Those strange lipomas!

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Learning objectives

The aims of this study are to:

1. analyze some atypical magnetic resonance imaging (MRI) and ultrasound (US) findings of musculoskeletal lipomatous tumours;
2. assess simple lipomas within clinical situation.

Background

Lipomatous tumors are common findings in ultrasound and magnetic resonance imaging and constitute half of all soft-tissue tumors in surgical series.

Among these tumors, it can be difficult to distinguish simple lipomas from well-differentiated liposarcomas through imaging, because they have got imaging similarities, although histologically different. Usually, higher grade liposarcomas do not appear ambiguous in MRI because they typically contain little or no macroscopic fat\textsuperscript{1,2}.

In accordance with World Health Organization, the term "atypical lipoma" refers to subcutaneous extremity or trunk lesions which arise at surgically amenable locations. The term "well differentiated liposarcoma" is used for lesions in all remaining sites, but "well-differentiated liposarcoma" and "atypical lipoma" are pathologic synonyms, representing the lowest grade lesions in the spectrum of liposarcomas.

Unlike simple lipomas, well-differentiated liposarcomas are characterized by a higher rate of local recurrence (from 0% to 50% for superficial extremity lesions, from 43% to 69% for deep extremity lesions), and can dedifferentiate becoming higher grade tumors\textsuperscript{1,2}.

Because of this different behaviour, a different treatment is provided, well-differentiated liposarcomas requiring wider excision and long-term clinical follow-up. So there’s the need to distinguish these lesions preoperatively.

Besides, even a typical lipoma could lead to negative effects that must be recognized and pointed out by the radiological report, such as effect of compression on peripheral nerves.

Findings and procedure details

We selected and analyzed with US/contrast-enhanced US and MRI/contrast-enhanced MRI six unusual clinical cases from the archives of Operative Unit of Diagnostic
Radiology, C.T.O. Hospital, Turin: three lipoma-like well-differentiated liposarcomas, fat necrosis of a lipoma, an intratendineous lipomatosis, a posterior interosseous nerve syndrome caused by a supinator intramuscular lipoma.

LIPOMA-LIKE WELL-DIFFERENTIATED LIPOSARCOMAS: SUSPECT ELEMENTS

There are some clinical and imaging features helpful to identify well-differentiated liposarcomas:

- patient age (middle-age);
- large lesion size;
- thickened septa (> 2 mm);
- nodular and/or globular areas of non-adipose tissue within the lesion;
- associated non-adipose masses;
- prominent foci of high T2 signal;
- a total amount of non-adipose tissue composing more than 25% of the lesion;
- enhancement of septa.

But we should be aware that non-adipose areas may be present even within a simple lipoma (muscle fibers, blood vessels, calcification, fibrosis, myxoid change), and there are secondary inflammatory processes that can affect fatty components changing their normal aspect, such as fat necrosis, panniculitis, lipogranuloma formation (events that can occur in a well-differentiated liposarcoma, too).

Trying to simplify, we could use this rule: all intralesional components different from few thin and discrete septa and/or bands of muscle fibers (in intramuscular lipomas) raise suspicion for well-differentiated liposarcoma.

It’s important to distinguish these lesions preoperatively.

With these criteria, in a series of 126 consecutive grossly fatty masses, Gaskin et al reported that MRI was 100% sensitive and 83% specific for well-differentiated liposarcoma, 100% specific for simple lipomas, showing a poor positive predictive value (38%) for well-differentiated liposarcoma: anyway, 10 of 16 suspicious masses had alternative benign histology.

As a matter of fact, there’s a number of benign lipoma variants that may present nonspecific imaging features, such as chondroid lipoma, osteolipoma, hibernoma, angiolipoma, lipoleiomyoma, necrotic lipoma.

We want to apply the previously described criteria to three cases with MRI and ultrasonographic aspects that raise the diagnostic suspicion of malignancy. All cases underwent complete surgical excision, and histologic diagnosis was “well-differentiated lipoma-like liposarcoma”.

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These are mass-type (Figg. 1, 2, 3), painless and slowly grew lesions, located respectively deep, intramuscular, in the proximal third of the forearm (a), within the right gluteus minimus (b) and in the interfascial plane of the proximal third of the thigh (c).

In case (a), the lesion, approximately 2.5 cm in diameter, shows oval morphology and well-defined edges with net margins; the MRI signal is mostly fat, except for a central tick linear area, hyperintense in the high contrast sequence with fat suppression (STIR), which directs us to a lesion other than simple lipoma. In case (b), the patient complained of a swelling of the right buttock appeared about 5 months before; MRI highlights a formation within the gluteus minimus muscle, of about 13 cm, with adipose signal, some thick septa inside, and shaded areas of hyperintensity in STIR sequence at the level of the medial portion, where the margins appear slightly hazy and a concomitant enhancement both after intravenous administration of gadolinium and ultrasound contrast medium is observed.

In case (c), there is a voluminous mass (15 cm) in the interfascial plane, mainly with fat signal, that shows thick septa, nonadipose nodular areas and areas of hyperintensity in STIR sequences, with some nodules markedly hyperintense on T2-weighted sequences.

FAT NECROSIS OF A LIPOMA: NOT A SIMPLE DIAGNOSIS

Fat necrosis within large lipomas is described in literature, but rare. Because of its rarity, it's not well known that a lipoma with fat necrosis may show similar MRI findings to atypical lipomatous tumor.

The appearance of the fat necrosis may consist in globular areas of altered signal, hypointense on T1 and T2, with peripheral enhancement, hypointense stranding due to the presence of fibrous tissue and scarring in or adjacent to the area of fat necrosis, central fatty signal with a hypointense rim, or other nonspecific patterns that may vary from those described.

