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Clinics in Diagnostic Imaging (87)

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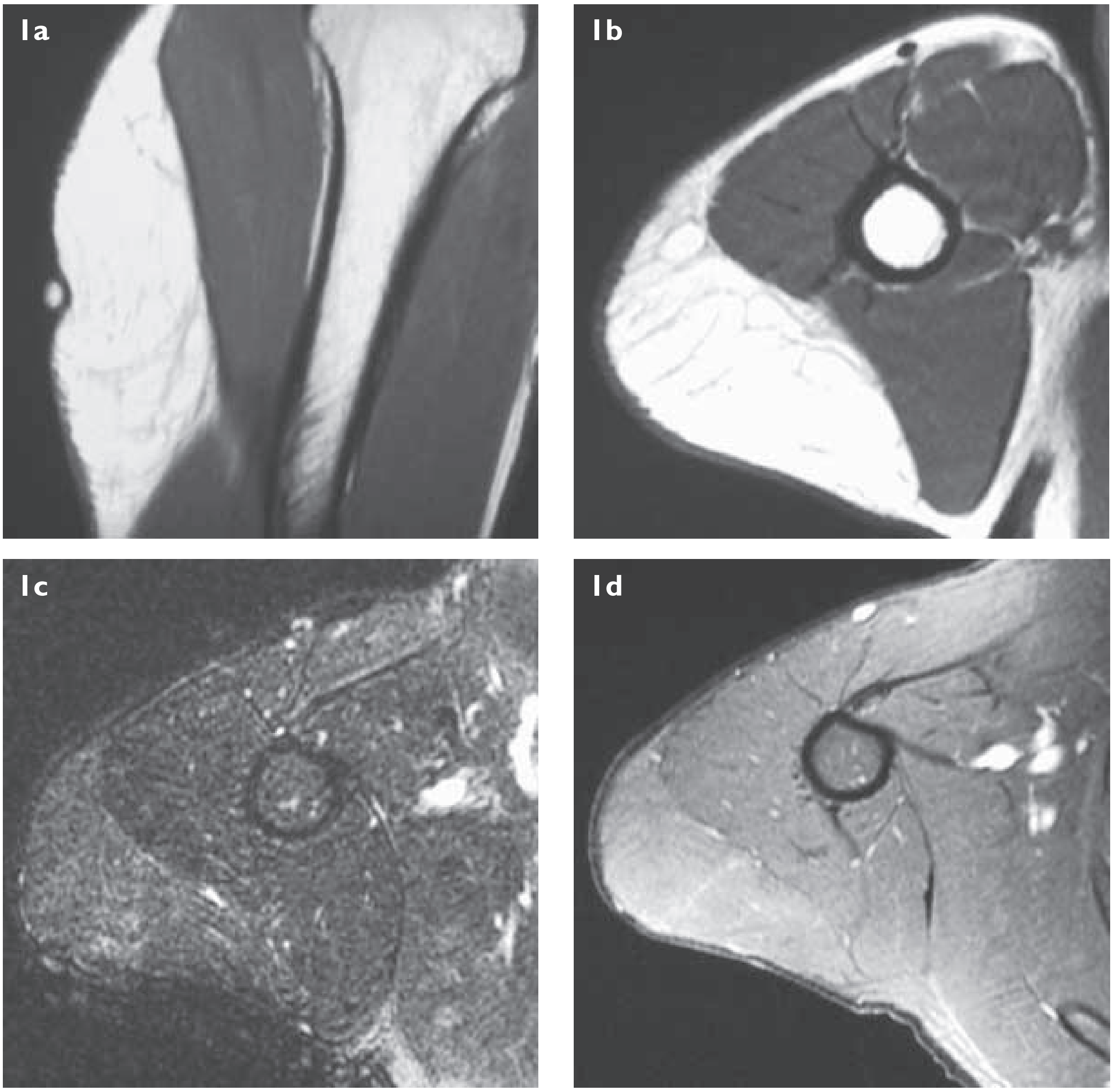

Fig. 1a-d (a) Coronal SE T1-W MR image of the right shoulder. Axial (b) SE T1- W, (c) fat-suppressed fast SE T2-W and (d) enhanced fat-suppressed SE T1-W MR images of the right shoulder. A surface marker is present.

