

## Case Report

# Comparative analysis of synovectomy and total knee replacement in knee joint synovial chondromatosis: A case series

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## Abstract

Synovial chondromatosis is a rare disorder characterized by cartilaginous growths within the joint lining, often confused with conditions like pigmented villonodular synovitis and rheumatoid arthritis. Primary treatment typically involves surgical synovectomy to remove the affected tissue and loose bodies. Documented cases are limited globally. The aim of this study was to present a case series of synovial chondromatosis and evaluate the functional outcomes by assessing the post-surgical Musculoskeletal Tumor Society (MSTS) score following different surgical interventions (synovectomy alone versus synovectomy with total knee replacement) in a resource-limited setting. Four cases of synovial chondromatosis were reported. A 61-year-old woman with a soft tissue tumor underwent synovectomy and total knee replacement on the right knee, then experienced a periprosthetic infection requiring revision arthroplasty, resulting in an MSTS score of 24. Another case was a 48-year-old woman who had a synovectomy for a lump on the right knee, also achieving an MSTS score of 24. Two additional cases involved women in their mid-to-late 60s who underwent synovectomy for knee lumps, with post-operative MSTS scores of 21 and 19, respectively. This case series underscores the diagnostic and management challenges of synovial chondromatosis in the knee joint, demonstrating various surgical interventions. This case series also suggested that the post-operative MSTS scores were slightly higher (indicating better outcomes) for synovectomy alone compared to synovectomy with total knee replacement, highlighting the need for further research to determine the most effective treatment approach.

**Keywords:** Synovial chondromatosis, benign tumor, cartilaginous nodules, joint pathology, synovectomy

## Introduction

Synovial chondromatosis is a rare, benign disorder marked by cartilaginous nodule formation within the synovium, commonly affecting the knee, hip, elbow, wrist, ankle, and shoulder joints [1]. The prevalence of this condition is low, with fewer than 1 in 100,000 individuals affected; although this figure may vary across populations [2]. Its rarity often leads to diagnostic challenges, as it presents with overlapping features of other joint diseases like pigmented villonodular synovitis, secondary synovial chondromatosis, and rheumatoid arthritis [3,4]. Early recognition and intervention are crucial, as untreated synovial chondromatosis can lead to significant joint destruction, pain, and impaired mobility, emphasizing the urgency of timely diagnosis and management. Surgical intervention, particularly synovectomy—removal of the affected synovial membrane and loose cartilaginous bodies—remains the preferred treatment



option for synovial chondromatosis [5]. Arthroscopic surgery has emerged as a less invasive alternative to open surgery, offering advantages such as faster recovery times and fewer complications. However, both synovectomy and arthroscopic surgery carry a risk of recurrence, with some studies reporting recurrence rates as high as 20–30% [6]. Therefore, long-term follow-up is essential for managing these cases.

In Indonesia, reported cases of knee synovial chondromatosis are rare, underscoring the need for accurate diagnosis and treatment. A multidisciplinary approach is crucial for early detection and management. Previous reports from other countries have primarily focused on the hip and shoulder joints, with fewer reports centered on the knee [7,8]. The previous case reports also often fail to address long-term functional outcomes, with a primary focus on recurrence rates and radiographic findings [5,6,9-14].

The aim of this study was to evaluate the functional outcomes of four patients with knee synovial chondromatosis using the Musculoskeletal Tumor Society (MSTS) score, a standardized tool for assessing post-surgical function. The MSTS scoring system is widely used to assess functional outcomes after orthopedic surgeries, particularly in cases involving tumors and joint disorders like synovial chondromatosis. It evaluates factors such as pain, function, emotional acceptance, support required for walking, and gait. The higher the MSTS score, the better the patient's functional outcome [15]. By incorporating this evaluation, this present case series seeks to determine the effectiveness of synovectomy and total knee replacement in restoring joint function and improving patient quality of life. The novelty of the present case series lies in its evaluation of functional outcomes following different surgical interventions (synovectomy alone versus synovectomy with total knee replacement) in a resource-limited setting. Additionally, the use of the MSTS score provides an objective measure of post-surgical joint function, which is often underreported in similar studies. This case series not only highlights the clinical importance of early intervention but also provides valuable insights into the long-term prognosis of patients in a setting where access to advanced healthcare is limited.

