Nocardia Septic Arthritis Complicating an Anterior Cruciate Ligament Repair

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CASE REPORT

Following a sporting injury, an otherwise healthy 27-year-old male mining engineer underwent revision of a hamstring tendon autograft anterior cruciate ligament (ACL) reconstruction of the left knee that had been performed 3 years earlier. Two 25-cm tibialis anterior tendon allografts were utilized and secured using fixation screws. The surgery was complicated by hemorrhaxis on the sixth postoperative day that required aspiration; however, there were no signs of infection at that time.

There was an increased range of movement in the knee and a reduction in pain during the first 2 months postoperatively. However, the patient then developed erythema and a small abscess around the inferior half of the surgical scar. He was commenced on a course of oral cephalexin for 5 days before undergoing a left knee washout and removal of the tibial fixation screw. Postoperatively, he commenced empirical intravenous vancomycin, which was discharged on the previous dose of sulfamethoxazole-trimethoprim (800/160 mg), given as two tablets orally twice daily, and the patient was discharged.

One week later, the patient began experiencing fevers and inflammation around the left knee. Surgical exploration was undertaken, and all remaining allograft and prosthetic material was removed. Vancomycin cement was inserted during this procedure, but this was also removed at a definitive arthroscopic debridement done 1 week later. Joint fluid, tissue, and operative wound cultures were negative from both procedures. Postoperatively, he received intravenous vancomycin and meropenem for 18 days and then was discharged on the previous dose of sulfamethoxazole-trimethoprim. This oral antibiotic treatment was continued for 12 months, during which time there was an increased range of movement and function in the knee and a resumption of activities, including surfing, golfing, and jogging. At review 6 weeks following cessation of antibiotics, there was no evidence of recurrent infection and inflammatory markers were normal. A follow-up X-ray, computed tomography (CT), and magnetic resonance imaging (MRI) scan confirmed no evidence of osteomyelitis or soft tissue inflammation. There was no complication of the bony tunnels created in the tibia and femur.

The Nocardia species was identified by PCR and sequencing of part of the 16S rRNA gene as most closely resembling Nocardia aobensis. Primers targeting conserved areas near the 5′ end of the 16S rRNA gene (forward, 5′-CCTAACACATGCAAGTCGARCGGCTGCT-3′; reverse, 5′-CGTATTACCGGGGTGCTGCT-3′) produced a 400-bp sequence (GenBank accession no. KR534216) (2). This was matched with the NCBI GenBank database (https://blast.ncbi.nlm.nih.gov) using BLAST search (3), returning 100% query coverage and 100% match to the first identified human clinical strains reported by Kageyama et al. (1) This is sufficient for identification to the species level according to CLSI guideline MM18A (4), but the validity of using only the 16S sequence has been questioned by Kong et al. as additional sequencing and matching of the secA1 gene were found to alter the identification in 16/20 cases (5). Susceptibility data are shown in Table 1.

The tissue bank that supplied the allografts performed a formal investigation, and this revealed that normal procedures had been followed in relation to procurement, irradiation, and microbiological testing, with no significant microbiological growth de-

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Nocardia infection following anterior cruciate ligament (ACL) allograft reconstruction is a rare occurrence. We report a case of Nocardia infection of an allograft ACL reconstruction and septic arthritis of the knee joint due to an organism most similar to the novel Nocardia species Nocardia aobensis.
There has been only one previous case reported of Nocardia infection involving the ACL after reconstruction with a tibialis anterior allograft (8); however, the species identified was Nocardia nova. Nocardia nova infection has also been reported as a complication of total knee replacement using uncemented natural posterior allograft (8); however, the species identified was Nocardia farcinica. (25) It is more difficult to treat infection empirically, and susceptibility testing of individual isolates has been subjected to an appropriate intensity of gamma irradiation. That none of these organisms caused relapse during prolonged follow-up (despite only receiving limited directed therapy initially) would suggest they were not the primary cause of infection.

Nocardia infections are often treated empirically, based on species identification, until results of susceptibility testing are available. Previously, species identification using 16S rRNA sequencing and phenotypic typing has shown good correlation with antibiotic susceptibility patterns (27). The emergence of new Nocardia species, for which only small numbers of isolates have been reported and thus only a small amount of susceptibility data is available, means that it is more difficult to treat infection empirically, and susceptibility testing of individual isolates is important. The present case also demonstrates the difficulties inherent in molecular identification of novel species by DNA sequencing when only small numbers of sequences are available in databases. Only 6 partial 16S rRNA gene sequences for Nocardia aobensis could be found in a public database, the Global Catalogue of Microorganisms (http://gcm.wfcc.info/speciesPage.jsp?strain_name=Nocardia aobensis [accessed 26 May 2014]).

This is the first reported case of Nocardia infection due to a novel species most closely resembling Nocardia aobensis in an ACL reconstruction using tendon allografts. This case highlights the difficulties inherent in species diagnosis by molecular methods when a novel species is concerned and the need for susceptibility testing of individual isolates.

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