Case Report

Rapid Destruction of Tuberculosis after Total Knee Replacement

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Authors reported a case of a 60-year-old female who had knee pain after first time total knee replacement 5 months earlier. The postoperative radiograph of her left knee showed progressive bone loss around prostheses both femur and tibia. She was diagnosed with chronic postoperative infection from mycobacterium that was positive culture from synovial tissue at the second time of surgery. Our study showed that the process of rapid bone destruction in short period from mycobacterium that must be concerned especially in endemic area.

Keywords: *Mycobacterium infection, Chronic postoperative infection, Bone loss after total knee replacement*

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Tuberculosis (TB) is a chronic infection that is caused by Mycobacterium. The infection usually occurs in the lungs[1]. Fortunately, tuberculosis is curable and preventable. In 2015, 87% of infected people usually infected with TB and HIV simultaneously[2]. The incidence of tuberculosis in Thailand was found that numerous patients had been increasing to 120,000 new cases every year. In 15 to 20% of active cases, the infection spread outside the lungs. The various extrapulmonary sites are bone, joints, lymph nodes, genitourinary tract, meninges, intestine etc. Joint tuberculosis or osteoarticular tuberculosis is found about 1 to 4.3% of all tuberculosis cases and 10 to 15% of all extrapulmonary tuberculosis cases[1,3].

The diagnosis of osteoarticular tuberculosis is often delayed, on an average of 16 to 19 months after infection[4]. The most common clinical symptoms are chronic pain, limit range of motion of affected joints and swelling. A sinus tract at surgical wound is found in more than 50% of all cases. There is a non-specific change in plain radiograph. The final diagnosis has to evolve from synovial fluid culture and synovial biopsy. In addition to histological examination, tissue should be sent for sero-diagnosis to detect of DNA/RNA of *Mycobacterium tuberculosis*[5].

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The main treatment of osteoarticular tuberculosis is appropriate for anti TB-drug therapy. Advanced joint destruction requires many surgical treatment options such as arthrodesis and arthroplasty[6-8]. In osteoarticular tuberculosis of knee joint, total knee replacement is considered as an effective treatment[8, 9]; however, there are controversies about timing of surgery, surgical planning and perioperative therapy regimens for advanced disease. Our study presented a case with advanced osteoarticular tuberculosis of knee joint after total knee replacement. The authors demonstrated that patient's manifestations, diagnosis, classification and treatment.

Case Report

A 60-year-old Thai female house-keeper suffered from left knee pain 2 years ago. She did not have an underlying disease. She complained about pain when she was walking approximately 400-500 meters and had trouble with climbing stair. She did not have fever and night pain. Then she decided to go to a rural hospital near her home. A doctor who has worked at this hospital made a diagnosis as left osteoarthritis knee. She took paracetamol and meloxicam when she felt pain. The treatment included physiotherapy for 3 months. In addition, she had to use a cane for walking inside her house. After treatment in a rural hospital for 6 months, she decided to go to a center hospital in order to get another evaluation.

Clinical examination of the left knee revealed tenderness of medial joint line with limited range of motion. Neither swelling nor sign of inflammation was

found on her knee. The knee flexion was restricted in 120° and extension had flexion contraction in 5°. She had antalgic gait when she was walking without gait aid.

Initial radiographs (Fig. 1) of left knee with weight bearing showed narrowing of medial joint space and an irregular border of medial femoral condyle. The tibiofemoral alignment was 3° in varus angulation. In lateral view, the knee was unremarkable both of tibiofemoral and patellofemoral compartment.

Initial laboratories revealed within normal limits: WBC 7,000 cell/ml in CBC, BUN, creatinine, electrolyte, liver function test, urinary analysis, EKG and chest x-ray. However, the patient did not initially have any investigation for an inflammatory marker.

Despite conservative treatment, she continued to experience progressive pain in left knee. At a center hospital, she was admitted to surgery with total knee arthroplasty (Fig. 2). After the first operation, she got an excellent result and she could walk without gait aid after 6 weeks. Moreover, the clinical examination showed the knee was flexion to 135°, extension was 0°. The knee society scores were 95 points at 6 weeks and 100 points at 12 weeks after surgery[10].

