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ORIGINAL

COMBINED SURGICAL AND ANTI-INFECTIVE THERAPY FOR BRUCELLA ARTHRITIS OF THE KNEE IN PLAYERS: A CASE REPORT

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Abstract

In some rural areas of northern China, brucellosis is an endemic zoonotic infection caused by a bacteria of the genus *Brucella*. As a result of brucellosis, osteoarticular involvement is the most common complication. Here, we report the case of a 50-year-old male who presented with severe swelling and pain in the right knee in players. *Brucella* arthritis was diagnosed based on his contact history, clinical manifestations, and results of serological tests, synovial fluid cultures, and radiological imaging. As part of the treatment plan, surgery including an arthrotomy, debridement, and irrigation of the joint cavity was carried out. In the weeks following surgery, the patient reported significant improvement in his right knee joint's function and a significant reduction in the intensity of his joint pain in players.

INTRODUCTION

Brucellosis is a highly infectious zoonotic disease caused by bacteria of the genus *Brucella* (Franco, Mulder, Gilman, & Smits, 2007). In China, brucellosis is endemic in rural parts of the North region (Wong et al., 2014; Zheng et al., 2018). The genus *Brucella* is divided into various biotypes, with the most common ones being *Brucella melitensis* and *Brucella abortus* (Galinska & Zagórski, 2013). Brucellosis is mainly transmitted to humans

through direct contact with secretions and excretions from infected animals, ulcerated skin, mucous membranes, or respiratory tract during fur processing or consumption of contaminated food. In recent years, China has seen an upward trend in the incidence of brucellosis (Wang et al., 2013). The clinical manifestations of human Brucellosis include undulant fever, sweating, migratory arthralgia, myalgia, and hepatosplenomegaly. However, brucellosis is prone to misdiagnosis due to the presence of complications in most cases, its potentially atypical symptoms, and its diverse manifestations. Few patients are left with organic lesions in the bones and joints due to delayed diagnosis or treatment, which limits their limb movements and severely impacts their quality of life and labor capacity (Lamb, 2020; Unuvar, Kilic, & Doganay, 2019). In this study, we report a case of unilateral knee in player's and osteoarthritis caused by bacteria of the genus *Brucella*. Surgical procedures including arthrotomy, debridement, and irrigation of the joint cavity were performed in addition to anti-infective therapy, which produced satisfactory results.

Case Presentation

The patient is a farmer of Hui ethnicity, who was admitted to the hospital due to persistent swelling, pain, and limited motion in the right knee joint for a duration of one week in players (Alahmar & Sengupta, 2021). He had no history of infectious or chronic diseases but had a history of contact with cattle and sheep. There was no history of fever, chills, night sweats, fatigue, cough, production of sputum, abdominal pain, or abdominal distension (Barbonetti et al., 2019). Upon admission, physical examination revealed a body temperature of 36.4 °C; his blood pressure and pulse rate were normal. The patient also presented with a limited range of motion (ROM) in the right knee joint in players (flexion position, 35°) (Table 1), no redness of the skin surrounding the joint, slightly elevated temperature, and limitation of active and passive knee joint movements in players (Breed et al., 2019). The patellar tenderness, patellar percussion tenderness, and floating patella tests were positive. He presented with no hepatosplenomegaly but had enlarged right inguinal lymph nodes. No abnormality was observed in other musculoskeletal examinations (Feferkorn et al., 2021). Results of routine biochemistry tests revealed the following: normal white blood cell count, mildly elevated serum procalcitonin levels (0.06 ng/ml (normal <0.05 ng/ml)), markedly elevated C-reactive protein (CRP) levels (106.04 mg/L (normal range 0-6 mg/L)), a significantly elevated erythrocyte sedimentation rate (ESR) (84 mm/h (normal range <30 mm/h)) (Figure 1), normal values for both antistreptolysin O (ASO) titer and rheumatoid factor, and a negative antinuclear antibody (ANA) test. Radiography of the right knee joint showed degenerative changes in players (Figure 2). Magnetic resonance imaging (MRI) showed significant collection of fluid in the joint and swelling in the surrounding soft tissues (Figure 3). Rose Bengal test was performed to detect *Brucella* in the patient's serum; the result was interpreted as positive (Kahrl, Johnson, & Cox, 2019). The

