

Total joint replacement for neglected posterior knee dislocation following septic arthritis after arthroscopy



Yusuf Öztürkmen*, Yunus Emre Akman, Ethem Ayhan Ünkar, Erhan Şükür

Istanbul Education and Training Hospital, Istanbul, Turkey

ARTICLE INFO

Article history:

Received 15 February 2015

Received in revised form

29 April 2015

Accepted 28 May 2015

Available online 16 May 2017

Keywords:

Knee dislocation

Septic arthritis

Arthroscopy

Total knee arthroplasty

ABSTRACT

This report presents the first case of a knee dislocation following septic arthritis after arthroscopy. A 65-year-old woman had an arthroscopy with irrigation and debridement (I&D) of the joint and microfracture for the chondral lesions. She had complaints of postarthroscopic infection but non-steroidal anti-inflammatory medication and local ice compression was recommended. She revisited her physician twice and at the last visit she had a large purulent effusion in her knee. The gram stain of the joint fluid aspirate demonstrated gram-positive cocci and the cultures grew methicilline-sensitive *Staphylococcus aureus*. She underwent arthroscopic assisted I&D and received intravenous antibiotics. I&D was repeated after two weeks. Intravenous antibiotherapy was continued for one more week and was changed to oral antibiotherapy for six weeks. At the third month visit's physical examination, a deformity at the knee was noticed and was referred to us for further treatment. A posterior knee dislocation with no neurovascular deficit was detected. The patient had a history of knee sprain but did not seek medical advice immediately. The blood samples showed no abnormality. The patient underwent a surgery with a cemented hinged revision total knee prosthesis following the exclusion of the active knee joint infection. Intraoperative frozen sections were also taken to exclude the active infection. The patient's knee is pain-free with full range of motion after 3 years. The objective of this report was to highlight the importance of early diagnosis, prompt appropriate treatment of septic arthritis following arthroscopy and the awareness of the knee dislocation as a rare dreadful complication of postarthroscopic infection particularly in elderly patients.

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Introduction

Knee arthroscopy is the most common orthopaedic procedure and recognized worldwide as a minimally invasive procedure with less complication risks. Postoperative complications of arthroscopy of the knee consist of hemarthrosis, thromboembolism, effusion, synovitis, synovial fistula, pain, complex regional pain syndrome and infection. Postarthroscopic infection is uncommon and septic arthritis rate is normally under 0.2%.^{1–6} Infection is more common among patients with longer operating times, an increased number of procedures during surgery, prior procedures and in those having chondroplasty or soft-tissue debridement. Although it is a very rare complication, the knee is the largest synovial cavity in the body therefore septic arthritis can have serious and significant consequences when it occurs. *Staphylococcus aureus* is a very destructive

infecting organism which may create a fragile condition of the soft tissues and ligaments of the knee joint. Knee dislocation may proceed this injurious condition as a dreadful complication after a subsequent minor trauma. We report the first case of the knee dislocation following septic arthritis after arthroscopy. The objective of this report was to highlight the importance of early diagnosis, prompt appropriate treatment of septic arthritis following arthroscopy and the awareness of the knee dislocation as a very rare but dreadful complication. We also aimed to remark the safety of prosthesis implantation to manage a non-stiff knee dislocation after the confirmation of the joint infection eradication.

Case report

A 65-year-old woman attended to a private institution with complaints of osteoarthritis in the left knee. An arthroscopy was performed with irrigation and debridement(I&D) of the joint and microfracture for the chondral lesions. On the third postoperative day, she had complaints of swelling and increase of temperature in

* Corresponding author.

E-mail address: yozturkmen@gmail.com (Y. Öztürkmen).