## Case

### Patient 1

A 61-year-old female patient presented to the Orthopedic Outpatient Clinic, Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia, with a chief complaint of pain and a lump on the right knee that had persisted for one year. Initially, the patient noticed a marble-sized lump accompanied by sporadic episodes of pain. Over the course of a year, the lump increased in size to that of a golf ball. The patient sought medical attention at a local hospital, where a soft tissue tumor in the right knee was identified. The patient had a history of type 2 diabetes mellitus and was taking metformin 500 mg twice daily. Subsequently, the patient was referred to Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia, for further evaluation and treatment.

Vital signs examination indicated blood pressure of 110/70 mm Hg, heart rate of 88 bpm, respiratory rate of 19×/minute, oxygen saturation level of 99%, and temperature at 36.8°C. Physical examination of the right knee revealed small protuberances approximately 40 cm in circumferential diameter, slightly larger than the contralateral knee, which measured 39 cm. The right knee also showed signs of swelling, tenderness, and had a similar tan color and warmth to the surrounding area. Mobility in the knee joint was restricted to 0–45°.

The laboratory findings showed anemia, elevated C-reactive protein (CRP), borderline high creatinine, and prolonged activated partial thromboplastin time (APTT), while other values, such as leukocytes, platelets, and liver enzymes, were within normal ranges. The complete laboratory findings are presented in **Table 1**. The X-ray examination revealed the presence of bony spurs in the intercondylar area of the right knee, and the magnetic resonance imaging (MRI) indicated substantial synovial growth within the anterior knee joint (**Figure 1**). Based on the patient's history, physical examination, and imaging studies, the patient was diagnosed with synovial chondromatosis of the right knee, and the synovectomy and total knee replacement were performed.

Table 1. Laboratory findings of patient 1

Parameter	Result	Reference range	Unit of measurement
Hemoglobin	10.3	12.0–15.0	g/dL
Hematocrit	30.8	36.0–46.0	%
Leukocyte	8.99	4.00–10.00	10 <sup>3</sup> /μL
Platelet	416	150–410	10 <sup>3</sup> /μL
C reactive protein (CRP)	6.4	0–6	mg/L
Alkali phosphatase	44	< 500	U/L
Lactate dehydrogenase	217	125–220	U/L
Blood urea	17.1	15–36	mg/dL
Blood creatinine	1.00	0.2–0.52	mg/dL
Serum glutamic oxaloacetic transaminase	18	5.00–34.00	U/L
Serum glutamic pyruvic transaminase	11	0.00	U/L
Sodium/potassium/chloride	134/4.5/101		mEq/L
Activated partial thromboplastin time (APTT)	39.6 (35.5)	28.0–37.9	Second
Prothrombin time (PT)	10.3 (11.5)	12.7–16.1	Second



Figure 1. (A) Preoperative clinical presentation of the patient. (B) Preoperative knee X-ray revealing bony spurs in the suprapatellar recess. (C) Intraoperative exposure of the knee joint and removal of osteophytes. (D) Postrevision surgery knee clinical presentation. (E) Postrevision surgery knee clinical radiograph. (F) Intraoperative exposure of the knee implant and removal of the implant. (G) Postoperative knee X-ray depicting implant removal with bone spacer augmentation.