Brucella standard tube agglutination test also generated positive results (1:800). To further confirm the diagnosis, we performed arthrocentesis and aspirated 120 ml of light yellow and clear fluid. Bacterial culture and antibiotic susceptibility testing of the aspirate confirmed the diagnosis of Brucella infection (Povey et al., 2020). Based on the abovementioned examinations, the patient was clinically diagnosed with "Brucella arthritis", and anti-infective therapy commenced with oral doxycycline (0.1 g twice a day), oral rifampicin (0.3 g twice a day), and etimicin sulfate (i.v., 100 ml twice a day) for three weeks. Ibuprofen and Codeine tablets were also administered for pain relief. Since the patient did not experience any significant relief of his symptoms, ceftriaxone sodium (i.v. 2 g twice a day) was co-administered. After one week, the patient's condition had still not improved; the pain and flexion contracture deformities of the joint worsened and motion was severely limited (Table 1). After repeated discussions, we finally decided to perform surgery on the patient. Arthrotomy incision of the right knee revealed obvious hyperplasia of the synovial tissue and the granulation tissue in the joint cavity as well as partial loss of the articular cartilage on the medial femoral condyle (Sacha et al., 2020). The necrotic, hyperplastic synovial, and granulation tissues and the osteophytes around the articular cartilage were removed. Hydrogen peroxide, iodine, and saline solution were used to repeatedly immerse and irrigate the joint cavity and incision (Shkelzen et al., 2020). The infected joint was then slowly flexed and extended by hand until the passive ROM in the knee joint reached 0-110° in patients. Three drainage tubes were placed in the joint cavity thereafter, one of which was used for delivering irrigation fluid. Continuous antibiotic irrigation (with gentamicin) of the joint cavity was performed for 3 weeks. Postoperative pathological examinations showed no bacterial growth in the fluid collecting in the right suprapatellar bursa, negative acid-fast stain (Figure 4A) and infiltration of a large number of small lymphocytes and a small number of neutrophils into the submitted tissue (Figure 4B). Postoperatively, CRP and ESR values gradually decreased to normal levels (Figure 1). Three weeks postoperatively, the patient experienced significant pain relief and improvement of ROM in the right knee joint in patients (joint angles 0-100) (Table 1). The joint functions gradually returned, and the patient was able to get out of bed and walk around. Follow-up radiography three months postoperatively showed clear details of the joint structure (Figure 5). The patient's joints function well at the time of reporting.

Discussion

Brucellosis is a class B infectious disease in China, and the Chinese population is generally susceptible to bacteria of the genus Brucella. The Hui ethnic group makes up a high proportion of Ningxia's population and most farmers have experience in livestock farming (cattle and sheep). After the brucellae enter the blood, foci of infection may develop in multiple sites including the liver, spleen or joints. The incidence of peripheral arthritis caused

by *Brucella* is relatively low (Esmailnejad-Ganji & Esmailnejad-Ganji, 2019). Peripheral arthritis, especially monoarthritis, is the most common musculoskeletal manifestation of brucellosis (Cerit, Aydın, & Azap, 2012) and mostly affects the large joints including the knee, hip, and ankle joints in players. Clinical manifestations of brucellosis and the results of physical examination in patients are non-specific, and mostly include pain, swelling, and limited motion of the affected joints. These manifestations are easily confused with those of rheumatic arthritis and joint tuberculosis (Sardana et al., 2019). Radiological manifestations may include fluid buildup in joint cavities, narrowing of the joint space, intraarticular bone destruction and synovial hyperplasia, and swelling in the soft tissues surrounding the joint (Arkun & Mete, 2011). Septic arthritis caused by *Brucella* has also been reported, especially in areas with high prevalence (Jalan, Elhence, Elhence, & Jain, 2015).