Peer review under responsibility of Turkish Association of Orthopaedics and Traumatology.

her knee. Non-steroidal anti-inflammatory medication and local ice compression were recommended but then she revisited her physician twice. At the last visit she had a large effusion in her knee. The fluid from joint aspiration was purulent and revealed a white blood cell count of $30,000/\text{mm}^3$ with 88% neutrophils. The gram stain demonstrated gram-positive cocci. With the diagnosis of septic arthritis, the patient underwent arthroscopic-assisted I&D. Cultures ultimately grew methicillin-sensitive *S. aureus* and she was treated with intravenous third-generation cephalosporin antibiotics for ten days. Based on the continued pain and physical examination findings, one more arthroscopic I&D was performed after two weeks. Intravenous antibiotherapy was continued for one more week and was changed to oral ciprofloxacin antibiotherapy based on the sensitivity of microorganism in the culture. Her infection had been successfully treated with lowerization of erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels. Oral antibiotherapy was continued for six weeks and then stopped. Two weeks later, her infection had been eradicated and she was noted to walk with antalgic gait by using crutches and was discharged from the hospital. However, at the third month visit's physical examination a deformity at the knee was noticed and the x-rays revealed a posterior knee dislocation (Figs. 1 and 2). Thus, she was referred to us for further treatment without a history of iatrogenic injury to the cruciate ligaments during previous arthroscopies. At our hospital's emergency, no neurovascular deficit was detected at the deformed lower extremity and muscle strength was assessed as grade 4. MRI and computerized tomography (CT) revealed posterior dislocation of the knee joint, ruptures in both anterior and posterior cruciate ligaments (Fig. 3). The patient had a history of knee sprain one month ago. She had sustained an acute internal rotation of the femoral bone in a semi-flexion position of the knee while climbing down the stairs. But the patient did not seek medical advice immediately and her condition worsened with

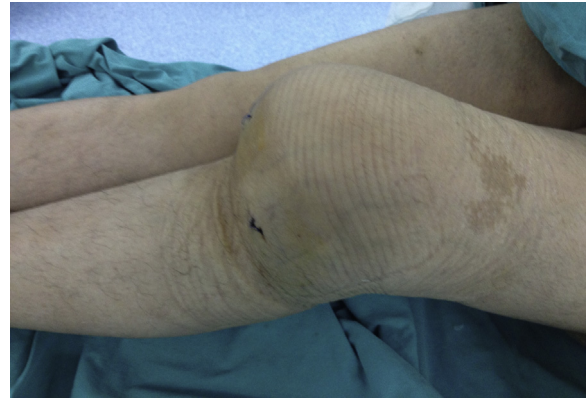


Fig. 2. Preoperative picture of the deformed knee at initial presentation.

inability to bear any weight till the last visit. The blood samples for ESR were normal, less than 20 mm/h (normal, 0–20/h) and for CRP were also normal, less than 0.8 mg/dl (normal, 0–0.8 mg/dl) and leukocyte count was 8100/ml (normal, 4000–10.800/ml).

Arthroscopy was performed to establish the treatment strategy. A joint aspiration and synovial biopsy were taken under sterile conditions in the operating room. The knee joint was mobile and the arthroscopy revealed no chronic joint empyema. The microbiological culture, gram and acid-resistant bacteria (ARB) staining for the joint aspirate were negative and synovial biopsy showed no infection. Exclusion of the active infection was based on the proposed criteria of Parvizi et al.⁷ The patient underwent surgery with a cemented hinged revision total knee prosthesis. Following wide debridement of the soft tissue, specimens for pathological and microbiological screenings were also taken during the surgery. Granulation tissue was analyzed in intraoperative frozen sections