At 5 months after surgery, she suddenly felt pain again at left knee when she was walking. She needed to rest by sitting and tried to use cane for helping herself to back home. She came to the hospital again before follow-up because this problem made her stressed. The clinical examination revealed the surgical scar was good; however, the left knee had significant limited range of motion: flexion was 30° and extension was 5°. There were no sign of effusion and inflammation. The special tests were abnormal both varus and valgus stress test. The x-ray of the knee showed severe subsidence of femoral component and significant medial tibial bone loss. Both of the components were changed in the position that was compared to the previous x-ray (Fig. 3).

At this visit, the diagnosis was likely from bacterial infection of prosthesis because the bones were rapidly destroyed and the laboratories favored infection rather than aseptic cause. The ESR and CRP were higher than 30 mm/hr and 10 mg/dl respectively. Therefore, she was diagnosed as chronic post-operative periprosthetic infection which was classified by Tsukayama. Then she underwent irrigation and debridement in order to remove all prostheses and a surgeon also used vancomycin 4 g a batch and

Fig. 2 Immediate post-operative: 2 degrees in valgus alignment, implant position was in acceptable alignment.

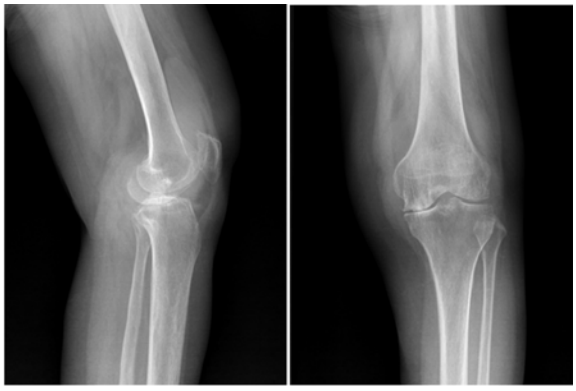

Fig. 1 Pre-operative radiography of left knee: narrowing medial compartment, osteophytes at medial side of tibial plateau and 3 degrees of tibial-femoral angle in varus alignment.

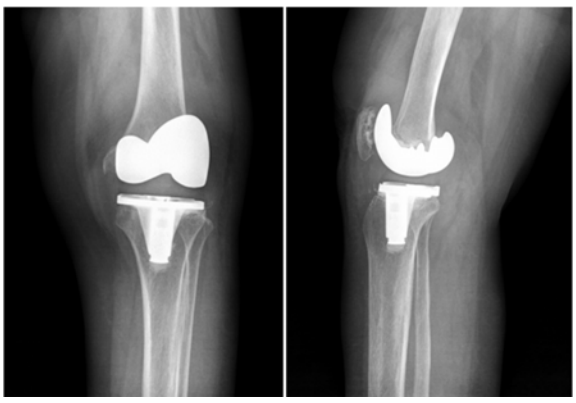

Fig. 3 At 5 months, post-operative: 3 degrees in varus alignment, implant position changed both tibial and femoral component.

gentamicin 240 mg a batch into a cement spacer. During surgery, the surgeon did not find any pus. After the operation, was she relieved the pain suddenly. Synovial tissue and a fragment of bone were sent for bacterial culture. The final reports of tissue and bones were negative. All inflammatory related markers were observed by serial ESR and CRP every week. They found a significant decrease until one month after surgery. The CRP level slightly increased again and came up with worse clinical symptom.

The doctor decided to re-operate for irrigation and debridement and changed cemented antibiotics. Intraoperative tissue was sent again for culture and PCR test for mycobacteria in order to find atypical infection. This is because tuberculosis is not uncommon pathogen in Thailand. The result of the culture for bacteria and mycobacteria remained negative; however, the PCR test for mycobacteria was positive. She was given a new diagnosis for tuberculosis periprosthetic infection. In our final decision, we consulted an infectious disease doctor to start an anti-tuberculosis drugs regimen. After she took the medicine, the ESR and CRP profoundly decreased until it was within the normal range at 3 months.

The x-ray of left knee showed significant bone loss both of femur and tibia (Fig. 4). The space between femur and tibia was filled with antibiotic cemented spacer. According to AORI classification about bone loss of the knee, the femur was type 2B and the tibia was type 2B. Therefore, the patient waited until all laboratories of inflammation markers were in the normal limit. Nine months after treatment with anti-tuberculosis drug, the patient got the last operation for reimplantation with revision constraint for total knee arthroplasty with cemented stem (Fig. 5).

After reimplantation, she did not have any pain. She can walk without a walker at 3 weeks and she felt like a normal knee at 3 months. The clinical examination showed that flexion was 110° and extension was 5°, which was proper enough for her routine activities. The knee society scores were recorded at 2, 6, 12 weeks after surgery. The scores are 55, 77 and 90 points, respectively. The laboratories were collected every appointment (Table 1).

