Not the usual liposarcoma... could it be a fatty benign tumor?

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Learning objectives

To describe the radiologic spectrum of musculoskeletal lipomatous tumors, with emphasis on the manifestations of the benign ones that may cause confusion with liposarcoma.
Background

Lipomatous tumors are the most frequently encountered masses in clinics and are also among the largest group of primary soft tissue tumors. According to the World Health Organization (WHO) Classification system for soft tissue tumors, benign adipocytic tumors include lipoma, lipomatosi, fibrolipomatous hamartoma of the nerve, lipoblastoma/lipoblastomatosis, angiolioma, myolipoma of soft tissue, chondroid lipoma, extra-renal angiomyolipoma, extra-adrenal myelolipoma, spindle cell / pleomorphic lipoma and hibernoma.

The majority of these tumors occur in adults, with the exception of lipoblastoma/ lipoblastomatosis. The diagnosis of typical lipoma is usually straightforward based on fat signal maintained throughout all imaging sequences or on the presence of fatty tissue on CT examinations. However, the radiologist should beware of the imaging features of other less frequent benign lipomatous tumors that would raise the suspicion for malignancy. These rare adipose tumors should be included in the differential diagnosis of lipomatous soft-tissue tumors.

For the musculoskeletal radiologist interpretation of an MRI examination of a soft tissue mass should include:

- Defining the shape and size of the tumor, best by three-plane measurements.
- Location of the lesion: compartment/muscles involved, relation to or involvement of superficial fascia.
- Describing local invasiveness, clear planes of separation or pseudocapsule. -Relationship with adjacent structures, muscle, neurovascular compartment and osseous tissues. Bone invasion or periosteal reaction.
- Description of the intrinsic appearance of the mass which may suggest the tumor type: determine whether its signal and contrast enhancement represents fat, necrosis, calcification or blood products. Any prominent feeding vessels should be mentioned on the report.

In some cases benign apparent lesions may finally be intermediate, locally aggressive adipocytic tumors or atypical lipomatous tumors (ALT). Their radiological appearance is very similar. In this review, we evaluated the imaging characteristics that may differentiate ALT from benign adipose tumors with an aim to help in the diagnosis of both tumor categories.
1. LIPOMA

Most common benign soft tissue tumor, representing 50% of masses in some tumor series. It estimated prevalence is 2% in adults and it is more common than liposarcoma in a ratio of 100/1. Lipomas consist of a cumulus of mature adipose cells, generally larger than normal adipocytes, delimited by a thin fibrous capsule. Clinically it usually presents as a single palpable soft nodule of elastic consistency, covered by normal, non-adhered skin. Usually lipomas grow slowly and are often asymptomatic, except for the presence of a palpable lump. In 10% of cases there may be multiple lipomas, especially in male patients. According to their location they are divided into superficial and deep lipomas. Superficial lipomas are usually located on neck, back, shoulder, proximal regions of the limbs and abdominal wall. They affect both sexes equally and their highest incidence is between the 5th and 7th decades of life. 80% of the lipomas do not exceed 5 cm in diameter. Deep lipomas These lipomas are located below the superficial fascia or in an inter- or intramuscular location. When they are large in size with an association of intra and intermuscular components receive the name of infiltrating lipoma They are much less common than superficial ones, and mainly affect males in the 4th to 6th decades of life. The most frequent locations are the large muscle groups of the lower limbs (45%), trunk, shoulder and upper limbs. In the mediastinum or retroperitoneum should suggest the possibility of well differentiated liposarcoma.

The radiological appearance of lipomas is characteristic and its diagnosis is usually straight forward:

Conventional Radiography (X-ray)

On X-ray lipomas may show the appearance of a soft-tissue mass with lower density than the muscle. (Fig. 1) In some rare occasions lipomas with a superficial location to bone may lead to compression and chondroid and osteoid mineralization.

