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Case report 840

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Journal

Skeletal Radiology, 23(4)

ISSN

0364-2348

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Publication Date

1994-05-01

DOI

10.1007/bf02412367

Peer reviewed

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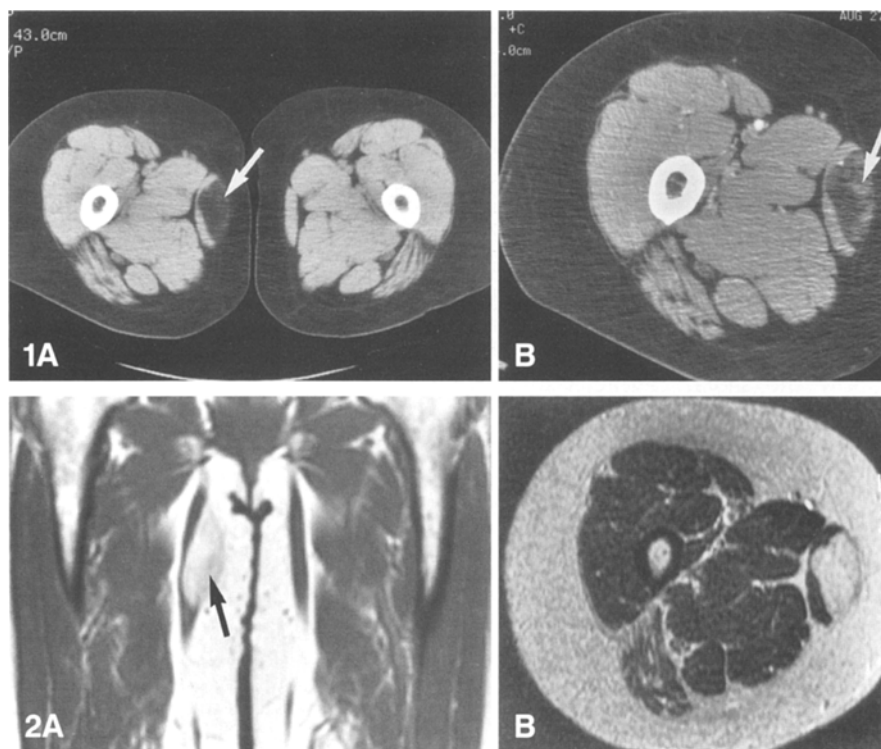
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Fig. 1. **A** Unenhanced computed tomographic (CT) scan. **B** CT scan following the intravenous administration of contrast medium. The lateral portion of the lesion demonstrates fat density both before and after contrast administration. The medial portion of the mass (*arrow*) is inhomogeneous and enhances with contrast

Fig. 2. **A** Coronal T1-weighted magnetic resonance (MR) image (SE 550/10). The lateral portion of the mass is isointense to subcutaneous fat. The inferomedial portion (*arrow*) is slightly lower in signal intensity. **B** Axial T2-weighted MR image (SE 2000/80). The lesion is nearly isointense to fat

Clinical information

A 44-year-old woman presented with a several-month history of a painless mass in the right thigh. Her past medical history was unremarkable,

and she denied previous trauma or surgery to the area. Physical examination was significant only for a soft, palpable 6 × 8 cm mass which was localized to the adductor region of the right thigh. The mass was nontender.

Imaging evaluation included unenhanced and enhanced computed tomography (CT) and magnetic resonance imaging (MRI). Unenhanced CT images demonstrated a well-circumscribed, low attenuation mass lesion within the right gracilis muscle (Fig. 1A). The mass was predominantly of fat density, but heterogeneous increased density was present within its medial portion. Following intravenous contrast administration, the medial component of the mass further increased in density and became nearly isodense to neighboring skeletal muscle (Fig. 1B). T1-weighted coronal MR images again showed the right gracilis intramuscular mass (Fig. 2A). The lateral portion of the lesion was isointense to subcutaneous fat, but the more medial portion was slightly lower in intensity. With T2-weighted imaging the mass was nearly isointense to subcutaneous fat (Fig. 2B).

Open biopsy, review of frozen section, and resection of the proximal gracilis with the mass lesion were performed.

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Diagnosis: Hibernoma of the right gracilis muscle

The differential diagnosis included low-grade liposarcoma versus benign atypical fatty tumor.