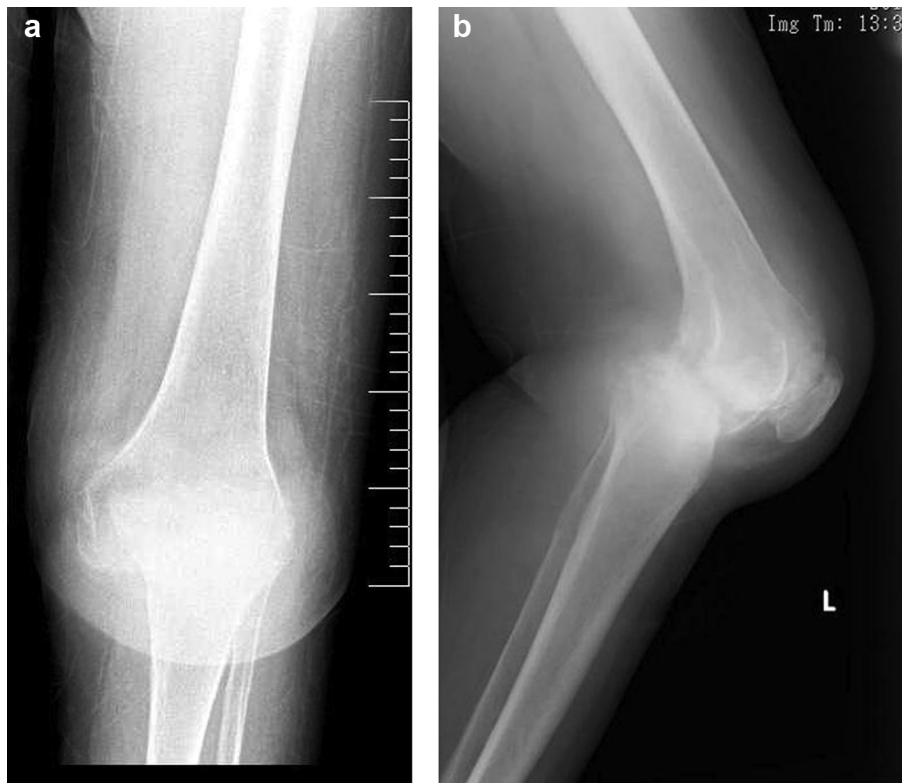


Fig. 1. (a) Anteroposterior and (b) lateral radiographs demonstrate posterior dislocation of the knee.



Fig. 3. (a, b) CT scans confirm the destruction of the femoral, tibial and patellar surfaces of the dislocated knee joint.

to exclude active infection during the knee arthroplasty (Fig. 4). Two samples of tissue was sent to pathology to minimize sampling error. No reproduction of any microorganism was observed in different microbiological studies. Surgical prophylaxis was performed with cefazolin. The patient's knee is pain-free, with full range of motion after 3 years (Fig. 5).

Discussion

Post-arthroscopic infection is previously well defined and discussed in the literature but there has been no report of knee joint dislocation following infection. Bonnaig et al⁸ reported a case of non-traumatic posterior knee dislocation following septic arthritis in a 59-year old female with leukopenia secondary to sarcoidosis. This patient had undergone corticosteroid injection. She may have

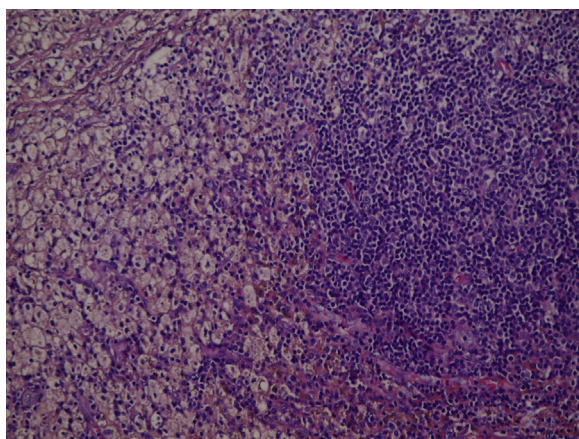


Fig. 4. Analysis of the intraoperative frozen sections demonstrate no polymorphonuclear leukocytes per high-power field. The findings show the absence of infection and correspond with the diagnosis of chronic inflammation. Groups of adjoining lymphocytic and histiocytic cells are visualized (hematoxylin and eosin $\times 400$).

been infected due to this immunocompromised state secondary to sarcoidosis.

