Calcified Thigh Mass

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Case Presentation

A 31-year-old man presented with a 4-week history of a palpable left thigh mass and anterolateral left thigh pain. Initial radiographs (not shown) were unremarkable. He was referred for an MRI (**Fig. 1**) which revealed a mass within the vastus lateralis. Ultrasound examination (**Fig. 2**) showed a heterogeneous intramuscular lesion within the vastus lateralis with an incomplete peripheral echogenic, shadowing calcified rim. No central calcifications were present. Increased peripheral color flow was present with no abnormal flow in the central portion of the mass (not shown).

Repeat left femur radiographs (not shown) again demonstrated no calcifications. A non-contrast CT (**Fig. 3**) performed the same day showed an amorphous, peripheral, incomplete rim of calcification corresponding to the intramuscular lesion within the vastus lateralis. After consulting with the orthopedic surgeon, a decision was made to proceed with watchful waiting and follow-up. Repeat radiographs performed on follow-up 5 weeks later remained unremarkable. Clinically, the palpable mass had decreased in size and was no longer tender to palpation.

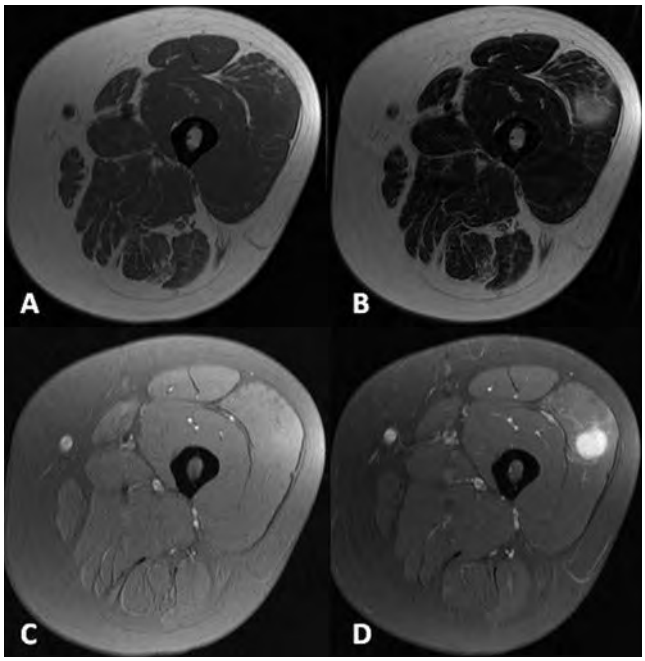

Figure 1. (left) Axial T1 (A), T2 (B), FST1 pre- (C) and post-contrast (D) images demonstrate a 2 cm intramuscular mass with isointense T1 signal, hyperintense T2 signal, and diffuse enhancement.

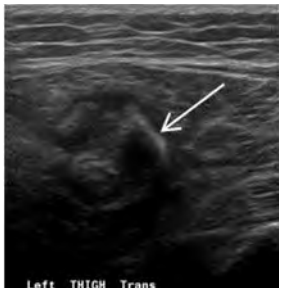

Figure 2.
Gray scale ultrasound image of the mass demonstrates multiple peripheral hyperechoic calcifications (arrow) with shadowing.

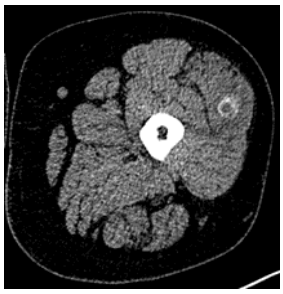

Figure 3.
Axial non-contrast CT image demonstrates peripheral calcification and no central calcifications.

Key Image Finding(s)

Peripherally calcified intramuscular soft tissue mass

Differential diagnoses

Myositis Ossificans

Extraskeletal Osteosarcoma

Synovial Sarcoma

Discussion

The differential diagnosis of a soft tissue mass with calcification includes benign and malignant etiologies, such as myositis ossificans, extraskeletal osteosarcoma, and synovial sarcoma. These entities have overlapping clinical and MR imaging findings. In fact, MRI may be misleading due to its limited ability to characterize calcifications, especially with regards to the peripheral calcified rim of myositis ossificans. In addition, soft tissue edema can extend beyond the lesion border, further complicating the MR imaging appearance. A distinguishing feature of myositis ossificans is a peripheral rim of mature, lamellar bone with a lucent center, best seen on CT or radiographs. In contrast, malignant lesions typically have an ill-defined periphery and central calcification or ossification. The typical peripheral calcification of myositis ossificans may not be apparent on initial radiographs, necessitating repeat radiographs in subsequent weeks. When features of myositis ossificans are suspected on imaging, short-term follow -up is preferable to biopsy due to the potential for histologic misdiagnosis as a soft tissue sarcoma.[1,2]

Myositis Ossificans.