At surgery, an open biopsy revealed a hibernoma. Because the tumor had replaced most of the proximal gracilis, the muscle was resected from its origin to a point caudal to the tumor mass.

Grossly, the tumor was a well-circumscribed light yellow-brownish fatty mass that was adherent to skeletal muscle. The specimen weighed 58 g and measured 8.0 × 4.5 × 5.5 cm. Microscopically, the tumor was composed of a mixed population of fat cells. One population was characterized by multivacuolated eosinophilic cells with centrally placed nuclei. The vacuoles were filled with pigment granules, typical of brown fat. The second population was a group of univacuolated white fat cells with eccentrically placed nuclei whose vacuoles appeared empty, typical of white fat cells. Although not noted in the pathology report, variations in the vascularity and the relative proportion of brown versus white fat cells probably accounted for the inhomogeneous enhancement seen on the CT scan and the regional difference in signal intensity evident on the MRI.

The patient was doing well 6 months after surgery.

Discussion

Hibernoma is a rare, benign, lipomatous tumor that is composed of "brown" fat [1, 2] which is multiglobular and is considered an immature form of more typical "white" fat [4]. The tumor is named for its similarity to the brown glandular fat of hibernating animals, and is considered a remnant of a primitive fat storage organ [8]. Intermediate forms of hibernoma and lipoma such as this case are more common than pure hibernomas which are exceedingly rare.

The mean age at presentation for hibernoma is 26 years. There is a slight female sex predilection. The most common locations include the interscapular region, the thigh, the

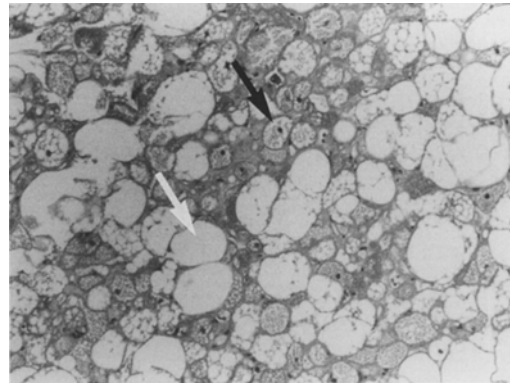


Fig. 3. Hibernoma showing a mixture of both brown fat cells (black arrow) and white fat cells (white arrow). (H&E, × 68)

axilla, and the chest wall [3]. Clinically, the tumor usually presents as a painless mass. Although the tumor is usually slow growing, rapid growth can occur [5].

While soft tissue lesions are easily defined with cross sectional imaging, tissue characterization is often difficult or impossible. This is especially true of primary soft tissue malignancy. Both CT and MRI can, however, show whether a tumor contains a significant amount of fat. Fat-containing lesions appear as low-density lesions on CT, with measurements usually of -30 HU and lower. With MRI, most benign fatty lesions will follow the signal characteristics of normal subcutaneous fat.

A simple lipoma may be diagnosed by its smooth contour, homogeneity, lack of septation, and absence of contrast enhancement. Differentiation of hibernoma, angioliipoma, and low-grade liposarcoma, however, is generally not possible. Angiography does not aid in this differentiation as all three lesions are hypervascular and may demonstrate irregular vessels with an intense vascular blush [6, 7]. Other uncommon benign lipomatous masses should also be considered, including spindle cell lipoma, pleomorphic lipoma, and benign lipoblastoma.

Ultimately, differentiation between low-grade malignancy and these uncommon benign lipomatous masses requires histologic evaluation. Hibernoma is diagnosed by the characteristic multivacuolated granular appearances of the cellular cytoplasm. An angioliipoma is composed of typical mature fat cells in conjunction with angiomatous elements. Liposarcoma contains neither multiva-

cuolated and/or granular cytoplasm nor angiomatous elements. Typically, open biopsy is performed to obtain a diagnosis, and surgical excision is the treatment of choice.

In *summary*, a 44-year-old woman presented with a several-month history of a painless mass in the medial part of the thigh. CT and MRI both demonstrated the lesion to contain a large component of fat, but the diagnosis of simple lipoma was excluded by the presence of focal inhomogeneity and contrast enhancement with CT. While malignancy should always be strongly considered in this setting, benign lipomatous neoplasms such as hibernoma and angioliipoma should also be considered. Biopsy is required for definitive diagnosis.

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