Case Report

Rhodococcus erythropolis Osteomyelitis in the Toe

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Abstract The *Rhodococcus* species rarely cause musculoskeletal infections, with only two cases reported in the literature. We report the case of a 53-year-old woman who had an infection develop after first metatarsophalangeal joint fusion. A year after surgery, she continued to have pain and swelling with nonunion. She underwent revision of the arthrodesis and tissue samples from surgery revealed *Rhodococcus erythropolis*. The patient's symptoms improved with oral antibiotics. One year after the revision surgery, the fusion had united. We believe this is the first report of a case of a musculoskeletal infection caused by *Rhodococcus erythropolis*.

Introduction

Rhodococcus species are gram-positive bacteria that are distributed widely in the environment and have excited considerable interest because of their potential ability to

render environmental pollutants harmless (bioremediation) [5]. *Rhodococcus equi* is well recognized as a cause of infection in humans and animals and is associated with a range of clinical manifestations, especially cavitating pneumonia in immunocompromised individuals, such as recipients of solid organ transplants and those with AIDS [1], although infection in apparently immunocompetent persons also has been reported [8]. Osteomyelitis associated with the bacterium appears to be very uncommon in humans [3, 6]. Human infection associated with species of *Rhodococcus* other than *R. equi* is infrequently reported. We report the first case of an orthopaedic infection in humans caused by *R. erythropolis*.

Case Report

A 53-year-old fit and healthy woman underwent metatarsophalangeal joint arthrodesis with cerclage wire technique. One week after the operation, the patient had a superficial wound infection develop, which was treated empirically with a 1-week course of oral flucloxacillin without obtaining cultures. Two months after surgery, she still had substantial pain and swelling at the surgical site. Radiographs showed no evidence of infection. Her leukocyte count was $9.4 \times 10^9/L$, C-reactive protein was less than 5 mg/L, and plasma viscosity was 1.86 (reference range, 1.5–1.72). One year after the operation, she continued to have severe pain and swelling around the surgical wound site, with an established radiographic nonunion (Figs. 1, 2). She underwent revision surgery with removal of wires and thorough débridement of the bone ends; refusion was performed with two standard 3.5-mm cortical screws under compression. There was no evidence of pus, but the soft tissue surrounding the joint was unexpectedly

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Fig. 1 A preoperative radiograph shows an anteroposterior view of the foot before the metatarsophalangeal joint arthrodesis.

Fig. 2 An anteroposterior radiograph of the foot, taken 1 year after the metatarsophalangeal joint arthrodesis (first operation), shows evidence of nonunion.

inflamed. Soft tissue samples were taken to exclude a low-virulence organism as a cause of delayed union. Tissue samples revealed a gram-positive bacillus and were incubated aerobically, anaerobically, and in CO₂. Growth on primary culture was noted after 72-hour incubation in CO₂. Direct culture yielded a pure growth of a gram-positive rod subsequently identified as *Rhodococcus erythropolis* (Fig. 3) and later confirmed by a reference laboratory using 16S rDNA sequencing. Disk diffusion testing revealed the

Fig. 3 A culture of *Rhodococcus erythropolis* on horse blood agar shows marked colonial variation, giving the impression of a mixed (and thus contaminated) culture.

isolate was susceptible to erythromycin, tetracycline, fusidic acid, vancomycin, teicoplanin, ciprofloxacin, and rifampicin but resistant to penicillin and trimethoprim. Postoperatively, the patient was discharged and received a 5-day course of oral ciprofloxacin. Postoperatively, there was no wound problem, pain and swelling had subsided, and the arthrodesis had united at 1 year (Fig. 4).

Discussion

The genus *Rhodococcus* consists of 42 species. It belongs to the Nocardioform group of the aerobic actinomycetes, which also includes genera such as *Nocardia* and *Mycobacterium* [2]. Recently *Rhodococcus erythropolis* has been identified as part of the regional microflora of individuals with normal and dry eyes [4]. The importance of this finding is uncertain, although there is a case report of *Rhodococcus erythropolis* endophthalmitis after lens implantation [10]. There is only one other case report of human infection with this bacterium cultured from an aspirate from an HIV-positive individual who presented with multiple subcutaneous nodules [9]. Because the bacterium is environmental in origin, its isolation from clinical material must be assessed carefully, as growth from a microbiologic specimen could merely indicate contamination during specimen collection or subsequent processing in the microbiology laboratory rather than true infection. Marked colonial variation exhibited by the bacterium

Fig. 4A–B (A) Anteroposterior and (B) lateral radiographs of the foot, taken 1 year after revision of the metatarsophalangeal joint arthrodesis with cortical screws (second operation), show union had occurred.

(Fig. 3) also may lead to erroneous discarding of cultures as contaminated. However, in this case, the specimen was taken under sterile conditions; the bacterium was seen on a gram-stained preparation of the specimen obtained at surgery and also grew in pure culture, which thus would make contamination an extremely unlikely explanation. Our patient's good clinical response to an antimicrobial to which the isolate was susceptible also argues against contamination. As with many other bacteria of environmental origin, *Rhodococcus erythropolis* likely has limited pathogenicity, which may explain why removal of the foreign body and source of infection may have yielded a good clinical response to treatment with a short course of antibiotics. Our patient had no obvious risk factors for infection with the *Rhodococcus* species and was not immunocompromised. Unlike other *Rhodococcus* species, *Rhodococcus erythropolis* is not well recognized as a cause of nonhuman infection. There is only one report of infection in this context relating to systemic infection in farmed salmon [7]. Although our patient gave a history of bathing in the sea, it remains unclear regarding how she might have acquired the infection. Our case report could represent a single incidental finding; however, orthopaedic surgeons and microbiologists should be aware this bacterium is capable of causing infection, especially as the colonial morphology of the bacterium (Fig. 3) may result in its misidentification as a diphtheroid and thus it may be dismissed as a contaminant in clinical specimens.

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