EAS Journal of Radiology and Imaging Technology
Abbreviated Key Title: EAS J Radiol Imaging Technol
ISSN: 2663-1008 (Print) & ISSN: 2663-7340 (Online)
Published By East African Scholars Publisher, Kenya

Volume-5 | Issue-3 | May-Jun-2023 | DOI: 10.36349/easjrit.2023.v05i03.008

OPEN ACCESS

Case Report

Imaging of Knee Tuberculous Arthritis: A Case Report and Literature Review

Dr. Boui Meriem[1*], Zakaria Zouaki[1], Mohamed El Biadi[1], Nabil Hammoune[1], Badr Slioui[1], Salah Bellasri[1], El Mehdi Atmane[1], Abdelilah Mouhsine[1]

[1]Department of Radiology, Avicenne Military Hospital, Marrakech, Morocco

Article History
Received: 15.04.2023
Accepted: 22.05.2023
Published: 12.06.2023

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: Osteo-articular tuberculosis is a rare condition, with knee localization ranking third after the spine and the hip. Its symptomatology is vague and persistent, typically presenting as subacute or chronic arthritis, and the diagnosis is often made during the stage of joint destruction. Early diagnosis and appropriate treatment are crucial to prevent functional complications. Imaging plays a prominent role in the diagnostic process. We report a case of advanced knee tuberculosis in a young adolescent, investigated using CT and MRI to highlight the role of imaging in diagnosing this condition.

Keywords: Osteo-articular tuberculosis, knee, hip, chronic arthritis.

Copyright © 2023 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution **4.0 International License (CC BY-NC 4.0)** which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Bone and joint tuberculosis is a relatively rare condition, accounting for 1 to 3% of all cases and 10 to 11% of extra-pulmonary cases [1-3]. Knee location ranks third, following the spine and hip [2, 4]. Early diagnosis and proper treatment are crucial to prevent functional complications [2, 4]. Imaging plays a significant role in diagnostic guidance. We present a case of advanced knee tuberculosis in a young adolescent, explored through CT and MRI, to emphasize the role of imaging in diagnosing this condition."

CASE REPORT

This is a 16-year-old young girl with no history of immunodepression or knee trauma. She has been under observation in the pediatric department for eleven months due to septic arthritis (non-specific germ) of the left knee. The patient has undergone two surgeries and received medical treatment, but without any improvement. Upon clinical examination, the patient appeared emaciated, and the left knee was swollen, painful, and showed multiple scars (Fig. 1). Additionally, the patient's laboratory examination revealed elevated CRP levels and leukocyte count. She was admitted to the radiology department for ultrasound and tomographic assessment of her arthritis.

During the ultrasound examination, an effusion of heterogeneous hypoechoic contents was observed (Fig. 2). The effusion was then punctured under ultrasound guidance and sent to the bacteriology department for mycobacterial analysis and Genexpert research. X-ray of the knee revealed erosion of the external tibial plateau, femorotibial subluxation, and absence of individualization of the growth plate (Fig. 3). Furthermore, a CT scan of the knee was performed, which revealed a heterogeneous joint effusion containing air bubbles, bone lysis of the external tibial plateau, significant infiltration of the soft tissues, and a prominent geode of the external tibial plateau (Fig. 4). An MRI of the knee was also conducted, confirming the aforementioned abnormalities seen in the CT scan and additionally showing significant cartilage lysis (Fig. 5). Lastly, a chest x-ray was performed to investigate for pulmonary lesions, which returned normal."