Diagnosis in this patient was based on his history of contact with cattle and sheep, the clinical signs of inflammation in right knee joint in players (e.g., tenderness and pain), a positive serological test, and a positive culture of the synovial fluid obtained via arthrocentesis (Wernaers & Handelberg, 2007). Although the gold standard for the diagnosis of *Brucella* arthritis is blood or tissue (e.g., synovial fluid or bone marrow) culture, blood culture in this patient produced negative results. It has been reported that blood culture is not sensitive in the detection of *Brucella* and is only positive in 20-70 % of patients (Pappas, 2010). Moreover, the patient did not present any symptoms outside the joint, which increased the difficulty of diagnosing him. Luckily, the patient's serological test and synovial fluid culture were positive. Therefore, in areas with high prevalence of brucellosis, if the patient presents with symptoms of arthritis, a diagnosis of brucellosis should be considered in order to avoid misdiagnosis and severe complications.

Drug therapy is the most common method for the prevention and treatment of recurrent *Brucella* arthritis. Tetracycline and rifamycin are commonly used, and quinolones, sulfonamides, aminoglycosides, and third-generation cephalosporins can also be used (Jiang, O'Callaghan, & Ding, 2020). However, this patient did not experience significant relief of his symptoms after receiving anti-infective drug treatment. Considering the likelihood of further impairments to joint functions due to severe stiffness of his right knee joint and the presence of underlying disease in players, we decided to perform surgery as soon as possible. During the operation, we excised the necrotic and hyperplastic granulation tissues, moderately relaxed the ligaments around the knee, and protected the anterior and posterior cruciate ligaments and the medial and lateral menisci as well as their blood supply. Postoperatively, we irrigated the joint cavity and instructed the patient to perform knee-extension and flexion exercises. We believe that the aim of surgical treatment is to effectively remove the abscesses and necrotic and hyperplastic granulation tissues, relieve the pain, effectively prevent further bone destruction, and recover joint

functions. Apart from being auxiliary diagnostic markers for Brucella arthritis, CRP and ESR are also helpful in monitoring the patient's therapeutic responses. This patient received systemic anti-infective treatment before surgery, but the treatment did not yield satisfactory results. In contrast, CRP and ESR values gradually returned to normal levels after surgical procedures and joint irrigation were performed.

Conclusion

In summary, this patient experienced rapid relief of symptoms, gradual recovery of joint functions, gradual return to normal levels of inflammatory markers in players, and a satisfactory outcome after surgical procedures were promptly performed in addition to anti-infective drug treatment. However, follow up duration was short and the patient is still being followed up.

Declaration of conflict of interest

None.

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Table 1. Changes in the range of motion of the patient's knee joint

Time	Preoperative			Immediately Postoperative	Postoperative		
	3 weeks	2 weeks	1 week	1-day post-surgery	2 weeks	3 weeks	1 month
ROM	flexion35°↓↑ extension20°	flexion35°↓↑ extension30°	flexion35°↓↑ extension35°	flexion 30°↓↑ extension20°	flexion40°↓↑ extension10°	flexion90°↓↑ extension10°	flexion100°↓↑ extension0°

