Synovial Sarcoma of the Knee: Case Report

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ABSTRACT
We present the case of a 22-year-old patient with chronic medial pain in the left knee, initially interpreted as a meniscal syndrome, who was later diagnosed with intra-articular synovial sarcoma (SS) after undergoing various diagnostic studies. Magnetic resonance imaging (MRI) at the time of consultation revealed a well-circumscribed, homogeneous mass with nonspecific characteristics in the medial compartment of the knee. Subsequent histological examination confirmed that the lesion was a synovial sarcoma originating from the synovial membrane. After review by a multidisciplinary team, wide resection of the lesion was performed, followed by ligament and capsular reconstruction. Synovial sarcoma is a rare mesenchymal tumor, accounting for less than 10% of soft tissue sarcomas. Its nonspecific MRI characteristics, along with ambiguous symptoms, make early diagnosis challenging. This condition should be considered in the differential diagnosis of nonspecific joint pain, especially when imaging findings do not align with more common pathologies.
Keywords: Synovial sarcoma; knee pain; intra-articular tumor; soft tissue sarcoma; mesenchymal tumor.
Level of Evidence: IV

Sarcoma sinovial de rodilla: Reporte de un caso

RESUMEN
Presentamos el caso de una paciente de 22 años con dolor crónico medial en la rodilla izquierda que inicialmente fue interpretado como un síndrome meniscal y, luego de diversos estudios, se diagnosticó como un sarcoma sinovial intrarticular. La resonancia magnética realizada en el momento de la consulta mostraba una masa homogénea bien circunscrita y de características inespecíficas dentro del compartimento interno de la rodilla. En el examen histológico posterior, se informó que dicha lesión se correspondía a un sarcoma sinovial que surgía de la membrana sinovial de esa articulación. Tras presentar el caso en un ateneo multidisciplinario, se procedió a la resección amplia de la lesión como único tratamiento y a la posterior reconstrucción ligamentaria y capsular. El sarcoma sinovial es un tumor mesenquimatoso raro que representa <10% de los sarcomas de partes blandas. Las características inespecíficas de la resonancia magnética, así como sus manifestaciones clínicas plantean un desafío en el diagnóstico precoz. Este cuadro debe considerarse dentro de los diagnósticos diferenciales ante dolores articulares inespecíficos y cuando las imágenes no son características de otras enfermedades.
Palabras clave: Sarcoma sinovial; dolor de rodilla; tumor intrarticular; tumor de partes blandas; tumor mesenquimatoso.
Nivel de Evidencia: IV

INTRODUCTION

Synovial sarcoma (SS) is a malignant mesenchymal spindle cell tumor characterized by variable epithelial differentiation and uncertain histogenesis, which can be monophasic or biphasic, and represents less than 10% of soft tissue sarcomas. Intra-articular SS, however, is extremely rare.[1,2]

SS typically affects patients between the ages of 15 and 35, with a slight male predominance. Although it has been reported in almost all anatomical locations, about 90% of SS cases originate in the periarticular tissue and tendon sheath of the extremities, with the knee being the most frequently affected site.[2] Due to its slow growth and nonspecific clinical and radiologic features, the diagnosis and treatment of intra-articular SS are often delayed.[3-5] While larger lesions tend to appear more heterogeneous on magnetic resonance imaging (MRI), smaller SS le-

Received on June 9th, 2023. Accepted after evaluation on May 31st, 2024 • Dr. FRANCISCO TÁLAMO • frantalamo@gmail.com https://orcid.org/0000-0001-9060-6433
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sions (<5 cm) may present with well-demarcated margins and homogeneous signal intensity, mimicking benign conditions such as intra-articular localized nodular synovitis.[5] Therefore, it is important to consider SS within the differential diagnoses when faced with this type of presentation.

CLINICAL CASE

A 22-year-old woman presented to our center for the first time in August 2020, seeking a second opinion for chronic medial pain in her left knee, which worsened after physical activity. She had been evaluated by an orthopedic surgeon approximately 12 months earlier and underwent several tests, including an MRI that was initially reported as normal.

