CASE REPORT

A rare cause of wound infection after an open fracture: *Shewanella putrefaciens*

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SUMMARY

An elderly gentleman presented with an open fracture of the calcaneum and ankle, following a boating accident. Despite treatment with repeated surgical debridement, delayed closure, prolonged antibiotics and strict adherence to national guidelines on the management of open fractures, he developed a wound infection with a rare organism, *Shewanella putrefaciens*, that appears to be increasing in prevalence.

BACKGROUND

Open fractures are common injuries seen in accident and emergency departments on a regular basis. They require prompt initiation of management to prevent potentially devastating infections and ensure optimal functional outcomes. This case demonstrates how despite swift and appropriate treatment that was in adherence to national guidelines on the management of such injuries, a slightly unusual mechanism of injury led to the development of a wound infection with a rare pathogen.

CASE PRESENTATION

A 92-year-old gentleman presented to our centre after a boating accident. He was sailing in shallow waters in East Anglia, UK, when he fell from his boat and caught his right foot in the propeller. He sustained a laceration to the foot and was unable to weight-bear, so he attended the accident and emergency department. His medical history included type 2 diabetes mellitus, for which he was taking insulin; however, he was otherwise fit and well. On examination, he had a wound that was approximately 7 cm, extending from just posterior to the medial malleolus anterolaterally. There was no distal neurovascular deficit.

INVESTIGATIONS

Plain radiographs taken at presentation showed that he had sustained fractures of the calcaneum and the medial malleolus.

TREATMENT

Immediate management involved irrigation of the wound, coverage with a normal saline-soaked gauze and application of a below-knee plaster of paris backslab. Broad-spectrum intravenous antibiotics were started as per national guidelines (co-amoxiclav 1.2 g). He was taken to the operating theatre the following morning for washout and debridement of the wound, and open reduction and internal fixation of the calcaneal and medial malleolus fractures (figure 1). The calcaneum was

fixed using percutaneous screws, whereas a new surgical incision was made for fixation of the medial malleolus. The surgical wounds were closed; however, the large traumatic wound was left open and packed with betadine and saline-soaked ribbon gauze. A plaster of paris backslab was reapplied. He was taken back to the operating theatre 2 days later for a wound check and further debridement and washout. The traumatic wound was reported as looking clean, but was curetted and irrigated with a further 3 litres of normal saline and subsequently closed. The patient remained on intravenous co-amoxiclav (1.2 g three times daily) for 5 days in total, before being prescribed a further 9 days of oral co-amoxiclav (625 mg three times daily).

OUTCOME AND FOLLOW-UP

He was discharged home 10 days after he initially presented; however, when he was seen at his routine clinic follow-up appointment on day 14, the traumatic wound was examined and found to be oozing, warm to the touch with a surrounding cellulitis. The surgical wound was normal. Despite being systemically well, he was admitted and started on intravenous benzylpenicillin and flucloxacillin. Swabs were taken for microscopy and culture. These swabs grew *Shewanella putrefaciens*, sensitive to ciprofloxacin, trimethoprim, amoxicillin and gentamicin. The patient was then prescribed an 8 week course of oral ciprofloxacin (750 mg twice daily) on the advice of the microbiology team. He has been followed up for 8 months, and in this time the traumatic wound and fractures have healed and there have been no further complications. Since completing the course of antibiotics, subsequent wound swabs taken from the previously infected traumatic wound have not grown any microorganisms.

Figure 1 Radiographs of the fixation of the calcaneum and medial malleolus (A) lateral and (B) anteroposterior.

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DISCUSSION

S putrefaciens is a Gram-negative rod. It is a non-fermentative, oxidative bacterium that produces hydrogen sulfide on triple sugar iron agar (TSI) and is oxidase-positive.¹ Reports show that *S putrefaciens* and *Shewanella algae* are the only *Shewanella* species found in clinical specimens and they are similar in terms of their biochemical characteristics.²

S putrefaciens is usually isolated from marine environments—freshwater and seawater—although it has also been isolated from fish and soils.³ It has been reported to cause infections of the skin and soft tissues, pneumonia and intra-abdominal abscesses.^{4–6} There are also documented cases of presentation with florid bacteraemia and soft tissue infections that have progressed to necrotising fasciitis.^{7–8} These presentations have typically been described in patients who are immunocompromised.⁹ Furthermore, chronic infections of the lower limb and liver disease have been identified as risk factors for the development of bacteraemia.¹⁰ Infections with *S putrefaciens* tend to occur in warm climates, or during particularly hot summers of temperate climates, due to the correlation of its occurrence with the temperature and salinity of water.⁹

In this case report, the boat propeller itself is likely to have been the source of the bacterium, with the laceration caused by the propeller providing the nidus for entry. The patient had diabetes mellitus and thus a degree of immunocompromise, which will have increased his risk for developing a wound infection.

What is particularly interesting is that despite the strict adherence to national guidelines on the management of open fractures,¹¹ the bacterium was still able to manifest with significant clinical infection. In the accident and emergency department, the patient received immediate irrigation, appropriate wound coverage and early broad-spectrum intravenous antibiotics, followed by two washouts with curettage under general anaesthesia. The patient received antibiotics for a further 2 weeks, despite a clean wound, due to concern about the unusual environment in which the injury took place. At the time, it was felt that co-amoxiclav had a spectrum that was sufficiently broad to cover against most pathogens.

The authors feel that the hospital management of this presentation was appropriate. However, in retrospect, given the unusual environment and the fact that the patient was diabetic, there should have been a higher index of suspicion for the possibility of developing infection and a formal wound check should have been arranged sooner. With *S putrefaciens* having been reported to cause bacteraemia and even progress to necrotising fasciitis, it could be argued that identifying the pathogen from the wound, while a superficial infection, saved the patient from a potentially more devastating outcome. An important learning point from this case, therefore, is the need to closely monitor patients with significant wounds in the outpatient setting after discharge from the hospital, even if they appear to be clean and the patient is on antibiotics. We must also be aware of the existence of unusual pathogens that we do not encounter regularly,

and be vigilant particularly when mechanisms of injury are unusual and when dealing with patients who are more prone to infection. While rarely manifesting clinically, *S putrefaciens* infections do seem to be reported with increasing frequency, and as a result it is being thought of as an emerging opportunistic pathogen in immunocompromised patients.¹⁰

Learning points

- ▶ *Shewanella putrefaciens* is a bacterium that is isolated from marine environments.
- ▶ While there are only a handful of reported cases of infections caused by *S putrefaciens* to date, they do seem to be occurring more frequently.
- ▶ It most commonly causes skin and soft tissue infection, and so it should be considered when treating wounds sustained in fresh or seawater.
- ▶ Clinicians must be vigilant to the existence of rare pathogens, especially when injuries occur in unusual environments, and must continue to closely monitor such wounds until they heal.

Competing interests None.

Patient consent Obtained.

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