Ultrasound examination (US)

US is very useful for the diagnosis of superficial lipomas. Their common appearance is a well defined mass with the major axis parallel to the skin, hyperechogenic and without posterior acoustic shadow. It may show heterogeneous echogenicity if the lipoma has fibrous septa or other non-lipomatous content. (Fig. 2)

Computed tomography (CT) and magnetic resonance (MRI)
Both imaging techniques have the greater accuracy in the characterization of adipose tissue and therefore in the diagnosis of deep lipomas. Their appearance is an homogeneous lipomatous mass that does not enhance after contrast injection, except for the thin capsule surrounding the lesion, sometimes with some inner septa. At CT, the lesion shows attenuation values between -65 and -120 UH. (Fig. 3)

In MRI the lesion is isointense to fat in both T1 and T2, suppressing its signal in STIR or with other fat suppression techniques. 37-49% of lipomas show few fine septa, of less than 2 mm. (Fig. 4) Atypical appearance of lipoma is an heterogeneous mass of predominantly fatty content, together with areas of fat necrosis, fibrous septa or nodular areas of other non-lipomatous mesenchymal components. (Fig.5) These characteristics on imaging techniques are similar to those described on well differentiated liposarcoma and, in these cases, biopsy should be performed, preferably in non-adipose foci.

Ohguri defines five types of adipose masses according to the appearance of non adipose components on MRI imaging:

- Type I, non adipose components unrecognizable
- Type II, only thin septa (<2 mm) with low signal intensity
- Type III, one or two thick septa (>2 mm) with low signal intensity
- Type IV, three or more thick septa detectable
- Type V, nodular or patchy non adipose component detectable

Lipomas usually fall in categories I and II while most of the liposarcomas fall in category IV. Distinction of soft tissue nodules from entrapped muscle fibers, blood vessels and areas of necrosis or inflammation is sometimes difficult on MRI. There may also be areas of calcification in the interior, although this is a more frequent finding in well differentiated liposarcomas/ALTs. In the subcutaneous and intermuscular lipomas a fibrous capsule can be seen with similar density to the muscle and variable enhancement after injection of contrast. (Fig. 6) On the other hand, in intramuscular lipomas a visible capsule is not commonly identified so their appearance is more frequently of fingertips inserted between the muscle fibers, giving the muscle a striated appearance in the sagittal plane. This radiological manifestation is consistent with intramuscular lipoma and allows to discard the diagnosis of liposarcoma. (Fig. 7) After treatment of deep lipomas there is an estimated rate of local recurrence of 5%. The infiltrative ones are very difficult to remove completely. Superficial lipomas usually do not require treatment, except by aesthetic purpose.

**KEY POINTS**

- It is the most common benign tumor of soft tissues
• Maximum incidence between 5th-7th decades
• Involvement of adjacent bone is rare
• 10% have mineralization
• Fat signal intensity in all MRI sequences
• Presence of thin septa in almost half of the cases

2. LIPOMATOSIS

Diffuse, infiltrating overgrowth of mature adipose tissue affecting subcutaneous adipose tissue and muscle. In Madelung’s disease it is more common a multiple and symmetrical form of lipomatosis. Histologically it takes the form of multiples subcutaneous unencapsulated fatty deposits characteristically affecting neck, shoulders, trunk and proximal limbs. More frequently it affects males with a maximum incidence between 20-60 years. Etiology of lipomatosis is unknown, though there is association with chronic alcoholism and metabolic disorders such as hyperuricemia, hyperlipidemia and diabetes. Clinically most of the patients consult for cosmetic reasons and less frequently for problems of cervical mobility.

CT and MRI show infiltrating subcutaneous masses of adipose tissue with fat attenuation values in CT and high signal intensity both on T1-weighted and T2-weighted sequences on MRI examination. (Fig. 8)

3. LIPOBLASTOMA/LIPOBLASTOMATOSIS

Lipoblastoma (70%) is an adipose tumor composed of immature fat cells mixed with mature fat defining lobes separated by connective tissue septa and myxoid matrix areas. Externally is delimited by a capsule. Very rarely presents over age 20 years (usually presents under age 3).

Lipoblastomatosis (30%) is the diffuse variant of lipoblastoma. It is a non-encapsulated and infiltrative mass, usually deep and locally recurrent (9-25%), but with no metastatic potential. It has histological characteristics similar to lipoblastoma, except for a less lobular pattern and the presence of muscle fibers in relation to its infiltrating nature. It usually has a superficial location, infiltrating subcutaneous tissue and underlying muscles.

In children under 3 years, the myxoid component predominates with only small elements of fat tissue, giving the lesion an indistinguishable aspect of myxoid liposarcoma (although this appearance is exceptional in patients younger than 10
years). In older children there is predominance of the mature adipose tissue giving it a lipoma-like appearance.

Both types are more frequent in male patients and it usually affects the extremities. Other less frequent locations are the chest wall, neck, retroperitoneum, mesentery, and mediastinum.