ROM: range of motion

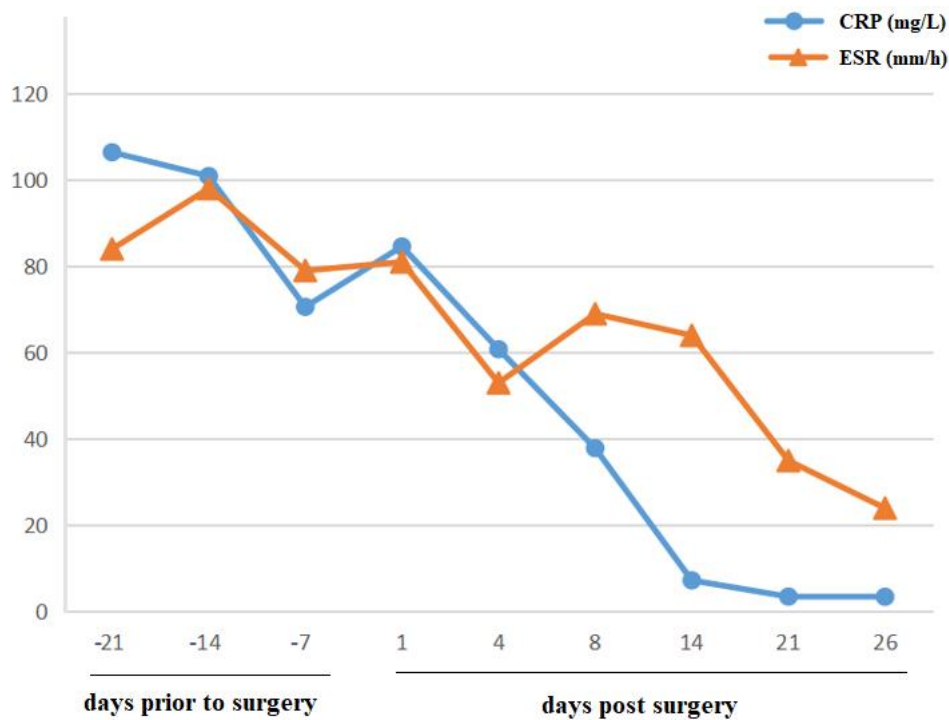


Figure 1. CRP and ESR measurements.

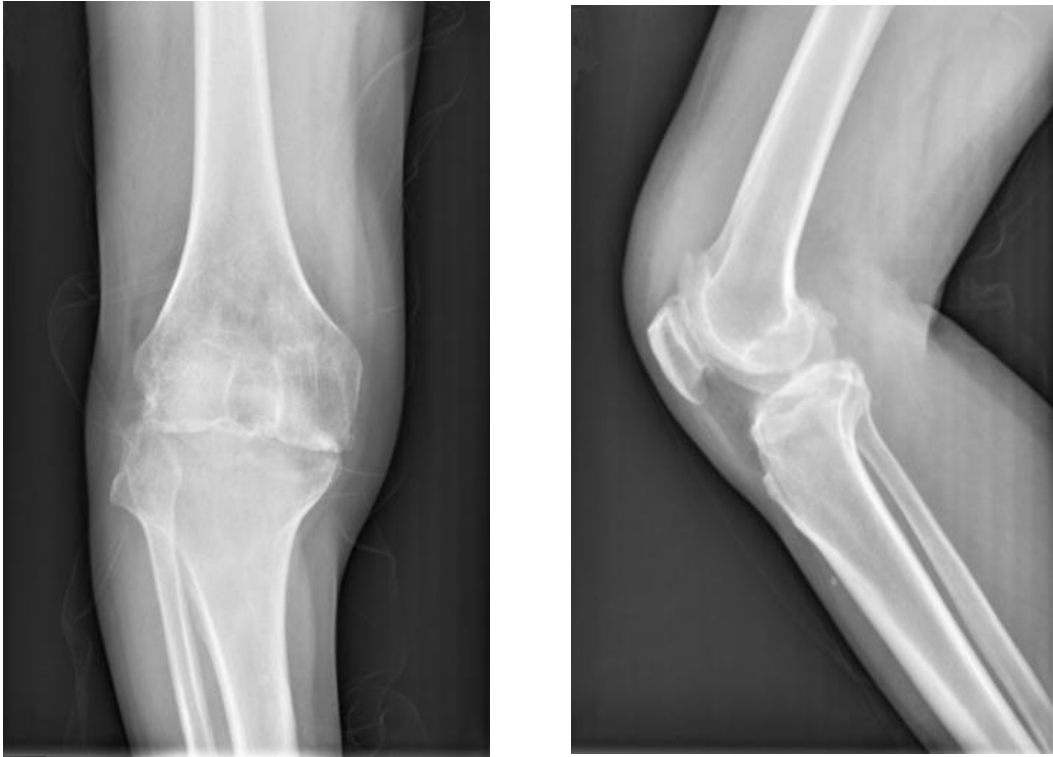


Figure 2. Radiography of the right knee joint showing degenerative changes (left: frontal view; right: lateral view)