The exact mechanism of a knee dislocation following septic arthritis of knee is unknown. Once the joint is inoculated, bacterial virulence factors and the immune response incite inflammatory changes to the surrounding tissues. This includes the recruitment of polymorphonuclear leukocytes which release proteolytic enzymes that are destructive to both the pathogen and the host tissue. *S. aureus* in particular has been shown to release lysosomal enzymes to surrounding tissues, hastening destruction of cartilage and surrounding tissues.⁷ Hence, regarding these issues Bonnaig et al⁸ hypothesized that the soft tissues including the cruciate and collateral ligaments were made incompetent by enzymes from both the pathogenic organism and from the host immune cells and subsequent stretching with mobilization allowed the knee to dislocate without a direct traumatic event. The similar attribution was made by Chu et al⁹ in a posterior dislocation of a cruciate-retaining total knee arthroplasty (TKA) following an acute bacterial infection. The patient's premature weight-bearing activity on her acute septic knee and the injury forces acting on a semi-flexion position of the knee were responsible for the ultimate tearing of the fragile posterior cruciate ligament (PCL). On the other hand, it was proposed that PCL of elder patients typically undergo substantial changes in mechanical properties. Recession of the PCL may violate the anatomic and functional integrity of the ligament. So deterioration of cruciate ligaments is easier after infection in elderly patients.^{8,9} These assertions explain the dislocation mechanism with a minor trauma in our elderly patient. Our patient similar to the other two cases did not have a major trauma. Sudden uncontrolled axial loading and twisting in a semi-flexion position of the knee were responsible for the acute tearing of the fragile cruciate ligaments and subsequently elicited the dislocation of the knee.

There are different methods to treat a dislocated knee after infection in elderly patients, including arthroplasty, knee arthrodesis, and as a final resort amputation.^{10,11} Polyzois et al¹⁰ reported a case of a neglected posterior knee dislocation as a late sequel of septic arthritis in a 60-year-old woman. The patient had an absence

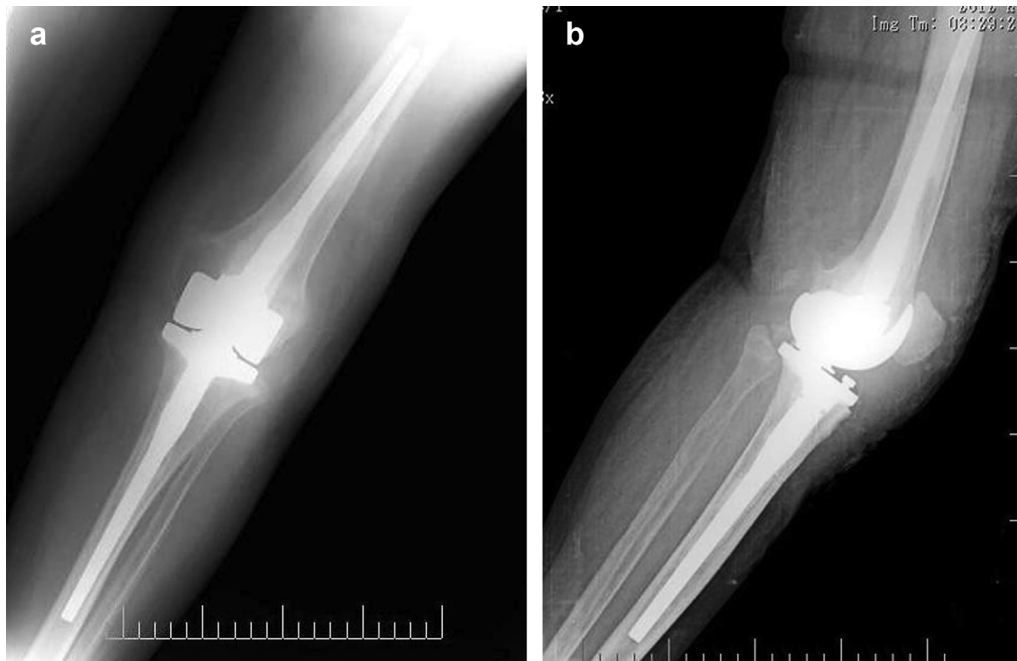


Fig. 5. (a) Anteroposterior and (b) lateral radiographs taken 3 years after the total knee arthroplasty with a hinged revision prosthesis.