***Corresponding Author:** Dr. Boui Meriem
Department of Radiology, Avicenne Military Hospital, Marrakech, Morocco

Figure 1: Numerous scars of the thin left knee

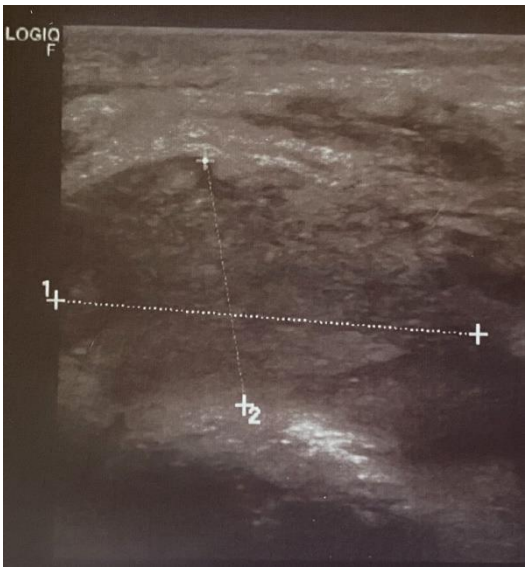


Figure 2: Ultrasound showing an effusion of heterogeneous hypoechoic contents

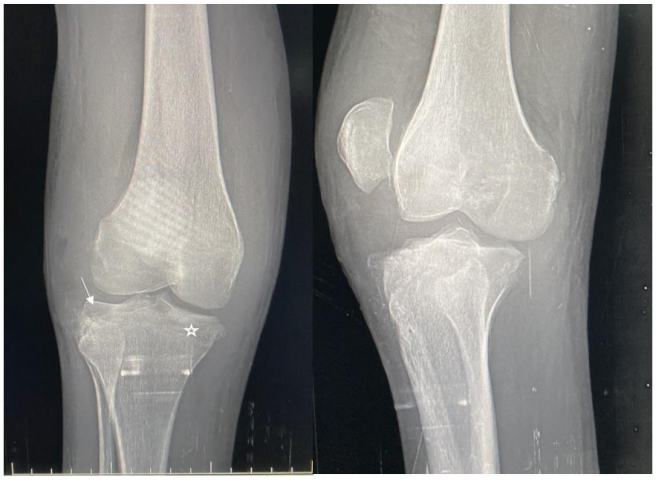
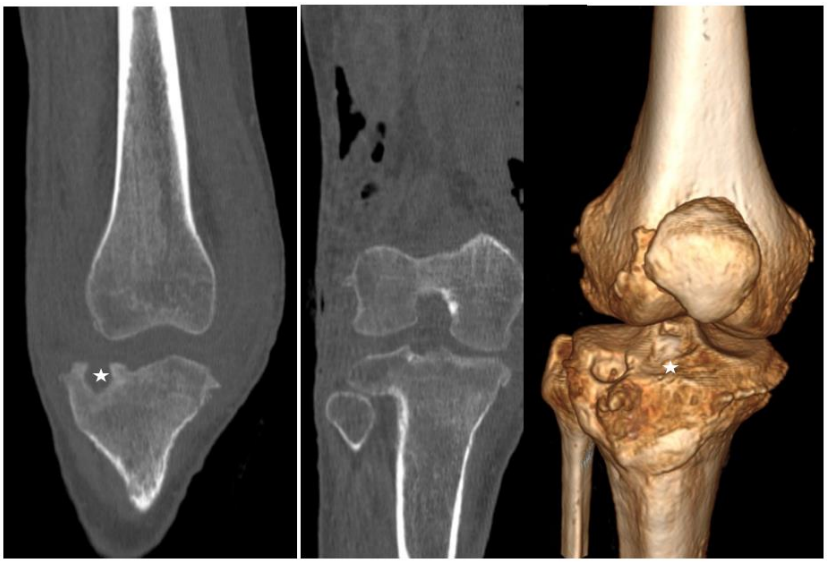
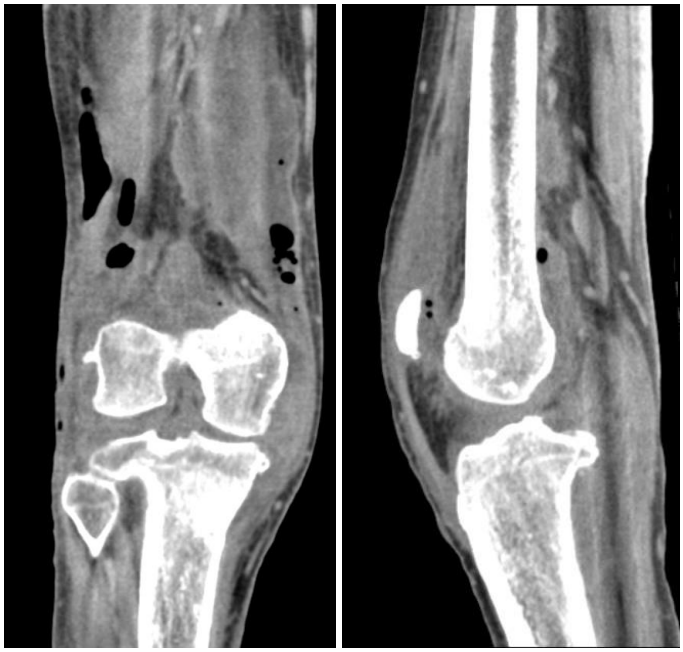