Radiologically lipoblastoma is shown as a well-defined lobulated mass with a heterogeneous and septated internal appearance

- In the US the fat content is hyperechogenic, while the myxoid matrix is hypoechoic. (Fig. 9)
- In CT both the fat and the myxoid matrix are hypodense, although the attenuation values in UH are different and can be differentiated. (fig. 10)
- In MRI adipose tissue has high signal at T1 and T2-weighted imaging with suppression of its signal in STIR while the myxoid matrix is hypointense on T1 and hyperintense in fat suppression and T2 sequences, due to its water content. (Fig. 11)
- Both on CT and MRI, the myxoid matrix and the fibrovascular septa, enhance contrast injection.

**KEY POINTS**

- **Children under 10 years (more in males)**
- **Preferential location in extremities**
- **Lobed mass, well defined and septate with myxoid/fat content**
- **Fibrovascular septa which enhance with contrast**
- **The myxoid portion has low signal intensity on T1-weighted and high signal on T2-weighted sequences**
- **The fat content has the same signal intensity to that of the subcutaneous fat**

4. FIBROLIPOMATOUS HAMARTOMA OF THE NERVE

Formerly known as intraneural lipoma, fibrolipomatous hamartoma is a rare tumor of unknown etiology, secondary to infiltration of the nerve or its branches by fibroadipose tissue, which surrounds and separates the nervous fascicles, infiltrating epineurium and perineurium and causing the affected nerve to increase in volume in a diffuse form.
Clinically it is a slow, but progressively growing mass of the wrist, hand and forearm. It can cause pain or specific neurological symptoms, such as carpal tunnel syndrome.

The upper extremity is the most frequently affected (78-96%), especially the median nerve (85%). It can also affect the radial, ulnar and peroneal nerves.

In 27-67% of the cases it is associated with macrodactyly. Decompression of the median nerve in patients with carpal tunnel syndrome may improve symptomatology. In cases with severe deformity it can be treated with amputation.

Its radiological appearance is almost pathognomonic: diffusely enlarged nerve with fascicles surrounded by the fatty tissue ("coaxial cable" or "spaghetti-like" appearance). (Fig. 12)

**KEY POINTS**

- **Affects the median nerve in 85% of cases**
- **In many cases it is associated with macrodactyly, Usually 2nd or 3rd finger**
- **Increased volume nerve with tubular longitudinal structures, iso or hypointense on T2-weighted and surrounded by fat component.**

5. ANGIOLIPOMA

Angiolipomas are painful and slow growing masses, usually of small size (less than 2 cm) but in some occasions can reach a great volume. They commonly appear in young adults and affect the upper limbs and trunk. In 70% of the cases are multiple. Histologically angiolipomas are composed of mature fat with numerous capillaries. Fibrin thrombi are almost always present within the vessels. Due to their characteristic superficial location and small size they are rarely studied with diagnostic imaging techniques.

Radiological appearance it is determined by the presence of adipose tissue on US, CT and MRI, with vascularization that shows an important enhancement after administration of contrast. (Fig. 13)

Since they do not have malignant potential, the surgical indication is decided according to the symptomatology. Excision is curative and has no tendency to recur.

**KEY POINTS**
• Predilection for trunk and upper limbs

• 70% of the cases are multiple

• Generally smaller than 2 cm.

• MRI fat-like signal, with interposed vascular structures

6. MYOLIPOMA

Myolipoma is a rarely reported benign tumor composed of a mixture of mature adipose tissue and smooth muscle tissue. Muscle generally predominates in a 1:2 ratio. It manifests in adults (age 28-73). More frequent in the abdomen, retroperitoneum and inguinal region.

Most of the lesions are large with an average size of 10-25 cm, except those of subcutaneous location, due to their earlier detection. Myolipomas are completely or at least partially encapsulated lesions.

Its CT and MRI appearance is heterogeneous, with a prominent lipomatous component and poorly defined areas of smooth muscle tissue, hypodense on CT scan and of non-specific MRI features (isointense in T1 and iso/hyperintense in T2). In larger lesions, coarse calcifications may occur. The findings are indistinguishable from a well-differentiated liposarcoma. (Fig. 14)

Its treatment is surgical without significant rates of recurrences, malignant transformation or distant metastases.

KEY POINTS

• More common in adults

• Preferred location on trunk, retroperitoneum and inguinal region

• Large size, except on subcutaneous localization

• Larger ones may have coarse calcifications

• Both on CT and MRI are difficult to distinguish from low-grade liposarcoma

7. PLEOMORPHIC/SPINDLE CELL LIPOMA
Frequent histologic overlap of these two fatty tumors. Spindle cell lipoma is a neoplasm of mature fat containing atypical cells, restricted in location to the dermis or subcutis of the posterior neck, upper back or shoulders (if located in other sites, it is considered to be atypical lipomatous tumor). Pleomorphic lipoma contains abundant fibrous stroma and bundles of collagen with fat free.

