

# Implant-associated ESBL-*Klebsiella pneumoniae* producing small colony variant bone and joint infection in a healthy 40-year-old man

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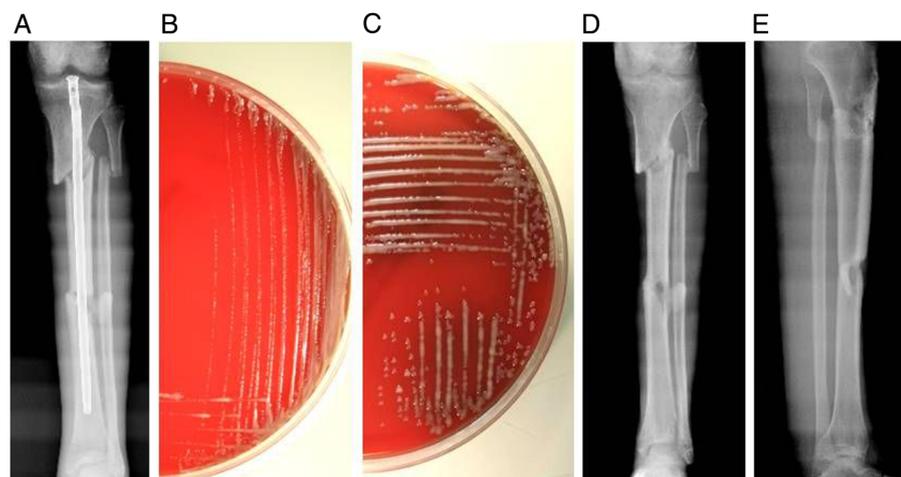
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## DESCRIPTION

A 40-year-old man underwent a bifocal fracture of the left leg in Senegal. An intramedullar rod was implanted to obtain consolidation. At 7 months, the patient was admitted to our institution as the distal fracture had not consolidated (figure 1A). There was no clinical sign of infection. A 1-stage exchange of the rod was performed. No abscess or suspected tissue was detectable during the surgery. Systematic peroperative test of samples were performed, and revealed *Klebsiella pneumoniae* producing extended-spectrum  $\beta$ -lactamase (ESBL), and some colonies expressed the small colony variant (SCV) phenotype in the culture (with the same antibiotic susceptibility), which was also identified to be *K. pneumoniae* (figure 1 B and C). An early new intervention was required due to local abscess formation, the rod was explanted, the tibia was immobilised with a cruro-pedal cast and negative pressure therapy on the skin defect was instated. Peroperative bacteriology always showed *K. pneumoniae* in culture. Antibiotics with meropenem (6 g/day) and colimycine (colistimethate sodium, 6 MUI/day) were started, and skin and soft tissue flap was performed to cover the exposed bone of the proximal tibia. At 3 months of antimicrobial therapy (no adverse event occurred), the fracture had consolidated as seen on the X-ray (figure 1 D and E) and the antibiotics were stopped. The outcome was

favourable, and the patient is walking now without pain and without any sign of infection.

*Enterobacteriaceae* could be responsible for bone and joint infection (BJI), but are most of time responsible for acute postoperative or haematogenous infections. The SCV phenotype corresponds to a reversible switch of the metabolism of bacteria, leading to slow-growing forms that are associated with intracellular persistence and pin point colonies on blood agar.<sup>1</sup> Most of the BJIs associated with the expression of the SCV phenotype are chronic implant-associated staphylococci BJI.<sup>1 2</sup> To the best of our knowledge this is the first case of *K. pneumoniae* SCV description, especially in a BJI. Gram-negative SCV are well described with *Pseudomonas aeruginosa* or *Stenotrophomonas* spp. in cystic fibrosis, but less is known in BJI. Sendi *et al* reported that *Escherichia coli* SCV could be detected on tissues and sonication fluid in patients with chronic prosthetic-joint infection. Biochemical reactions were modified in variants, but some were restored after passage on culture medium. This study concludes that with Gram-negative rods expressing the SCV phenotype, biochemical modifications lead to mis-identification or non-identification with routine bacteriological methods.<sup>3</sup> A combination antimicrobial therapy is usually proposed to treat BJI due to multidrug-resistant pathogens, to avoid a relapse with acquisition of further resistance.



**Figure 1** (A) X-ray of the tibia at admission, showing the unconsolidated bifocal fracture and the tibial nail; (B) Pinpoint colonies on blood agar of ESBL *Klebsiella pneumoniae* from peroperative samples corresponding to the SCV phenotype; (C) Classical phenotype on blood agar of the ESBL *K. pneumoniae* from the same peroperative samples; (D) and (E) X-ray of the tibia (face and profile) 6 months after the end of the antimicrobial therapy showing consolidation, in a patient walking without any pain. ESBL, extended-spectrum  $\beta$ -lactamase; SCV, small colony variant.



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## Learning points

- ▶ *Klebsiella pneumoniae* could express the small colony variant (SCV) phenotype in patients with implant-associated bone and joint infection (BJI).
- ▶ Implant removal and a 3 months course of targeted antimicrobial therapy facilitate the cure of SCV in implant-associated BJI.
- ▶ Gram-negative SCV could express biochemical modifications that may lead to mis-identification or non-identification with routine bacteriological methods.

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