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Staphylococcus lugdunensis: A Rare Pathogen for Osteomyelitis of the Foot

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ABSTRACT

Staphylococcus lugdunensis is an aggressive gram-positive bacteria that can lead to devastating infections in humans. *S. lugdunensis* has been associated with rare cases of osteomyelitis of the vertebra, prosthetic implants, and endocarditis. Reports of this organism associated with osteomyelitis of the foot or ankle have been infrequent. We present a unique case of acute osteomyelitis of a foot caused by *S. lugdunensis* after a patient stepped on a thorn. Our case is unique, because the radiographic changes were noted within 4 days, despite normal plain films and magnetic resonance images on the day of admission. This finding suggests the aggressiveness and virulence of *S. lugdunensis*. In addition, we report the first case of foot osteomyelitis as a result of isolated *S. lugdunensis* that involved 2 distinct specimens with 2 different antibiotic sensitivity reports.

Staphylococcus lugdunensis is a coagulase-negative, gram-positive, nonmotile, catalase-positive, facultative anaerobic coccus (1). It was first described by Freney et al (2) in 1988 using DNA-DNA hybridization. Since then, it has emerged as a rare, but important, cause of human infection (3). The behavior of *S. lugdunensis* is more similar to that of *S. aureus* than to that of other coagulase-negative staphylococci (CoNS) in its virulence and aggression (1). *S. lugdunensis* has usually been considered a skin contaminant, but it can be an important cause of both nosocomial and community-acquired infections, including vertebral osteomyelitis, bacteremia, endocarditis, severe skin and soft tissue infection, central nervous system infection, and infections associated with medical devices (1,3,4). We report a rare case of foot osteomyelitis caused by *S. lugdunensis*.

Case Report

The patient was a 66-year-old male with a medical history of alcoholic cirrhosis, diabetes mellitus type 2 with neuropathy, coronary artery disease, and depression. The patient did not have a history of foot ulceration or infection. Four days before his admission, the patient's wife had noticed her husband's left foot had become red and swollen. On closer inspection, she discovered multiple "goat head" thorns embedded in the plantar forefoot near the fifth metatarsal head. She attempted to remove the thorns with limited success. The redness and swelling subsequently worsened. On January 7, 2014, the patient presented at the emergency department and had left foot radiographs taken (Fig. 1), which revealed no identifiable foreign bodies and no cortical erosion. The patient left without treatment owing to the long wait time.

The patient returned to the emergency department the next day (January 8, 2014) and was evaluated. Subjectively, he had experienced no constitutional symptoms and had very little pain in the left foot. On physical examination, erythema was present, extending 3 to 4 cm proximally from the multiple small punctate wounds near the plantar and lateral aspects of the fifth metatarsal head. The largest wound measured 3 mm in diameter. The most concerning of these could be probed to the left fifth metatarsophalangeal joint capsule. Mild, localized, nonpitting edema to the area was present. The wounds were debrided at bedside in the emergency department, all additional debris or signs of the "goat head" thorns were fully removed, and a dressing of wet to dry Betadine-soaked gauze was applied to the wounds. No induration and no purulent drainage were present. No fluid for culture was encountered; thus, no cultures were obtained. The patient had intact pulses with the absence of gross sensation in both feet.

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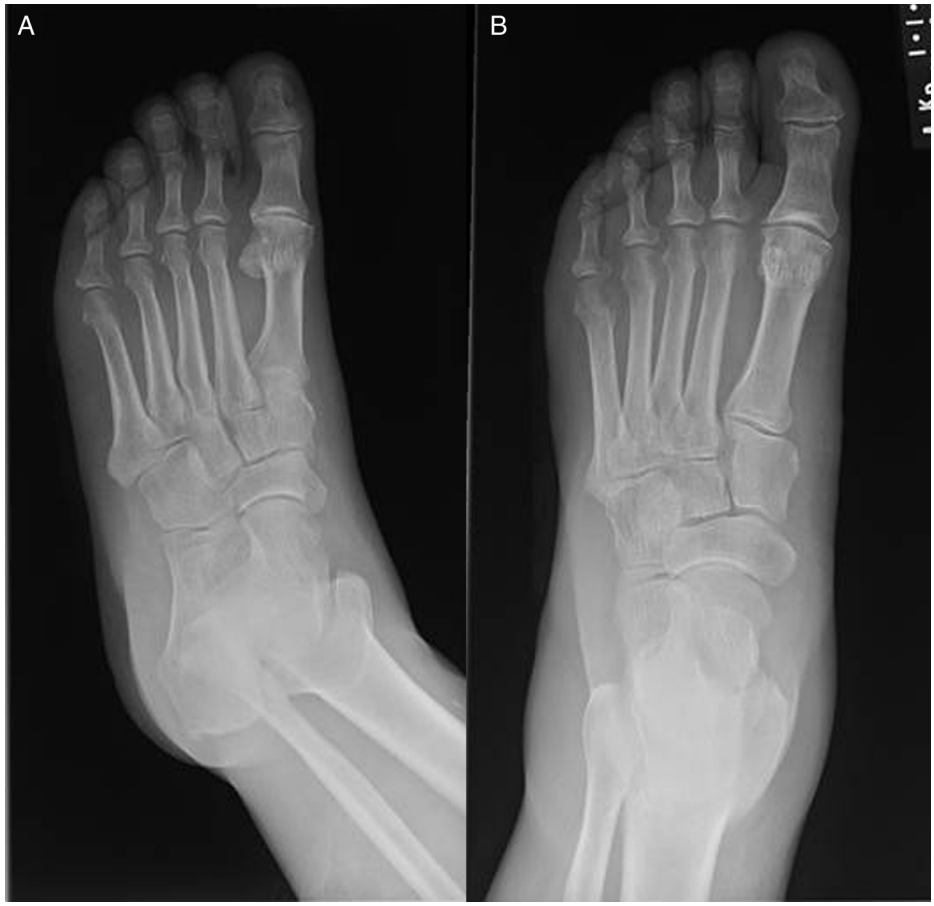

