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Case Report

Imaging features of shoulder tuberculosis with rice bodies formation: A case report ☆,☆☆

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ABSTRACT

Osteoarticular tuberculosis is less common than pulmonary tuberculosis and is often overlooked in the differential diagnosis of people with joint disease. In this article, we present a case of a 71-year-old female patient admitted to the hospital because of pain and limited movement of her right shoulder for a year. The patient had diabetes for 10 years, and no history of tuberculosis or previous history of tuberculosis exposure. Blood test results showed inflammatory condition and positive IGRA test. X-ray, ultrasound and magnetic resonance imaging images revealed osteolytic and sclerotic lesions of the humeral head, diffuse thickening of the synovial membrane, and loose bodies in the joint and bursa. The clinical diagnosis was tuberculous inflammatory osteoarthritis of the right shoulder. The patient underwent arthroscopy surgery to remove loose bodies and the inflamed portion of the synovium and send them to the pathology department. Histopathological examination of the loose bodies and synovial membrane revealed features suggestive of tuberculosis of the shoulder joint. Afterward, the patient was treated with antituberculosis drugs according to the guideline and rehabilitation exercises. After 3 months of treatment, the clinical symptoms were reduced, the pain rating was decreased and the range of motion was increased.

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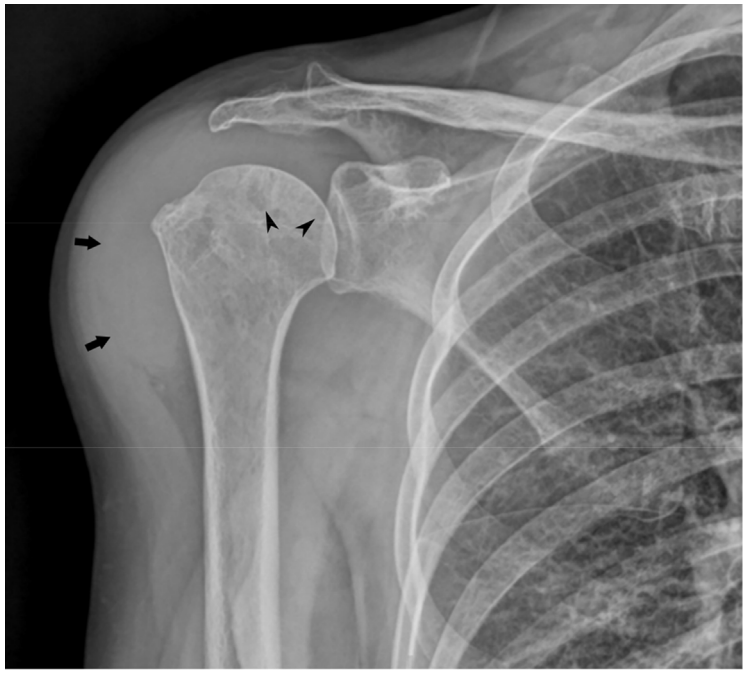

Fig. 1 – The anterior-posterior (AP) view of the right shoulder X-ray showed lytic and sclerotic lesions in the head of the humerus (arrowhead), no joint space narrowing, and no calcification. The corresponding soft tissue of the subdeltoid bursa was blurred (arrow).

Introduction

Musculoskeletal tuberculosis accounts for 35% of all extrapulmonary tuberculosis cases. Shoulder joint tuberculosis is a rare condition that often affects immunocompromised patients and people living in tuberculosis-endemic areas [1]. Peripheral tuberculous arthritis is frequently diagnosed late regarding the vague clinical symptoms and slow progression [2–4]. In the early stage of the disease, it can mimic other inflammatory arthritis. Early diagnosis and prompt treatment are important to prevent serious complications. In this article, we aimed to describe the imaging features of shoulder joint tuberculosis on X-ray, ultrasound, and magnetic resonance imaging (MRI) which was confirmed by pathology.