Both types are well defined, subcutaneous lesions of slow growth, generally asymptomatic, with a size that varies between 2-29 cm (most are comprised between 3-5 cm). Special preference for the male (approximately 90% of the patients) aged 45-65 years.

Non-adipose components are similar to muscle on CT and MRI, which are isointense to muscle on T1 and iso-hyperintense in T2 with respect to fat, showing an intense enhancement after contrast injection, reflecting pseudoangiomatous component. Although these signs may suggest a well differentiated liposarcoma, its characteristic location as well as the marked enhancement foci are more suggestive of these entities.

Its treatment is surgical, being the local recurrence rare. It does not metastasize.

**KEY POINTS**

- **Maximum incidence between 45 and 65 years**
- **90% in male patients**
- **Well delimited subcutaneous tumor**
- **Variable size, most between 3-5 cm.**
- **Location of posterior portion of neck, shoulders and back**

### 8. CHONDROID LIPOMA

It is a rare benign lipomatous tumor. It presents as a subcutaneous mass or a deep, painful and slow growing tumor. Age 14-75 years, median 36 and affects women more than 4:1.

The most common site is the waist and proximal aspect of the limb, although other areas may be affected.

Histologically, it is formed by lipoblasts and mature adipocytes within a poorly vascularized myxoid and chondroid matrix.
It usually appears as a well defined mass with predominant areas of fluid density, in US, CT and MRI, reflecting the myxoid matrix and areas of fatty tissue both centrally and peripherally, usually with calcifications, which are best evaluated by X-ray or CT. (Fig. 16)

The differential diagnosis includes myxoid liposarcoma and extraskeletal myxoid chondrosarcoma.

Resection is curative without relapse. No malignant transformation or distant metastasis has been reported.

**KEY POINTS**

- **Well-defined tumor more frequently located in trunk and proximal limbs**
- **Generally with calcifications**
- **Presents dominant areas of fluid density/intensity which alternate with fine bands of fatty tissue**
- **On MRI is isointense to skeletal muscle on T1-weighted and iso/hyperintense on T2-weighted sequences with intense enhancement after gadolinium injection**

9. **HIBERNOMA**

It is a very rare tumor described in 1906 by Merkel with the name of pseudolipoma. Derivative of embryonic brown fat, it is denominated hibernoma by the resemblance with the brown fat of the hibernating animals. This type of fat seems to participate in processes of fetal thermoregulation and progressively decreases after birth, remaining in small quantity at the interscapular, axillary and inguinal areas. These are the most frequent locations.

Its presentation is more frequent in the 3rd, 4th and 5th decades, with a slight predominance in women.

Generally it is a flexible, subcutaneous mass of slow and generally painful growth, warm to the touch by its important vascularization.

In the histological study it is a soft encapsulated lesion of lobulated aspect, with a yellowish/brown color. Microscopically it has numerous small cytoplasmic vacuoles combined with a pale to intensely eosinophilic granular cytoplasm. Normal fat cells may be admixed and in 7% of the cases there is predominantly mature fat.
There have been described four histological variants, including the typical one, the myxoid type, the spindle cell and finally a lipoma-like variant.

On X-ray the appearance is a radiolucent mass concordant with a lipomatous tumor, without calcifications or alterations of underlying bone.

On US typically presents as a hyperechogenic lesion, with vascularization with Doppler. (Fig. 17)

On CT scanning, hibernomas are hipodense, similar to fat with septa and focal areas of higher density, which enhancement after contrast injection.

On MRI, despite their fat content, T1-weighted shows some low signal intensity material, making these lesions heterogeneous, with a predominance of hyperintensity in T2. Contrast enhancement is also noted on MRI and high flow vessels are almost always present in these masses. (Fig. 18)

Differential diagnosis is with well differentiated liposarcoma (WDL does not have those high flow vessels).

