broad-spectrum antibiotic therapy. Patients with a history of chronic liver disease or are immunocompromised require close monitoring, given their propensity for rapidly evolving soft tissue infection and ischemia.^{1,2} In addition, it is paramount to carefully evaluate for foreign bodies in the wound site as retained foreign bodies are a nidus for infection.

We present a case of prepatellar bursitis of the right knee in a healthy non-immunocompromised 11-year-old male caused by *Vibrio parahaemolyticus* and *Shewanella algae* associated with retained oyster shell fragments. *V. parahaemolyticus* is a free-living, motile gram-negative bacterium species that is common to marine environments.¹ It can cause gastrointestinal illness in those who ingest contaminated seafood. This organism is also associated with wound infections and septicemia. *S. algae* are a motile gram-negative rod that

is also found in aquatic environments, with a similar disease presentation and risk factors as *V. parahaemolyticus*.³

Case

A previously healthy, fully vaccinated, non-immunocompromised 11-year-old male sustained a laceration to his right knee after falling out of an airboat onto an oyster bed in a mudflat in the Gulf of Mexico in Levy County, FL, in December 2019. He initially presented to an outside hospital emergency department where the laceration was cleaned and sutured. He was placed on twice daily oral doxycycline to cover empirically for *Vibrio vulnificus* after he was cut by the oyster shell and clindamycin to cover empirically for methicillin-resistant *Staphylococcus aureus* (MRSA). Over a

¹University of Florida College of Medicine, Gainesville, FL, USA

²Department of Pediatrics, University of Florida Health, Gainesville, FL, USA

³AdventHealth Ocala, Ocala, FL, USA

⁴Division of Pediatric Infectious Diseases, Department of Pediatrics, University of Florida Health, Gainesville, FL, USA

Corresponding Author:

Frances M Saccoccio, Division of Pediatric Infectious Diseases, Department of Pediatrics, University of Florida Health, 1600 S.W. Archer Road, HD-214 Box 100296, Gainesville, FL 32610, USA.
Email: fsaccoccio@peds.ufl.edu



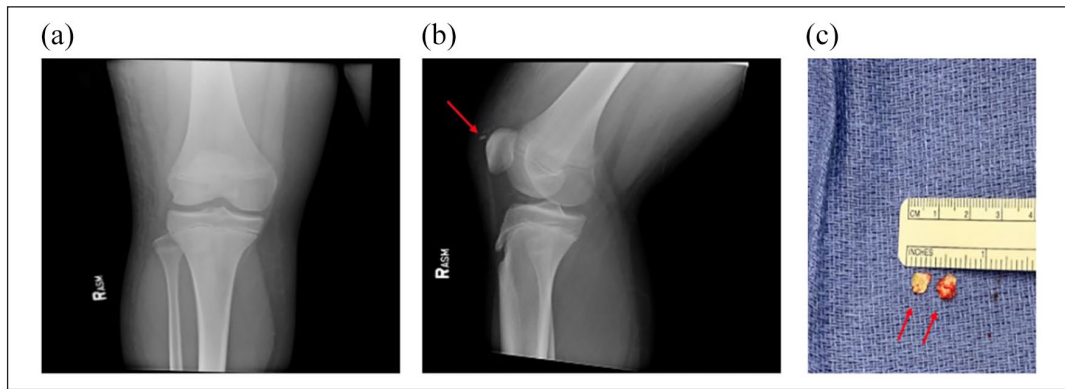


Figure 1. Retained oyster shell fragments in the right knee. (a) AP view of right knee revealing soft tissue swelling. (b) Lateral view of right knee revealing evidence of retained foreign bodies. (c) Surgical specimen depicting oyster shell fragments removed from the right knee measuring approximately 0.5 cm and 1 cm.

period of 48 h, his right knee gradually became swollen, warm to touch, and increasingly painful to the point where he was unable to bear weight. A red streak was noticed on the anterior surface of the affected knee. The patient subsequently developed a maximum temperature of 100.7°F. The next day, he presented again to the outside emergency department where he received a dose of ceftriaxone due to worsening of symptoms despite empiric oral therapy. An X-ray (Figure 1(a) and (b)) of the knee performed at that time revealed foreign bodies overlying the patella. He was subsequently transferred to our hospital for further management.

On admission, orthopedic surgery performed a synovial fluid aspiration, which showed gross blood with white blood cells 1500/CUMM (reference range <5/CUMM), red blood cells 82,000/CUMM (reference range 0/CUMM), neutrophils 25% (reference range 0%), monocytes 71% (reference range 0%), and lymphocytes 4% (reference range 0%). His C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were elevated at 19 mm/H (reference range 0 to <20 mm/H) and 71.45 mg/L (reference range 0–5 mg/L), respectively. He also had neutrophilia. A blood culture was not obtained. Oral antibiotics were discontinued since his symptoms worsened on oral therapy, and he was started on intravenous (IV) levofloxacin and doxycycline to cover empirically for *Vibrio* species, gram-positive organisms, including MRSA, and gram-negative organisms. The levofloxacin was subsequently changed to IV ceftazidime after consultation with the pediatric infectious disease team to provide improved coverage for *Aeromonas* and *Vibrio* species, as well as to cover for fluoroquinolone-resistant organisms. Surgical wound debridement was performed, which revealed purulent synovial fluid and two fragments of oyster shells measuring 0.5 cm and 1.0 cm (Figure 1(c)). Bacterial, fungal, and acid-fast bacillus (AFB) cultures from the synovial aspirate were sent from the operating room. Aerobic cultures grew *V. parahaemolyticus* and *S. algae*. The *V. parahaemolyticus* isolate was sensitive to all antibiotics tested. However, the *S. algae* isolate was resistant to colistin but sensitive to other antibiotics tested. He was given a tetanus vaccination and discharged after clinical improvement with 4 weeks of oral

doxycycline and ciprofloxacin to provide the most appropriate coverage for his infections based on the culture results and sensitivities.

