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CASE REPORT

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Efficacy of Arthroscopic Surgery in the Management of Synovial Giant Cell Tumors: a Case Report

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ABSTRACT

Giant cell tumors of the synovial membrane are benign but locally aggressive lesions that primarily affect synovial joints. Histologically, they are characterized by the proliferation of histiocytes, multinucleated giant cells and prominent hemosiderin deposition. Clinically, patients often experience joint pain, swelling and restricted movement, which can significantly impact their mobility and quality of life. Traditionally, open surgical excision has been the standard approach for managing these tumors. However, advancements in minimally invasive techniques, particularly arthroscopic surgery, have emerged as effective alternatives. Arthroscopy offers several benefits, including reduced postoperative pain, quicker recovery and minimal surgical trauma, while still allowing for complete tumor removal. This article presents a case of a giant cell tumor of the synovial membrane in the knee of a female patient, highlighting the successful use of arthroscopic treatment and the favorable postoperative outcomes. By presenting this case, we aim to emphasize the growing role of arthroscopic intervention in managing these tumors, further supporting its integration into clinical practice.

Keywords: giant cell tumor, synovial membrane, arthroscopic surgery, tumor excision, postoperative management.

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INTRODUCTION

Synovial giant cell tumor (SGCT) is a benign lesion characterized histologically by an accumulation of proliferating histiocytes, lipid-laden cells, hemosiderin deposits and multinucleated giant cells (1). The predominant cellular component, proliferating histiocytes, display a foamy cytoplasm due to intracellular lipid accumulation. Their excessive proliferation is a hallmark feature of the disease. Lipid-laden cells, originating from histiocytes, are rich in intracellular fat and contribute to the distinct histopathological appearance of the tumor (1). Hemosiderin deposits, reflecting previous microhemorrhages, are frequently observed in SGCT and serve as an important diagnostic clue. Multinucleated giant cells, formed by the fusion of macrophages, are characteristic of SGCT and play a central role in the tumor`s inflammatory microenvironment (1).

Giant cell tumors are typically benign and commonly arise from the synovium of joints, tendon sheaths, or bursae (1). Tenosynovial giant cell tumors (TGCTs) are classified based on their growth pattern – either localized or diffuse – as well as their anatomical location, which may be intra-articular or extra-articular (2). Localized TGCTs are more frequent, typically affecting small joints such as the hand and wrist. In contrast, diffuse TGCTs, though less common, are more likely to involve large joints such as the knee and ankle (2). While extra-articular forms primarily occur in periarticular tissues, they may also arise within subcutaneous or intramuscular compartments. In rare cases, TGCTs may exhibit locally aggressive or even malignant behavior (2).

These tumors predominantly affect individuals aged 25-50 years, with a slightly higher incidence in females. Various factors have been implicated in their pathogenesis, including trauma, chronic inflammation, metabolic disorders, and neoplastic mechanisms. Clinical symptoms depend largely on the tumor's location and subtype (3). Localized TGCTs may present as a confined mass or abnormal tissue growth within a joint, initially manifesting as swelling followed by pain. Some patients may also experience joint instability or a mechanical "locking" sensation (4, 5). On the other hand, diffuse TGCTs, commonly present with persistent pain, swelling, along with restricted range of motion, localized tenderness, joint warmth, sensations of clicking or popping, and stiffness (3, 6). These symptoms typically have an insidious onset (2, 4). If left untreated, diffuse TGCTs may lead to joint degeneration, arthritic damage, and deterioration of surrounding cartilage and bone (2, 4).

The purpose of the study is to report a rare case of a sizable intra-articular synovial giant cell tumor in the knee joint, which was successfully treated via arthroscopic excision. Emphasis is placed on the diagnostic process, surgical management and postoperative outcome. ❑

CASE PRESENTATION

A 57-year-old female [body mass index (BMI) 23.8 kg/m^2] with no significant medical history and no smoking habits, presented to our hospital with anterior-medial pain in her left knee which was persisting for the past six months. She did not report any history of injury in the affected knee. On physical examination, a tender, palpable mass was noted in the medial compartment of the knee, detectable only in deep flexion. However, no joint effusion or limitation in range of motion was observed. Additionally, localized tenderness was present along the anteromedial joint line.

