



Tuberculous Arthritis Diagnosed After Total Knee Replacement

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Abstract

Total knee arthroplasty is primarily done in elderly individuals with degenerative osteoarthritis and rheumatoid arthritis. The most dreaded complication of Total Knee Arthroplasty (TKA) is infection, which results in failed surgical outcome that requires subsequent treatment with prolonged morbidity and disability to the patient. The use of TKA to treat active joint tuberculosis remains controversial and most orthopaedic surgeons would advise against it in cases with active tuberculosis (TB). As a precaution it is always necessary to rule out both systemic and local infection pre operatively by thorough relevant history and laboratory investigations. Skeletal tuberculosis is an uncommon infection that accounts for approximately 2% of all musculo skeletal tuberculosis. In the musculo skeletal system it affects most commonly the spine followed by hips and knees. When literature was reviewed TKA has been reported for subclinical TB with reported reduction in pain, excellent range of motion and minimal reactivation of TB. The good results of TKA in patients on treatment of extrapulmonary TB can be attributed to the biological behavior of mycobacterium tuberculosis and its reaction to implant as compared to other bacterial infections such as staphylococcus aureus.

The diagnosis of knee Tuberculosis can be challenging especially in patients with no obvious pulmonary disease and discharging sinuses. Active TB diagnosed after TKA has been reported in several small series with good outcomes after systemic chemotherapy. The clinical outcomes of TKA in patients diagnosed with TB post-surgery compare favorably with those of non-infected knees.

Keywords: Tuberculosis; Pilonodular synovitis; Total Knee Arthroplasty (TKA); Postoperative

Abbreviations: TKA: Total Knee Arthroplasty; TB: Tuberculosis

Case Report

A 36 year old male who presented with a history of right knee pains, swelling and progressive stiffness with severe limitation of function was seen at the The Mp Shah

Hospital in Nairobi over 4 year duration. He had been seen elsewhere and diagnosed with pylonodular synovitis after an open biopsy and arthroscopic biopsy without significant improvement. The initial X- rays did not reveal any significant joint destruction (Figure 1). The initial biopsy in 2016 was arthroscopic and the mantoux test then was negative for TB with an ESR of 66 mm. The second biopsy was done open in 2017 and included

metaphyseal biopsy of the tibia and revealed pillonodular synovitis. We repeated an arthroscopic biopsy which revealed pillonodular synovitis and I sent him for radiotherapy and physiotherapy which on completion he still reported severe pains and limitation of movement.



Figure 1: Initial knee X rays in 2014.

Due to the progressive limitation of function and severe pains with no signs to suspect active TB in any of the systems or organs both clinically and radiologically, we preceded plan for a synovial biopsy and total knee replacement. The pre op MRI revealed severe degenerative changes with synovial changes suggestive of Pillonodular Synovitis (Figure 2 A and B). His Haemoglobin was 14.7g/dl, total WBC count $7.50 \times 10^9/l$, and lymphocyte count of 21.1 %. He was seronegative, had a normal uric acid level but the acute and chronic inflammatory markers were normal.

Intra-operatively I found a totally inflamed synovium with nodules and complete damage to the articular surface with multiple punched out lesions (Figure 3). A total synovectomy and biopsy was done and sent for histology. TKA was done using Smith and Nephew cemented knee implant. The biopsy specimens were firm brownish membranous tissue fragments aggregating to 7 cm and weighing 3.6 grams. The biopsy report was reported as granulomatous synovitis consistent with tuberculosis. Synovium specimen microscopy showed necrosis and granulomas attended with epithelioid cells, lymphocytes, plasma cells and langerhan's cells. The ZN stains were positive. But AFB and fungal staining came as negative.