of ankylosis in the joint, 7 cm of leg length discrepancy, dry fistulas, foot equinus deformity and a translation of 4 cm in the postero-anterior plane. Ilizarov was the treatment of choice for deformities of such magnitude and duration and was applied safely for a gradual and precise restoration of anatomy and function. However, a major disadvantage of the Ilizarov external fixator is its bulkiness which causes considerable discomfort. Arthrodesis after a knee prosthesis infection may be required when there is much loss of bone, when the extensor function of the knee is deficient, with the soft tissues around the knee is deficient or compromised with very little movement of the joint.

In our case, the knee joint was mobile and the infection was eradicated. It was confirmed by a joint aspiration and synovial biopsy which were taken under sterile conditions in the operating room. Histologic examination is a diagnostic procedure that is associated with high sensitivity and specificity and can provide confirmatory evidence for the presence or absence of an infection.^{12–17} Musculoskeletal infection society (MSIS) analyzed the available evidence to propose a new definition for periprosthetic joint infection. Greater than five neutrophils per high-power field in five high-power fields observed from histologic analysis of periprosthetic tissue at $\times 400$ magnification was one of the six criteria to define a joint infection. Four of the six criteria should be positive to indicate the existence of a joint infection.⁷ Our diagnostic approach was to adopt the definition of MSIS. Based on the exclusion of the possibility of an infection, an arthroplasty was considered to achieve early mobilization and rehabilitation of the elderly patient. After an extensive debridement of the nonviable tissues, and destructed bone, the quality and quantity of the available bone was good and appropriate match of a flexion-extension gap was obtained during the implantation of a hinged-constrained revision type knee prosthesis. Our patient did not have risk factors for immune compromise which also affected our decision for arthroplasty.

Some risk factors such as open arthrotomy, foreign bodies (including ACL grafts), age 50 years and older, tourniquet time > 60 min, remote body-site infections, open wounds, post-operative medical/dental procedures, obesity, diabetes mellitus,

altered immune response, systemic illness, cancer, lifestyle factors including nutritional status, tobacco use, coexisting corticosteroid therapy, osteo/rheumatoid arthritis, preoperative shaving, length of preoperative hospitalization have all been described in contributing to an increase in infection rates after arthroscopy.^{1–6,17,18} Our patient was 65 years old and had osteoarthritis which may be considered as risk factors for postarthroscopic infection.

Any patient presenting with an increasingly painful knee within a month of an arthroscopy must be presumed to have septic arthritis until proven otherwise. Effusion and synovitis may persist after arthroscopic surgery particularly for degenerative joint disease. If symptoms continue further investigation may be indicated.^{1–4,11} Prompt identification of the microorganism and treatment is important in order to eradicate infection and prevent progression of the joint infection into the fourth stage which is described by Gächter.¹⁹ Complications of protracted synovitis, cartilage damage and joint destruction occurs in the final stage. Early and appropriate management of the postarthroscopic infection helps to limit function sequel for the patient and medicolegal aspects for the surgeon. The appropriate treatment of septic arthritis is arthroscopic lavage.^{20–22} Adequate removal of all infected material can only be achieved by an arthroscopic lavage and may also be repeated. However it is reported that the results of the arthroscopic I&D of the patients, who had 12 days or less between initial symptoms and the operation, were more successful.²² Continuous irrigation-drainage system is also recommended for cleaning enzymatic products and necrotic material. Debris material can prolong the destruction of cartilage, even if the joint could be sterilized.^{21,22}

In conclusion, arthroscopy is not a harmless procedure. Septic arthritis of the knee after arthroscopy is a very rare complication but may result in knee dislocation particularly in the elderly population, if prompt accurate diagnostic and appropriate therapeutic management are not undertaken. TKA with a hinged-prosthesis can be considered as a safe procedure once the eradication of the infection is confirmed with histologic examination of the soft tissues in addition to negative results of the knee joint fluid aspiration and blood CRP level.

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