X-rays did not reveal any soft-tissue mass shadow or bone erosion and all laboratory tests were within normal limits (Figure 1). Magnetic resonance imaging (MRI) demonstrated a well-circumscribed intraarticular nodular lesion in the anterior-medial compartment, without any without any associated joint effusion, cartilage damage, or other abnormalities (Figure 2).

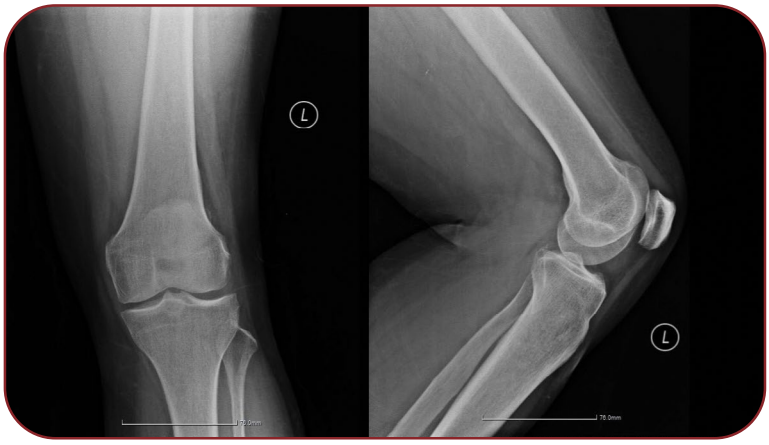

FIGURE 1. Preoperative anteroposterior and lateral radiographs of the left knee

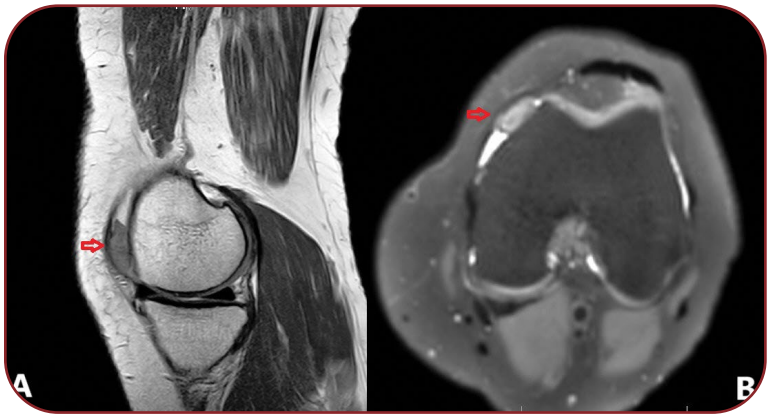

FIGURE 2. Preoperative magnetic resonance imaging (MRI), in which the tumor is marked with red arrows: (A) sagittal view; (B) transverse view

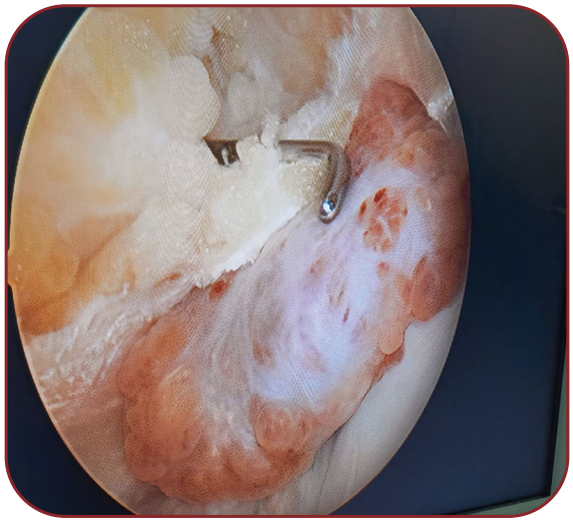

FIGURE 3. Arthroscopic visualization of the well-circumscribed intraarticular nodular mass