Case report

A 71-year-old female patient was admitted to the hospital because of constant and progressive pain and stiffness in the right shoulder for a year. She also complained of having numbness along the arm. The medical history highlighted diabetes mellitus for 10 years and no tuberculosis-related conditions. On the clinical examination, the patient had no fever, and her right hand was slightly swelling with multiple axillary lymph nodes (2 in number, the largest measuring about 1.5 cm, firm, mobile) which were on the same side as the numb hand. The blood test result showed that the erythrocyte sedimentation rate and C-reactive protein test were increased, total white blood cell counts and percentages of the types of white blood cell were normal. The interferon-gamma release assay (IGRA) test was positive.

The right shoulder X-ray revealed lytic and sclerotic lesions in the head of the humerus with no reduced joint space. The corresponding soft tissue of the subdeltoid bursa was blurred with no calcification (Fig. 1). Chest X-ray was normal.

Shoulder ultrasound revealed diffuse subdeltoid bursa wall thickening, a moderate amount of hypoechoic fluid, numerous well-defined hyperechoic oval lesions with no acoustic shadowing, and rotator cuff tendinitis (Fig. 2). Sonography evaluation of the regional lymph node figured out multiple structures with a thick cortex and a normal hyperechoic hilum in the right axillary fossa. The maximum transverse diameter of the largest one was 8 mm. The magnetic resonance imaging (MRI) of the shoulder showed scattered nodes on the head of the humerus (the largest size was 12 × 13 mm), which were hypointense on T1weighted (T1W), and hyperintense on the Proton Density fat-saturated (PDfs) sequence. On the post-gadolinium image, these lesions showed thick rim enhancement, (Fig. 3A-C). Moreover, the synovial bursa was diffusely thickened and vividly enhanced. The joint effusion diameter was 11 mm (Fig. 3A-D). Numerous free nodules in the joint cavity and bursae were presented with hypo-signal on T1W and PDfs, no contrast enhancement (about 7 mm in diameter) (Fig. 3E and F). The ipsilateral axillary fossa had many lymph nodes with the largest short axis diameter of 11 mm (Fig. 4). No edema of soft tissue around the shoulder was documented.

The patient was diagnosed with shoulder osteoarthritis due to tuberculosis. She underwent fine-needle aspiration

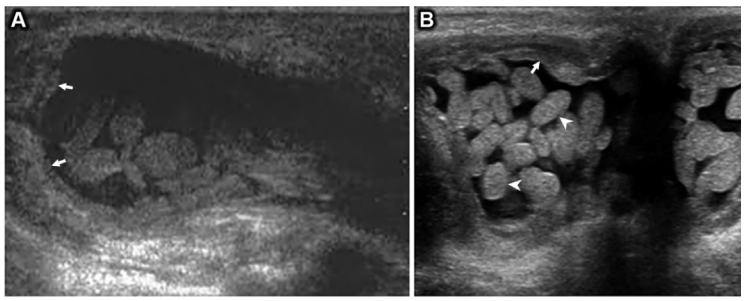

Fig. 2 – Right shoulder ultrasound on the longitudinal plane through the deltoid muscle shows diffuse thickening of the subdeltoid bursa (arrow) with fluid and numerous well-defined hyperechoic oval lesions, no acoustic shadowing (arrowhead).

