

Pulmonary Tuberculosis with Delayed Tuberculosis Infection of Total Knee Arthroplasty

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Tuberculous prosthetic joint infection is rare. While early diagnosis is critical for treatment, it is usually delayed. Here, we present the case of a 72-year-old patient who underwent total knee arthroplasty for his right knee due to degenerative arthritis 4 years ago. Three years after arthroplasty, pulmonary tuberculosis was found and he hesitated on starting antituberculosis chemotherapy. He suffered from progressive pain and swelling of the right prosthetic knee for 2 months before this admission. The pathologic report of the debridement of the right prosthetic knee was caseous granulomatous inflammation with positive acid-fast staining bacilli. The culture of the debridement also yielded *Mycobacterium tuberculosis*. He died due to aspiration pneumonia with multiorgan dysfunction. This case is a reminder of the possibility of tuberculosis while dealing with prosthetic joint infection. [*J Formos Med Assoc* 2007;106(1):82–85]

Key Words: prosthetic joint infection, tuberculosis

Total joint endoprosthesis is currently used widely in many joint diseases. However, prosthetic joint infection is a serious complication of this treatment. Tuberculous prosthetic joint infection is rare, and information regarding its epidemiology has been limited to case reports and small cases series.¹ Thus, the diagnosis is often missed because it is not the priority while considering the pathogen of septic arthritis. Here, a case is reported to alert the physician about the diagnosis of tuberculous prosthetic joint infection.

Case Report

The patient was a 72-year-old man who was a smoker consuming two packs a day for the last 50 years. He had suffered from progressive knee

pain for several years and had difficulty in walking. Degenerative osteoarthritis of the right knee was diagnosed 3 years ago at another hospital. Total knee arthroplasty with prosthesis was subsequently performed. After the operation, he regained the ability to walk and the pain was relieved.

However, he complained of chronic productive cough that began 1 year ago. Pulmonary tuberculosis was diagnosed by microbiology in another hospital. He was later lost to follow-up and did not receive antituberculous chemotherapy. Progressive right knee pain was also noted for 2 months. The pain was so severe that the patient became bedridden for the last 2 weeks before this admission. He was sent to our emergency department due to a high fever >39°C.

Physically, body temperature was 39°C. Breath sounds were diminished and hyper-resonant by

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Figure 1. Chest X-ray shows infiltrates in bilateral upper lobes.



Figure 2. Plain film of the right knee (anteroposterior view) shows the prosthetic joint *in situ* with acceptable alignment. There is no apparent osseous destruction or osteopenia.

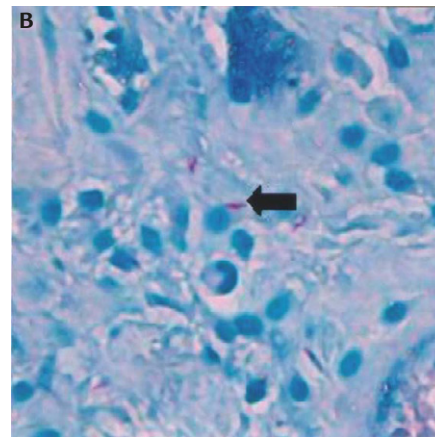
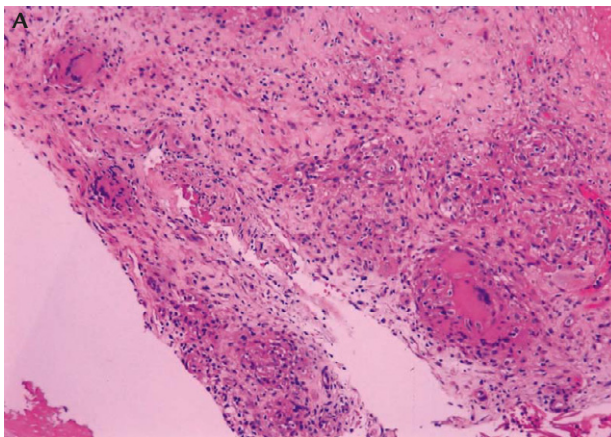


Figure 3. (A) Histologically, the specimen shows granulomas composed of epithelioid histiocytes with Langhans' giant cells and caseous necrosis (hematoxylin & eosin, 100 \times). (B) Acid-fast stain shows the presence of acid-fast bacilli (1000 \times).

percussion. No adventitious breathing sounds were noted. A 5 \times 5 cm tender protrusion with local heat, located at the lateral aspect of the right knee, was found. Otherwise, the physical findings were not remarkable.

