

## An unusual case of prosthetic joint infection due to *Arcanobacterium bernardiae*

A 78-year-old man was admitted to the orthopaedic ward of the Centre Hospitalier Régional Universitaire for a haematoma of the left thigh which had appeared after a fall and 3 weeks of insidious pain. Medical history included a left total hip prosthesis because of a work accident 27 years previously. Examination revealed that his left hip prosthesis had worked loose, which was probably responsible for the fall. Laboratory data included a blood leukocyte count of  $9.3 \times 10^9 \text{ l}^{-1}$ , with 73 % polymorphonuclear leukocytes, and a C-reactive protein level of  $18 \text{ mg l}^{-1}$ . The haematoma was drained surgically and the prosthesis was removed and replaced by a spacer. During the intervention, four biopsies (haematoma, muscle, femur and acetabulum) were performed. Gram stain of the haematoma and the femur biopsy smears showed Gram-positive bacilli. As the patient was afebrile, blood cultures were not performed. A combination of linezolid and cefotaxime was started until the microbiological results were available.

The four biopsies grew only a Gram-positive coryneform rod after 48 h incubation at  $37^\circ\text{C}$ . The presence of this bacterium in all per-operative samples led us to consider this bacterium as the origin of the total hip prosthesis infection and its loosening, as Atkins *et al.* (1998) showed that the isolation of an indistinguishable micro-organism from three or more independent specimens was highly predictive of infection. The unpigmented colonies were able to grow as well in an aerobic atmosphere as in an anaerobic atmosphere. The strain grew better on Columbia agar in the presence of 5 %  $\text{CO}_2$ . The isolate was catalase- and cytochrome oxidase-negative. The API CORYNE strip (bioMérieux) gave a final profile number 2010222 with a good identification for *Arcanobacterium bernardiae* (probability: 98.8 %; typicality: 0.94). To confirm the identification of this agent, which is rarely isolated in clinical samples, sequencing of the 16S rRNA gene was performed using a

MicroSeq 500 16S rRNA Bacterial Sequencing kit (Applied Biosystems). The 407 bp fragment obtained was compared with NCBI GenBank entries by using the BLAST algorithm (<http://www.ncbi.nlm.nih.gov/BLAST>). It showed 99 % identity with the 16S rRNA gene of *Arcanobacterium bernardiae* strain DSM 9152<sup>T</sup> (GenBank accession no. X79224) previously determined by Funke *et al.* (1995). *In vitro* susceptibility tests were performed using the diffusion method by Etest (AES) on Mueller–Hinton medium with 5 % sheep blood. As no specific recommendations exist for this bacterium, the breakpoints described for general bacteria by CA-SFM 2008 (Comité de l'Antibiogramme de la Société Française de Microbiologie; <http://www.sfm.asso.fr>) allowed us to consider that this bacterium was only resistant to penicillin G (MIC=0.5  $\text{mg l}^{-1}$ ), amikacin (MIC=16  $\text{mg l}^{-1}$ ) and trimethoprim/sulfamethoxazole (MIC=16/304  $\text{mg l}^{-1}$ ) and susceptible to amoxicillin (MIC  $\leq 0.016 \text{ mg l}^{-1}$ ), amoxicillin/clavulanic acid (MIC  $\leq 0.016 \text{ mg l}^{-1}$ ), cephalothin (MIC  $\leq 0.016 \text{ mg l}^{-1}$ ), cefotaxime (MIC=0.032  $\text{mg l}^{-1}$ ), imipenem (MIC=0.004  $\text{mg l}^{-1}$ ), erythromycin (MIC  $\leq 0.016 \text{ mg l}^{-1}$ ), clindamycin (MIC  $\leq 0.016 \text{ mg l}^{-1}$ ), rifampicin (MIC  $\leq 0.002 \text{ mg l}^{-1}$ ), teicoplanin (MIC=0.5  $\text{mg l}^{-1}$ ), vancomycin (MIC=0.25  $\text{mg l}^{-1}$ ), linezolid (MIC=0.5  $\text{mg l}^{-1}$ ) and levofloxacin (MIC  $\leq 0.016 \text{ mg l}^{-1}$ ). On the basis of these results, the treatment was changed and a combination of rifampicin plus ofloxacin was administered for 12 weeks. After this prolonged antibiotic therapy, replacement of the prosthesis was successfully performed, with no new infection to date.

*Arcanobacterium bernardiae* is a non-spore-forming, facultatively anaerobic, Gram-positive rod, with coccobacilli predominating. In 1987, the Centers for Disease Control and Prevention (CDC) described 11 strains of an organism

designated coryneform group 2 (Na'was *et al.*, 1987). In 1995, Funke *et al.* (1995) proposed the name *Actinomyces bernardiae* sp. nov. for the CDC coryneform group 2 bacteria, based on a comparative 16S rRNA sequence analysis. In a more recent taxonomic study, the genus *Actinomyces* was divided into different genera, with *Actinomyces bernardiae* and *Actinomyces pyogenes* assigned to the genus *Arcanobacterium* as *Arcanobacterium bernardiae* comb. nov. and *Arcanobacterium pyogenes* comb. nov., respectively (Ramos *et al.*, 1997). The role of *Arcanobacterium bernardiae* in human infections has not been clearly established and is limited to a few reports. The bacterium was first described in 1995 by Funke and others, who identified the strain from blood culture and abscesses (Funke *et al.*, 1995). Two cases of severe urinary tract infection and one case of septic arthritis have also been reported. The common trait between these reported cases was the acute infection: severe urinary tract infection complicated by septicaemia (Ieven *et al.*, 1996), urinary tract infection in a patient with a urinary tract diversion (Lepargneur *et al.*, 1998) and septic arthritis (Adderson *et al.*, 1998). Moreover, in the arthritis case, the patient was immunocompromised because of systemic lupus erythematosus treated with corticosteroids and cyclophosphamide (Adderson *et al.*, 1998). *Actinomyces pyogenes* (Lynch *et al.*, 1998) and *Arcanobacterium haemolyticum* (Goyal *et al.*, 2005) have been described in arthritis with an acute presentation due to a virulence factor such as  $\beta$ -haemolysin. This case illustrates the ability of a new species to cause a prosthetic joint infection in an immunocompetent patient. The initial source of *Arcanobacterium bernardiae* in this case report was unknown, but the organism may be part of the normal skin flora.

In conclusion, this case illustrates a rare occurrence of *Arcanobacterium bernardiae*

associated with prosthetic joint infection. Physicians and microbiologists should pay particular attention to *Arcanobacterium bernardiae* causing opportunistic bone infections to better understand its action as a human pathogen.

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