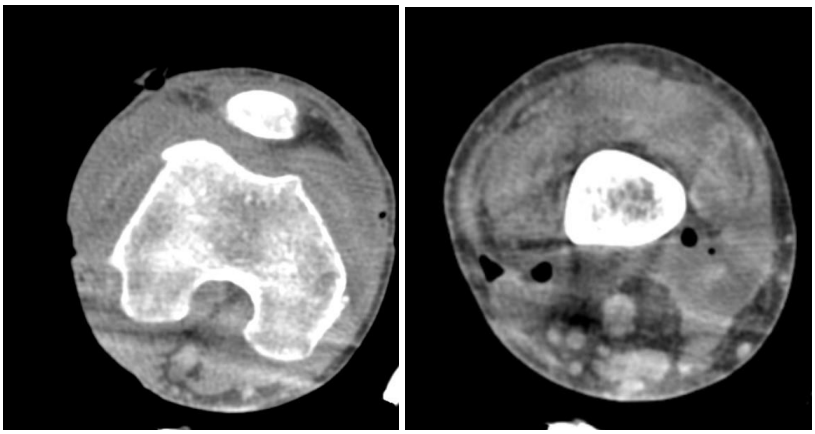
Figure 3: Anteroposterior and profile view x-ray of the knee, showing erosion of the external tibial plateau (white arrow), femorotibial subluxation and the absence of individualization of the growth plate (White star)



