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# Synovial chondromatosis in a young female knee: diagnostic and therapeutic insights

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of the article

**Keywords:** knee joints, cartilage, synovectomy, hyaline nodules.

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**Aim of the study:** to present a rare case of synovial chondromatosis involving the knee joint in a young female patient, highlighting its clinical features, diagnostic challenges, pathological findings, and management outcomes, in the context of its recent reclassification as a benign neoplasm.

**Materials and methods.** A 19-year-old female presented with chronic swelling and pain in the right knee for one year, with increased pain and restricted joint movement over the past two months. Clinical evaluation, fine-needle aspiration cytology, and magnetic resonance imaging were performed. The patient underwent open surgical excision with extensive synovectomy, and the excised specimen was subjected to detailed gross and histopathological analysis.

**Results.** Magnetic resonance imaging revealed multiple intra-articular cartilaginous nodules within the knee joint, predominantly located around the cruciate ligaments and Hoffa's fat pad. Gross examination revealed multiple grayish-white nodules, while histopathology demonstrated lobules of hyaline cartilage lined by synovium without atypia, confirming the diagnosis of synovial chondromatosis. Postoperative recovery was uneventful with significant improvement in joint mobility. At the three-month follow-up, the patient achieved full, painless range of motion, and no recurrence was noted clinically or radiologically at six months.

**Conclusions.** Synovial chondromatosis is a rare benign neoplasm of the synovium that may mimic other intra-articular pathologies. Diagnosis requires a combination of clinical, radiological, and histopathological findings. Complete surgical excision with synovectomy offers excellent functional recovery and minimizes the risk of recurrence. Vigilant long-term follow-up is recommended to monitor for potential malignant transformation.

**Ключові слова:** колінні суглоби, хрящі, синовектомія, гіалінові вузлики.

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## Синовіальний хондроматоз коліна у молодої жінки: діагностичні та терапевтичні аспекти

**Гіт Бхуян, Сандіп Хахларі, Анушміта Ґоґой**

**Мета роботи –** навести рідкісний випадок синовіального хондроматозу колінного суглоба у молодої пацієнтки, описати його клінічні прояви, діагностичні труднощі, патоморфологічні зміни і результати лікування в контексті його нещодавньої перекласифікації як доброякісного новоутворення.

**Матеріали і методи.** Пацієнтка віком 19 років звернулася зі скаргами на хронічний набряк і біль у правому колінному суглобі протягом одного року, з посиленням болю й обмеженням рухів у суглобі протягом останніх двох місяців. Здійснили клінічне обстеження, виконали тонкоголкове аспіраційне цитологічне дослідження та магнітно-резонансну томографію. Пацієнтці здійснили відкрите хірургічне видалення утворень із розширеною синовектомією. Виконали детальне макроскопічне та гістопатологічне дослідження видаленого матеріалу.

**Результати.** У результаті магнітно-резонансної томографії виявлено множинні внутрішньосуглобові хрящові вузлики в колінному суглобі, переважно локалізовані навколо хрестоподібних зв'язок і жирового тіла Гоффа. Макроскопічно визначено множинні сірувато-білі вузлики, а під час гістопатологічного дослідження виявлено часточки гіалінового хряща, вистелені синовіальною оболонкою, без ознак атипії, що підтвердило діагноз синовіального хондроматозу. Післяопераційний період перебігав без ускладнень із суттєвим покращенням рухливості суглоба. Під час тримісячного спостереження пацієнтка досягла повного безболісного обсягу рухів, а через шість місяців клінічно та за даними візуалізації рецидиву не виявлено.

**Висновки.** Синовіальний хондроматоз – рідкісне доброякісне новоутворення синовіальної оболонки, що може імітувати інші внутрішньосуглобові патології. Діагностика передбачає поєднання клінічних, променевих і гістопатологічних даних. Повне хірургічне видалення із синовектомією сприяє відмінному функціональному відновленню та мінімізує ризик рецидиву. Рекомендоване тривале спостереження для контролю можливого злоякісного переродження.

Synovial chondromatosis (SCh) is a locally aggressive tumor characterized by the development of multiple hyaline cartilage nodules within the periarticular soft tissues [1]. Recently, it has been reclassified as a benign neoplasm rather than a metaplastic lesion [2]. This condition is rare, with an estimated incidence of approximately 1.8 cases per million person-years, and typically presents during the third to fifth decades of life [3,4]. Large joints are most commonly affected, with 60–70 % of cases involving the knee, followed by the hip, shoulder, elbow, ankle, and wrist [5].