Upon review of that MRI, a rounded hyperintense image measuring approximately 5 x 7 x 5 mm was observed on T1 and T2 sequences, located at the anteromedial border of the knee (Figure 1).

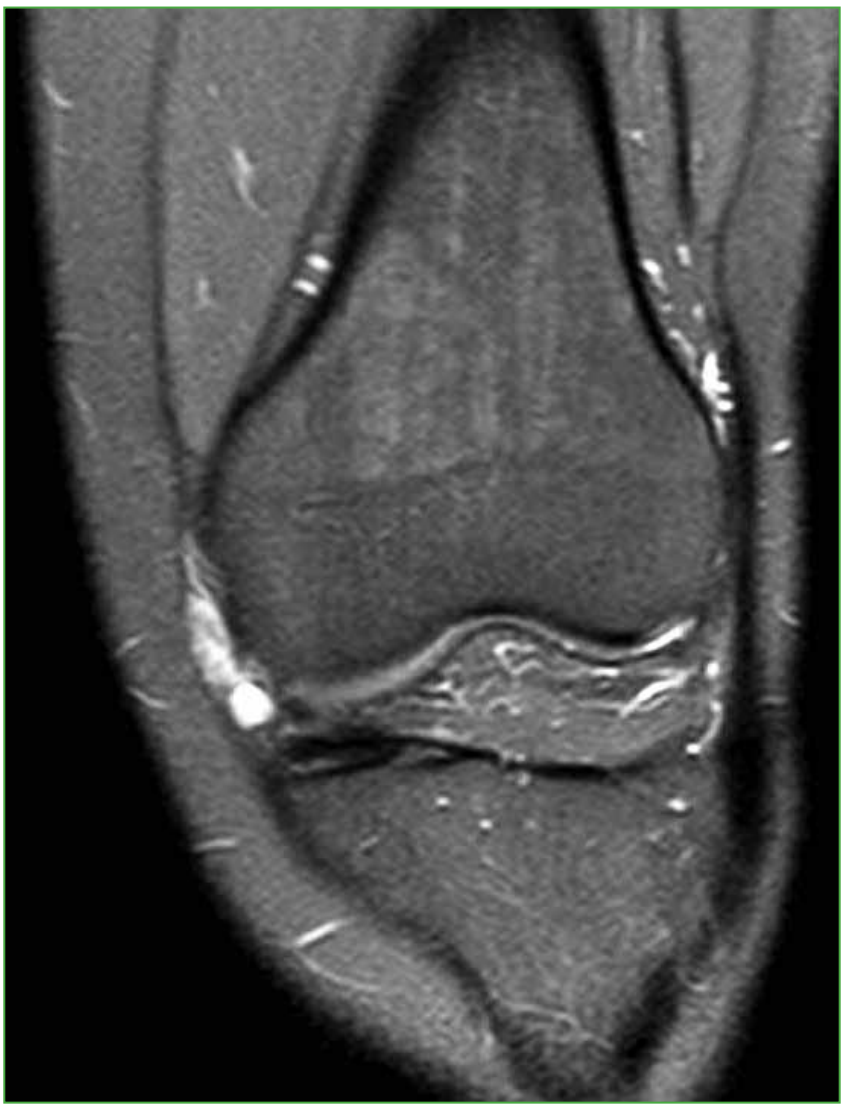

Figure 1. MRI. Hyperintense rounded image in T1 and T2 sequences measuring approximately 5 x 7 x 5 mm in the anteromedial border of the knee, not initially diagnosed.

The patient reported that she continued experiencing pain, which had persisted for 18 months, without any history of trauma. She described the pain as dull and located in the medial aspect of the knee, slightly anterior.

On physical examination, frank ligament laxity and mild joint effusion were noted, without signs of erythema or inflammation (phlogosis). Strength was preserved, and the neurovascular assessment was normal.

