CASE REPOSITORY

Palmar Soft Tissue Infection From *Shewanella putrefaciens*

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Shewanella putrefaciens, a gram-negative bacillus, ubiquitous in marine environments, is an opportunistic agent reported to cause rare human infection, most commonly in patients who are immunocompromised or who have a preexisting soft tissue defect. We present an immunocompetent, 40-year-old woman with a soft tissue infection of the left palm caused by *S. putrefaciens*. The patient's infection was complicated by the presence of retained foreign bodies, seashell fragments, from a traumatic fall. Following appropriate evaluation and surgical treatment, our patient experienced a successful outcome with no recurrence of infection or deficit in the affected hand. This case report complements the growing literature regarding morbidity attributed to *S. putrefaciens* infection. *(J Hand Surg Am. 2017;■(■):1.e1-e4.*

Key words Bacterial infection, foreign body, immunocompetent, *Shewanella*, soft tissue.

Online Exclusive

The presence of *Shewanella putrefaciens* has been frequently demonstrated in all forms of water, fish, and marine environments.[1,2] Most reports of infection with *S. putrefaciens* cite soft tissue involvement manifesting as abscesses, cellulitis, or infected leg ulcers, often originating after marine exposure in patients with ulceration of the lower extremities, burn wounds, or lower limb trauma.[3] This chronic necrotic or compromised tissue serves as a site for opportunistic bacterial growth and infection.

The main phenotypic characteristic of the *Shewanella* genus is production of large amounts of hydrogen sulfide gas on triple sugar iron agar slants. It was previously believed that the majority of *Shewanella* infections are caused by *S. putrefaciens*, a gram-negative, motile, saprophytic, oxidative, and facultative nonoxidative bacillus. This genetically heterogeneous species has varying levels of cytosine and guanine content. After *Shewanella algae* was recovered from red algae in the early 1990s, it was realized that this distinct species had been erroneously considered a variant of *S. putrefaciens*.[4] As a result, literature reviewing *Shewanella* infections published before the early 1990s has understandably unreliable data regarding speciation. Literature reviews now attribute greater than 90% of *Shewanella* infections to *S. algae*, suggesting that previous cases had been incorrectly identifying *S. putrefaciens*.[5] Whether or not these species have differing prognoses or treatment approaches is yet to be determined.

We present a case of a monomicrobial *S. putrefaciens* infection of the hand in an immunocompetent patient. The purpose of this report is to highlight the possibility of *Shewanella* infections regardless of immune status and to stress the importance of adequate treatment of all open wounds in which foreign bodies may be present.

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CASE REPORT

A 40-year-old previously healthy right-handed woman presented to the emergency department with erythema and swelling of her left hand 1 day after a fall on a rock while kayaking on the shore of Connecticut. Hours after sustaining the open laceration to her left palm, she received irrigation and wound closure without antibiotic therapy at a local emergency department.

During the following 24-hour period, she experienced worsening erythema, swelling, and pain in her left palm, leading her to seek medical attention upon return to her home in Washington, DC. She had a temperature of 35.5°C, heart rate of 56 beats/minute and blood pressure of 124/69 mm Hg upon admission. Physical examination of her left upper extremity revealed a laceration of the volar aspect of the left hand between the third and the fourth web spaces with swelling and erythema that was minimally painful to palpation and without fluctuance, purulence, or foul smell.

The patient's laboratory levels were significant for leukocytosis (13.2 K/μL) and an elevated serum C-reactive protein (44.90 mg/L). Owing to worsening symptoms in the setting of a recent exposure to unknown saltwater flora, the infectious disease service was consulted, wound cultures were obtained, and the patient was treated empirically for gram-positive, gram-negative, and anaerobic bacteria, a regimen consisting of intravenous piperacillin/tazobactam (3.375 g every 6 hours), vancomycin (1 g every 12 hours), and ciprofloxacin (400 mg every 12 hours). Radiographs of the left hand revealed a triangular radiopaque body possibly representing a foreign body within the soft tissues over the fourth metacarpophalangeal joint (Fig. 1). Within 12 hours of admission, erythema and swelling of the patient's left hand had decreased, and her digital range of motion had improved.

Thirty-six hours after admission and initiation of antibiotics, she had made no further clinical progress and was reporting increased pain in the hand. A small purulent area at the proximal aspect of her laceration had also begun to develop. The patient was taken to the operating room for incision and drainage. Investigation of the wound resulted in retrieval of 2 foreign bodies, later determined to be seashell fragments (Fig. 2). All infected material was debrided. The distal infected wound was irrigated and closed loosely. The following day, the patient returned to the operating room for a repeat incision and drainage to ensure complete removal of necrotic or foreign material.

FIGURE 1: Initial anteroposterior radiograph of the left hand.

Initial cultures from the wound grew *S. putrefaciens*. The organism was sensitive to first-, second-, and third-generation cephalosporins, gentamicin, imipenem, and trimethoprim/sulfamethoxazole but was resistant to aztreonam. No other organisms were isolated from the wound. Per the infectious disease consultant's recommendation, the patient was discharged 48 hours later on a new antibiotic regimen of ciprofloxacin 250 mg orally twice per day for 2 weeks and doxycycline 100 mg orally twice per day for 2 weeks.

DISCUSSION

The *Shewanella* genus contains multiple human pathogens with unknown clinical differences. Table 1 outlines the points of phenotypic differentiation between *S. putrefaciens* and the more common *S. algae*.[2] Although it remains unclear, characteristics such as utilization of hemolysins, the capacity to adhere to epithelial cells, production of exotoxins and a biofilm, and the ability to withstand cold temperatures have been proposed as potential virulence factors of *S. putrefaciens*.[6]

Several documented reports of human infections and bacteremia from *S. putrefaciens* exist, although many accounts lack appropriate identification of *Shewanella*