A

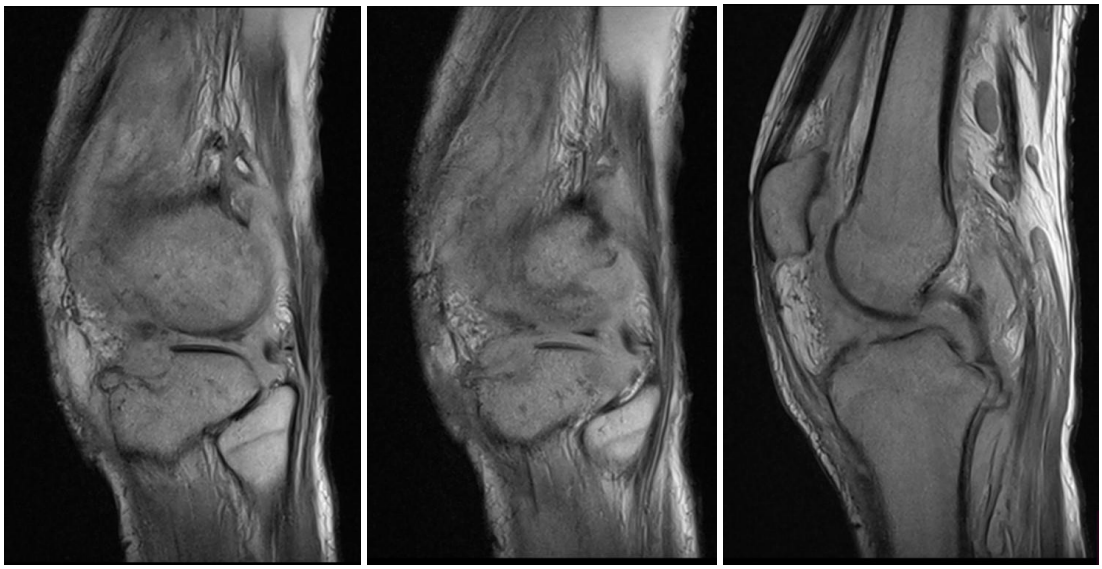


B

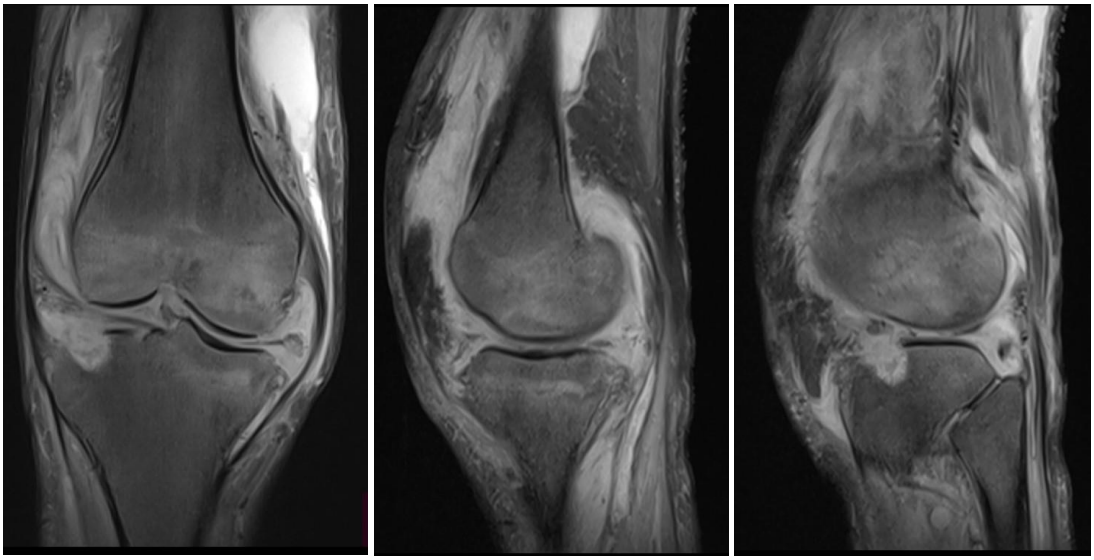


C

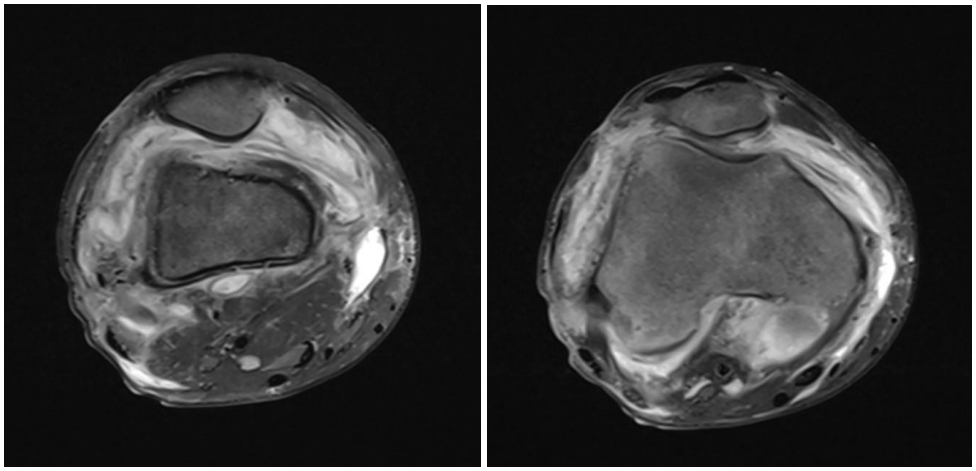
Figure 4: Computed Tomography of the knee: A). Coronal view of bone window with 3D reconstruction: showing geode of the external tibial plateau (white star), femorotibial subluxation and the absence of individualization of the growth plate. B). Sagittal and coronal view of parenchymal window. C). Axial view with enhancement of parenchymal window



A



B



C

Figure 5: A). **MRI of the knee: A. Sagittal sequence T1: showing geode of the external tibial 1plateau (white star), cartilage lysis. B). Sagittal and coronal DP FAT SAT sequences showing important synovial thickening, popliteal lymph node. C). Axial T2 sequence showing important synovial thickening**

DISCUSSION

The osteoarticular locations of tuberculosis represent 1 to 3% of all tuberculous cases and 10 to 11% of extra- pulmonary cases [1-3]. Any location can be affected. The main characteristics include a subacute or chronic clinical presentation with persistent symptoms, variable general signs and inflammatory syndrome, and radiological findings that can sometimes be suggestive. The arthritis tends to have a progressively destructive course. This condition affects both sexes equally, and the causative agent is Mycobacterium tuberculosis (BK) [2, 3, 5]. Articular involvement can occur hematogenously or through direct diffusion from an adjacent focus of osteitis [3, 5]. However, the coexistence of active pulmonary tuberculosis and osteoarticular involvement has a prevalence of only 29% [3, 6]. Articular tuberculosis typically presents as monoarticular involvement (90% of cases). It commonly affects weight-bearing joints such as the hip and knee, with the knee being the third most commonly affected osteoarticular location after the spine and the hip [1, 5, 6]. Knee involvement is influenced by trauma, pre-existing diseases, and intra-articular steroid injections.

Clinically, tuberculous arthritis usually manifests as subacute or chronic arthritis with a gradually worsening course over several weeks or months [7]. In our case, the symptoms persisted for 11 months before tuberculosis was diagnosed. Typical findings include pain during joint mobilization, joint swelling, and stiffness. Fistulization to the skin is found in 15% of cases [7]. General signs are variable, often of moderate significance, and may include asthenia, anorexia, weight loss, night sweats, and low-grade fever. The diagnosis is often delayed, as seen in our case, which explains the frequent destructive nature of this arthritis.