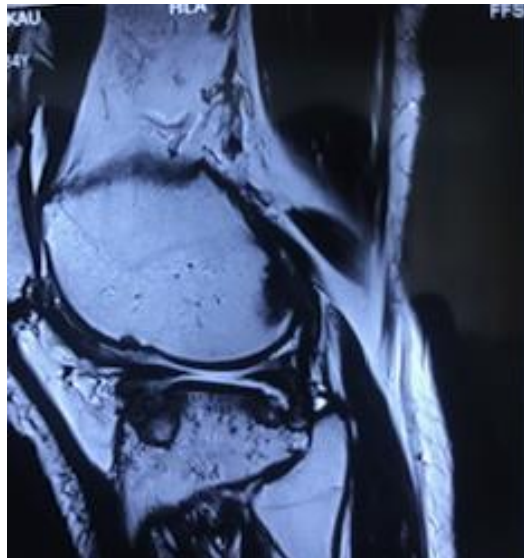


Figure 2 A: pre-operative MRI Scan showing extensive articular damage with extension into the subchondral bone.

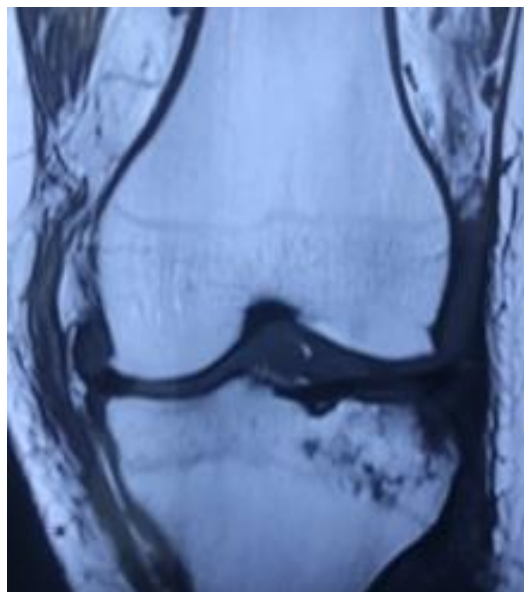


Figure 2 B: pre-operative MRI Scan showing extensive articular damage with extension into the subchondral bone.



Figure 3: Intra operative image showing the destruction of the tibia articular surface.

Post operatively he was started on 9 months Anti TB chemotherapy including Rifampicin and Isoniazid by the infectious disease specialist. His postoperative check X rays had a good alignment implant position (Figure 4 A & B). He was mobilized from the second day post-operative with active exercises and discharged on the 5 post-operative days for outpatient follow up.



Figure 4 A: Immediate postoperative AP X ray.



Figure 4 B: Immediate postoperative lateral X ray

Patient had been followed up for six months so far without any reactivation of tuberculosis or implant loosening. Six months follow up post op x-ray showed good alignment of the implants (Figure 5 & 6). His functional outcome was also good with improvement in range of flexion from 10 degrees pre op to 120 degrees post op and normal quadriceps muscle bulk (Figure 7).



Figure 5: Antero posterior knee X ray at 6 months.



Figure 6: Lateral knee X ray at 6 months.



Figure 7: Healed knee with no sinus or features of inflammation at 6 months and flexion 120 degrees.

Discussion

This case demonstrates an unusual presentation of extra pulmonary Mycobacterium tuberculosis in a young seronegative patient missed on two initial biopsies. The postoperative incidental diagnosis after TKR has allowed us to study the behavior of orthopedic implants in an actively infected joint on treatment for TB. Traditionally the treatment of choice for active TB in a joint includes debridement, arthrodesis and resection arthroplasty

along with proper anti TB treatment using regimens for extrapulmonary infections [1-8]. But debridement will damage the cartilage hence resulting in further pain and reduced range of movement. Arthrodesis gives a pain free joint but with major functional limitation. Resection arthroplasty on the other hand gives a hypermobile painless but unstable joint. Hence today it's imperative to explore treatment options for joints with active TB that gives the patients a better quality of life. In this case the patient had an ankylosed joint with severe pains that could only be relieved by total joint replacement.