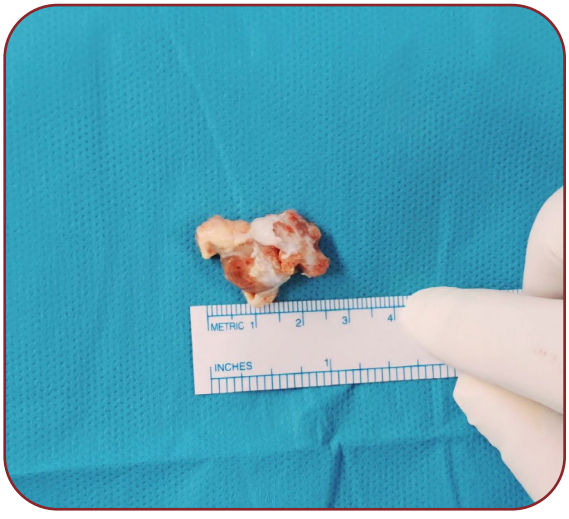

FIGURE 4. Macroscopic appearance of the tumor (3 x 2 x 0.8 cm in size)

A few days later, the patient underwent arthroscopy of the left knee under general anesthesia. The procedure confirmed that the articular cartilage, menisci and cruciate ligaments were intact. However, a well-encapsulated, mobile, oval-shaped mass measuring 3 x 2 x 0.8 cm was visualized, arising from the synovium near the anterior horn of the medial meniscus. The mass did not cause impingement during knee extension or flexion and allowed for a full range of motion (Figure 3). Using radiofrequency ablation, the mass was carefully dissected from the surrounding synovial tissue and excised en bloc through an enlarged anteromedial portal (Figure 4). The base of the lesion was cauterized to minimize recurrence. Macroscopically, the external surface of the mass exhibited a brown-yellow multinodular appearance. Histopathological analysis confirmed the diagnosis of a giant cell tumor of the synovial membrane.

The perioperative period was uneventful. Postoperatively, the patient initiated passive and active mobilization of the knee on the same day of surgery and was mobilized with crutches under partial weight-bearing. By the third postoperative week, full weight-bearing was permitted. At the two-month follow-up, she was asymptomatic with a full knee range of motion in the knee and had resumed all daily activities.

No recurrence was observed at the one-year follow-up, while the patient reported no pain or functional limitation (Figure 5). The Lysholm score was 95 and the KOOS (knee injury and osteoarthritis outcome score) subscale scores were 98 for pain, 96 for symptoms, 100 for activities of daily living (ADL), 90 for sports/recreation and 94 for the quality of life (QoL). These high Lysholm and KOOS scores demonstrate excellent functional recovery at one-year follow-up. ❑

DISCUSSION

Giant cell tumors of the synovial membrane are benign but locally aggressive neoplasms. Their potential to infiltrate adjacent tissues complicates treatment and often necessitates complete surgical excision to minimize the risk of recurrence (1, 2). This can be particularly challenging due to the proximity of the tumor to critical joint structures, which requires meticulous dissection to avoid iatrogenic injury (6). In

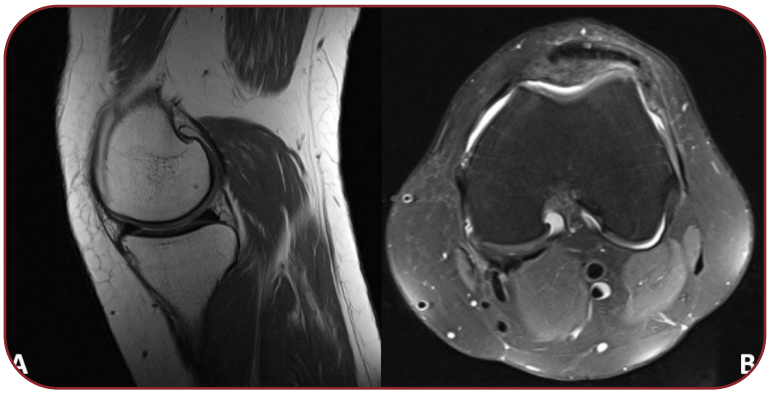

FIGURE 5. Postoperative magnetic resonance imaging (MRI) at one-year follow-up showing no signs of tumor recurrence: (A) sagittal view; (B) transverse view

some cases, joint arthrotomy or release of adjacent tendons and ligaments may be required to achieve adequate exposure (6). Arthroscopic excision can offer a minimally invasive alternative to open surgery, providing enhanced visualization and reduced soft tissue trauma (7, 8). It is especially suited for well-circumscribed lesions accessible within the joint space (7, 8).