**KEY POINTS**

- More frequent in the 3rd, 4th and 5th decades
- No calcification or bone abnormalities
- It is a painful and sometimes hot palpable mass.
- US: hyperechogenic and vascularized (Doppler)
- MRI: Hypointense with respect to the subcutaneous fat on T1-weighted sequences, heterogeneous on T2WI and has enhancement with gadolinium sometimes combined with flow void

10. ATYPICAL LIPOMATOUS TUMOR (WELL DIFFERENTIATED LIPOSARCOMA)

There is some controversy about the nomenclature. Both lesions are histologically and genetically identical. There are differences in behavior and resectability; in the retroperitoneum, mediastinum, and spermatic cord local recurrence is common and obtaining a tumor-free margin is almost impossible for the surgeon. An histologically identical tumor in the limbs is usually resected without significant rate of recurrence. In deep locations some times recurrences are uncontrollable. In the absence of dedifferentiation these tumors do not metastasize but some WDL may dedifferentiate and then metastasize. For these reasons some authors prefer the term atypical..
lipomatous tumor (ALT) for deep lesions and well differentiated liposarcoma (WDL) for superficial lesions.

These are neoplasms of mature fat exhibiting at least focal cytological atypia occurring at sites other than the subcutis of posterior neck, back and shoulders (in these locations fatty tumors with atypia are called pleomorphic lipoma.

WDL is the most frequent liposarcoma, representing 40-50% of cases.

It is a tumor of intermediate malignancy, with tendency to relapse, which does not metastasize, although with potential of dedifferentiation, transforming into dedifferentiated liposarcoma (DLS) in a rate ranging from 1% to 4%.

These tumors almost exclusively appear in adults with a similar incidence in both sexes. They are preferentially located in the lower extremities (50%), retroperitoneum (25%), upper extremities (14%), trunk and mediastinum, being rare in the distal portions of the limbs (wrist / hand and ankle / foot).

Its clinical presentation is insidious and the most frequent manifestation is that of a slowly growing mass that is sometimes painful. In the retroperitoneum, there may be abdominal symptoms.

Histologically WDL are well circumscribed tumors of multilobular appearance, composed microscopically by mature adipocytes and other atypical cells with large, hyperchromatic nuclei of irregular morphology. There are four histological subtypes: lipoma, sclerosing, inflammatory and spindle-like subtypes, which often coexist in the same tumor, mainly in retroperitoneal liposarcomas.

On X-ray, depending on the size and location, a mass of low density can be noticed, which calcifications in 20%, and normally it is not accompanied by alterations of the adjacent bone. (Fig. 19)

On US it appears as a well defined mass, multilobulated and with heterogeneous internal echogenicity, with septa and hyperechogenic foci corresponding to the adipose tissue.

On CT, it is shown as a well delimited mass with fat attenuation values in more than 75% of the lesion and higher density nodular or globular foci corresponding to the non-fat nodules that enhance with intravenous contrast.

On MRI, the fat content of the lesion is isointense to fat in all sequences, , with alternating fine and gross septa (> 2 mm) (Fig. 20) and non-adipose foci which are hypointense in T1-weighted sequences and of variable signal intensity in T2, with contrast enhancement in the non-fat component. This late finding helps differentiate them from lipoma or variants of lipoma. (Fig. 21). Treatment of ALT/WDL consists of resection with sufficiently wide free of tumor margins.
KEY POINTS

• It is the most frequent of the liposarcomas (40-50%)
• Does not recur or metastasize
• Tendency to dedifferentiation (1-4%)
• Lower limb preference (50%)
• Presence of calcifications (20%)
• Well delimited mass with abundant adipose content and non-adipose foci that enhance with gadolinium on MRI
**Fig. 1:** Conventional radiography (AP view) of the thigh. Low density mass representing intramuscular lipoma.

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**Fig. 2:** From left to right, ultrasound sagittal view, MRI T1-weighted and fat suppression sequences. Hyperechoic fusiform lesion on US, with signal similar to that of the fat on T1-weighted and fat suppression sequences. Some thin septa are noticed inside the lesion on MRI examination. Lipoma

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Fig. 3: Axial reconstruction of an unenhanced CT examination of the proximal thigh. A large mass of predominantly fat density is noticed with some inner thin septa. Lipoma

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**Fig. 4:** MRI of typical lipoma. Sagittal view, T1 and T2 weighted sequences. Intramuscular lipoma showing signal similar to that of the subcutaneous fat in all sequences. Some thin septa noticed inside the lesion.

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Fig. 5: T2-weighted MR of lipomas with septa, foci of fat necrosis and fibrosis (arrow).

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Fig. 6: T1-weighted sagittal and coronal views of MRI examination of intramuscular lipoma with a capsule delineated by a thin low signal intensity line and sharp delimitation from the muscle (arrow).