## Aim

To present a rare case of synovial chondromatosis involving the knee joint in a young female patient, highlighting its clinical features, diagnostic challenges, pathological findings, and management outcomes, in the context of its recent reclassification as a benign neoplasm.

## Materials and methods

A 19-year-old female presented with a one-year history of chronic swelling of the right knee. She reported a recent increase in pain intensity over the last two months, accompanied by restriction of knee movement. The patient had a history of trauma to the right knee five years ago following a fall from a bicycle, after which she experienced intermittent pain and mild swelling without movement limitation. She was managed conservatively with nonsteroidal anti-inflammatory drugs and rest, leading to resolution of symptoms at that time.

On clinical examination, the patient maintained the right knee in 10–20 degrees of flexion, with noticeable quadriceps wasting compared to the contralateral limb. Palpation revealed a firm, non-tender mass measuring approximately 3.5 × 4.0 cm over the right knee. There was no local rise in temperature, although diffuse tenderness was present, more prominent on the medial aspect. The range of motion was limited, with a flexion contracture from 10 and to 75 degrees. Fine-needle aspiration cytology demonstrated a few synovial cells and scattered calcified material, which was nondiagnostic. Magnetic resonance imaging revealed multiple moderately sized intra-articular masses within the right knee joint, along both the anterior and posterior cruciate ligaments, and predominantly within Hoffa's fat pad *(Fig. 1)*. Routine laboratory investigations, including a complete blood count, erythrocyte sedimentation rate, high-sensitivity C-reactive protein level, and rheumatoid factor, were within normal limits.

Open surgical excision was performed, during which a growth was identified beneath the patellar tendon and lateral retinaculum. Irregular nodular outgrowths and several loose bodies along the margins of the swelling were excised, followed an extensive synovectomy. The excised tissue was submitted for histopathological ex-