The patient, positioned supine under combined spinal-epidural anesthesia, underwent a surgical procedure that began with aseptic and antiseptic preparation of the surgical field. A medial parapatellar approach incision was made, penetrating through the skin and subcutaneous tissue, deepening the wound into the intra-articular space with lateral retraction of the patella. Osteophytes were removed from the patella, distal femur, and proximal tibia, and synovial tissue was excised for pathological examination. The distal femur was prepared using a 9 mm cut at 4 degrees of valgus, while the tibia was prepared with a 2 mm proximal cut and a 3-degree posterior slope. Tibial sizing was performed, and a tibial implant of size 2.5 was inserted, followed by femoral sizing and the insertion of a size 2.5 femoral component with a box osteotomy. A trial implant of size 2.5 with an 8 mm thickness was evaluated, showing stable results. Flexion, extension, and alignment were assessed, followed by the insertion of bone cement and placement of the final femoral and tibial components. Patellar resurfacing was performed, bleeding was

controlled, and the wound was irrigated with sterile 0.9% saline. The wound was closed in layers, and the surgery was completed.

Three months postoperatively, the patient experienced discharge from the surgical site. Although there was no fever, the patient reported an inability to ambulate due to pain. Laboratory tests indicated elevated levels of leukocytes ( $3.43 \times 10^6 \mu\text{L}$ ), erythrocyte sedimentation rate (ESR) (135 mm; reference level: 10–15 mm), and CRP (270.9 mg/L; reference level: <5.0 mg/L). Knee aspiration was performed, and synovial fluid culture identified *Staphylococcus saprophyticus*. The patient was diagnosed with a periprosthetic joint infection of the right knee, classified as Tsukuyama Segawa type IV [16]. Subsequent medical interventions included debridement, implant removal, and bone spacer application were conducted. Three months later, the patient underwent a revision procedure, replacing the spacer with a revision total knee arthroplasty (**Figure 1**). At four months post-revision total knee arthroplasty, the MSTS score was utilized to assess the condition of the knee, yielding a total score of 24. The patient reported a pain level of 4, functional impairment level of 4, emotional distress level of 4, perceived support level of 5, walking ability level of 4, and gait quality level of 3.

### Patient 2

A 48-year-old female patient presented to the Orthopedic Outpatient Clinic, Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia, with a chief complaint of pain and a lump that had persisted for five years. Initially, the patient noticed a marble-sized lump on the left knee, accompanied by sporadic pain. Over five years, the lump grew to the size of an egg, with an associated increase in pain severity. There was no relevant nor significant prior history of disease, family history, or biopsychosocial history of the patient.

Vital signs indicated blood pressure of 120/80 mm Hg, heart rate of 92 bpm, respiratory rate of 18×/minute, oxygen saturation level of 100%, and temperature at 36.9°C. Physical examination of the left knee revealed small protuberances approximately 40 cm in diameter, larger than the contralateral knee, which measured 36 cm. The left knee also exhibited signs of swelling and tenderness on palpation. The color and warmth of the affected area were consistent with the surrounding tissue, and knee mobility was around 0–50°. The lab results indicated anemia, raised ESR and AST levels, along with high urea levels, while other values, including creatinine, ALT, D-dimer, and CRP, were within normal limits. The X-ray examination revealed bony spurs in the infrapatellar region, while MRI findings indicated a heterogeneous mass with a chondroid matrix and ossification in the Hoffa fat pad (**Figure 2**). The patient was then diagnosed with synovial chondromatosis of the left knee. Based on the findings from the patient's physical examination, lab results, and imaging examination, a synovectomy of the left knee was conducted.

