BONE INFECTIONS DUE TO THE RALSTONIA GENUS – OSTEOMYELITIS CAUSED BY RALSTONIA MANNITOLILYTICA, A RARE OPPORTUNISTIC PATHOGEN

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ABSTRACT

Ralstonia spp. are non-fermentin aerobic gram-negative rods found in humid environments, whose role as opportunistic human pathogens has lately been recognized. RBone infections by Ralstonia spp. are very rare. We report a case of femoral osteomyelitis caused by R. mannitolilytica.. Despite its low virulence, Ralstonia has specific characteristics that promote its spread and shows high antibiotic resistance, partly due to its ability to create a biofilm. Identification of Ralstonia spp. poses unique difficulties as the distinction between the species of the genus is not straightforward. Additionally, the bacteria may be misidentified as other closely related species. Recent data suggests that modern spectrometry and gene sequencing techniques are essential to avoid these pitfalls. Susceptibility data about the genus is limited and based on a small number of case reports, therefore there is no standardized antibiotic susceptibility testing and European Committee on Antimicrobial Susceptibility Testing (EUCAST) breakpoints exist.

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INTRODUCTION

Ralstonia spp. are non-fermenting aerobic gram-negative rods, found in moist environments such as water, soil and plants. Ralstonia Mannitolilytica is one of the three members of the Ralstonia genus (R. Mannitolilytica, R. Pickettii and R. Insidiosa) that have been lately recognized for their role as human pathogens. Bone infections by the Ralstonia genus are very rare and only a few cases have been reported.

CASE PRESENTATION

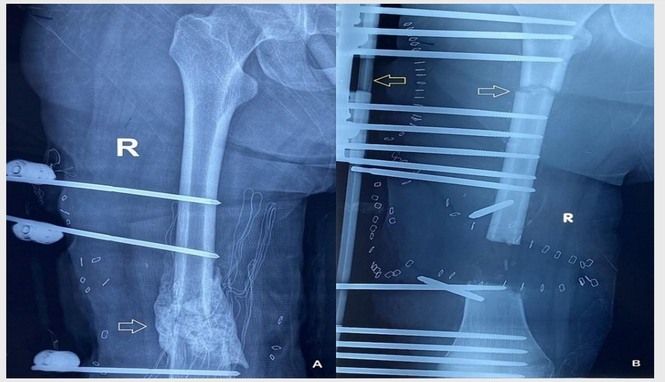
A 18 year old male sustained an open diaphysis fracture (Gustilo IIIb) on the right femur after a motorcycle accident. The crash took place off road and the wound was massively contaminated with soil. Initially, the patient underwent an extensive lavage and surgical debridement, and the fracture was stabilized with an external fixator. Postoperatively, the wound showed signs of infection. Further surgical debridements were performed, leading to a 5 cm limb shortening, but allowing partial soft tissue coverage of the radically debrided region. After two weeks the patient was reoperated to correct the limb shortening. A proximal femoral corticotomy was performed and an external fixator for bone transfer was used. A partial thickness skin autograft from the left femur was used to cover the residual skin deficit. Bone transfer was initiated one week postoperatively, at a rate of 1 mm per day. In each of the above surgical procedures, bone specimens were obtained and sent for cultivation. After testing positive for Ralstonia Mannitolilytica, further analysis with phenotypic tests, MALDI-TOF and 16s rDNA gene sequencing confirmed the diagnosis. At first, the patient was empirically treated with cefuroxime, metronidazole and amikacin. According to the antibiotic susceptibility testing following the identification of R. Mannitolilytica, the regimen was changed to tigecycline which was administered intravenously for three months.

CLINICAL OUTCOMES

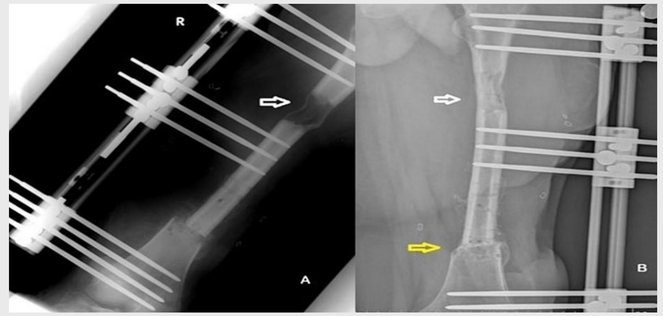
The postoperative course of the patient was uncomplicated. The bone transfer was completed uneventfully in seventy days, resolving the leg length discrepancy. Partial weight-bearing was allowed two months postoperatively. The external fixation device was removed ten months postoperatively. On his last visit, one year postoperatively, the patient is ambulatory with only mild pain complaints. He has a fully functional right lower limb and a normal hip and knee range of motion. The inflammatory markers on his blood tests remain negative.

DISCUSSION

Among literature only eight cases of bone infections due to the Ralstonia genus have been described, all of which were caused by R. Picketii. To our knowledge, this is the first reported case of a bone infection attributed to R. Mannitolilytica. Identification of Ralstonia spp. poses special difficulties as the distinction between the species of the genus is not straightforward. Additionally, the bacteria may be misidentified as other closely related species. Recent data suggests that modern spectrometry and gene sequencing techniques are important to avoid these pitfalls. Treatment protocol needs careful planning as the genus produces enzymes that can hydrolyse antibiotics and are capable of biofilm formation. Susceptibility data about the genus is limited and based on a small number of case reports, so no standardized antibiotic susceptibility testing and EUCAST breakpoints exist. In most cases, ciprofloxacin and co-trimoxazole is used as the antibiotic treatment of choice. In our case, due to a multidrug resistance profile in the susceptibility testing, tigecycline was the selected regimen.



1. A. Sequential debridements resulted in a bone defect that was initially filled with polymethylmethacrylate (PMMA) cement (white arrow). B. The cement was later removed and a segmental bone transport was initiated to fill the bone defect and to correct the leg length discrepancy. The distraction site is seen proximally (white arrow) and the unilateral external fixator to the left (yellow arrow).



2. A. End of bone transport at three months post-operatively. New bone formation is obvious at the distraction site (white arrow). B. Consolidation at the distraction site (white arrow) and callus formation at the docking site (yellow arrow) eight months postoperatively.

3. A. Full weight-bearing after the removal of external fixation device. B. Skin autograft