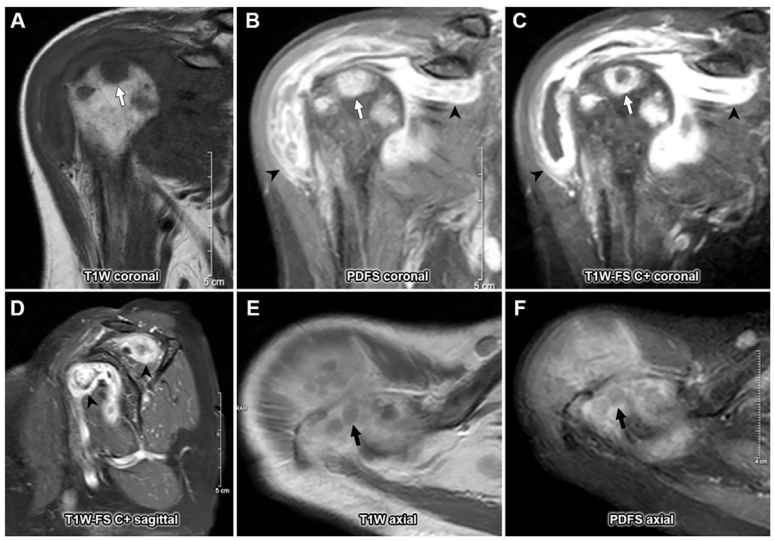

Fig. 3 – The contrast-enhanced MRI of the right shoulder on the coronal T1 weighted (T1W) (A), coronal Proton Density fat-saturated (PDFS) (B), coronal and sagittal postgadolinium fat-saturated T1W (C and D) demonstrated several lesions in the head of the humerus which were hypointense on T1W, hyperintense on PDFS with thick rim enhancement (white arrow) on postgadolinium sequence. Joint effusion, bursal wall thickening (arrowhead). The axial T1W and axial PDFS (E and F) display numerous free nodules in the joint cavity and bursae which were hypointense on T1W and PDFS with no contrast enhancement (black arrow). No soft tissue edema.

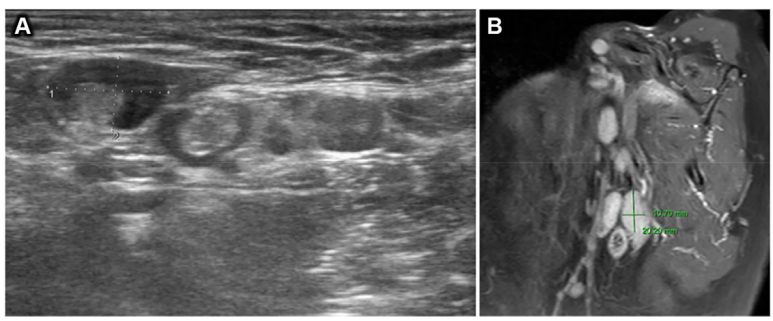

Fig. 4 – Ultrasound of the right axillary fossa (A) showed several axillary lymph nodes which were ovoid, hyperechogenic hilum, and thick hypoechogenic cortex. Sagittal postcontrast fat-saturated T1WI (B) showed oval lymph nodes, hyperechoic hilum with thick cortex, and homogeneous enhancement.

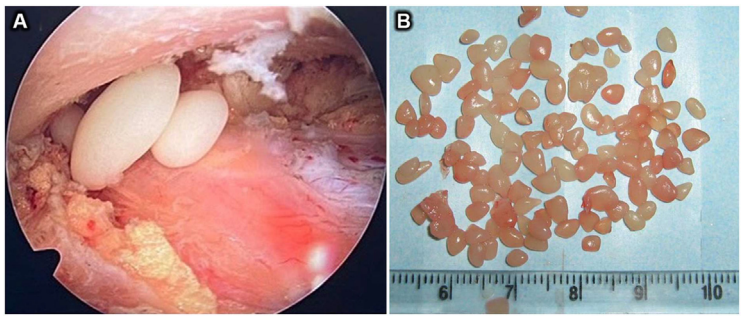

Fig. 5 – Intraoperative picture showed white-colored loose bodies resemble rice bodies (image A, B).

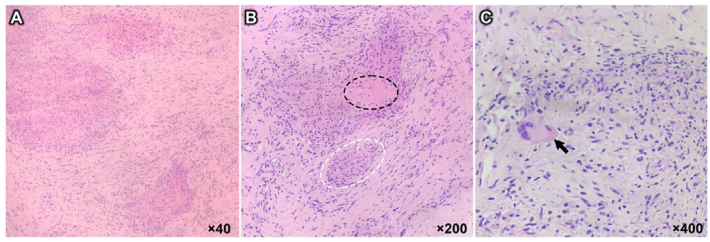

Fig. 6 – Histopathological examination showed homogeneous necrosis (black dashed circle), epithelioid cells (white dashed circle), and multinucleated giant cells (arrows) which were most likely tuberculous lesions.

