

Tuberculosis of the knee as a great mimicker of inflammatory arthritis: a case report

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Case presentation

In January 2015, a 36-year-old man with good past health presented to a hospital in Hong Kong with intermittent low-grade fever and left knee effusion. Physical examination revealed mild effusion, erythema, warmth and tenderness over the left knee, with 10° flexion contracture and flexion range up to only 70°. The levels of inflammatory markers (C-reactive protein [CRP], erythrocyte sedimentation rate [ESR], and antinuclear antibodies [ANA]) were elevated. Single-attempt arthrocentesis on the affected knee yielded 1 mL of yellow fluid, subsequently negative for Gram stain and culture only. No obvious abnormalities were observed on plain radiograph (Fig 1a), but magnetic resonance imaging (MRI) in June 2015 demonstrated synovial thickening, bone marrow oedema and subtle cortical erosion at the lateral femoral condyle (Fig 1b). Infection could not be excluded. Non-steroidal anti-inflammatory drugs were prescribed for symptomatic control. The recurrent left knee effusion persisted despite treatment, but no further attempts at arthrocentesis were made until 2018.

In view of the joint stiffness, recurrent knee effusion and persistently elevated levels of inflammatory markers, the patient was referred to a rheumatologist. A working diagnosis of atypical rheumatoid arthritis (RA) was made despite negative testing of anticyclic citrullinated peptide antibody and rheumatoid factor. Sulphasalazine was started in September 2015. Due to persistent knee inflammation, intraarticular steroid injection was given in November 2015 with limited effect. Methotrexate and leflunomide were prescribed in escalating doses. The patient was simultaneously followed up by the orthopaedic department where analgesics and physiotherapy were prescribed. Interval MRI in December 2017 showed diffuse synovial thickening, multifocal erosive changes and bone marrow oedema in the proximal tibia, reported to be in keeping with RA. Due to progressive worsening of his knee, the patient attended the private sector and was prescribed golimumab biologics in February 2018.

In April 2018, a cystic swelling developed over

the posterolateral aspect of his left knee. Results of aspiration yielded a positive acid-fast bacilli smear and rapid cultures via Mycobacteria Growth Indicator Tube grew *Mycobacterium tuberculosis*. Knee X-ray revealed complete erosion of the medial and lateral tibiofemoral joints (Fig 1c) while MRI showed synovial thickening and intraosseous collection over the medial and lateral tibia (Fig 1d and e). Disease-modifying antirheumatic drugs were discontinued and the patient commenced a 9-month course of antituberculous drugs, namely isoniazid, rifampicin, ethambutol, pyrazinamide, and pyridoxine.

Despite eventually controlling the tuberculosis (TB), the patient's knee function deteriorated and he was referred to a tertiary hospital for consideration of total knee arthroplasty (TKA). Preoperative assessment revealed 60° ankylosis of the left knee (Fig 2a) and healed sinus tracts without signs of residual infection. Preoperative investigations revealed normal ESR and CRP levels. Robotic arm-assisted TKA with varus-valgus constrained insert (Fig 1f) was performed in March 2020 and the patient was prescribed a 12-month course of antituberculous chemotherapy postoperatively. Postoperative range of motion (ROM) was 0° to 70° with 10° extension lag at 6 weeks due to quadriceps atrophy. Manipulation under anaesthesia was performed 3 months postoperatively to enhance flexion range. A final ROM was of 0° to 95° was achieved with no residual extension lag (Fig 2b and c). The latest follow-up 1.5 years postoperatively showed stable ROM with no signs of reinfection. The patient could walk unaided.

Discussion

Tuberculosis of the knee is a rare form of osteoarticular TB that is prone to misdiagnosis due to its nonspecific presentation. It has an indolent course compared with bacterial septic arthritis. The clinical, radiological and laboratory features mimic inflammatory arthritis such as RA. Both diseases can present with monoarticular joint pain, erythema, swelling, and stiffness. In knee TB, the Phemister triad of juxta-articular osteopenia, joint space narrowing and peripheral bone erosions can



FIG 1. Left knee of the patient. (a) Anteroposterior plain radiograph showing no obvious arthritic changes in 2015. (b) Coronal T2-weighted magnetic resonance imaging (MRI) showing bone marrow oedema in distal femur, proximal tibia and proximal fibula (arrows), mild bony erosion in lateral femoral condyle (dashed arrow) and synovial thickening (circles) in June 2015. (c) Anteroposterior plain radiograph showing severe joint space narrowing (arrow), bone erosion (dashed arrow), and a caseating lesion (circle) in the proximal tibia in 2018. (d) Coronal and (e) sagittal T2-weighted MRI showing diffuse synovial thickening, multifocal bone erosions (dashed arrows in [d]), cartilage thinning (arrow in [e]), and joint space narrowing in 2018. (f) Anteroposterior plain radiograph 1 year post-total knee arthroplasty in September 2021

be observed on plain radiographs, but these can also be evident in RA. Magnetic resonance imaging features of TB include multifocal bone erosions, articular surface destruction, cartilage erosions, and marrow oedema.¹ Similar laboratory results include elevated white cell count (WCC) and percentage of polymorphonuclear neutrophils (PMNs) in blood and synovial fluid, and sustained elevation of ESR, CRP and anti-nuclear antibody levels due to active inflammation.