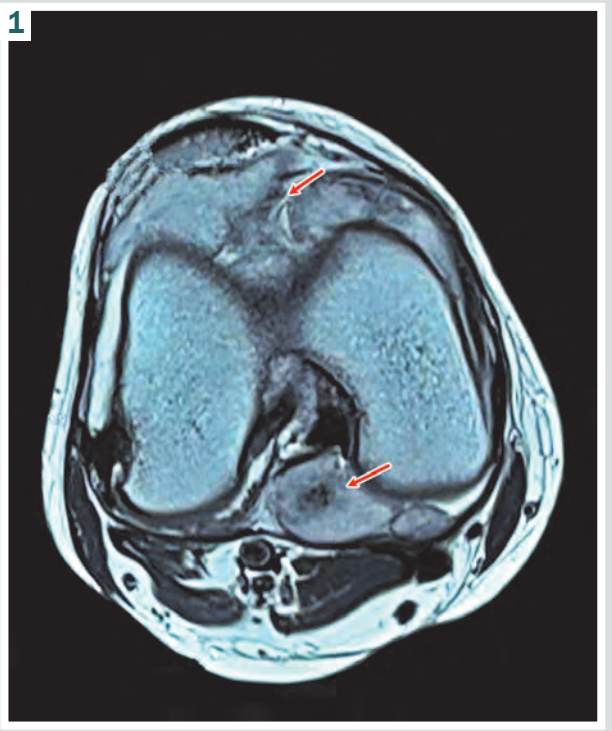

**Fig. 1.** Intra-articular calcified masses in knee joint and in posterior cruciate ligament (red arrow).

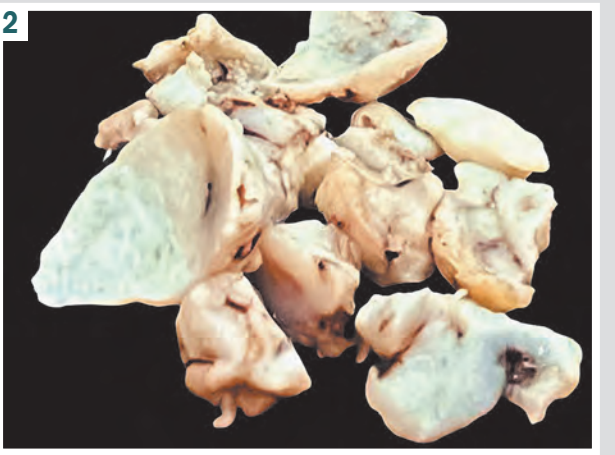

**Fig. 2.** Gross image of multiple grayish-white, smooth to irregular nodules of varying sizes (loose bodies).

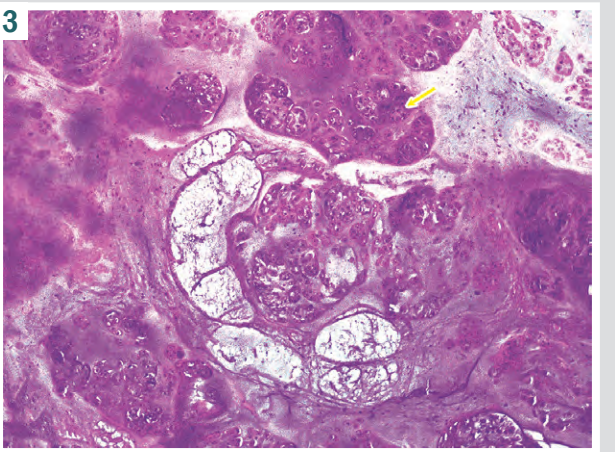

**Fig. 3.** Multiple hyaline cartilaginous nodules (yellow arrow) embedded in fibrocollagenous stroma (H & E, ×10).

amination. On gross examination, multiple grayish-white, smooth to irregular nodules of varying sizes (loose bodies) were observed, some of which were attached to the synovium *(Fig. 2)*. Microscopic examination revealed multiple hyaline cartilaginous nodules embedded within the synovium, without evidence of cellular atypia. Based on these findings, a final diagnosis of SCh was established *(Fig. 3)*.

Postoperatively, the patient received multimodal analgesia (oral paracetamol 1 g and tramadol 50 mg, transitioning to nonsteroidal anti-inflammatory drugs), prophylactic low-molecular-weight heparin for DVT prophylaxis, and oral antibiotics. The knee was immobilized in a hinged brace at 0–30° flexion for 2 weeks, with partial weight-bearing on crutches. Physiotherapy began on day 3, emphasizing quadriceps strengthening and range-of-motion exercises. Postoperative radiographs at 3 months show resolution of effusion, no new loose bodies, and preserved joint space without recurrence. A 6-month follow-up magnetic resonance imaging confirmed complete clearance of intra-articular masses with a normal synovial signal.

## Discussion

Synovial chondromatosis is a locally aggressive neoplasm characterized by the formation of hyaline cartilaginous nodules within the synovial membrane or as loose bodies within the joint space [3,6]. Recent molecular studies have identified a recurrent FN1–ACVR2A gene fusion as the underlying genetic alteration driving the lesion [7,8]. In a study by E. P. Buddingh et al., chromosomal anomalies involving chromosome 6 were also reported in a subset of cases [9]. These findings support the concept that SCh represents a true neoplastic process rather than a reactive or metaplastic condition. Malignant transformation of SCh into secondary synovial chondrosarcoma is rare, occurring in approximately 1–10 % of patients, and these cases may also demonstrate the FN1–ACVR2A fusion gene [10].

According to the Milgram classification, synovial chondromatosis progresses through three sequential phases. The early phase is characterized by active synovial proliferation without loose body formation. The intermediate phase demonstrates concurrent synovial proliferation and the presence of loose bodies, whereas the late phase is defined by multiple loose bodies with minimal or no active synovial involvement [11,12].

Radiological imaging plays a crucial role in differentiating SCh from other conditions with similar clinical presentations, while histopathological evaluation remains essential for a definitive diagnosis [13]. The main differential diagnoses include soft tissue chondroma, osteochondroma, lipoma arborescens with osseous metaplasia, osteoarthritis, and chondrosarcoma [4,14,15]. These entities can be distinguished through a combination of clinical assessment, imaging findings, and histopathological features. Synovial chondromatosis typically does not respond to non-surgical management and rarely shows spontaneous resolution. Although arthroscopy offers a minimally invasive approach, complete removal of intra-articular loose bodies may be challenging.

Therefore, open synovectomy with excision of all loose cartilaginous nodules and involved synovium is generally considered sufficient to achieve disease control in most cases [16,17]. Although malignant transformation into synovial chondrosarcoma is a rare phenomenon described in the literature, it was not a feature in the present case, which demonstrated classical benign histology. Nevertheless, long-term clinical follow-up remains advisable in patients with this neoplasm.

## Conclusions

1. We present a case of primary synovial chondromatosis in the knee of a young female patient, successfully managed with open synovectomy and excision. This case underscores that even in young patients presenting with chronic monoarticular symptoms and a history of trauma, a high index of suspicion for this rare neoplasm is warranted.

2. Our experience confirms that accurate diagnosis, based on a triad of clinical, radiological, and histopathological findings, followed by complete surgical excision, provides excellent functional outcomes and disease control.

**Ethical approval**
This case report was reviewed and approved by Institutional ethics committee, IEC(H) Reg. No. EC/NEW/INST/2020/1221, approval number: SMEJ/JMCH/MEU/841/PT-2/2024.

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