On admission, white blood cell count was 12,460/ μ L with 80.4% neutrophils. Blood urea nitrogen was 40 mg/dL and serum creatinine was 1.8 mg/dL. The results of other biochemical studies were within normal ranges. Chest radiography revealed infiltrates in bilateral upper lobes (Figure 1). Plain film of the right knee was also taken (Figure 2). There was no apparent osseous destruction, osteopenia, or radiolucent zone.

In the clinical history taken on admission, the patient denied having a history of active pulmonary

tuberculosis. Sputum acid-fast staining (AFS) was checked due to the abnormal findings of the chest plain film. Aspiration of the protrusion in the right knee yielded pus-like material. Empirical oxacillin was given under the impression of septic arthritis.

Arthrotomy and synovectomy were performed on the 5th hospital day. The operative findings showed pus formation with massive caseous necrotic debridement in the right knee. The implant was not removed simultaneously since no definite signs of loosening were noted. Meanwhile, sputum AFS revealed a positive result. Subsequently, the pathologic report showed caseous granulomatous tissue with positive AFS (Figure 3). Tissue and sputum culture both yielded

Mycobacterium tuberculosis that was only resistant to streptomycin.

Antituberculosis chemotherapy with isoniazid, rifampicin, ethambutol, and pyrazinamide was given. His fever subsided after the initiation of antituberculous chemotherapy. The swelling and tenderness of the right knee improved gradually, with decrement of hemovac drainage. The hemovac was removed on the 26th hospital day. Series of serum aspartate aminotransferase and alanine aminotransferase were normal. Poor appetite and general weakness from a depressed mood progressed during his stay in the isolation room. A psychiatrist was consulted and an antidepressant was given, but in vain.

The patient suffered from severe cough just after feeding on the 25th hospital day. It induced vomiting and suffocation subsequently developed. Adult respiratory distress syndrome with septic shock and multiorgan dysfunction developed. He died on the 34th hospital day due to multiple organ failure.

Discussion

Skeletal involvement occurs in approximately 1% of the population with acute tuberculosis and is probably the most common extrapulmonary manifestation of the disease.² Tuberculous prosthetic joint infection is relatively rare and is more difficult to diagnose. The clinical and radiologic manifestations are often similar to those of rheumatoid arthritis and pyogenic arthritis.³ Moreover, < 50% of patients with tuberculous arthritis have radiographic evidence of pulmonary tuberculosis.² Tokumoto et al reported that only 63% of patients with tuberculous prosthetic joint infections demonstrated the characteristic histopathology and < 1/3 had positive smear and/or culture.⁴ Hence, it is sometimes difficult to diagnose.

The length of delayed diagnosis ranges from 3 weeks to 2 years in the current medical literature.⁴ In this case, definitive diagnosis was made within 1 week. There are several pictures suggestive of a tuberculous prosthetic joint infection,

including active or healed tuberculosis on chest radiography, unexpected early prosthetic failure,⁵ and a persistent clinical infection despite adequate antibacterial treatment.⁴ Consideration of the possibility of tuberculosis is therefore the most important factor in avoiding delayed diagnosis.

Most osteoarticular tuberculosis presumably results from endogenous reactivation of infectious foci seeded during the bacteremia of the primary pulmonary infection. The tendency for tuberculosis to localize in the metaphyses of long bones is due to the relatively rich blood supply and the scarcity of phagocytic cells in this portion of the bone.⁶ The same phenomenon of reactivating a quiescent focus of infection was observed in the majority of tuberculous prosthetic joint infection.

Hematogenous spread from the reactivation of other sites occurs less because the blood supply in the prosthetic joint is interrupted. Ueng et al reported two cases of possible hematogenous spread to total hip arthroplasty from pulmonary tuberculosis.⁷ This case is similar to the report of Ueng et al, and both etiologies are possible in the presence of active pulmonary tuberculosis.

Pyogenic arthritis is still the most common form of septic arthritis involving a prosthetic joint. The diagnosis is often made according to the culture of the synovial fluid. But Tokumoto et al and Berbari et al observed bacterial coinfection in tuberculous prosthetic joint infections, mainly *Staphylococcus aureus*.^{4,8} It was postulated that bacterial coinfection might be from the route of draining sinuses. As such, tuberculous infections cannot be excluded absolutely when there is a positive result from the synovial bacterial culture.