Initially, the lesions primarily affect the synovium, and damage to the cartilage and subchondral bone occurs subsequently. Imaging can sometimes aid in the diagnosis, enabling prompt and appropriate care. On standard radiographs, joint tuberculosis is classically characterized by Phemister's triad, which includes peripheral bone erosions, periarticular osteoporosis, and joint space narrowing [5]. Radiographic imaging findings depend on the stage of the disease. In the early stage, X-rays may appear normal or show increased transparency of the epiphyses or even densification of the soft tissues. In the more advanced stage, osteolytic damage is observed, particularly with the presence of geodes or erosions with indistinct contours in the sub- or peri-chondral region. The presence of intra-articular sequestration also suggests a diagnosis of knee tuberculosis [1, 3, 6]. Joint space narrowing becomes evident later, and destructive damage progresses, resulting in joint deformity. In advanced stages, one or more soft tissue abscesses or "droplet" calcifications may also be present within the abscess. At the terminal stage, bone ankylosis can occur. In children, there is an accelerated ossification of the epiphyseal nuclei, which can lead to premature fusion of the growth plates [7]. In our case, we observed fusion of the growth plates and femoro-tibial erosion in the young patient Computed tomography allows for precise analysis of the extent of bone lesions and joint destruction, particularly by detecting small erosions, bone sequestrations, abscesses, and calcifications within the abscess. Bone scintigraphy almost always demonstrates non-specific joint hyperfixation in cases of tuberculous arthritis. It is especially useful in identifying other sites of osteoarticular tuberculosis [7]. MRI is currently considered a reference examination for diagnosing tuberculous arthritis of the knee due to its high resolution and ability to provide multi-planar imaging. It enables visualization of joint effusion, synovial thickening, marginal erosions, cartilage damage, and extraosseous extension [8, 9]. In T1-weighted imaging, intra-articular effusion appears as hyposignal, while in T2-weighted imaging, it appears as hypersignal, potentially containing tissue debris of intermediate signal [2, 8]. Synovial thickening shows an intermediate signal in T1- weighted imaging, while in T2-weighted imaging, it can be either intermediate or hypersignal [9]. The intermediate signal corresponds to caseous necrosis, while the hypersignal indicates granulomas or synovial inflammation. Enhancement after gadolinium injection helps differentiate synovial thickening from joint effusion [4, 8, 10]. The active nature of the synovial pannus is defined by its extension into the subchondral bone and enhancement following contrast injection. The synovial pannus can become chronic and fibrous, no longer enhancing after gadolinium injection. MRI, which is more sensitive than standard X-rays in detecting bone erosions, is present in 70% of cases [11]. These erosions, whether central or peripheral, appear as hyposignal in both T1 and T2-weighted imaging, but their signal enhances after gadolinium injection. Cartilage destruction is observed in 40% of cases and manifests as localized or diffuse thinning [11]. Periarticular abscesses consist of two parts: the abscess itself, which appears as hyposignal in T1-weighted imaging and hypersignal in T2-weighted imaging, and a peripheral ring that appears as hypersignal in T1-weighted imaging and hyposignal in T2-weighted imaging."

The differential diagnosis mainly involves pyogenic arthritis. MRI can assist in the diagnosis by indicating specific signs related to the nature of the pathogen and the characteristic progression of joint tuberculosis, which has low inflammation [8, 9, 11]. The presence of chondral and subchondral erosions, with a preserved joint space height, supports the diagnosis of tuberculous arthritis [9]. The MRI appearance of periarticular abscesses also helps distinguish tuberculous arthritis from pyogenic arthritis. In tuberculous arthritis, the abscess wall is typically thin

and regular, while in pyogenic arthritis, it is thick and irregular [9, 11]. Tuberculous abscesses may show slight hyperintensity on T1- weighted images, unlike abscesses of other origins [12]. The presence of both abscess and bone fragments strongly suggests a diagnosis of tuberculosis. MRI plays a significant role in these cases, particularly with the use of gradient echo sequences, which highlight hemosiderin deposits within the hypertrophied synovium as hyposignal in both T1 and T2- weighted images [10]. Differential diagnosis with fungal arthritis is challenging on MRI; however, the presence of soft tissue abscesses and peripheral enhancement is uncommon in fungal arthritis cases [13]. Rheumatoid arthritis is characterized by polyarticular involvement, a rapid reduction in joint space height, and the absence of abscess formation [10].