CASE PRESENTATION

A 40-year-old man has had a painless soft mass over the right shoulder for several years. He presented complaining that the mass had been increasing in size over the past one year. There was no recent injury or other medical history of note. On examination, a soft mass measuring about 8 cm in diameter was palpable over the right deltoid area. It was non-tender and the overlying skin was normal. The shoulder joint had full range of motion. Radiographs were normal, with no calcification or underlying bone lesion. Magnetic resonance (MR) imaging was performed (Figs. 1a-d). What do these show? What is the diagnosis?

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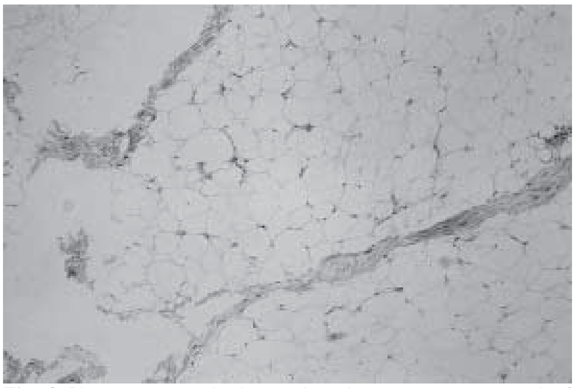


Fig. 2 Photomicrograph shows that the mass is composed of mature adipose cells with no evidence of malignancy, confirming the diagnosis of a simple lipoma. (Haematoxylin & eosin stain) [Courtesy of Dr Tony WH Shek, Department of Pathology, The University of Hong Kong.]

IMAGE INTERPRETATION

The spin-echo (SE) T1-weighted MR images showed a lobulated hyperintense mass overlying the posterolateral deltoid muscle (Figs. 1a-b). The lesion measured 7.0 cm (transverse) by 3.4 cm (anteroposterior) by 10.3 cm (craniocaudal) in dimension. It was located wholly within the subcutaneous plane and had hypointense thin internal septae. The mass was homogeneously hypointense on both fat-suppressed fast SE T2-weighted (Fig. 1c) and enhanced fat-suppressed SE T1-weighted (Fig. 1d) images. The mass had signal characteristics identical to those of normal fat found in the subcutaneous layer and bone marrow, and in fact blended in with the adjacent subcutaneous fat. The surface marker helped localise the site of the palpable mass. The underlying deltoid and long head of triceps muscles were normal, and the bone marrow and adjacent neurovascular bundles were uninvolved.

DIAGNOSIS

Subcutaneous lipoma.

CLINICAL COURSE

The patient was anxious about the mass, and was keen on its removal. The mass was excised and the diagnosis of a simple lipoma was confirmed on histopathological examination (Fig. 2). The patient made an uneventful recovery.