At this time, a new set of radiographs, Doppler ultrasound, and MRI were ordered. The radiographs showed no significant findings. However, the ultrasound revealed a "cystic solid mixed nodular process with proximal calcification, measuring approximately 22 x 5 mm, seemingly associated with the patellofemoral joint and suggestive of synovial origin" (Figure 2). The MRI displayed the same lesion as before, now measuring 16 x 18 x 21 mm, still hyperintense on T1 and T2 sequences (Figure 3).

Given these findings, an ultrasound-guided needle biopsy was performed, and immunohistochemical staining of the specimen was carried out. Microscopy revealed a spindle cell neoplasm with ovoid nuclei and elongated cytoplasm, arranged in dense, converging fascicles, accompanied by blood vessels. Isolated mitotic figures were also observed.

Immunohistochemistry results were as follows: S100, focal positive; CK AE1/AE3, negative; CK7, negative; EMA, focal positive; CD99, positive; CD34, positive in vascular structures; Bcl-2, positive; desmin, negative; AML, negative; SOX10, focal positive. These immunophenotypic findings were compatible with monophasic SS.

The case was presented at a multidisciplinary meeting, and in collaboration with the Oncology Department, it was decided that wide resection of the lesion would be the sole treatment.

A medial longitudinal approach was performed, including resection of the biopsy tract. The tumor was excised with wide margins, including the knee joint capsule as the deep margin, and resecting the medial patellofemoral ligament along with a portion of the medial collateral ligament. The specimen was sent for intraoperative frozen section analysis, which confirmed clean margins.

Next, a fascia lata and hamstring graft (gracilis and semitendinosus) was harvested from the same knee. The anteromedial knee capsule was reconstructed using the fascia graft, anchored with five suture anchors, following a technique similar to Gallie's capsular reconstruction for recurrent shoulder instability.[6] In a second stage, the medial ligament was plicated using a semitendinosus graft, with femoral and tibial fixation achieved using 7 x 20 mm interference screws. The posteromedial capsule was then plicated and secured with a 5 mm suture anchor, followed by plication of the medial patellofemoral ligament with another 5 mm suture anchor (Figure 4). Intraoperative maneuvers confirmed good joint stability.

