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Synovial Chondromatosis of the Knee Joint Secondary to Osteoarthritis Treated with Total Knee Arthroplasty and Excision: A Rare Case Report

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ABSTRACT

Introduction: Synovial chondromatosis is a rare, benign condition characterized by the formation of multiple cartilaginous nodules within the synovial membrane leading to attached or unattached loose body. It can arise either spontaneously (idiopathic) or secondary to osteoarthritis (OA). The aim of this study is to highlight the importance of early diagnosis and effective management of synovial chondromatosis.

Case presentation: A 66-years-old female complained of pain in the left knee for a year accompanied with swelling and stiffness 6 months later and limitation to walk occurs 8 months since the first complaint. An X-Ray of left knee showed multiple mass calcification and narrowing joint spaces. The patient treated with total knee arthroplasty due to severe joint damage and conducted complete evacuation of loose bodies with excision and performed a biopsy, which confirmed the diagnosis. Range of motion (ROM) exercise and weight bearing was started in second post operative day and proper education was given to the patient before discharge. Following 2 months follow up, patient left knee flexion extension ROM ranged from 0-150˚ and no further swelling experienced by the patient.

Discussion: The rarity of synovial chondromatosis results in a delay in the diagnosis. Atypical symptoms of synovial chondromatosis are commonly confused with OA itself. Secondary synovial chondromatosis is associated with joint abnormalities, such as mechanical or arthritic conditions, as presented in this case. The choice of management is based on the patient's clinical condition, degree of joint damage, and the involvement of the loose bodies. Early detection may allow for management with arthroscopic debridement. But, if severe joint damage takes place, total knee arthroplasty following the removal of loose bodies is an effective treatment that give favorable result with satisfactory functional outcomes.

Conclusion: Synovial chondromatosis, a rare benign synovial disease-causing knee pain and limited motion, was successfully managed in this case by removing loose bodies during total knee arthroplasty, with the patient showing significant improvement, highlighting the need for

regular exercise and follow-up to prevent recurrence.

Clinical Importance: Early diagnosis of synovial chondromatosis is crucial to prevent severe joint damage, and total knee arthroplasty with removal of loose bodies can yield excellent functional outcomes.

Keywords: excision, synovial chondromatosis, osteoarthritis, total knee arthroplasty

INTRODUCTION

Synovial chondromatosis is a rare, benign condition characterized by the formation of multiple cartilaginous nodules within the synovial membrane of joints, bursae, or tendon sheaths.[1] Although it can occur in any synovial joint, it predominantly affects large joints such as the knee, hip, and elbow.[2,3] The exact etiology of synovial chondromatosis remains unclear, but it is often regarded as a result of metaplasia of the synovial cells, which leads to the production of cartilaginous loose bodies within the joint. These nodules can eventually calcify or ossify, and while the condition is benign, it can lead to progressive joint dysfunction, pain, and restricted range of motion. Over time, mechanical symptoms such as clicking, locking, or joint swelling may also arise due to the presence of loose bodies within the joint space.[4,5]

On the other hand, OA is a common degenerative joint disease primarily associated with aging and mechanical wear and tear on the joint cartilage. It typically presents with joint pain, stiffness, and decreased range of motion, leading to significant functional impairment and reduced quality of life. In severe cases of knee OA, total knee arthroplasty (TKA) is often considered the definitive treatment, offering significant pain relief and improved joint function.[6]

The coexistence of synovial chondromatosis and OA in the same joint, although rare, presents a complex clinical challenge. Primary synovial chondromatosis is typically observed in younger individuals without pre-existing joint disease, whereas secondary synovial chondromatosis is often associated with chronic joint conditions, such as OA or post-traumatic changes.[7] In cases where both synovial chondromatosis and advanced OA are present, the management strategy becomes more complicated due to the potential for mechanical disruption caused by loose bodies, superimposed on the chronic degenerative changes of the joint. Therefore, surgical intervention is often necessary to address both the degenerative joint disease and the mechanical symptoms associated with synovial chondromatosis.

In this case report, we present a rare occurrence of synovial chondromatosis of the knee secondary to OA, treated successfully with a combined approach of total knee arthroplasty and excision of intra-articular loose bodies. To our knowledge, this is one of the few documented cases where both conditions were addressed concurrently with a favorable outcome. This case highlights the importance of recognizing synovial chondromatosis as a potential secondary condition in patients with advanced OA and emphasizes the role of a comprehensive surgical approach in achieving optimal results.

