RadioGraphics

Superficial Soft-Tissue Masses: Analysis, Diagnosis, and Differential Considerations[1]

TEACHING POINTS
See last page

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A wide variety of superficial soft-tissue masses may be seen in clinical practice, but a systematic approach can help achieve a definitive diagnosis or limit a differential diagnosis. Superficial soft-tissue masses can generally be categorized as mesenchymal tumors, skin appendage lesions, metastatic tumors, other tumors and tumorlike lesions, or inflammatory lesions. With regard to their imaging features, these masses may be further divided into lesions that arise in association with the epidermis or dermis (cutaneous lesions), lesions that arise within the substance of the subcutaneous adipose tissue, or lesions that arise in intimate association with the fascia overlying the muscle. The differential diagnosis may be limited further by considering the age of the patient, anatomic location of the lesion, salient imaging features, and clinical manifestations.

Introduction

Superficial soft-tissue masses are common in clinical practice, and the expanding availability of radiologic imaging has increased radiologists' familiarity with these entities. In the case of some masses, such as superficial lipomas, the imaging characteristics usually enable a definitive diagnosis. However, the imaging features of many other superficial soft-tissue lesions may be disappointingly nonspecific, and the possible diagnostic considerations initially may seem extensive. In such cases, the use of a systematic approach can help narrow the differential diagnosis.

Superficial soft-tissue masses may be classified in one of the following general diagnostic categories: mesenchymal tumors, skin appendage lesions, metastatic tumors,
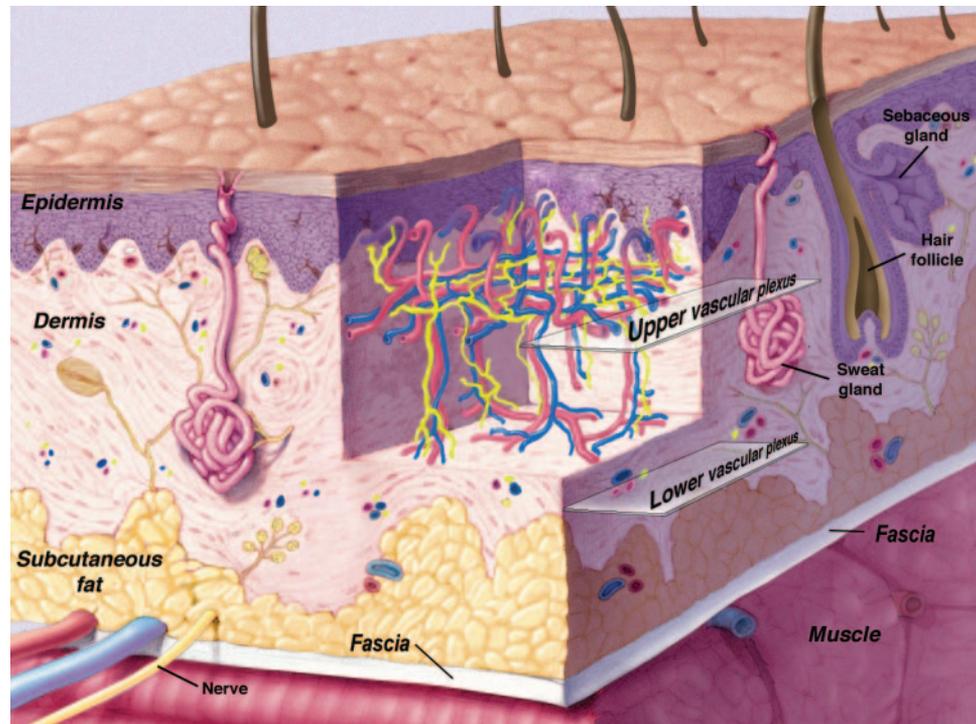
Figure 1.   Diagram shows the superficial soft-tissue layers.

other tumors and tumorlike lesions, and inflammatory lesions. Although these categories comprise a plethora of possible diagnoses, an orderly list of differential considerations may be constructed by considering the patient's age, the anatomic site of the mass, and the specific location of the mass within the superficial tissue.