DISCUSSION

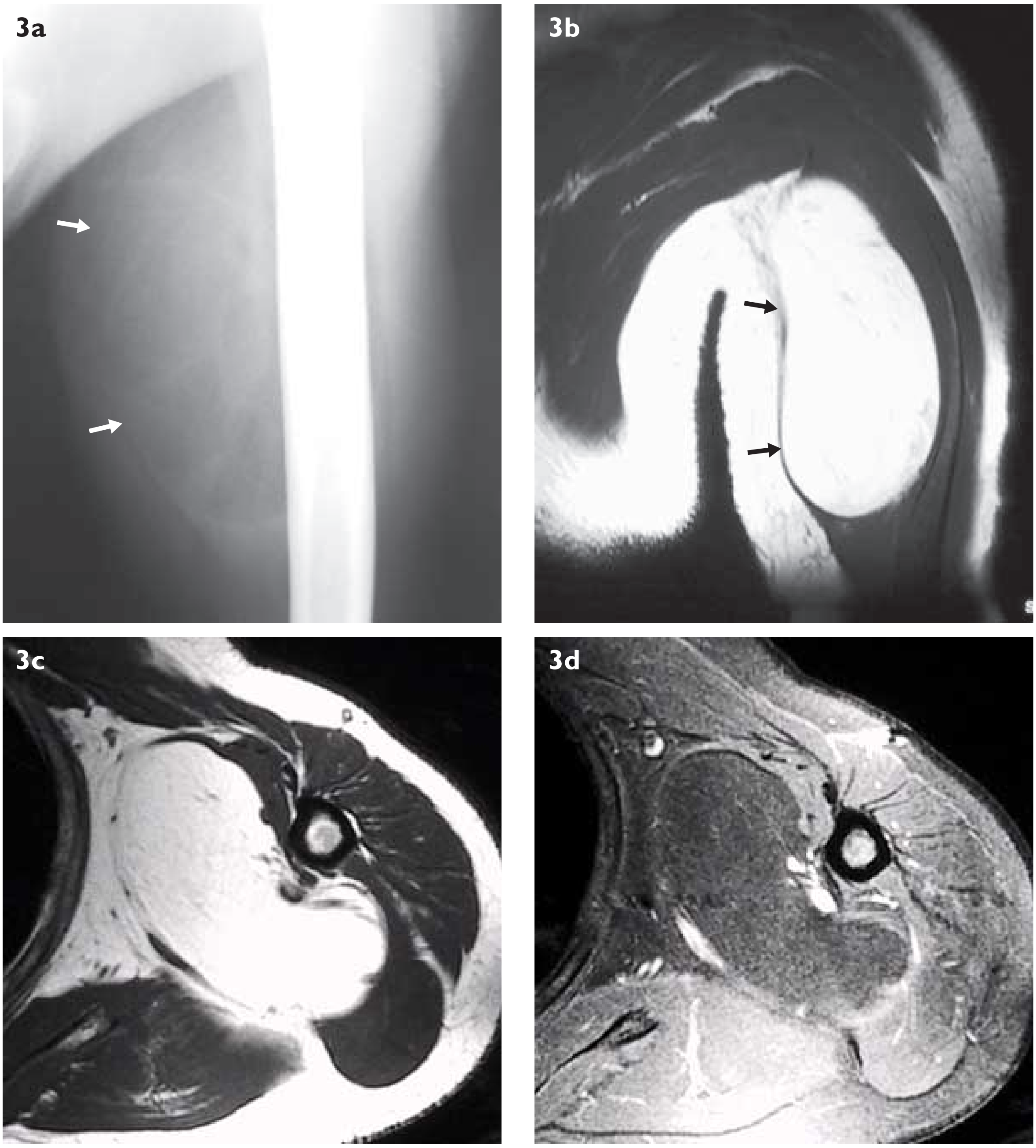
Lipomas are benign soft tissue tumours composed of mature adipose tissue. They are the most common soft tissue tumours of mesenchymal origin. They may occur at any age but are most often seen in middle-aged patients[1]. The exact aetiology of lipomas is unknown. Lipomas have been reported to appear following trauma but it is uncertain if the trauma is causative or the discovery of the lesion is incidental[2]. Lipomas may develop with weight gain in an individual, and tend to stabilise in size after an initial period of growth[3].

Lipomas may be classified by their location into superficial and deep lesions. Superficial lipomas occur in the subcutaneous tissue while deep lipomas arise in the subfascial tissue or within muscle. Superficial lipomas are commonly found in the posterior trunk, neck and proximal extremities. Occasionally, they may occur in the hands, lower limbs and feet[4]. Clinically, superficial lipomas are nodular and lobulated, with a rubbery consistency. They are not attached to the overlying skin. Eighty percent of lipomas are less than 5 cm in size. Intramuscular lipomas are rare in comparison with superficial lipomas. They are often small, well-defined, solitary masses identical to superficial lipomas but occasionally, they may have infiltrative margins[5]. Intramuscular lipomas often occur in the lower extremities.

Histologically, lipomas are composed of mature adipose cells. However, they are biochemically different from normal fatty tissue due to the presence of a large number of precursor cells and high levels of lipoprotein lipase[6]. Lipomas are often discrete lesions with a fibrous capsule surrounding the lesion. Fibrous septa may be present, dividing the lesion into smaller lobules. Some lipomas are infiltrative, and these lesions often contain immature fat cells.

A small number of patients may have multiple lipomas[7]. The number of lipomas that occur in these patients may vary from several to several hundred. This entity is known as familial multiple lipomatosis and typically presents during or soon after adolescence. A family history for multiple lipomas is usually present. The mode of inheritance is autosomal dominant. This entity predominantly occurs in males. There are no detectable metabolic or lipid metabolism abnormalities present in this entity. Multiple lipomas do not show the chromosomal alterations seen in solitary lipomas[8]. Rarely, lipomas have been associated with congenital bone anomalies such as osseous overgrowth or malformations.