CASE PRESENTATION

A 66-year-old female patient presented with a one-year history of left knee pain that progressively worsened, severely limiting her ability to stand for the past two months. The patient reported swelling and mechanical symptoms such as stiffness, especially after walking, which had persisted for approximately four months. Examination revealed difficulty in both flexing and extending the knee, leading to significant functional impairment. The patient was referred from a regional hospital with a diagnosis of left knee synovial chondromatosis along with left and right knee OA Kellgren-Lawrence grade IV.

Further anamnesis revealed a history of hypertension, for which she was taking

regular candesartan medication. The patient had no history of diabetes or previous trauma to the knee, though she underwent cataract surgery on her right eye six months prior. Physical examination of the left knee revealed swelling, tenderness, warmth, and varus deformity of 20°, with active knee flexion extension ROM was significantly reduced to 25-50° and marked crepitus. In contrast, her right knee was non-tender, with a full active knee flexion extension ROM of 0-120°. Radiographs confirmed severe degenerative changes, including joint space narrowing, osteophyte formation, and the presence of multiple calcified loose bodies suggestive of synovial chondromatosis.

Figure 1. Patients Preoperative Clinical Picture

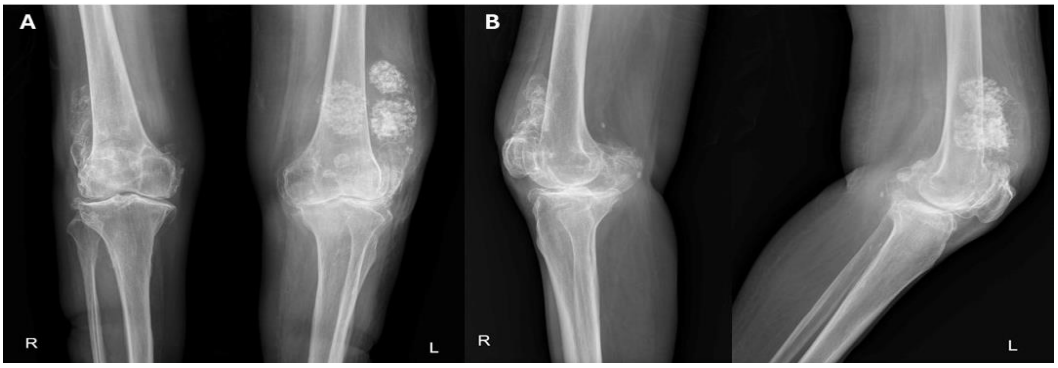

Figure 2. Patients plain radiograph AP lateral view of both knees showing a calcifying mass and destruction of articular joint surface

SURGICAL PROCEDURE

The patient underwent left TKA with excision of the intra-articular loose bodies. Under general anesthesia, the patient was positioned supine, and a midline skin incision was made over the left knee. A medial parapatellar approach was used to expose the joint, with deep dissection continued through the retinaculum. The synovium and infrapatellar fat pad were excised, revealing multiple cartilaginous nodules, which were removed and sent for histopathological examination. Additionally, tissue samples suspected of gouty arthritis were collected.

The patella was everted, and the joint was inspected for osteophytes, which were identified on the medial and lateral femoral condyles, tibia, and patella. These osteophytes were excised, and both the anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) were removed to prepare for the prosthetic components. Femoral preparation was performed using intramedullary alignment, followed by distal femoral cutting. Tibial preparation involved extramedullary alignment with proximal tibial cutting.

After determining the appropriate component sizes, the femoral, tibial, and polyethylene insert components were placed. A femoral component size L2, tibial component size 2+, and a 10 mm polyethylene insert were cemented into

place. Varus-valgus stability, as well as extension and flexion stability, were evaluated and confirmed to be satisfactory. Intraoperative blood loss was estimated at 150 cc. Postoperative radiographs showed appropriate component alignment, with a medial distal femoral angle of 86.33° and medial proximal tibial angle of 91.24°.

FOLLOW-UP AND OUTCOME

Postoperatively, the patient was managed with intravenous antibiotics, anticoagulation, and analgesics. She received a transfusion due to mild anemia (Hb 8.80 g/dL) and was mobilized with partial weight-bearing using a walker. Ice compression and bladder training were also implemented as part of her postoperative care. The wound was checked every three days or as needed.

At her six-month follow-up, the patient demonstrated significant improvement in her knee function. She reported no pain, and there were no signs of recurrence of synovial chondromatosis or any mechanical symptoms. Her left knee flexion extension ROM had improved to 0-150º, allowing her to perform daily activities with minimal discomfort. Radiographs confirmed stable prosthetic positioning with no evidence of loosening or new loose body formation. The patient was satisfied with the outcome, having regained significant functional mobility and pain relief.