The incidence of tuberculous prosthetic joint infection is rare but it should be higher in areas with a high prevalence of tuberculosis. The majority is from the reactivation of a quiescent focus. However, there is no good method for predicting whether or not the occult tuberculous focus is reactivated before routine arthroplasty for apparently degenerative arthritis. Currently, it is known that an immunocompromised status can reactivate the dormant tubercle bacilli in a

caseous focus.⁹ Some authors suggested that prophylactic chemotherapy could prevent the complication while patients with healed tuberculosis arthritis undergo total joint endoprosthesis.¹⁰ Further studies are needed to determine whether or not prophylactic chemotherapy is necessary, especially in endemic areas, in immunocompromised patients or in patients with radiographic manifestations of old pulmonary tuberculosis. On the other hand, the early diagnosis and adequate management of pulmonary tuberculosis is very important for the prevention of tuberculous prosthetic joint infection. If this patient had not hesitated about starting antituberculosis therapy, the failure and infection of the prosthetic joint would not have occurred.

Treatment of patients with tuberculous infection after prosthetic implantation remains a major challenge. There are diverse treatment modalities present in the medical literature, including antibiotics and the removal of the components; antibiotics, aggressive debridement and retention of the components; and antibiotics alone.^{1,5,8,9,11-14} However, there is no prospective, randomized trial to show the superiority of any treatment modality. There is also no definite duration of chemotherapy for tuberculous prosthetic joint infection in the different treatment modalities. But at least 9–12 months is necessary for nonresistant strains.⁸

In conclusion, a case of delayed tuberculous prosthetic joint infection accompanied by uncontrolled pulmonary tuberculosis was presented here. The initial manifestations were similar to pyogenic arthritis. This case is a reminder of the possibility of delayed tuberculous infection after total joint endoprosthesis. The diagnostic delay could have been avoided if this diagnosis had been considered.

References

1. Baldini N, Toni A, Gregg T, et al. Deep sepsis from *Mycobacterium tuberculosis* after total hip replacement. *Arch Orthop Trauma Surg* 1988;107:186–8.
2. Davidson P, Horowitz I. Skeletal tuberculosis. A review with patient presentations and discussion. *Am J Med* 1970;48:78–84.
3. Engin G, Acunas B, Acunas G, et al. Imaging of extrapulmonary tuberculosis. *Radiographics* 2000;20:471–88.
4. Tokumoto JI, Follansbee SE, Jacobs RA. Prosthetic joint infection due to *Mycobacterium tuberculosis*: report of three cases. *Clin Infect Dis* 1995;21:134–6.
5. Kreder HJ, Davey JR. Total hip arthroplasty complicated by tuberculous infection. *J Arthroplasty* 1996;11:111–4.
6. Berney S, Goldstein M, Bishko F. Clinical and diagnostic features of tuberculous arthritis. *Am J Med* 1972;53:36–42.
7. Ueng WN, Shih CH, Hseuh S. Pulmonary tuberculosis as a source of infection after total hip arthroplasty. A report of two cases. *Int Orthop* 1995;19:55–9.
8. Berbari EF, Hanssen AD, Duffy MC, et al. Prosthetic joint infection due to *Mycobacterium tuberculosis*: a case series and review of the literature. *Am J Orthop* 1998;27:219–27.
9. Fink B, Casser HR, Zilkens KW, et al. Reactivation of a tuberculous coxitis due to loosening of a total hip endoprosthesis. *Arch Orthop Trauma Surg* 1995;114:298–301.
10. Jupiter JB, Karchmer AW, Lowell JD, et al. Total hip arthroplasty in the treatment of adult hips with current or quiescent sepsis. *J Bone Joint Surg Am* 1981;63:194–200.
11. Johnson R, Barnes KL, Owen R. Reactivation of tuberculosis after total hip replacement. *J Bone Joint Surg Br* 1979;61:148–50.
12. Hugate R Jr, Pellegrini VD Jr. Reactivation of ancient tuberculous arthritis of the hip following total hip arthroplasty: a case report. *J Bone Joint Surg Am* 2002;84:101–5.
13. Kim YH. Total knee arthroplasty for tuberculous arthritis. *J Bone Joint Surg Am* 1988;70:1322–30.
14. Hecht RH, Meyers MH, Thornhill-Joynes M, et al. Reactivation of tuberculous infection following total joint replacement: a case report. *J Bone Joint Surg Am* 1983;65:1015–6.