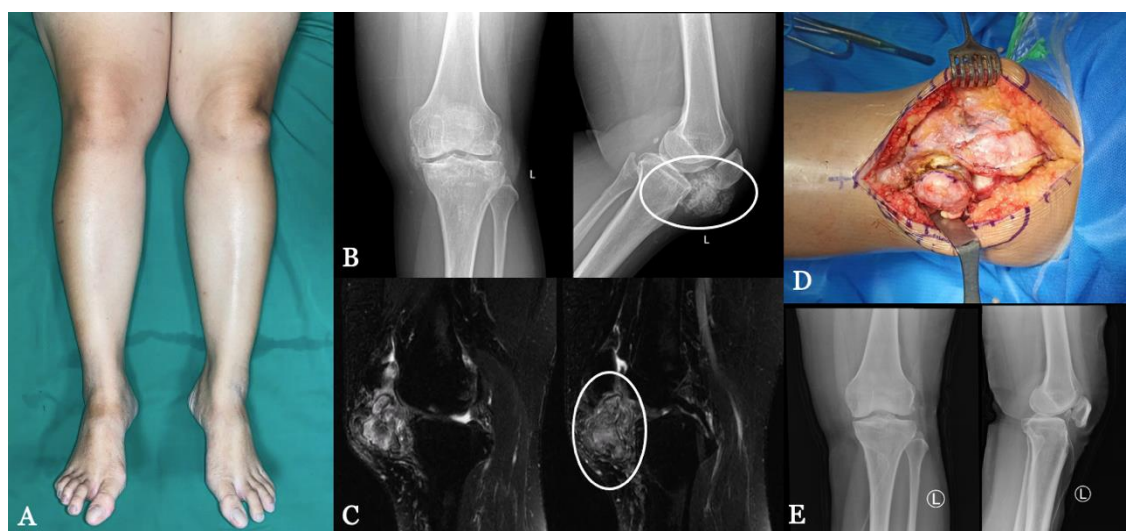


Figure 2. (A) Preoperative Clinical Presentation of both knees. (B) Preoperative knee X-ray revealing a calcified mass with partial deformity and indentation in the infrapatellar region. (C) Sagittal view of MRI revealing a chondroid matrix with evidence of ossification within the Hoffa's fat pad. (D) Intraoperative exposure of the tumor. (E) Postoperative knee X-ray imaging.

The patient was placed in a supine position under regional anesthesia. A lateral parapatellar incision was made, cutting through the skin and subcutaneous tissues layer by layer until the tumor was exposed beneath the patellar tendon. A marginal excision of the tumor was performed, followed by tendon augmentation using Ethibond sutures. The tumor tissue was sent for histopathological analysis; the histological features supported the diagnosis of synovial chondromatosis. The wound was irrigated with saline and hydrogen peroxide, a drain was inserted, and the wound was sutured in layers.

At four months postoperatively, the knee was assessed using the MSTs, yielding a cumulative score of 24. The patient reported a pain level of 4, functional ability of 4, emotional well-being of 4, perceived support level of 5, walking ability of 4, and gait quality of 3.

### Patient 3

A 66-year-old female patient presented to the Orthopedic Outpatient Clinic, Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia, with a chief complaint of pain and a lump that had persisted for three years. A marble-sized lump was observed on the right knee, initially without accompanying pain. The patient did not seek medical intervention at that time. The patient also had no relevant prior history of disease, family history, and biopsychosocial history. Two months later, the lump increased in size to that of a chicken egg. Vital signs of the patient were acquired with blood pressure of 110/60 mm Hg, heart rate of 76 bpm, respiratory rate of 20×/minute, oxygen saturation level of 100%, and temperature at 36.6°C. On the physical examination of the right knee, a mass measuring 40 cm in circumferential diameter was observed, larger than the contralateral knee, which measured 38 cm. The knee also exhibited swelling, tenderness on palpation, and similar color and warmth to the surrounding area. Knee range of motion was 0–50°. The relevant laboratory findings included normal inflammatory markers (CRP, ESR), normal liver and kidney function (SGPT, SGOT, creatinine, and urea), with no significant coagulopathy (normal APTT, PT, D-dimer, and fibrinogen), along with normal electrolyte levels. The X-ray examination revealed bony spurs in the suprapatellar region of the right knee, while the MRI findings indicated suprapatellar bursitis and femorotibial synovitis with accompanying suprapatellar calcifications also in the right knee (**Figure 3**). A synovectomy procedure was recommended for the right knee after the patient was diagnosed with synovial chondromatosis of the right knee (**Figure 3**).