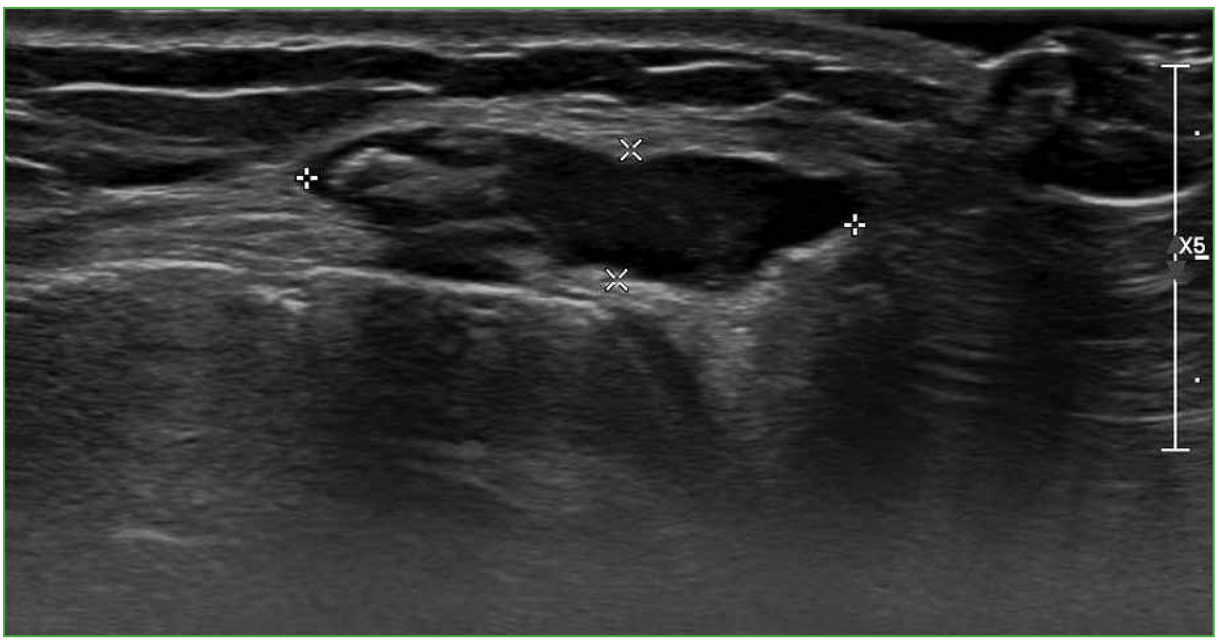

Figure 2. Doppler ultrasound reported as "cystic solid mixed nodular process with proximal calcification, measuring approximately 22 x 5 mm, appearing to be in relation to the patellofemoral joint, suggestive of synovial origin."

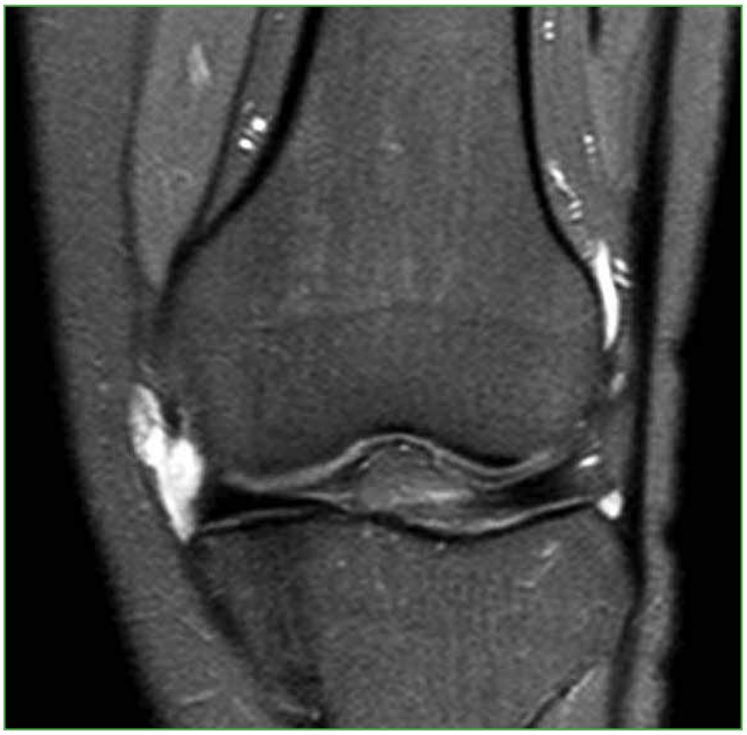

Figure 3. MRI. The same image already described, now measuring 16 x 18 x 21 mm, also hyperintense in T1 and T2 sequences.

