An Approach to Muscular Masses

By Lucie Roy, MD; and Alessandra Bruns, MD, MSc

Muscle masses can take different forms and the differential diagnosis of these masses is wide-ranging. Described above are the cases of two men with asymptomatic muscular masses who have undergone a complete investigation, including ultrasound and MRI. These imaging modalities point to the diagnosis of lipoma, though no definitive diagnosis could be raised, because there is no histologic proof. The differential diagnosis of a muscular mass is varied and includes traumatic lesions, abscesses, and tumors. These tumors are usually benign; though malignancy is rare (Table 1), the occurrence of a malignant lesion should always be kept in mind when evaluating a mass, even if it occurs in the setting of a local trauma.

Clinical Forms of Lipoma
Lipomas are the most frequently occurring soft-tissue neoplasia, accounting for 50% of cases. They affect approximately 1% of the general population at any age, with an incidence peak between 40 and 60 years of age. They usually form as a unique lesion, but can present as multiple lesions in 5% of cases. The most common presentation is a mass of the subcutaneous tissue measuring less than 5 cm, but lipoma may affect virtually any organ in the body. Like the skeletal muscle, lipomas are almost always located in the trunk, the thigh, the shoulder or the arm. They form a well-defined mass, except when an infiltrative non-malignant form exists.

Table 1

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<tr>
<th>Tumor</th>
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<td>Lipomas</td>
<td>Benign soft tissue tumor; usually subcutaneous, may occur in or among muscles.</td>
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<td>Intramuscular cysts</td>
<td>Benign soft tissue tumor composed of liquid.</td>
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<td>Hemangioma</td>
<td>Benign soft tissue tumor; often forms within muscle, typically in the thigh.</td>
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<td>Liposarcoma</td>
<td>Soft tissue sarcoma, includes five subtypes. Not the result of malignant transformation of lipoma.</td>
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<td>Myxoma</td>
<td>Benign tumor composed of fibroblast and myxoid deposits.</td>
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<td>Desmoid</td>
<td>Aggressive soft tissue tumor of connective tissue; characterized by rapid growth and highly infiltrative.</td>
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<td>Rhabdomyosarcoma</td>
<td>Most frequent malignancy of the muscle; usually affecting children.</td>
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<td>Metastasis</td>
<td>Rare; usually painless. Most often from carcinoma of breast, lung, and/or colon.</td>
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Clinically, lipoma forms a painless soft mass that usually grows slowly, although rapidly growing masses with compressive symptoms have been described. These symptoms might be vascular, respiratory and/or neurologic. Indeed, several case reports describe lipoma of the proximal forearm with radial nerve compression.3 In a literature search on Pubmed, four cases of sternocleidomastoid lipoma,4 two cases of deltoid lipoma,5 and no cases of triceps lipoma were described.

**Imaging Modalities**

Although subcutaneous lipoma typically does not necessitate the use of an imaging modality, care must be taken in the case of a large lipoma (more than 5 cm) or in the presence of an irregular shape or with suspicion of myofascial involvement. Multiple radiologic modalities exist to help in the diagnosis of lipoma, with sonography, computed tomography, and MRI to rule out a malignant process. A rapid and accessible technique is ultrasonography. The most common ultrason findings are a well-defined ovoid-shape lesion inside the muscle with the typical striated appearance of a subcutaneous lipoma. Intermuscular lipomas are a less common variant than intramuscular occurrences. In the well-circumscribed intramuscular lipoma, fatty tissue (hyperechoic appearance) is clearly delineated from the surrounding muscle (Figures 2 and 5). However, because of the different subtypes of lipoma, the sonographic appearance, in particular the echogenicity, is variable.
Intramuscular lipomas are generally non-compressible and the Doppler effect is negative. Finding blood-flow signals in a lipoma-like mass with color and power Doppler imaging merits further investigation with contrast-enhanced MRI.

One study retrospectively evaluated the accuracy of sonography to distinguish soft-tissue lipomas from other masses by using a histologic proof as the standard. This study concluded that sonography has low precision for the diagnosis of muscular masses because of the highly variable sonographic appearance. MRI remains the most sensible imaging modality for lipomatous masses and has a high negative predictive value. The appearance of lipoma shows a fat signal intensity on all pulse sequences in MRI. It is useful to distinguish a benign lesion from one that is malignant, which would present with an enhancing septae, nonadipose area, and a high T2 signal within the lesion. Despite these findings, some studies reveal difficulties with predicting a well-differentiated liposarcoma from a benign lesion, with a tendency to falsely identify many masses as a more aggressive entity. A definitive diagnosis can be posed with a biopsy or a surgical excision. The histologic features reveal well-circumscribed masses of mature adipocyte cells surrounded by a thin fibrous capsule. Note that there are different histologic variations of lipoma-forming subclasses, including fibrolipoma, myxolipoma, and many others.

Conclusions
In summary, an ultrasound helps determine whether a mass is composed of fat or not, but is less useful for determining a lesion's degree of malignity. As the appearance of most soft-tissue lesions is sufficiently specific in MRI, it is likely that no further investigation will be necessary. If there is a doubt, a biopsy must be performed.

The usual treatment for lipoma involves surgical removal. Cosmetic concerns, compressive symptoms, functional limitation and concerns that the lipoma might actually be a malignant tumor are typical reasons for surgery. Some research also demonstrated positive results with steroid injection that allowed for the shrinking of the lipoma. The risk of local recurrence after removal is higher with an intramuscular lipoma (19%), compared to the recurrence rate of a subcutaneous lipoma (1% to 2%).

To conclude, despite the fact that lipomas are a frequent entity, a systematic approach must be adopted with muscular masses to avoid missing a malignant lesion. For the first case of intramuscular lipoma presented here, given the cosmetic impact for the patient, a surgical excision was suggested.

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