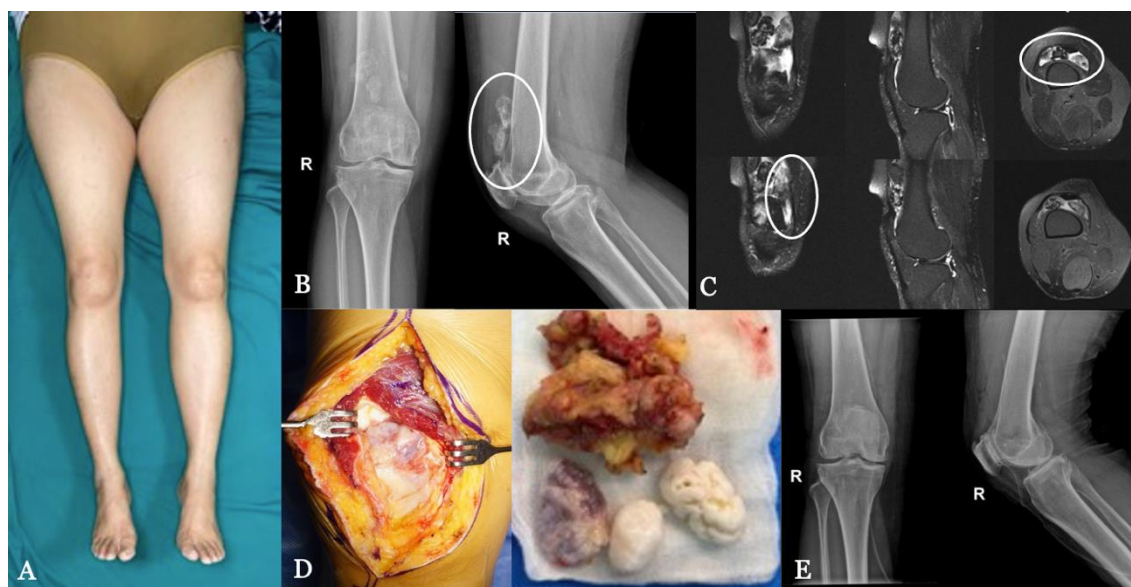


Figure 3. (A) Local condition of the lower extremity in a 66-year-old female patient with a lump over the left knee. (B) Knee X-ray depicting bony spurs in the suprapatellar region. (C) MRI revealing suprapatellar bursitis and femorotibial synovitis. (D) Intraoperative exposure of the joint and loose bodies; and loose bodies after removal. (E) Post-synovectomy knee X-ray imaging.

The patient was positioned supine under regional anesthesia. An incision was made through the skin and subcutaneous tissue, followed by an incision into the joint capsule, exposing the

joint. Loose bodies were identified and evacuated, and the synovial membrane was partially excised. The surgical site was irrigated with 0.9% normal saline, a drain was inserted, and the wound was closed layer by layer.

At four months postoperatively, the knee was assessed using the MSTS, yielding a total score of 21. The patient reported a pain level of 4, functional ability of 4, emotional well-being of 2, perceived support level of 4, walking ability of 3, and gait quality of 4.

#### Patient 4

A 58-year-old female patient presented to the outpatient department of the local health center with a chief complaint of pain and a lump that had persisted for three years on the left knee. The patient denied any history of trauma. Despite requiring the use of a walker, the patient was able to ambulate. The patient had not sought medical consultation previously and had inconsistently adhered to treatment regimens for the condition. One year prior, the patient experienced a deterioration in the condition of the knees. The patient had a history of type 2 diabetes mellitus and hypertension controlled with daily consumption of amlodipine 1×10 mg and metformin 2×500 mg. The patient subsequently sought medical attention at the Orthopedic Outpatient Clinic, Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia.