In our case, successful arthroscopic tumor resection not only ensured effective removal but also preserved joint integrity, facilitating a quicker return to normal function. The positive outcome aligns with existing literature supporting arthroscopic techniques for managing these tumors, particularly in select cases where the tumor is well-defined and confined (7, 8). Specifically, we demonstrate a technically challenging yet complete en bloc resection using an enlarged anteromedial portal and radiofrequency ablation, without compromising surrounding structures (7, 8). This underscores both the feasibility and precision of arthroscopic techniques, even for moderately sized lesions.

In parallel, unlike most cases of diffuse TGCTs which present with joint effusion, mechanical symptoms or restricted motion, our patient presented with a painful but non-restrictive palpable mass in the medial compartment of the knee, noticeable only in deep flexion (3, 6). Furthermore, the tumor was located on the anterior horn of the medial meniscus, a relatively uncommon site for localized TGCTs. Its well-encapsulated and mobile nature made it particularly amenable to arthroscopic excision. Such characteristics are not frequently reported in the literature, where tumors often present more diffusely or are not clearly demarcated (3, 6).

Compared to open surgery, arthroscopy offers several advantages, including reduced postoperative pain, minimal blood loss, shorter recovery times and a lower risk of complications such as infection and scarring (7, 8). Recent advances in arthroscopic techniques have significantly enhanced the surgeon's ability to manage intra-articular tumors with greater precision and safety. High-definition arthroscopes and improved angled optics now provide superior visualization, even in challenging compartments of the knee joint (7, 8). The use of radiofrequency ablation devices, as utilized in this case, offers precise soft tissue dissection with minimal thermal damage to adjacent structures, allowing for better margin control during tumor excision (7, 8). Additionally, modified portal placement techniques, including enlarged working portals or accessory posteromedial/posterolateral portals, can further improve access to deeper or posterior joint regions (7, 8).

One of the main concerns after arthroscopic excision, is the potential for incomplete tumor removal due to limited visualization or difficult access to certain joint compartments, particularly in cases where the tumor is poorly demarcated or located posteriorly (7, 8). Incomplete excision is associated with a higher risk of recurrence. Reported recurrence rates for localized TGCTs after arthroscopic excision vary between 4% and 15%, while those for open excision are often slightly lower, particularly when wide resection is achieved (7-9).

In cases where the tumor extends beyond the synovial lining into surrounding soft tissues, bones, or ligaments, open surgery remains the preferred approach (5). Open surgery, although more invasive, may offer better exposure and facilitate complete removal, especially for larger, aggressive or infiltrative lesions (7, 8). Additionally, tumors that involve multiple joint compartments may be more effectively addressed through open surgery due to the need for broader surgical access (5). However, open surgery is typically associated with greater soft tissue disruption, increased postoperative pain, longer recovery time and a higher risk of joint stiffness or complications such as infection (5, 8, 9). Therefore, the choice of surgical approach must be carefully individualized, balancing the risks of recurrence and incomplete excision with the benefits of a minimally invasive technique.

Preoperative evaluation is essential in selecting the most appropriate surgical strategy (7). Advanced imaging techniques play a crucial role in assessing the tumor's size, extent and relationship with surrounding structures. A multidisciplinary approach involving orthopedic surgeons, radiologists, and pathologists ensures comprehensive care (10).