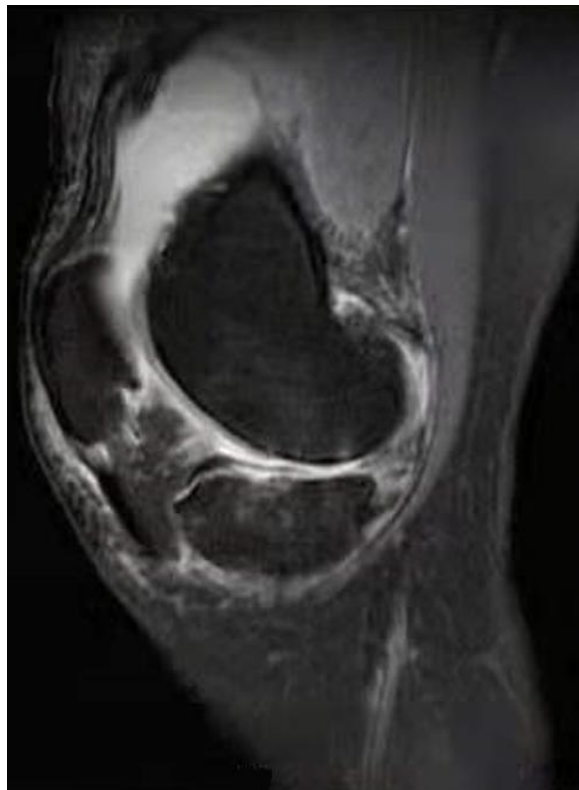


Figure 3. Magnetic resonance imaging of the right knee joint showing (T2) collection of fluid in the joint and soft tissue swelling.

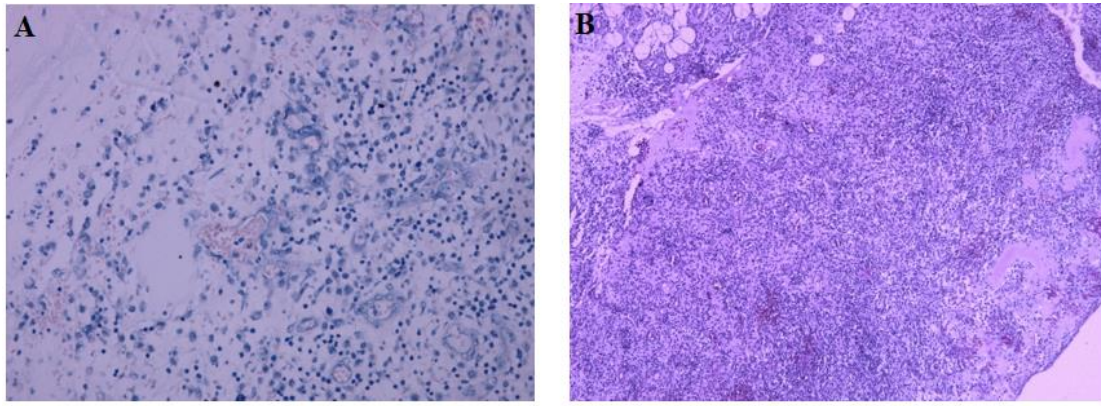


Figure 4. (A) acid fast stain, (B) postoperative pathology result (10×10).

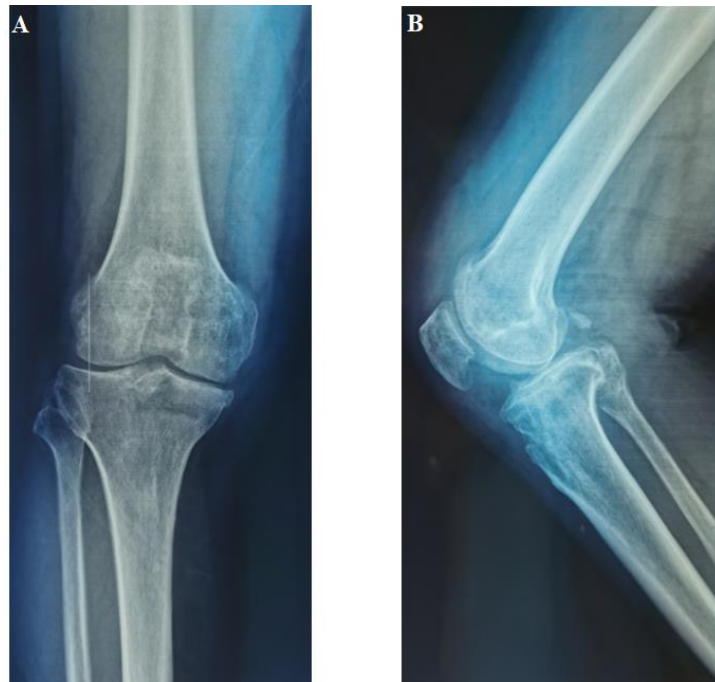


Figure 5. Follow-up radiography three months postoperatively.