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**Fig. 7:** T2- weighted sagittal and T1-weighted axial MRI examination of intramuscular lipoma affecting the soleus muscle, which presents the typical striated appearance.

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Fig. 8: T2-weighted MRI examination in axial and coronal views with extensive neck lipomatosis extending to supraclavicular fossa: Madelung's disease.

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Fig. 9: Ultrasound examination, sagittal view of lipoblastoma. 6 year-old patient with palpable lump on right shoulder. A predominantly hyperechoic solid mass is noticed with avascular characteristics on Doppler examination.

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Fig. 10: Unenhanced axial CT examination of a 5 year-old patient with lipoblastoma. Predominantly fatty mass in the posterior compartment of the right arm.

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**Fig. 11:** MRI characteristics of lipoblastoma. Same patient of figure 9. MRI examination with axial T1-weighted, coronal STIR and sagittal T2-weighted sequences. Myxoid component showing high signal intensity on T2-WI and STIR sequences and hypointense on T1WI. Central areas of adipose tissue noticed as focal hyperintensity on T1WI.

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Fig. 12: 11 year-old male patient with fibrolipomatous hamartoma of the median nerve showing characteristic "spaghetti-like" appearance in T1-weighted coronal and sagittal sections (upper half) and "coaxial cable-like" appearance in axial slices (lower half) on both T1- and T2-weighted images.

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Fig. 13: Coronal and axial T1-weighted image shows a subcutaneous well-defined fatty mass with multiple small low-signal-intensity linear areas in the central aspect. Dorsal angiolipoma

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**Fig. 14:** MRI of thigh with small myolipoma of the quadriceps compartment. Signal heterogeneity reflects the presence of adipose and muscular tissue.

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**Fig. 15:** MRI of pleomorphic lipoma. Complex fatty mass which may initially suggest the possibility of well-differentiated liposarcoma, although the characteristic location makes this lesion more suggestive of spindle cell lipoma or pleomorphic lipoma.

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Fig. 16: Chondroid lipoma appearing as a giant well-defined mass of the posterior aspect of the thigh with prominent fatty tissue on CT and chondroid calcifications.

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**Fig. 17:** Ultrasound characteristics of hibernoma of the right thigh. A well defined echogenic lesion with visible high flow vessels on Doppler examination.

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Fig. 18: T2-weighted MRI of small hibernoma of deltoid muscle, with a thin delimitation capsule (arrow) and low signal intensity nodules in its interior.

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Fig. 19: Atypical lipoma. X-ray with radiolucent mass and T2-weighted MR in which low-signal nodules and multiple septa are noticed within a predominantly adipose mass.

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**Fig. 20:** MRI with axial T1-weighted, coronal T2 and STIR sequences of a well differentiated liposarcoma with multiple non-adipose component nodules and multiple septa, some of them thick (< 2 cm)

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Fig. 21: Well differentiated liposarcoma: Thigh X-ray with a posteriorly located radiolucent mass. MRI with a predominantly fatty mass with non-adipose nodules of low signal in T1-weighted and intermediate signal in T2-weighted sequences.

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Findings and procedure details

We retrospectively reviewed the clinical, radiological and pathological records of all patients treated at our institution (a tertiary referral hospital) for soft tissue lipomatous benign and intermediate, low-grade, locally aggressive tumors (ALT/WDL). Pathological diagnoses included lipoma, fibrolipomatous hamartoma of the nerve, lipoblastoma/lipoblastomatosis, angiolipoma, myolipoma, chondroid lipoma, pleomorphic/spindle cell lipoma, hibernoma and ALT/WDL. All patients had CT and/or MRI prior to biopsy and surgery. The MRI protocol included T1-weighted, T2-weighted, fat-suppressed/fluid-sensitive sequences and T1-weighted images after injection of contrast agent (Gadolinium) with and without fat suppression.
Conclusion

A multidisciplinary approach involving oncologists, surgeons, pathologists, radiotherapists and radiologist is needed for the management of these tumors. Distinction by the musculoskeletal radiologist between benign adipose lesions and well-differentiated liposarcoma/atypical lipoma lypoma is essential as there are significant differences in their treatment and prognosis.

The radiologist reporting soft tissue masses should be aware of the differential characteristics of this heterogeneous group of soft tissue tumors and the frequent overlapping of the imaging features on MRI and CT of benign, malign and locally aggressive fat containing masses. This distinction is primordial as wide local excision is advocated for the treatment of WDL/atypical while benign lipomatous tumors are often successfully treated by local or marginal excision.

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