For purposes of analysis, it is most useful to consider two patient age groups: *(a)* adults and *(b)* children and adolescents. The dividing line between these groups is not rigidly defined, but we have arbitrarily designated those in the first 2 decades of life as children and adolescents. Anatomic location is also best considered in general categories such as the extremity, trunk, or head and neck. However, certain lesions show a striking predilection for a more specific anatomic location, as is true of epithelioid sarcoma, which usually occurs in the hand and wrist. Epithelioid sarcoma is rare, accounting for just over 1% of all sarcomas, but more than 40% of epithelioid sarcomas occur in the hand and wrist. Finally, the location of a lesion within the superficial tissue is best described as cutaneous (epidermis and dermis); subcutaneous (eg, adipose tissue); or fascial,

overlying the muscle or deep tissue (Fig 1). After a differential diagnosis is established on the basis of the patient's age and the location of the lesion (anatomic site and specific location within the superficial tissue), it may be further limited and ordered, or a specific diagnosis may be made, by considering that information in combination with the imaging characteristics.

The article is based on our experience with superficial soft-tissue masses. It is not intended as a comprehensive review but, rather, as an overview, with emphases on lesions that are more common or relatively more common and on diagnoses that may be suggested by MR imaging features.

Mesenchymal Tumors

The category of mesenchymal tumors is described in Table 1. The most common mesenchymal superficial malignancy is dermatofibrosarcoma protuberans, which arises from the dermis and therefore is considered a cutaneous lesion. Dermatofibrosarcoma protuberans accounts for about 6% of all soft-tissue sarcomas. The lesions usually are manifested at MR imaging as unmineralized nodular masses with nonspecific signal intensity and moderate enhancement (Fig 2) (1). Other benign and malignant mesenchymal tumors may arise in association with the cutaneous tissue, but

Table 1
Mesenchymal Tumors

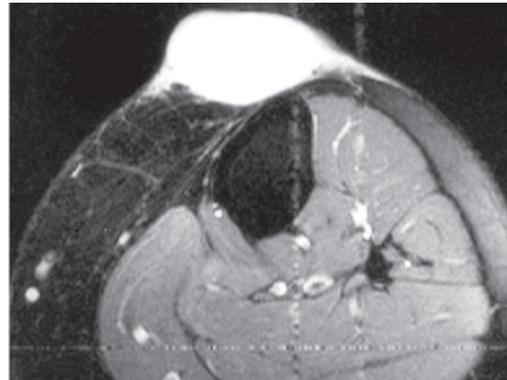| Diagnosis	Classification	Patient Age	Comments
Dermatofibrosarcoma protuberans	Cutaneous	Adults (peak, 20–40 years)	Protuberant mass with skin involvement; a fascial tail may be seen at imaging
Lipoma	Subcutaneous	Adults	Signal intensity mirrors that of fat
Angiomas (hemangioma, lymphangioma, mixed)	Subcutaneous	All ages	Signal intensity is intermediate to high on images obtained with fluid-sensitive MR pulse sequences
Peripheral nerve sheath tumor (schwannoma, neurofibroma)	Cutaneous, subcutaneous	Adults	Neurofibroma is usually associated with *NF1*; malignant peripheral nerve sheath tumor is rare
Malignant fibrous histiocytoma	Subcutaneous	Adults	Most common soft-tissue sarcoma, usually deep; 7%–10% of lesions are subcutaneous
Liposarcoma	Cutaneous (rare), subcutaneous	Adults	Extremities, retroperitoneum; most lesions contain some amount of fat
Leiomyosarcoma	Subcutaneous	Adults	Nonspecific vascular mass; may be associated with superficial veins
Epithelioid sarcoma	Subcutaneous	Adults (peak, 20–40 years)	Occurs on fingers, hands, forearms; imaging features are nonspecific
Nodular fasciitis	Fascial	Adults (peak, 20–40 years)	Fascial tail may be seen at imaging
Fibromatosis	Fascial	Adults	Signal intensity is low to intermediate

Figure 2. Exophytic dermatofibrosarcoma protuberans in the lower thigh of a 45-year-old man. **(a)** Axial unenhanced CT image shows a large mass with ulceration at the skin surface (arrowheads). **(b)** Axial short inversion time inversion recovery (4000/20/150) MR image shows extension of the protuberant mass along the skin layers and into the cutaneous and subcutaneous fat. **(c)** Photograph of a gross specimen cross section shows the mass with linear extension along the skin layers (arrows), features identical to those seen at imaging. Scale is in centimeters.

a.

b.

c.

their occurrence is unusual. Although the MR imaging signal intensity of dermatofibrosarcoma protuberans typically is nonspecific, areas of hemorrhage may be seen within the tumor. In our experience, linear extension along the skin surface also may be seen and is suggestive of the diagnosis (Fig 2b).