Therefore TKR can be done in joints with active TB if the patient is properly treated with anti TB treatment pre operatively and postoperatively with good outcomes compared to the alternatives. Su et al reviewed 15 patients (16 knees) who had TKR done prospectively and divided into two groups [4]. Group I of 8 knees had active TB and treated pre operatively and post operatively with anti TB regimen. Group II of 8 knees included cases with no active TB hence no anti TB regimen given pre operatively but as they were diagnosed to have TB after surgery they were administered TB drugs post operatively. Group I had one relapse due to steroid intake. Group II had four relapses.

Most orthopaedic surgeons would be reluctant to treat tuberculosis of the major joints with replacement procedures due to the risk of reactivation. However it's important to note the mycobacterium tuberculosis has specific biologic behavior that distinguishes it from most pyogenic infections and hence its response to implanted materials also differs significantly. Firstly the mycobacterium is known to reproduce slowly while producing minimal adhesion molecules, slime and occasionally becomes dormant. Secondly TB Bacilli forms a biofilm that differs from other pyogenic organisms and which according to Ha et al TB bacilli rarely or don't adhere to the metal surfaces [5]. This in contrast to a study by Ma et al that described biofilm formation by M tuberculosis on the surface of cobalt-chromium-molybdenum alloy or titanium alloy [8]. Further to this M tuberculosis is known to divide once in 15-20 hours, which is slower than Staphylococcus Aureus that divides every 20 min.

The difficulty of diagnosis TB originates from the lack of specific clinical symptoms and timely laboratory tests, which often results in delayed diagnosis [9-14]. The diagnosis of tuberculosis infection after TKA is challenging and after a review by Harwin [12] tuberculosis infection after TKA can be divided into early and late onset. Early-onset infections were classified as those occurring less than eight weeks after surgery as

in this case report, while late-onset infections are those occurring more than eight weeks post surgery. Tokumoto and group [15] have advanced three possible reasons for the delayed diagnosis of tuberculosis infection after TKA: (1) a missed diagnosis of joint tuberculosis infection before TKA, (2) suspected tuberculosis infections are difficult to diagnose, and (3) other, more readily diagnosable bacterial infections that can misdirect clinical management. In addition, the atypical nature of the presentation, and frequent lack of classic definitions of prosthetic joint infections, such as that of the Musculoskeletal Infection Society (MSIS), can result in false negatives [16]. Currently, the gold standard for diagnosis includes a joint fluid or synovial tissue analysis for acid-fast bacilli culture and histopathological examination [14, 17-21].

In a study of 23 cases of active TB of the hip joint confirmed histologically and by Polymerase Chain Reaction test with an average follow up of 4.7 years reported no reactivations [2]. All the patients in the study were given three months pre op and 18 months post op TB systemic treatment in conjunction with having undergone a cemented total hip replacement. In another study involving seven cases of active TB septic arthritis of the hip without discharging sinus treated by uncemented THR with thorough debridement and 12 months of post op TB treatment no relapse was recorded at a mean 4.8 year follow up [3].

The management of reactivated infection in a patient with unsuspected TB before arthroplasty as in this case is poorly understood with no clear consensus on treatment [19,21]. If there is reactivation of TB then proper TB regimen with or without debridement alone can save the prosthesis. If prosthesis cannot be saved then its removal with or without arthrodesis will be the choice may be the alternative treatment. So in post-operative follow up if patient has signs of infection with culture showing negative the surgeons should be aware of possibility of TB in the joint. To achieve successful outcome we should plan proper pre, peri and post-operative TB care with or without debridement and during the procedure we should completely curette inflamed soft tissues and necrotic bone [1].

Conclusion

Its also important for physicians to consider TB infection in chronic knee pains associated with significant joint destruction in young patients. Total knee replacement can be used in the treatment of active joint TB infection because Mycobacterium tuberculosis divides slowly with no major Metal implants biofilm formation.

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