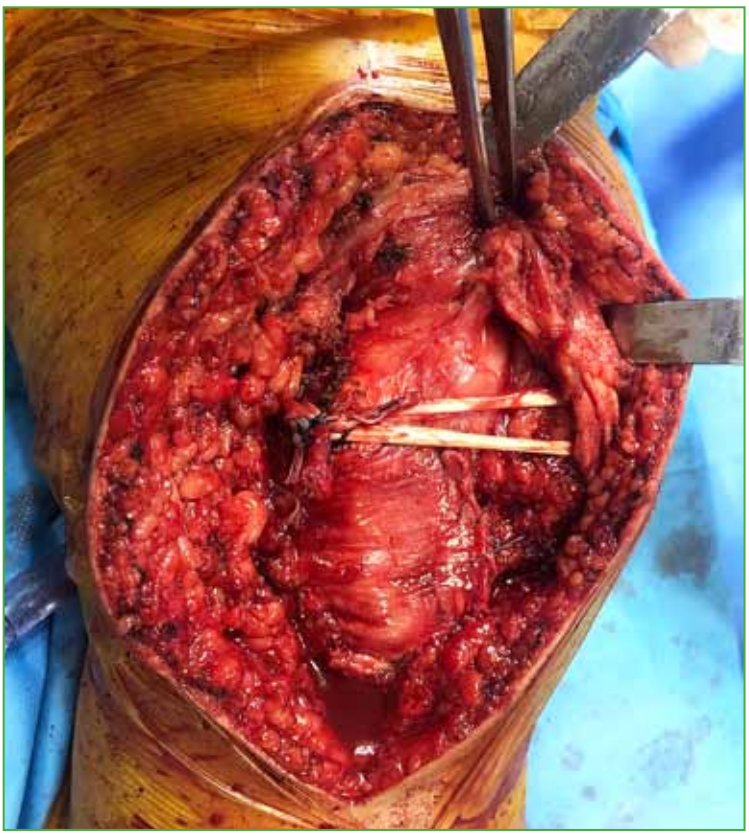

Figure 4. Reconstruction of the anteromedial knee capsule with fascia graft using 5 suture anchors.

Postoperatively, the patient was fitted with a knee immobilizer and allowed partial weight-bearing for six weeks. Supervised passive knee flexion exercises were initiated with a kinesiologist, gradually achieving 90° of flexion. After this period, exercises were advanced based on tolerance.

DISCUSSION

Synovial sarcoma (SS) typically presents as a periarticular soft tissue mass in adolescent and young adult patients.[7] Its etiology remains unknown, though several risk factors have been identified, including genetic syndromes, prior radiotherapy or chemotherapy, chemical carcinogens, chronic lymphedema, and persistent irritation.[3]

From an oncological standpoint, SS is classified as a high-grade sarcoma, characterized by slow tumor growth and a tendency to invade surrounding structures. Children and adolescents with low-grade SS who undergo surgical excision have an event-free survival rate of 72-90% at five years.[8]

SS most often arises near a joint, usually within 5 cm of the periarticular area, and predominantly affects the lower extremities, particularly around the knee. [9]

Multiple authors have described the radiographic characteristics of SS, although no pathognomonic features exist.[7,8] MRI is the imaging modality of choice for assessing intra-articular SS, as well as for determining tumor size, regional invasion, and involvement of adjacent structures. These tumors typically appear as heterogeneous hemorrhagic soft tissue masses with internal calcifications (present in approximately one-third of cases) and are hyperintense on MRI.[7] However, these findings are more specific in tumors larger than 5 cm. Tumors smaller than 5 cm may exhibit homogeneous signal intensity and well-demarcated margins, making diagnosis more challenging.

SS has four histologic subtypes: the biphasic type (20-30%) consisting of both epithelial and spindle cell components; the monophasic spindle cell type (50-60%); the monophasic epithelial cell type (<5%); and the poorly differentiated type (10-15%), which consists of round cells. In our patient, the tumor was of the monophasic spindle cell type, characterized by dense cords of spindle cells, small to medium in size, with pale nuclei, sparse cytoplasm, and indistinct cell borders. This is the most common histologic subtype of SS.[10]

The differential diagnosis of SS includes nodular synovitis, fibromatosis, solitary fibrous tumor, malignant peripheral nerve sheath tumor, Ewing's sarcoma, and rhabdomyosarcoma.

Various treatment options for SS have been proposed, including complete tumor excision or resection, chemotherapy (doxorubicin and ifosfamide), radiotherapy, amputation, or combinations of these therapies. Patients who undergo complete surgical resection with optimal margins, as in the case performed at our center, and who have adequate follow-up, have been reported to survive without disease recurrence for periods ranging from one to 12.5 years post-diagnosis.[8]

CONCLUSIONS

Synovial sarcoma often presents as a diagnostically challenging joint lesion. It is crucial for orthopedic surgeons to recognize cases such as the one described here to maintain a high index of suspicion when confronted with lesions of unknown etiology. In patients with prolonged unexplained knee pain or joint stiffness, intra-articular SS should be considered as part of the differential diagnosis. A biopsy in suspicious cases can help avoid delays in diagnosis and enable prompt definitive treatment.

Conflict of interest: The authors declare no conflicts of interest.

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