Myositis ossificans represents a benign self-limiting mass which typically arises within the large muscles of the extremities. The most frequent signs and symptoms include a soft tissue mass with pain and tenderness. This lesion is often the sequelae of local trauma but can also be an incidental finding, as some patients may not report a history of recent trauma. Histologically, myositis ossificans is typically well circumscribed with a rim of compressed fibrous connective tissue; it frequently contains an inner core of atrophic skeletal muscle. A typical distinct zoning pattern sets this lesion apart from other soft tissue tumors. Centrally, there is a non-ossified cellular focus which progresses to an intermediate osteoid region. Peripherally, there is a rim of mature lamellar bone. As the lesion matures, the nodular central fibrovascular areas may become hemorrhagic or cystic and eventually may become replaced by adipose tissue and mature bone in the oldest lesions.[1,2]

Plain radiographs typically demonstrate faint calcification within 2 to 6 weeks from the onset of symptoms. This progresses to a circumferentially well-defined calcified mass with more mature-appearing bone peripherally, typically at 6 to 8 weeks. By 4 to 6 months, the mass progressively becomes smaller in size and more mature in calcification/ossification.[1]

Computed tomography findings often confirm the specific appearance of myositis ossificans, depicting a peripheral rim of mineralization after 4 to 6 weeks. The center of the mass often has decreased attenuation. Mature lesions may show diffuse ossification. Surrounding soft tissue edema may be seen on CT but is better appreciated on MRI.[1]

The MRI appearance of myositis ossificans is nonspecific and changes with the age and maturation of the lesion, reflecting evolving histologic characteristics. Early lesions, in which mineralization is not yet radiographically visible, demonstrate heterogeneous T2 hyperintense signal with surrounding soft tissue edema. The lesions are usually isointense to skeletal muscle on T1 weighted images. The margins are frequently poorly-defined, often recognized secondarily due to mass effect and displacement of fascial planes. Fluid-fluid levels have been reported and attributed to previous hemorrhage. Intermediate lesions are similar to early appearing lesions but often demonstrate a rim of curvilinear low signal intensity corresponding to the peripheral ossification. Mature lesions are typically well-defined heterogeneous masses with signal intensity similar to mature bone with both cortical and medullary components, without associated edema.[1]

Extraskeletal Osteosarcoma.

Extraskeletal Osteosarcoma is a rare malignant neoplasm which produces osteoid or bone in soft tissues without an attachment to bone or periosteum. Patients typically present with an enlarging soft tissue mass that is not always accompanied by pain. The most common site of this tumor is the thigh.[1]

Radiographically, extraskeletal osteosarcoma commonly appears as a dense, cloudlike calcified mass; however, the amount of mineralization varies with up to 50% of cases showing no appreciable calcification.[1,3] CT imaging best demonstrates variable amorphous mineralization throughout the mass. The appearance is in contradistinction to the more mature peripheral ossification pattern of myositis ossificans. The MRI features are nonspecific, demonstrating heterogeneous signal and variable amounts of low signal calcification within the mass. Following contrast administration, variable heterogeneous tumor enhancement is seen on both CT and MRI depending on the degree of necrosis.[3]

Synovial Sarcoma.

Synovial sarcoma is an intermediate to high grade malignancy which most often affects the extremities. The initial clinical course is indolent. Although radiographic features are not pathognomonic, a soft tissue mass - particularly if calcified - near but not within a joint of a young patient, is suggestive of the diagnosis. Two features associated with synovial sarcoma which may lead to an initial mistaken diagnosis of a benign, indolent process are its slow growth (average time to diagnosis 2 to 4 years) and relatively small size (< 5cm at initial size).[4]

Radiographs may appear normal or demonstrate a nonspecific round to oval juxta-articular soft tissue mass. Calcifications may be identified in up to 30% of cases, are of variable size and character, and are often eccentric or peripherally located within the mass[4]. The appearance of synovial sarcoma on CT is frequently a heterogeneous soft tissue mass with attenuation similar to or slightly lower than that of muscle.[4] The mass will not demonstrate mature peripheral ossification, as is typically seen with myositis ossificans.

MRI is the preferred imaging modality to evaluate the extent and characteristics of synovial sarcomas. The lesions appear as heterogeneous, multilobulated soft tissue masses with T1 signal intensity similar or slightly higher than that of muscle. The T2 signal is heterogeneous with varying amounts of low, intermediate, and high signal intensity. Post-contrast imaging typically demonstrates diffuse heterogeneous enhancement.[4]

Diagnosis

Myositis Ossificans

Summary

The differential diagnosis of a soft tissue mass with calcifications includes both benign and malignant etiologies which often have overlapping imaging characteristics. When present, however, a mineralization pattern of a peripheral rim of mature, lamellar bone with a non-ossified central component on CT is suggestive of myositis ossificans. The MRI appearance is less specific with a similar appearance to malignant lesions. Since myositis ossificans may mimic aggressive sarcomas on histological examination, biopsy should be deferred for follow-up imaging in cases where myositis ossificans is suspected. This case demonstrates the progression and appearance of myositis ossificans and its unique imaging characteristics that should be recognized in order to avoid biopsy and potential misdiagnosis. Careful follow-up is an essential part of establishing a definitive diagnosis and guiding clinical management.

References

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