(FNA) for axillary lymph nodes and arthroscopic surgery to remove loose bodies and inflamed portions of the synovium simultaneously. Arthroscopy showed multiple rice bodies ranging from 3 to 10 mm in length (Fig. 5). The result of the cytology of axillary lymph nodes was chronic lymphadenitis. Histopathological examination of the synovial membrane and rice bodies showed a peripheral rim of epithelioid histiocytes (white dashed circle) surrounding the central homogeneous necrosis (black dashed circle). Some histiocytes are also forming multinucleated giant cells (arrows) (Fig. 6). External to the rim of histiocytes is an outer rim of lymphocytes and plasma cells. Histopathology is directed to granulomatous inflammation lesions which were most likely tuberculous lesions.

Subsequently, the patient was managed with antituberculosis drugs following the guidelines and rehabilitation therapy. After 3 months of treatment, the clinical symptoms were reduced, the pain rating was decreased and the range of motion was increased.

Discussion

Joint tuberculosis is a less common site of tuberculosis infection compared to the lungs. Among this entity, the most common affected locations are the spine, accounting for 50%. Shoulder tuberculosis, on the other hand, is a rare form [1]. Even though It can be transmitted through the bloodstream or by contiguous infection, adjacent bone spreading is still considered the most common route for joint tuberculosis. The symptoms of joint tuberculosis typically include swelling, joint pain with or without redness, and progressively leading to joint immobility. Additionally, low-grade fever in the afternoon and weight loss may also occur.

Joint tuberculosis often begins with synovitis, which causes a joint effusion and thickened synovial membrane. Subsequently, granulomatous lesion develops in the bones at the synovial contacted site, leading to cartilage destruction and bone erosion. Untreated lesions can spread to the soft tissues surrounding the joint, forming fistulas and cold abscesses [2]. The aggregation of fibronectin/fibrin in joint fluid and the microinfarction of the synovial membrane leads to the shedding of blood-clotted tissues which is considered as the primary form of the rice bodies. Shoulder tuberculosis arthritis is typically classified into 3 forms based on clinical presentation including dry form (caries sicca), exudative form (caries exudata), and mobile form [5]. Our case is of the exudative form (caries sicca).

The gold standard for diagnosing joint tuberculosis is to culture the tuberculosis bacteria in synovial fluid with a positivity rate of 33% [6], or to observe typical histopathological findings in the results of the synovial membrane biopsy, including caseous necrosis, epithelioid cells, Langhans cells, and lymphocytes [7], with a positivity rate of 80% [8]. Additionally, synovial fluid can be used for polymerase chain reaction testing, with a positivity rate of 95%-100% in cases with positive cultures and 50%-60% in cases with negative cultures. Interferon-gamma release assays are a blood test method for diagnosing tuberculosis by measuring the production of interferon and the stimulation of blood cells with specific antigens of the tuberculosis bacteria [9].

Imaging diagnostic tools have limited specificity in diagnosing tuberculosis of the bone and joints, but they play a role in directing diagnosis, guiding biopsies, and monitoring treatment progress. X-ray images of joint tuberculosis damage can be divided into 2 stages. In the early stage, the images show reduced bone density, joint space widening due to effusion, and bone erosion under-cartilage. In the late stage, the images could show subchondral bone defects and bone destruction, with joint space narrowing that may lead to dislocation or subluxation. Soft tissue swelling or synovial inflammation can manifest as an opacification around the joint on X-rays. Some authors describe the late-stage radiographic characteristics of joint tuberculosis on X-rays as the Phemister's triad, which includes reduced periarticular bone density, peripheral osseous defects, and progressive joint space narrowing [2,10]. Bone lesions that can be seen on CT are similar to those on X-ray. Contrast-enhanced CT can be used to evaluate joint effusion and soft tissue abscesses. On ultrasound, uniform synovial membrane thickening without nodules, increased vascularity, synovial fluid, and soft tissue abscesses are possible observable signs [11].