Most mesenchymal masses arise within the subcutaneous adipose tissue. Lipomas are by far the most frequently encountered subcutaneous masses. Eighty percent of lipomas occur in adults, and they are easily diagnosed on the basis of MR imaging findings, including a signal intensity that is characteristic of fat on MR images acquired with any pulse sequence, as well as a lack of enhancement after the administration of intravenous contrast material (Fig 3).

Angiomatous lesions also are common. Hemangiomas are the most common type of angiomatous lesions, but mixed hemangiolymphangiomas and pure lymphangiomas also may be seen. These lesions produce a wide spectrum of clinical manifestations and may occur in patients of all ages. Classic large-vessel (cavernous) hemangiomas have the generally characteristic imaging appearance of infiltrative lesions in which serpentine vessels interdigitate with fibroadipose tissue. Small-vessel hemangiomas may have a more nonspecific appearance, and the diagnosis may be suggested more by their clinical manifestations (Fig 4).

Peripheral nerve sheath tumors are another common type of mesenchymal tumor. Typically, an entering and exiting nerve cannot be identified in superficial lesions; however, the typical fusiform shape, signal intensity, and enhancement pattern often are present. Classic peripheral nerve sheath tumors have a signal that is isointense to that of skeletal muscle on T1-weighted MR images and hyperintense to that of skeletal muscle on T2-weighted images, with variable degrees of inhomogeneity and enhancement (Fig 5) (2).

The most common subcutaneous malignant soft-tissue tumor is the superficial variant of malignant fibrous histiocytoma. Malignant fibrous histiocytoma is the most common mesenchymal malignancy and accounts for approximately 24% of all soft-tissue sarcomas (3), with about 7%–10% of occurrences being confined to the subcutis, and there is typically no fascial involvement (4,5). The superficial form of malignant fibrous histiocytoma is histologically identical to the pleomorphic form; however, as a result of its superficial location, it has a benign clinical course. Therefore, to distinguish it more clearly from the deep, more biologically aggressive forms, superfi-

Teaching Point

Figure 3. Superficial (subcutaneous) lipoma in a 51-year-old man with a large posterior neck mass. Sagittal T1-weighted (620/17) spin-echo (SE) MR image shows a well-marginated lipomatous mass (*) in the subcutaneous fat. The signal intensity of the lesion on all MR images was identical to that of fat.

cial malignant fibrous histiocytoma has been termed atypical fibroxanthoma (6). Hemorrhage is not uncommon in such lesions and is usually well depicted on MR images.

Other superficial sarcomatous lesions include liposarcoma, leiomyosarcoma, and epithelioid sarcoma. Liposarcoma is the second most common soft-tissue sarcoma, accounting for 16%–18% of all malignant soft-tissue tumors. The lesions usually are located in the extremities, particularly the thigh, and in the retroperitoneum in adults 40–59 years old. Superficial liposarcoma is relatively uncommon, but when a superficial fatty lesion does not meet the imaging criteria for the diagnosis of lipoma, a lipoma variant should be considered as a diagnostic possibility, as should liposarcoma. The appearance of liposarcoma at CT and MR imaging typically correlates with the degree of tumor differentiation; tumors that are more differentiated contain more fat and less soft tissue (3).