Radiologists contribute to tumor detection and characterization through imaging modalities such as X-rays, MRI and computed CT scans, with MRI being particularly valuable for assessing soft tissue involvement, which might be critical for surgical planning (5, 6). Pathologists provide definitive diagnosis by analyzing biopsy specimens, distinguishing synovial giant cell tumors from similar soft tissue neoplasms (4, 11).

Postoperative rehabilitation is key to optimizing recovery, promoting joint mobility, and restoring function. Early rehabilitation focuses on pain management, swelling reduction, and protection of the surgical site. As healing progresses, gentle range-of-motion exercises help prevent stiffness, followed by strength training to restore muscle function and support the joint (12). The rehabilitation process should be individualized, taking into account factors such as tumor location, surgical approach, and joint stability. Since arthroscopic surgery is less invasive, recovery tends to be faster and rehabilitation less intensive compared to open surgery (12, 13). ❑

CONCLUSIONS

In conclusion, this case highlights the potential of arthroscopic treatment as a safe and effective option for managing well-circumscribed giant cell tumors of the synovial membrane in uncommon intra-articular locations, such as the knee joint. The favorable clinical outcome, combined with minimal invasiveness and preservation of joint integrity, supports the role of arthroscopic excision in selected cases. However, given the rarity and variability of TGCT presentations, further case series and larger clinical studies are needed to validate these findings, evaluate long-term outcomes and develop standardized treatment protocols. This case contributes to the ongoing discussion on optimal management strategies, emphasizing the importance of individualized treatment planning based on tumor characteristics and surgical accessibility. ❑

Conflicts of interest: none declared.

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Ethical statement: The present study was approved by the Institutional Review Board (15104/11-1-2025).

References

1. **Nau T, Chiari C, Seitz H, et al.** Giant-cell tumor of the synovial membrane: Localized nodular synovitis in the knee joint. *Arthroscopy* 2000;16:E22.
2. **Ansel S, Yan X, Chong P, et al.** Tenosynovial giant cell tumor: case report. *J Med Case Rep* 2023;17:419.
3. **Schwartz HS, Unni KK, Pritchard DJ.** Pigmented villonodular synovitis. A retrospective review of affected large joints. *Clin Orthop Relat Res* 1989:247:243-255.
4. **Mavrogenis AF, Igoumenou VG, Megaloikonomos PD, et al.** Giant cell tumor of bone revisited. *SICOT J* 2017:3:54.
5. **Abdalla RJ, Cohen M, Nóbrega J, et al.** Synovial giant cell tumor of the knee. *Rev Bras Ortop* 2015;44:437-440.
6. **Alghamdi B, Koaban S, Alnaqa H.** Giant cell tumor of tendon sheath in knee capsule. *Cureus* 2021;13:e16632.
7. **De Ponti A, Sansone V, Malcherè M.** Result of arthroscopic treatment of pigmented villonodular synovitis of the knee. *Arthroscopy* 2003;19:602-607.
8. **Chandra AA, Agarwal S, Donahue Ahna, et al.** Arthroscopic *versus* open management of diffuse-type tenosynovial giant cell tumor of the knee: A meta-analysis of retrospective cohort studies. *J Am Acad Orthop Surg Glob Res Rev* 2021;4:e21.00217.
9. **Noailles T, Brulefert K, Briand S, et al.** Giant cell tumor of tendon sheath: Open surgery or arthroscopic synovectomy? A systematic review of the literature. *Orthop Traumatol Surg Res* 2017;103:809-814.
10. **Staals EL, Ferrari S, Donati DM, et al.** Diffuse-type tenosynovial giant cell tumour: Current treatment concepts and future perspectives. *Eur J Cancer* 2016;63:34-40.
11. **Kazemi SM, Minae-Noshani R, Hosseininejad SM.** The knee tenosynovial giant cell tumor: A deceptive case report with non-specific presentations. *J Orthop Spine Trauma* 2023;9:192-194.
12. **Asik M, Erlap L, Altinel L, et al.** Localized pigmented villonodular synovitis of the knee. *Arthroscopy* 2001;17:E23.
13. **Palmerini E, Staals EL.** Treatment updates on tenosynovial giant cell tumor. *Curr Opin Oncol* 2022;34:322-327.