The vital sign of the patient was attained with blood pressure of 150/100 mm Hg, heart rate of 97 bpm, respiratory rate of 21×/minute, oxygen saturation level of 98%, and body temperature of 37.1°C. Physical examination of the left knee revealed a mass measuring 38 cm in circumferential diameter, slightly larger than the contralateral knee, which measured 37 cm. The affected knee exhibited swelling, tenderness on palpation, and had a similar color and warmth compared to the surrounding area. The patient demonstrated a normal range of motion in the right knee joint and 0–115° flexion-extension in the left knee joint. The knee X-ray showed an ossified mass in the infrapatellar region, and the MRI showed multiple lesions in the left suprapatellar region with left knee joint effusion, consistent with synovial osteochondromatosis (**Figure 4**). A surgical procedure involving synovectomy of the left knee followed by a total knee replacement was performed.

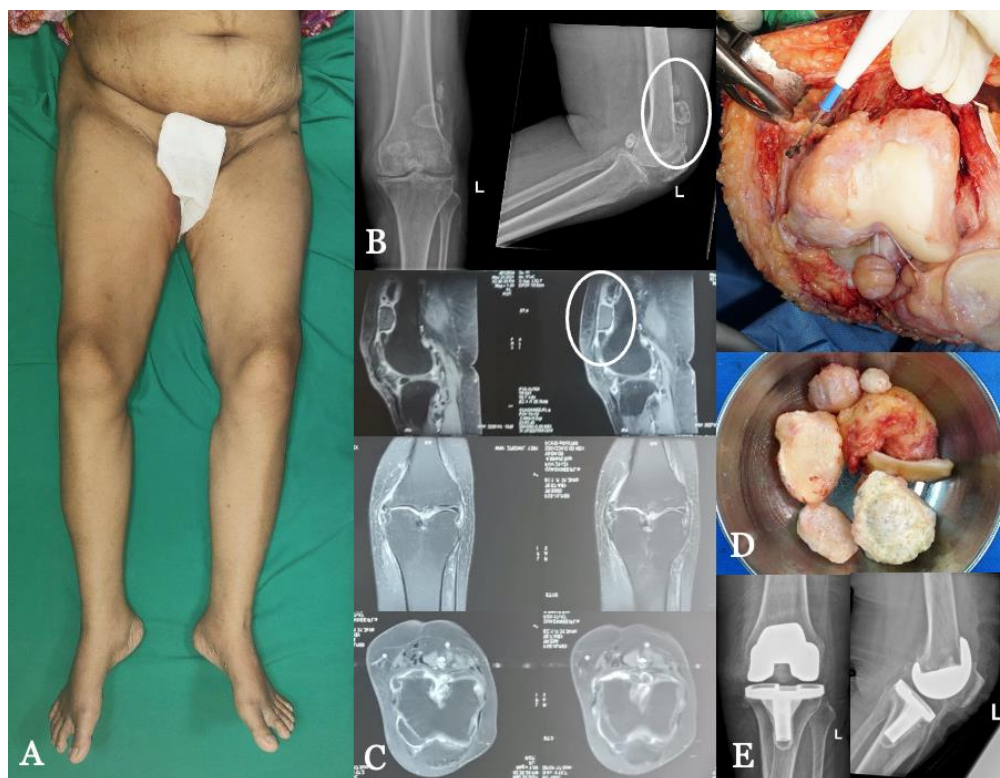


Figure 4. (A) Local condition of both knees preoperatively. (B) Knee X-ray depicting an ossified mass in the infrapatellar region. (C) MRI revealing multiple lesions in the left suprapatellar region with left knee joint effusion, consistent with synovial chondromatosis. (D) Synovectomy performed on the exposed knee joint, and loose bodies were removed. (E) Final construct in the postoperative X-ray.

The patient was positioned supine under combined spinal-epidural anesthesia. A medial parapatellar approach incision was made, followed by a synovectomy. Patellar denervation was then performed. The tibial bone was prepared with a 2.5 mm cut from healthy bone and a 3-degree slope. The femur was prepared by cutting 9 mm from healthy bone with a 5-degree valgus correction, ensuring an extension gap of 8 mm between the femur and tibia. Trial components were inserted, with a size 2 femoral component and a size 2.5 tibial component, along with a 10 mm insert component. Stability was checked and confirmed to be adequate. The final femoral component (size 2) and tibial component (size 2.5) were then inserted, along with a 10 mm insert component. The wound was thoroughly irrigated with 0.9% NaCl and then closed in layers.