Fig. 4 Evaluated bone loss.

Fig. 5 Post-operative revision surgery.

Table 1. Representation of ESR and CRP level

Duration	ESR (mm/hr)	CRP (mg/dl)
Before the last operation	107	59
2 weeks after surgery	73	15
6 weeks after surgery	64	11
12 weeks after surgery	56	9.2

Discussion

The tuberculosis infection is a one of the transmitted diseases in Thailand because this country is an endemic area. The tuberculosis is a disease from mycobacterial infection[11]. There are many sources that can be infected in the human body such as lungs which is the most commonly affected organ, but can be found in kidneys, bone and joints[1]; however, in immuno-compromise patients, infection can be found in every organ[12,13].

Mycobacterial infection after prosthesis replacement is rare[14,15]. According to published studes about this problem, the septic arthritis after total knee

replacement is often delayed because a history of prior Mycobacterium tuberculosis was unknown. The treatment requires a combined medical and surgical approach[14]. The prosthesis usually needs removal during irrigation and debridement. All patients in prior studies are most often found to be HIV patients and IV drug users; however, all available studies do not have long-term follow-up.

Medical regimens for treatment of Mycobacterium tuberculosis periprosthesis infection are as identical as anti-tuberculosis in a native joint[1,15]. The regimens, for example, are rifampicin, isoniazid, and pyrazinamide; however, some regimens need to change to include culture sensitivity.

In our case, the patient did not present as septic arthritis at the beginning. Clinical symptoms showed likely to osteoarthritis rather than septic arthritis and osteonecrosis of femoral condyle[16,17]. After the first time of total knee replacement, she relieved pain dramatically. However, she became worse on her left knee again after three months. The first differential diagnosis should be from bacterial infection because all bones were destroyed rapidly. However, it can be ruled out, after final reported of positive in PCR for TB. To sum up, mycobacterium can lead to destroying the joint aggressively. Indeed, all implants were loosened in the intra-operative field.

After she took an anti-tuberculosis drug until inflammatory marker that subsided in 9 months, she was undergoing re-implantation of total knee arthroplasty. The knee society scores[10] were significantly increased and finally the pain disappeared.

Conclusion

Mycobacterium infection after total knee replacement can cause severe bone loss and rapid onset. In endemic area, surgeons should be concerned by patients who do not respond to treatment as a bacterial infection. This is because infected prostheses from mycobacterium have a different means of treatment.

What is already known this topic?

Mycobacterium infection after total knee replacement is rare situation but can be found. However, severe bone loss from mycobacterium has not been presented.

What this study adds?

This study demonstrated the diagnosis method of mycobacterium infection after total knee replacement. Moreover, it showed the process of bone loss and evaluated bone loss with treatment method. The clinical result in the short-term was also shown.

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Potential conflicts of interest

None.

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การถูกทำลายอย่างรวดเร็วในข้อเข่าเทียม โดยเชื้อวัณโรค

วิทวัส บุญญานุวัตร, รณชิต บุญประเสริฐ

รายงานกรณีของผู้ป่วยหญิงอายุ 60 ปี ที่มีอาการปวดเข่าหลังจากการผ่าตัดเปลี่ยนข้อเข่าเทียมข้างซ้าย 5 เดือน จากถ่ายภาพรังสีหลังการผ่าตัดของข้อเข่าข้างซ้ายแสดงให้เห็นถึงการสลายของกระดูกที่เพิ่มขึ้นรอบ ๆ ข้อโลหะเทียมอย่างรวดเร็ว หลังจากการผ่าตัดแก้ไขครั้งที่สอง ผู้ป่วยได้รับการวินิจฉัยว่าเป็นการติดเชื้อเรื้อรังจากเชื้อ Mycobacterium โดยตรวจพบจากเยื่อหุ้มข้อเข่าที่ได้จากการผ่าตัด ซึ่งจากการศึกษานี้แสดงให้เห็นถึงกระบวนการสลายของกระดูกอย่างรวดเร็วหลังการผ่าตัดข้อเข่าเทียมในระยะเวลาสั้นจากเชื้อ Mycobacterium ที่ต้องคำนึงถึงเสมอในผู้ป่วยที่อยู่ในพื้นที่ที่มีการระบาดของโรคนี้
