Case Report

Brucella Periprosthetic Joint Infection Involving Bilateral Knees with Negative Synovial Fluid Alpha-Defensin

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Periprosthetic joint infection (PJI) due to Brucella is uncommon despite relatively high endemicity of human brucellosis and its osteoarticular predilection. We report a case of a 57-year-old woman with bacteraemic brucellosis complicated by Brucella periprosthetic infection of both knee joints occurring a decade after bilateral knee arthroplasty and associated with a negative synovial fluid alpha-defensin test. The patient was successfully treated with anti-Brucella therapy alone and without surgical revision, resulting in clinical and microbiological cure. We propose that Brucella should be considered as a possible cause of prosthetic joint infection in the appropriate clinical and epidemiological settings. A negative synovial fluid alpha-defensin (Synovasure AD test) should not be used as a rule-out test for Brucella PJI. Brucella PJI without radiological loosening may be treated conservatively and solely with antimicrobial therapy.

1. Introduction

Brucellosis is a zoonotic infection with approximately 500,000 cases reported annually in disease-endemic regions [1]. Brucellosis is caused by any of the four pathogenic species to humans, namely, Brucella abortus, B. melitensis, B. suis, and B. canis. Although brucellosis is believed to be a significant livestock infection in Oman, it has not been studied extensively [2, 3]. Ingestion of unpasteurized milk or milk products is believed to be the commonest route of transmission in Oman [4]. A retrospective analysis of human brucellosis in Oman between 1995 and 2012 identified 2737 human cases of brucellosis with 96.7% of these in the southern part of Oman (Dhofar) [4]. Brucellosis is characterized by its myriad presentations and multisystemic nature with osteoarticular involvement being one of the most frequent manifestations of this disease [5].

Total knee arthroplasty is one of the most common procedures in orthopaedic surgery including in areas where brucellosis is endemic [6] with periprosthetic joint infection (PJI), one of the most serious complications of prosthetic joint implantation [7]. Periprosthetic joint infections may account for up to 25% of revision total knee arthroplasties [8].

Periprosthetic joint infection due to Brucella is infrequent. In a recent review of published literature of Brucella PJIs, thirty cases were identified of which nineteen cases were prosthetic knee infections including four cases with Brucella infection of bilateral knee prostheses [9]. The median time from implantation of the prosthesis to the diagnosis of PJI was two years in this same cohort [9]. The pathogenesis of Brucella PJI is believed to be due to hematogenous seeding of the arthroplasty components complicating bacteraemic brucellosis [10].

Diagnosis of periprosthetic joint infection—albeit Brucella PJI—can be challenging. However, several publications exist to guide diagnosis of PJI in general, and these include guidelines by the Musculoskeletal Infection Society [11], the
A 57-year-old woman underwent bilateral total knee arthroplasty for treatment of severe degenerative joint disease 10 years prior to her current presentation. She presented to our hospital with progressively worsening pain and swelling of both prosthetic knee joints for six weeks. She also reported a history of indolent fever, night sweats, and malaise started one week prior to joint symptoms. She was recently diagnosed with deep vein thrombosis of the left femoral vein for which she is on rivaroxaban. She reported consumption of possibly unpasteurized milk four weeks prior to her illness.

Examination revealed a lethargic, febrile woman with bilateral swollen, warm, and tender knee joints with moderate effusions. Rest of examination was normal. Initial investigations showed a hypochromic microcytic anaemia with a haemoglobin of 9.4g/dl, a normal total white cell count (5600 cells/mm³), and elevated inflammatory biomarkers with predominance of lymphomononuclear cells. Lateral prosthetic knee joint infection was established, targeting antimicrobial therapy commenced with a combination of intravenous gentamicin 5 mg/kg once daily (for one week) in addition to oral doxycycline 100 mg twice daily and oral rifampicin 600 mg once daily (both given for 24 weeks), and a rescue revision arthroplasty was planned contingent on the outcome of antimicrobial therapy. In view of the chronicity of symptoms and associated bacteraemia, the patient underwent a transthoracic echo which showed no vegetations. Subsequent follow-up sterility blood cultures were negative. By end of first week of antimicrobial therapy, the patient was able to walk unassisted, and at 3 months, she had complete resolution of symptoms with normalization of inflammatory biomarkers; hence, a revision surgery was not performed. The patient remained symptom-free three years later with no evidence of disease recurrence or relapse.
the organism and the nonspecific synovial fluid findings. Synovial fluid alpha-defensin testing is an innovative diagnostic test for PJI [15]. However, its role in the diagnosis of Brucella PJI is unknown and has not been studied. In our patient, we used the lateral flow device (Synovasure AD test) intraoperatively for detection of alpha-defensin in synovial fluid from both knee joints. Both samples tested falsely negative. Arguably, this is the first published report on the use of Synovasure AD test for detection of alpha-defensin in synovial fluid from Brucella PJI. We propose to examine the role of alpha-defensin and other biomarkers in this infrequent but challenging diagnosis. According to WAIO'T, novel diagnostic tests may be implemented in the definition of PJI if they meet the required sensitivity and/or specificity thresholds [14]. This is currently unknown for synovial fluid alpha-defensin in Brucella PJI.

Treatment of Brucella PJI is equally challenging. There is no consensus on how best Brucella PJI should be treated. Published case reports of Brucella-related PJI suggest that in the absence of radiological evidence of joint loosening, standard anti-Brucella antimicrobial therapy alone may be appropriate [19]. Our patient did not have evidence of joint loosening; hence, she was exclusively treated with anti-Brucella antimicrobial therapy, resulting in sustained clinical and microbiological cure without the need for revision surgery further supporting current dogma.

4. Conclusion

We reported a case of bacteraemic brucellosis complicated by late Brucella periprosthetic infection of both knee joints with negative synovial fluid alpha-defensin and successfully managed with antimicrobial therapy alone. We propose that Brucella should be considered as a possible cause of prosthetic joint infection in the appropriate clinical and epidemiological settings and a negative synovial fluid alpha-defensin (Synovasure AD test) should not be used as a rule-out test for Brucella PJI.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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