The objectives of radiological assessment of suspected soft tissue tumours are to confirm the presence of the lesion, assess the surgical stage of the lesion and if possible, establish a diagnosis or differential diagnoses. The main modalities used in the radiological assessment of soft tissue tumours include ultrasound (US), computed tomography (CT) and MR imaging. The role of radiographs is limited in the evaluation of lipomas. Occasionally, the lesion may be identified as a low density soft tissue mass, consistent with fatty tissue (Fig. 3a). Lipomas located



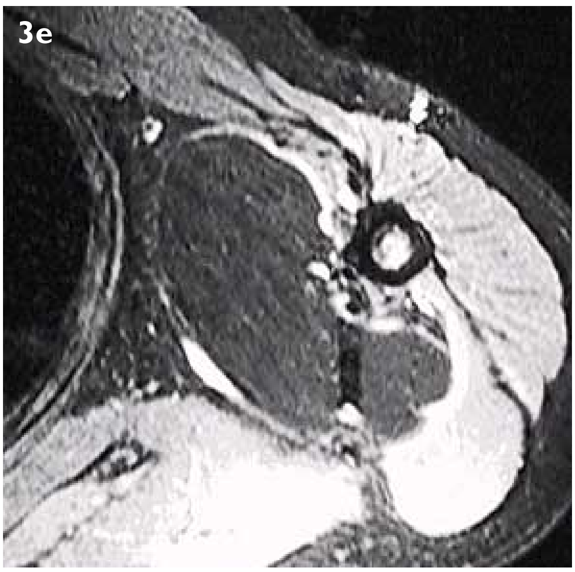


Fig. 3a-e Imaging appearances of an intramuscular lipoma in a 65-year-old woman. (a) Anteroposterior radiograph of the left humerus shows an oval area of low-density (arrows) in the soft tissues. (b) Coronal SE T1-W MR image shows a well-defined hyperintense mass (arrows) within the biceps muscle. (c) Axial SE T1-W MR image shows the mass to be mainly situated within the biceps muscle. It also extends posteriorly to involve the triceps muscle and into the axillary fossa. (d) Enhanced axial fat-suppressed SE T1-W and (E) axial fat-suppressed fast SE T2-W MR images show the lesion has a homogeneous hypointense signal. The relation of the lipoma to the adjacent vascular structures are well demonstrated. Note that the signal intensity of the mass is identical to that of the subcutaneous fat on all MR sequences.

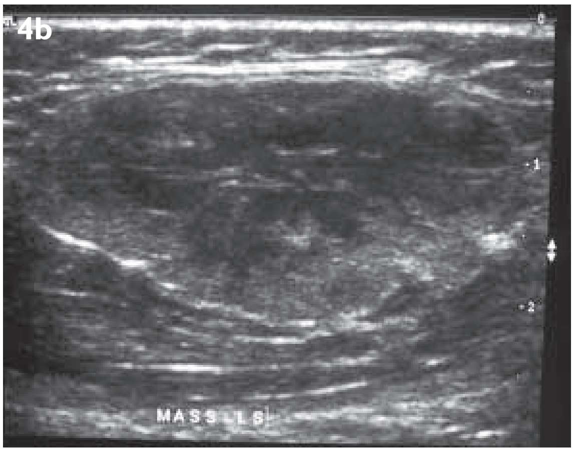


Fig. 4a-b US appearances of superficial and deep lipomas in two different patients. (a) Seven-year-old boy presenting with a soft tissue mass in the left lower chest. US scan shows a well-defined subcutaneous hyperechoic lesion (between cursors). Histological examination of the excised specimen confirmed the diagnosis of a lipoma. (b) Eight-year-old boy presenting with a soft tissue mass at the right deltoid muscle. US scan shows a well-defined, lobulated intramuscular mass. The echogenicity of the lesion is almost equivalent to that of muscle. Diagnosis of intramuscular lipoma was confirmed at surgery.

Fig. 5 CT appearances of lipoma in a two-year-old girl presenting with a soft tissue lump in the right inguinal region. Enhanced axial CT scan shows a fatty mass (arrows) that blends with the subcutaneous tissue. Diagnosis of lipoma was confirmed at surgery.

close to the bone may cause hyperostosis or bony erosions[9]. Cartilage and even bone formation may occasionally be seen within a lipoma, particularly if it is long-standing.