At a postoperative interval of six months, the knee was assessed using the MSTS, yielding a total score of 19. The patient reported a pain level of 4, functional impairment of 4, emotional distress of 3, perceived support of 4, walking difficulty of 3, and gait abnormalities of 4.

## Discussion

Management of synovial chondromatosis aims to prevent recurrence and secondary joint damage [17]. Standard treatment involves excision of loose bodies and synovectomy, which can be performed through open surgery or arthroscopy [18]. Arthroscopic synovectomy is increasingly preferred due to its minimally invasive nature, shorter recovery time, and lower complication rates [19]. However, open synovectomy may be more effective in cases with significant synovial chondromatosis, as it allows for more thorough removal of the disease and reduces recurrence risk [20].

If left untreated, synovial chondromatosis can result in secondary arthritis due to mechanical stress from loose bodies and disruption of articular cartilage nutrition [21]. For patients with both secondary arthritis and synovial chondromatosis, total joint replacement may be considered in addition to synovectomy [21]. Although total knee arthroplasty has shown success, recurrence remains a concern, particularly with rapid growth or joint destruction, which may suggest malignant recurrence [21]. Thorough removal of all loose bodies during surgery is essential to prevent complications and prosthesis damage [22]. Regular monitoring, including biennial evaluations for patients with a history of synovial chondromatosis who have undergone total knee arthroplasty, is crucial for detecting new or enlarging synovial osteochondromas that may not be visible on X-rays but can cause discomfort and complications [23].

Postoperative results generally show positive outcomes with satisfactory functional recovery and low recurrence rates. However, monitoring for signs of relapse during follow-up examinations is essential. Local recurrence of synovial chondromatosis has been documented in some cases, even after surgical intervention involving the excision of loose bodies and synovectomy [24]. Cartilaginous nodules may cause impingement and restricted joint movement, as observed in a case presenting as anterior impingement syndrome in the ankle, leading to inflammation and pain [25].

In the present case series, two out of four patients underwent total knee replacement to address knee deformity and instability. Adherence to protocols for debridement, irrigation, and infection control was crucial in reducing the incidence of prosthetic joint infection [26]. One patient required implant removal due to a prosthetic joint infection. Despite this, all patients showed positive outcomes and good functional abilities by the end of the follow-up period. None scored below 20 on the MSTS scale, and all were able to walk independently and perform regular activities without assistance.

Although the MSTS scoring system provides some insights into the functional outcomes of individuals with synovial chondromatosis, it lacks specific customization for this particular condition. The present case series reported an average MSTS score of 22.5 for patients who underwent synovectomy alone and 22 for those who had synovectomy combined with total knee replacement.

This case series has several limitations. The cases included may not represent the full spectrum of synovial chondromatosis presentations. The study may not capture long-term outcomes or late recurrences, which are important considerations in synovial chondromatosis management. These limitations underscore the need for larger, multi-center prospective studies

with longer follow-up periods and standardized outcome measures to better understand the optimal management strategies for synovial chondromatosis.

## Conclusion

Synovectomy alone in the management of synovial chondromatosis patients yielded similar functional outcomes as measured by the MSTS scores compared to combined synovectomy and total knee replacement. However, synovectomy produced slightly higher MSTS scores (mean score of 22.5) compared to combined synovectomy and total knee replacement (mean score of 21.5). Therefore, further research is needed to determine the most effective management strategies for synovial chondromatosis and to improve patient outcomes.

## Ethics approval

Informed consent was obtained from patients included in the study. Patients were fully informed about the nature and purpose of the study, and written consent was secured prior to their participation. To ensure confidentiality and privacy, their identities were blinded throughout the manuscript.

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## Competing interests

All the authors declare that there are no conflicts of interest.

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## Underlying data

All data underlying the results are available as part of the article and no additional source data are required.

## How to cite

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