Figure 3. Postoperative clinical pictures of patient left knee

Figure 4. Postoperative plain radiograph AP lateral view of patient left knee after underwent TKA

DISCUSSION

Secondary synovial chondromatosis, as seen in this case, presents unique management challenges, particularly when superimposed on severe degenerative changes in the joint, such as OA. This case demonstrates the complexity of treating advanced knee OA complicated by synovial chondromatosis with a combination of total knee arthroplasty (TKA) and excision of the intra-articular loose bodies.

The dual presence of synovial chondromatosis and OA represents a significant challenge for orthopedic surgeons. While synovial chondromatosis alone can cause pain, swelling, and mechanical symptoms such as joint locking, the underlying OA adds an additional layer of functional impairment, chronic pain, and structural deformity. In the present case, the patient had left knee synovial chondromatosis and severe OA (Kellgren-Lawrence grade IV), leading to debilitating symptoms such as joint stiffness, swelling, and varus deformity, which had rendered her wheelchair-bound. Conservative management, including physical therapy and intra-articular injections, provided no significant relief, necessitating surgical intervention.[8]

One of the main challenges in managing synovial chondromatosis with OA is determining the appropriate surgical approach. In cases of synovial

chondromatosis without significant OA, synovectomy and excision of the loose bodies are typically sufficient to relieve symptoms and restore joint function.[9] However, when synovial chondromatosis is complicated by advanced OA, the joint degeneration may be too severe for synovectomy alone to provide a lasting solution. In such cases, joint replacement with TKA becomes the preferred treatment, as it addresses both the mechanical symptoms caused by the loose bodies and the degenerative joint disease.

The decision to perform a combined TKA and excision of loose bodies, as was done in this case, reflects the necessity of treating both pathologies concurrently. TKA addresses the pain and functional limitations caused by OA, while the excision of the loose bodies alleviates the mechanical symptoms caused by synovial chondromatosis, such as joint locking and instability. This combined approach is essential in preventing recurrence of symptoms that would likely persist if only the OA or the loose bodies were addressed in isolation.

Intraoperatively, one of the challenges was ensuring complete removal of the loose bodies while preparing the joint for TKA. Synovial chondromatosis often results in the formation of numerous cartilaginous or calcified loose bodies, which can vary in size and are scattered throughout the joint. These loose bodies can be embedded within the synovium or free-floating within the joint cavity. During the TKA procedure, after exposure of the knee joint via the medial parapatellar approach, loose bodies were identified in the infrapatellar fat pad and around the medial and lateral condyles. These were carefully excised to avoid leaving any residual loose bodies that could lead to persistent symptoms or complications, such as mechanical impingement or further joint damage. The excised specimens were sent for histopathological examination, confirming the diagnosis of synovial chondromatosis.[10]

Another critical challenge in performing TKA in the presence of synovial chondromatosis is ensuring proper alignment and stability of the prosthetic components. The presence of extensive osteophytes, joint deformity, and soft tissue contractures in patients with advanced OA, as seen in this case, can make component alignment and balancing more difficult. Intraoperative navigation and careful attention to soft tissue balancing are essential to ensure that the TKA provides the patient with a stable, well-aligned joint that will not be prone to early loosening or failure. In this case, meticulous intraoperative evaluation confirmed that the prosthetic components were well-aligned, with a medial distal femoral angle of 86.33° and a medial proximal tibial angle of 91.24°, within the normal range for postoperative TKA alignment.

Postoperative management and rehabilitation in cases like this are crucial for achieving optimal outcomes. The patient's postoperative care included antibiotic prophylaxis, anticoagulation therapy, and analgesia, as well as early mobilization with partial weight-bearing. The goal of rehabilitation was to improve the range of motion and functional strength, while preventing complications such as stiffness, deep vein thrombosis, and infection.[11] The patient's recovery was uneventful, and at the six-month follow-up, she exhibited significant improvement in both pain and functional mobility. Her range of motion had increased to 0-110 degrees, and there was no radiographic evidence of recurrent loose bodies or implant-related complications.

The recurrence of synovial chondromatosis is an important consideration in the postoperative management of these patients. While the excision of loose bodies and synovectomy can provide relief, there is a risk of recurrence, particularly in cases where complete synovectomy is not feasible due to extensive joint degeneration.[12] In this case, the combination of TKA and excision was successful in preventing the recurrence

of synovial chondromatosis-related symptoms, as evidenced by the patient's improvement in knee function and the absence of loose body formation on follow-up radiographs.

CONCLUSION

The management of synovial chondromatosis of the knee joint in conjunction with severe OA is challenging, requiring a tailored surgical approach that addresses both the degenerative joint changes and the mechanical symptoms caused by loose bodies. TKA combined with excision of loose bodies is an effective treatment option in such cases, providing significant pain relief, improved function, and a low risk of recurrence.

Declaration by Authors

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