Synovial fluid aspiration and synovial biopsy are essential for the diagnosis of joint tuberculosis [3]. The presence of BK (Mycobacterium tuberculosis) on direct examination or through culture confirms the definitive diagnosis of tuberculosis. Under anti-tuberculosis treatment, the overall prognosis is generally favorable, especially since the issue of bacterial resistance is less significant when tuberculosis affects the joints [5, 6]. It is important to remember that early treatment leads to a favorable prognosis for joint involvement. The improvement in medical treatments has significantly reduced the need for surgical interventions.

CONCLUSION

The diagnosis of tuberculous arthritis of the knee, although rare, should be considered when there is any inflammation of the knee, even in the absence of a positive tuberculin skin test. Magnetic resonance imaging can suggest the diagnosis and facilitate prompt initiation of treatment. A definite diagnosis is confirmed through synovial fluid aspiration and/or surgical biopsy for histological and bacteriological analysis.

REFERENCES

1. Araki, Y., Tsukaguchi, I., Shino, K., & Nakamura, H. (1993). Tuberculous arthritis of the knee: MR findings. *American Journal of Roentgenology*, *160*(3), 664–664.
2. Chan, Y. L., Griffith, J. F., & Cheng, J. C. (2001). MR imaging of children's knees. *Clin Radiol.*, *56*(8), 631–46.
3. Hamza, M. (1993). Tuberculose articulaire et vertébrale. Revue du rhumatisme et des maladies ostéo-articulaires [Internet]. [cited 2023 Jan 26]; Available from: https://www.semanticscholar.org/paper/Tuberculose-articulaire-et-vert%C3%A9brale-Hamza/d2934245af69a33ba0f960649572a007bc01de9c
4. Chen, Y. C., & Hsu, S. W. (2001). Tuberculous arthritis mimic arthritis of the Sjögren's syndrome: findings from sonography, computed tomography and magnetic resonance images. *Eur J Radiol.*, *40*(3), 232–5.
5. Paradisi, F., & Corti, G. (1999). Skeletal tuberculosis and other granulomatous infections. *Best Practice & Research Clinical Rheumatology*, *13*(1), 163–77.
6. Malaviya, A. N., & Kotwal, P. P. (2003). Arthritis associated with tuberculosis. *Best Pract Res Clin Rheumatol.*, *17*(2), 319–43.
7. Masson, E. Imagerie de la tuberculose articulaire extrarachidienne [Internet]. EM-Consulte. [cited 2023 Feb 9]. Available from: https://www.em-consulte.com/article/979597/imagerie-de-la-tuberculose-articulaire-extrarachid
8. Graif, M., Schweitzer, M. E., Deely, D., & Matteucci, T. (1999). The septic versus nonseptic inflamed joint: MRI characteristics. *Skeletal Radiol.*, *28*(11), 616–20.
9. Hong, S. H., Kim, S. M., Ahn, J. M., Chung, H. W., Shin, M. J., & Kang, H. S. (2001). Tuberculous versus pyogenic arthritis: MR imaging evaluation. *Radiology*, *218*(3), 848–53.
10. Parmar, H., Shah, J., Patkar, D., Singrakhia, M., Patankar, T., & Hutchinson, C. (2004). Tuberculous arthritis of the appendicular skeleton: MR imaging appearances. *European Journal of Radiology*, *52*(3), 300–9.
11. Sawlani, V., Chandra, T., Mishra, R. N., Aggarwal, A., Jain, U. K., & Gujral, R. B. (2003). MRI features of tuberculosis of peripheral joints. *Clin Radiol.*, *58*(10), 755–62.
12. Vuyst, D. D., Vanhoenacker, F., Gielen, J., Bernaerts, A., & Schepper, A. M. D. (2003). Imaging features of musculoskeletal tuberculosis. *European Radiology*, *13*(8), 1809–19.
13. Yao, D. C., & Sartoris, D. J. (1995). Musculoskeletal tuberculosis. *Radiol Clin North Am*, *33*(4), 679–89.

Cite This Article: Boui Meriem, Zakaria Zouaki, Mohamed El Biadi, Nabil Hammoune, Badr Slioui, Salah Bellasri, El Mehdi Atmane, Abdelilah Mouhsine (2023). Imaging of Knee Tuberculous Arthritis: A Case Report and Literature Review. *EAS J Radiol Imaging Technol*, *5*(3), 71-76.