US is used as a first-line screening tool due to its ready availability and non-invasiveness. It is used to confirm the presence of a soft tissue lesion as well as to evaluate its size and extent. Lipomas usually appear as encapsulated, well-circumscribed lesions on US. Occasionally, a distinct echogenic capsule may be identified. When the margins of the tumour blends into the surrounding subcutaneous tissues, the margins appear less distinct on US. The echogenicity of lipomas on US may vary but most lesions are iso- or hyperechoic[10] to muscle (Fig. 4a-b). The fibrous stroma dividing the lesion into several lobules can be identified on US[11]. Lipomas usually do not demonstrate any Doppler signal. US is also useful in guiding needle biopsy of lesions[12].

On CT, lipomas generally appear as well-defined, homogeneous lesions (Fig. 5). Septations within the lesion may be seen on CT as linear areas with higher attenuation than that of fat[13]. The fibrous capsule surrounding a lipoma has similar CT attenuation to that of muscle. Lipomas have a Hounsfield unit measurement of between -65 to -120[14]. Intramuscular lipomas may have infiltrative margins and are seen as ill-defined areas of homogeneous fat density replacing individual muscle or infiltrating between the muscle bundles. Lipomas do not show contrast enhancement[15].

MR imaging is the most useful modality in determining the extent and depth of lipomas due to its ability to scan in orthogonal planes and superior contrast resolution compared to other modalities. On MR imaging, the signal intensity of the lipomas is equivalent to subcutaneous fat on SE T1-weighted and SE T2-weighted pulse sequences and short tau inversion recovery (STIR) sequences (Figs. 1 & 3). Thus, an encapsulated lipoma is seen as a well-defined mass with high signal intensity on T1-weighted images and low or intermediate signal on SE T2-weighted or STIR sequences. Occasionally, haemorrhage or fluid can be demonstrated on T1- and T2-weighted MR studies. Intra- and intermuscular lipomas are well identified and delineated on MR images as predominantly fatty lesions within or in-between the adjacent skeletal muscles (Fig. 3). The specificity of MR imaging in diagnosis of lipomas using T1-weighted sequences alone is 77%. Using combined T1- and T2-weighted or STIR sequences increases the specificity to 88%[16]. Lipomas do not enhance after intravenous administration of Gadolinium-DTPA. Fat-suppression imaging is a useful adjunct as its application decreases or eliminates the MR signal of fat, confirming the diagnosis of lipoma (Figs. 1 & 3).

Lipomas are not removed unless there is a concern for cosmesis, compression of surrounding structures due to its size, or if the diagnosis is uncertain despite imaging. An alternative to standard excision is to manually squeeze the lipoma through a small incision created with a scapel. This can be done on areas with thin skin such as the face or extremities[17]. Differential diagnoses of soft tissue tumours containing fatty tissue include liposarcoma in adults and lipoblastoma in children[18,19]. A lipoma of uniformly low density may be differentiated from the heterogeneously- denser liposarcoma on CT[20]. On MR imaging, a well-differentiated liposarcoma may demonstrate increased vascularity in the dividing septa within the lesion[21]. It may also show the presence of linear or nodular foci of hyperintense areas dividing the lesion into smaller lobules on T2-weighted or STIR sequences, and the visualisation of thick septa or nodules on T1-weighted images with non-fatty signal within the tumour. Similarly, in a child under three months of age, MR images showing a predominantly fatty but inhomogeneous soft-tissue mass are suggestive of lipoblastoma[22].

ABSTRACT

A 40-year-old man presented with recent increase in size of a painless long-standing soft mass over the right shoulder. Magnetic resonance (MR) imaging showed a lobulated mass located within the subcutaneous layer overlying the deltoid muscle. It was homogeneously T1- hyperintense, T2-hyperintense, and non-enhancing. Signal characteristics were those of a simple lipoma. The diagnosis was confirmed on histopathological examination of the excised specimen. Musculo-skeletal lipomas are discussed, with emphasis on their characteristic appearances on various imaging modalities, and illustrated by additional examples.

Keywords: lipoma, computed tomography, magnetic resonance imaging, soft tissue mass, ultrasonography.

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