As in all circumstances of suspected infection, a patient's symptoms and risk factors such as diabetes mellitus, RA and prior surgery should be assessed.² Local skin condition, effusion and ROM should be noted on physical examination. Synovial fluid from arthrocentesis should be sent for total and differential cell counts, biochemistry, microbiology, crystals, and cytology. Total and differential counts are helpful in differentiating infective and

inflammatory causes. Synovial fluid with WCC of $>50\,000/\text{mm}^3$ and PMN level of $>75\%$ point towards acute septic arthritis, while WCC of 2000 to $100\,000/\text{mm}^3$ and PMN level of $>50\%$ suggest inflammatory arthritis.³ Nonetheless in TB, the WCC is typically in the inflammatory range of $10\,000$ to $20\,000/\text{mm}^3$.^{3,4} Joint aspirate should be sent for fungal and acid-fast bacilli smear, culture and TB-polymerase chain reaction (TB-PCR) to identify atypical organisms in refractory patients. Although the high specificity and shorter turnaround time of TB-PCR can complement cultures and help achieve an early diagnosis of TB, culture remains the gold standard to exclude TB infection due to its higher sensitivity. When synovial fluid aspirate is inadequate, repeated aspiration or even arthroscopic synovial biopsy should be considered. Autoimmune markers should be determined to exclude an autoimmune cause. Serial knee X-rays and MRIs

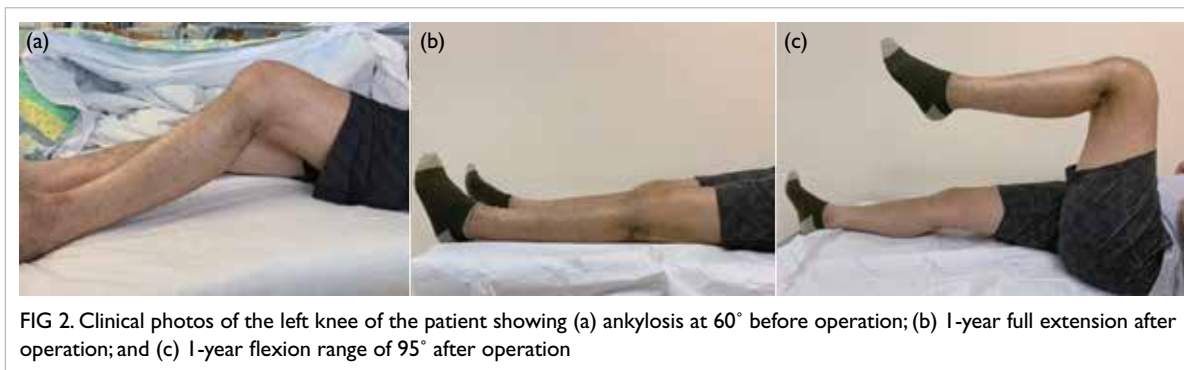


FIG 2. Clinical photos of the left knee of the patient showing (a) ankylosis at 60° before operation; (b) 1-year full extension after operation; and (c) 1-year flexion range of 95° after operation

should be taken regularly to monitor disease progression. In equivocal cases, arthroscopic synovial biopsy can be performed. A typical histological finding of caseating granuloma with lymphocytic infiltration is diagnostic of TB. Although arthrocentesis is less invasive, it has a lower diagnostic sensitivity (80%) for knee TB than synovial biopsy (90%).⁴

Tuberculosis of the knee can be managed conservatively by 12 to 18 months of antituberculous chemotherapy if identified early. With increasing joint damage, surgical intervention including debridement, synovectomy and arthroplasty might be necessary. The long disease course of joint destruction leads to fibrosis and ankylosis of the knee joint. Total knee arthroplasty is regarded as a primary treatment for advanced TB of the knee. Sultan et al⁵ suggest TKA be performed 1 to 5 years following eradication of TB to minimise reinfection risk. Postoperatively, 12 to 18 months of antituberculous drug therapy is believed to be highly effective in preventing recurrent infection, possibly due to the biofilm-lacking nature and poor metal adherence of TB.⁵

Robotic arm-assisted TKA with varus-valgus constrained insert was performed for our patient. The use of a constrained implant facilitated greater coronal plane stability in view of the extensive bone loss, ankylosis and ligamentous laxity secondary to prolonged TB infection. Robotic arm-assisted TKA was adopted since it enables higher accuracy in bone cutting and implant positioning than manual TKA.⁶ This is important for a patient receiving TKA at a young age.

Tuberculosis of knee is rarely documented in Hong Kong. This case highlights the importance of recognising TB as an important differential diagnosis of inflammatory arthritis. Maintaining a high index of suspicion will facilitate early diagnosis, potentially sparing the patient from joint destruction and TKA at a young age. In the event of recurrent knee effusion, synovial fluid samples should be sent for TB-PCR in addition to cell count, cytology, bacterial, acid-fast bacilli smear and cultures. Total knee arthroplasty plays a significant role in restoration of acceptable ROM in a knee with extensive bone erosion and

ankylosis.

Author contributions

Concept or design: All authors.

Acquisition of data: All authors.

Analysis or interpretation of data: All authors.

Drafting of the manuscript: HMH Chan, H Fu.

Critical revision of the manuscript for important intellectual content: H Fu, KY Chiu.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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Ethics approval

The patient was treated in accordance with the Declaration of Helsinki and provided consent for publication of this case report.

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