He followed up with the pediatric infectious disease clinic 4 weeks after discharge. At the time of follow-up, he had been cleared by orthopedics to participate in gym class and had been jumping on the trampoline at home. He had no fever and rated his pain a zero out of ten using a standard numeric pain scale. On exam, he exhibited full range of motion and no residual swelling. At that time, ESR was 6 mm/h and CRP was 7.4 mg/L. The only residual sequelae were a 1-cm scab and a healing 4-cm linear surgical scar on his knee, which the patient was excited to show off.

Discussion

This case illustrates the importance of a careful assessment and prompt removal of foreign bodies following an injury in saltwater. Retained foreign bodies of any type can precipitate an inflammatory reaction, and as in this case, may also serve as a nidus for infection. Early identification and treatment of retained foreign bodies and wound infection are essential for preventing serious long-term sequelae.

As mentioned previously, *V. parahaemolyticus* is a species of aquatic bacteria.¹ It is a curved, gram-negative rod, found in seawater. It can cause gastrointestinal illness in those who ingest contaminated seafood. This organism is also associated with wound infections and septicemia. One study found that the majority of *V. parahaemolyticus* cases in Florida occurred from April through October and were more likely to cause gastrointestinal disease.⁴ As with all cases of *Vibrio* infections, those with predisposing risk factors, such as liver disease, will have a more severe disease course with *V. parahaemolyticus*, including sepsis and multi-organ failure.¹ There is no standard treatment regimen for *V. parahaemolyticus*. However, treatment is guided by the same principles as for *Vibrio cholerae*, including tetracyclines, third-generation cephalosporins, aminoglycosides, fluoroquinolones, and trimethoprim-sulfamethoxazole.¹

Similar to *Vibrio* species, *S. algae* is also an aquatic bacterium. *S. algae* is believed to cause upward of 80% of all known *Shewanella* species infections.³ It shares many of the same risk factors for infection as *Vibrio* species, such as consumption of raw contaminated seafood and open wounds. It is more likely to produce severe septicemia in patients with chronic liver disease.^{2,5,6} Other risk factors for severe *Shewanella* infections are chronic kidney disease, venous stasis, and diabetes. Skin and soft tissue infections, with or without subsequent bacteremia, are the most common presentations of *Shewanella* infections. *Shewanella* are usually susceptible to third- and fourth-generation cephalosporins, aminoglycosides, carbapenems, erythromycin, and fluoroquinolones and resistant to first- and second-generation cephalosporins and penicillin.³ *S. algae* are resistant to colistin, while other *Shewanella* species are not consistently resistant to this agent. The isolate in this case was susceptible to all antibiotics tested except for colistin.

Due to their status as newly emerging pathogens, little research has been conducted on either organism. This case report demonstrates the necessity of further study and effective dissemination of information to physicians who are likely to be presented with these organisms. Data such as incubation periods are unavailable and robust data of their epidemiology are limited and are thought to resemble those of closely related organisms such as *V. cholerae*. With increased research, treatment recommendations will become standardized and long-term sequelae will be identified.

Conclusion

This patient was initially treated with doxycycline, but the infection progressed due to lack of source control. Once the oyster shell fragments were removed, the patient improved with oral doxycycline and ciprofloxacin, which is consistent with suggested antibiotic therapy for treatment of *Vibrio* species and *S. algae*. Infection rates with these organisms have been steadily rising over the years, increasing the need for further study of this pathogen and its treatment.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Funding


The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

ORCID iDs

Travis Bryant  <https://orcid.org/0000-0001-6496-5272>

Frances M Saccoccio  <https://orcid.org/0000-0001-5575-0253>

References

1. Baker-Austin C, Oliver JD, Alam M, et al. *Vibrio* spp. infections. *Nat Rev Dis Primers* 2018; 4: 8.
2. Srinivas J, Pillai M, Vinod V, et al. Skin and soft tissue infections due to *Shewanella algae*: an emerging pathogen. *J Clin Diagn Res* 2015; 9: DC16–DC20.
3. Holt HM, Gahrn-Hansen B and Bruun B. *Shewanella algae* and *Shewanella putrefaciens*: clinical and microbiological characteristics. *Clin Microbiol Infect* 2005; 11: 347–352.
4. Hlady WG and Klontz KC. The epidemiology of *Vibrio* infections in Florida, 1981–1993. *J Infect Dis* 1996; 173: 1176–1183.
5. Latif A, Kapoor V, Vivekanandan R, et al. A rare case of *Shewanella septicemia*: risk factors, environmental associations and management. *BMJ Case Rep* 2019; 12: e230252.
6. Vignier N, Barreau M, Olive C, et al. Human infection with *Shewanella putrefaciens* and *S. algae*: report of 16 cases in Martinique and review of the literature. *Am J Trop Med Hyg* 2013; 89: 151–156.