Fig. 1. (*A*) Anteroposterior and (*B*) oblique views of the left foot taken the day before admission showing the normal osseous structure of the left fifth metatarsophalangeal joint, including the fifth metatarsal head and proximal phalanx of the fifth digit.

His laboratory values included a white blood cell count of 8.4 $\times$ 10^3/μL, neutrophils of 72.2%, 2 negative blood cultures, and blood glucose of 379 mg/dL. A hemoglobin A1c level of 11.3% at 8 months before the present admission. His vital signs during the next 24 hours were normal, except for a temperature maximum of 99.9°F.

The patient was admitted to receive intravenous antibiotics to treat the cellulitis and began receiving vancomycin and piperacillin/tazobactam on January 8, 2014. Because a clinical suspicion was present for a deep abscess, septic joint, or osteomyelitis of the left fifth ray, an urgent magnetic resonance imaging study was ordered, but it did not show any abscess, joint sepsis, or osteomyelitis (Fig. 2). No signal uptake was noted in the fifth metatarsal or the proximal phalanx on the magnetic resonance imaging scan. During the next 24 hours, the patient's erythema initially worsened but then steadily improved. All puncture wounds had resolved, except for 1 wound. Hospital day 4 revealed no additional improvement in this residual wound; therefore, a repeat radiograph was taken (Fig. 3). This revealed fragmentation of the fifth metatarsal head and a fracture of the base of the proximal phalanx, with erosive changes consistent with osteomyelitis. The patient was taken to the operating room for incision and drainage of the left foot that included fifth metatarsophalangeal joint resection, followed by delayed primary closure at a later date. Intraoperatively, the bone was soft, necrotic, and fragmented. A small amount of purulent drainage was noted within the metatarsophalangeal joint. Cultures from the bone obtained in the operating room grew 2 different *S. lugdunensis* species, with 1 culture sensitive only to rifampin and vancomycin and the other sensitive to clindamycin, oxacillin, trimethoprim/sulfamethoxazole, rifampin, and vancomycin. The pathologic examination results of the bone were diagnostic for osteomyelitis (Fig. 4). After consulting the infectious disease service, the patient continued receiving 1 g vancomycin intravenously every 12 hours and 3.375 mg piperacillin/tazobactam intravenously every 6 hours, with steady improvement in the foot infection. Because the pathologic examination of the "clean edge" of the bone resection revealed the absence of osteomyelitis with negative cultures, the patient completed 3 weeks of the antibiotic therapy, from January 8, 2014 to January 30, 2014, in accordance with the infectious disease service's recommendations.

Discussion

S. lugdunensis is a rare coagulase-negative, gram-positive, coccus organism. Although *S. lugdunensis* has been classified as CoNS, it can be particularly virulent and aggressive. This organism has been documented to cause deep abscesses, skin and soft tissue infections, and central nervous system infections (1,5,6). Blood stream infections, including septic shock and endocarditis, that were complicated by embolic events have been reported in association with *S. lugdunensis* (7). One study found that patients with left-sided endocarditis all required surgery, with a mortality of 80% (7). Similar to *S. aureus*, this organism can form biofilms, which adds to the virulence associated with pacemaker-, prosthetic valve-, and prosthetic joint-associated infections (1,8,9). Osteomyelitis can be rare, but when it occurs, it has been reported more often in vertebral or disk space infections (1,10,11).

S. lugdunensis osteomyelitis of the foot is very rare. On a review of published studies, we identified several foot infections that had been