Some authors suggest incisional biopsy of lipomatous tumors which are indistinguishable in the imaging findings, and to take samples of not only adipose lesions, but also the thickened septa in order to reach the correct diagnosis, because of the risk of harvesting only mature adipose tissue in lipomatous regions.

We report a case of a 45 year old man with a mass in the soft tissues of the shoulder (Fig. 4), already diagnosed three years before as an intramuscular lipoma of the deltoid muscle (diameter 9 cm). The patient complained of pain and swelling from a month.

The MRI showed a globular hypointense area (1,5 cm) in the context of lipoma, with rim enhancement and surrounding thick enhancing septa.
Result of needle biopsy was "adipose and connective tissue". A magnetic resonance exam was repeated about four months later, and the globular area of signal alteration previously reported within the lipoma had disappeared, as well as the septa.

Surgical excision's been raccomanded, and the definitive histological diagnosis was that of a lipoma with fat necrosis foci.

We must keep in mind that fat necrosis can happen within both lipoma and liposarcoma.

In low-grade well-differentiated liposarcomas, both areas of dedifferentiation and fat necrosis can occur. For Kransdorf et al, a well defined nonlipomatous mass juxtaposed with a predominantly fatty tumor is suggestive of dedifferentiation, but it's not a rule.

**INTRATENDINEOUS LIPOMAS**

The appearance is that of hypoechoic well-defined masses within the tendon with loss of normal fibrillar structure. Obviously they don't have enhancement after intravenous administration of either gadolinium or ultrasound contrast medium. Intratendineous tumors are rare⁴. We present a case of multiple simple lipomas within the Achilles tendon (Fig. 5), studied through magnetic resonance and contrast-enhanced ultrasound. Diagnosis was confirmed histologically.

**POSTERIOR INTEROSSEOUS NERVE SYNDROME DUE TO A SUPINATOR MUSCLE LIPOMA: A RARE PARADIGMATIC CASE**

When we are sure about the simple lipomatous nature of a mass, we have to look for harmful effects that the mass can determine, despite of its benign histology. Compression effects belong to this category.

Posterior interosseous nerve (PIN) syndrome is a paralysis of the posterior interosseous nerve, that passes beneath the extensor carpi radialis brevis muscle and then continues between the superficial and deep layers of the supinator muscle. The PIN is vulnerable in this area⁵.

Usually PIN syndrome has neither pain nor other sensory symptoms, but there are cases of forearm pain and paralysis of the extensor muscles of the forearm⁵.

Rehabilitation is needed for rapid functional recovery of the upper extremity⁵.

We describe a rare case of compression neuropathy of PIN due to the presence of a 3 cm lipoma within the supinator muscle (Fig. 6), with MRI signs of neurogenic myopathy of extensor digitorum muscle (reduced volume of muscle and high signal in T2/STIR).
The patient was a 80 years old woman who presented with inability to extend the fingers of the hand gradually extending over 1 year.

Nerve compression must be early diagnosed because the recovery after surgery depends on the duration of symptoms.

For PIN syndrome, the longest reported duration of symptoms with full recovery postoperatively is 18 months\textsuperscript{5}.

Images for this section:
**Fig. 1:** LIPOMA-LIKE WELL-DIFFERENTIATED LIPOSARCROMAS: SUSPECT ELEMENTS - CASE A

It's just a lipoma! Isn't it? Axial TSE T2 (A), T1 (B) and STIR images of a forearm deep lipoma-like liposarcoma: central low signal area in T1 and T2, which is hyperintense in STIR, is very suspect.

**Fig. 2:** LIPOMA-LIKE WELL-DIFFERENTIATED LIPOSARCROMAS: SUSPECT ELEMENTS - CASE B

A 13 cm lipomatous tumor within gluteus minimus muscle shows some thick septa (TSE T1, B) and shaded areas of hyperintensity in STIR sequence (C) at the level of the medial portion, where the margins appear slightly hazy and a concomitant enhancement both after intravenous administration of gadolinium (A) and ultrasound contrast medium (D before contrast injection, E after contrast injection) is observed.
Fig. 3: LIPOMA-LIKE WELL-DIFFERENTIATED LIPOSARCOMAS: SUSPECT ELEMENTS - CASE C Thick TSE T1 hypointense septa (A) T2 bright nodules (B, black arrow) and hyperintense areas are observed in this well-differentiated liposarcoma.
**Fig. 4:** Simple lipoma or malignant fatty lesion? Axial TSE T1 (A, C) and STIR (B, D) images of fat necrosis whtin a big lipoma, at first exam (A, B) and after a 4-months (C, D) follow-up exam: suspect signal alteration inside the mass disappeared.
**Fig. 5:** INTRATENDINEOUS LIPOMAS Atypical locations of simple lipomas: sagittal TSE T1 MRI (A), and CEUS (B, C) appearance of intratendinous lipomas of the Achilles tendon, histologically confirmed

**Fig. 6:** POSTERIOR INTEROSSEOUS NERVE SYNDROME DUE TO A SUPINATOR MUSCLE LIPOMA: A RARE PARADIGMATIC CASE Sagittal TSE T2 (A), axial TSE T1 (B) and STIR (C) images of a supinator muscle lipoma; long TR-hyperintense and size-reduced extensor digitorum communis muscle (EDC, white arrow in C) is observed. The patient had posterior interosseous nerve compression.
Conclusion

MRI and US findings are essential to the management of lipomatous tumours; atypical aspects must be underlined in order to increase the suspect level towards malignancy or to explain a clinical problem.

Personal information

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