Leiomyosarcoma accounts for about 5%–10% of soft-tissue sarcomas (6). The lesions are highly vascular, occur most often in mature adults, and have a propensity to recur and metastasize. They are often intimately associated with vessels. At ultrasonography (US), they appear as circumscribed echogenic masses, with marked internal vascularity seen on Doppler US images. MR imaging features usually are not specific (Fig 6).
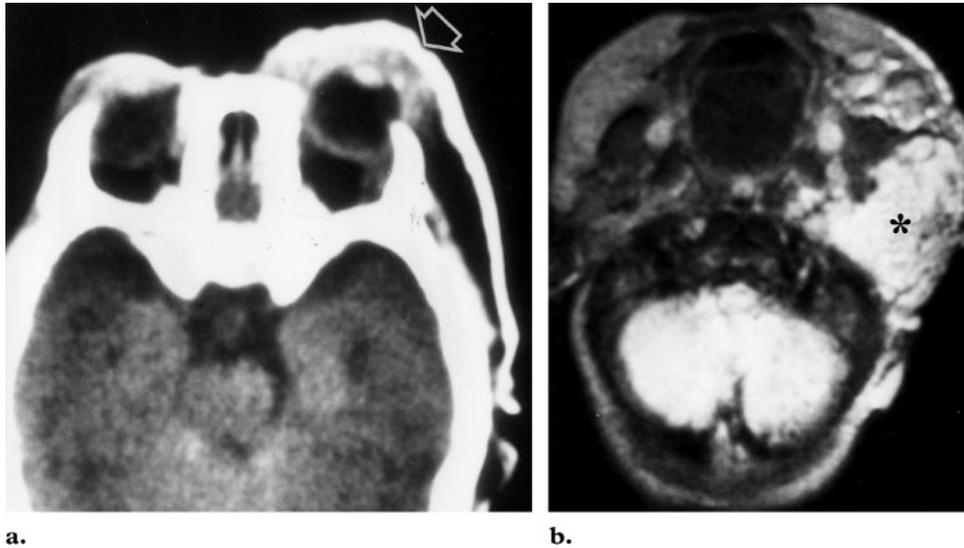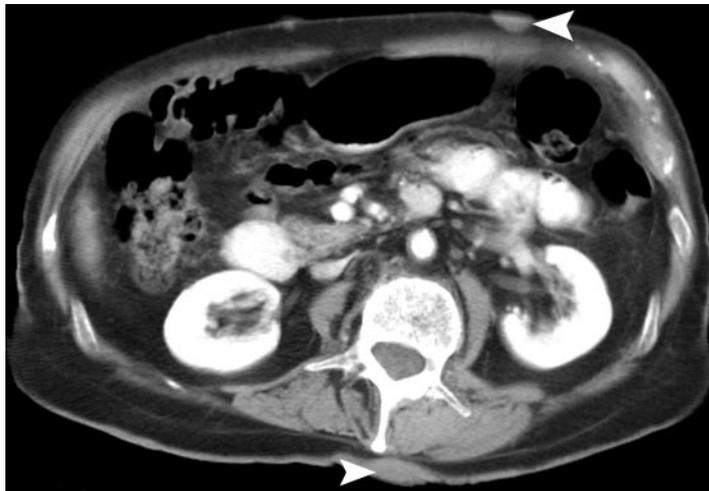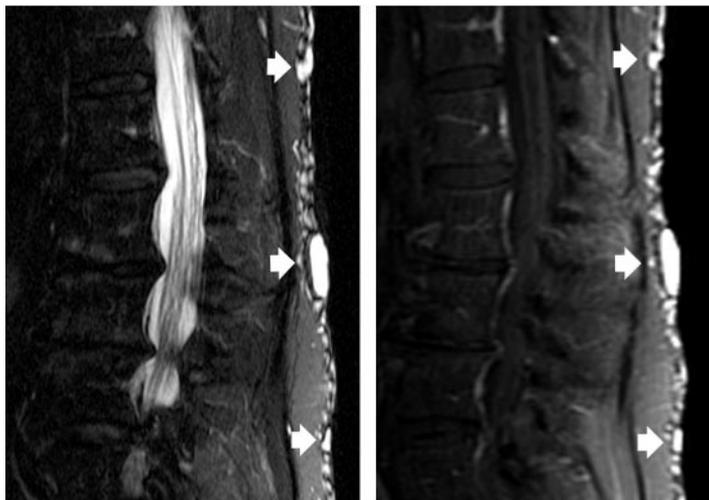
Figure 4. Juvenile capillary hemangioma (strawberry nevus) in a 2-month-old girl. **(a)** Axial unenhanced CT image shows infiltration of the skin and orbit (arrow). **(b)** Axial T2-weighted (2000/80) SE MR image depicts a mass (∗) that has infiltrated the subcutaneous and deeper soft tissues. The signal intensity of the lesion at T2-weighted imaging was nonspecific.