With contrast-enhanced MRI, bone lesions, synovial membrane, joint cartilage, and periarticular soft tissue can be assessed. Bone lesions include bone edema, subchondral bone defects, intraosseous abscesses, subperiosteal abscesses, fistulas, and sequestra. Synovial membrane lesions are characterized by diffusely thickened synovium without nodules, hyposignal T2W, strong enhancement, and joint effusion. Abscesses often have a well-defined enhancing rim with minimal peripheral inflammation [10–12]. Rice bodies have intermediate signal on T1W and T2W, do not enhance after injection. T2W is better for detecting rice bodies than T1W [13,14]. Our case presents humeral head bone defects, synovial thickening, diffuse homogeneous enhancement of the synovium, joint effusion, and rice bodies in the subdeltoid bursa. The synovial lesions in our case are quite similar to those described in the literature. However, the bone lesions do not have all the typical features described in the literature, which is likely because our case is not in the late stage of the disease.

The differential diagnosis of joint tuberculosis includes causes of erosive arthritis, manifesting in 1 joint leading to stiffness and joint destruction, such as pyogenic bacterial arthritis, rheumatoid arthritis, and synovial chondromatosis. Bacterial joint inflammation typically presents with severe clinical symptoms: swelling, redness, pain leading to restricted active movement, high fever and elevated inflammatory markers [15]. The abscesses in bacterial joint inflammation typically appear as hot abscesses with thick walls and extensive surrounding swelling. In contrast, the abscesses in tuberculosis-related joint inflammation often present as cold abscesses with thin margins and usually have minimal or no soft tissue edema [15,16]. Rheumatoid arthritis often appears in middle-aged women, affects small joints typically in a symmetric pattern on hands and feet. Differential diagnosis is necessary to distinguish rheumatoid arthritis and osteoarthritis tuberculosis when the damage is observed in fewer joints and in larger joints. Rheumatoid arthritis also tends to have a prolonged progression [16]. In terms of imaging, rheumatoid arthritis often has a thicker synovial membrane than tuberculosis It may exhibit synovial hyperplasia, forming nodules, and increased vascularity due to the response to inflammatory factors [17]. Furthermore, bone lytic lesions in rheumatoid arthritis are osteolytic bone lesions of the joint margins at the junction with the synovial membrane, but in tuberculosis-related joint pathology, they can occur in different locations [16,17]. There are rarely cold abscesses in rheumatoid arthritis, but sometimes it will be challenging to distinguish cold abscess lesions from synovitis lesions in rheumatoid arthritis.[16]. The free bodies in joint effusions in synovial chondromatosis often have calcification [18]. In the absence of calcifications, the picture is not specific, then negative bacterial culture tests and synovial histopathology are required.

The prognosis for bone and joint tuberculosis is generally poor. Early diagnosis and appropriate treatment are important to prevent functional disability. The main treatment for tuberculosis is using antituberculosis drugs for 12-18 months [19,20]. Surgery is considered in cases where joints have severe cartilage destruction, severe joint deformities, large abscesses, atypical or drug-resistant tuberculosis infections or patients do not respond to medical treatment after 4-5 months [21,22]. Minimally invasive intervention to drain abscesses under ultrasound guidance is also applied. Other supportive treatments include weight-bearing exercises after surgery and short-term orthotics to reduce symptoms and prevent joint deformities. Our patient underwent arthroscopic surgery to clean the joint, synovectomy, tuberculosis treatment according to guideline, and postoperative rehabilitation.

Conclusion

Bone and joint tuberculosis are often diagnosed late, resulting in joint dysfunction. It's important to consider tuberculosis as the underlying cause in patients with inflammatory joint symptoms that progress slowly, persist over time, and respond poorly to conventional treatment, especially in immunocompromised patients living in pandemic areas. Phemister's triad may be seen on X-rays. Images of bone and synovial lesions of joint tuberculosis on MRI include diffuse homogeneous synovial membrane thickening, hyposignal T2W, and rice bodies.

Author's contributions

Ho XT and Nguyen MD: Case file retrieval and case summary preparation. Ho XT and Nguyen MD: preparation of manuscript and editing. All authors read and approved the final manuscript.

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Availability of data and materials

Data and materials used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Our institution does not require ethical approval for reporting individual cases or case series. Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

Patient consent

Informed consent for patient information to be published in this article was obtained.

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