Figure 5. Multifocal cutaneous neurofibromas in a 78-year-old man with type 1 neurofibromatosis. **(a)** Axial CT image of the abdomen, obtained with oral and intravenous contrast material, shows multifocal isoattenuating soft-tissue masses (arrowheads) indicative of neurofibromas. **(b, c)** Sagittal T2-weighted turbo SE (4000/102) MR image **(b)** and sagittal gadolinium-enhanced fat-suppressed T1-weighted SE (650/16) MR image **(c)** show hyperintense signal in the enhanced cutaneous masses (arrows).
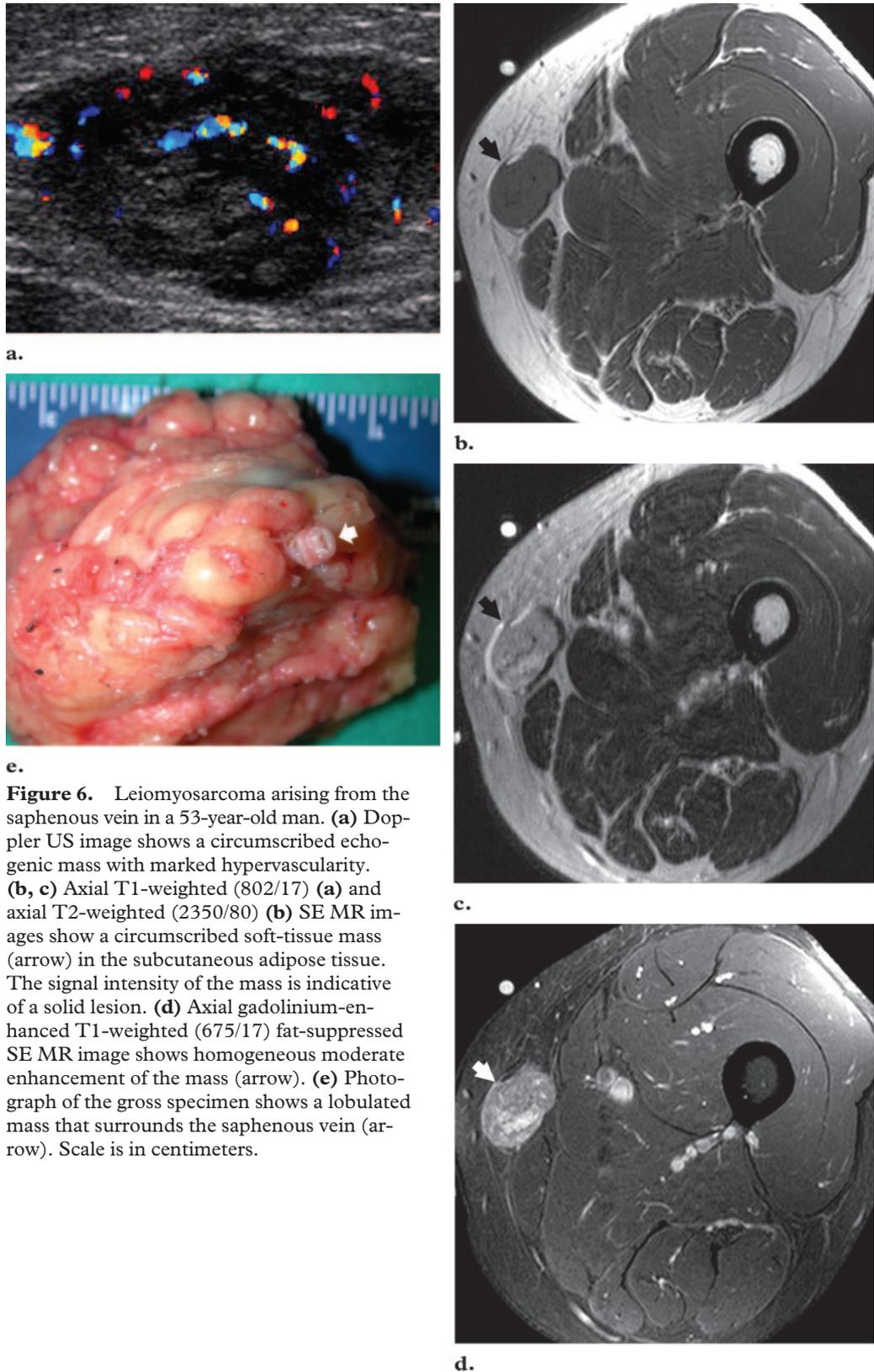
a.

e.

Figure 6.   Leiomyosarcoma arising from the saphenous vein in a 53-year-old man. **(a)** Doppler US image shows a circumscribed echogenic mass with marked hypervascularity. **(b, c)** Axial T1-weighted (802/17) **(a)** and axial T2-weighted (2350/80) **(b)** SE MR images show a circumscribed soft-tissue mass (arrow) in the subcutaneous adipose tissue. The signal intensity of the mass is indicative of a solid lesion. **(d)** Axial gadolinium-enhanced T1-weighted (675/17) fat-suppressed SE MR image shows homogeneous moderate enhancement of the mass (arrow). **(e)** Photograph of the gross specimen shows a lobulated mass that surrounds the saphenous vein (arrow). Scale is in centimeters.
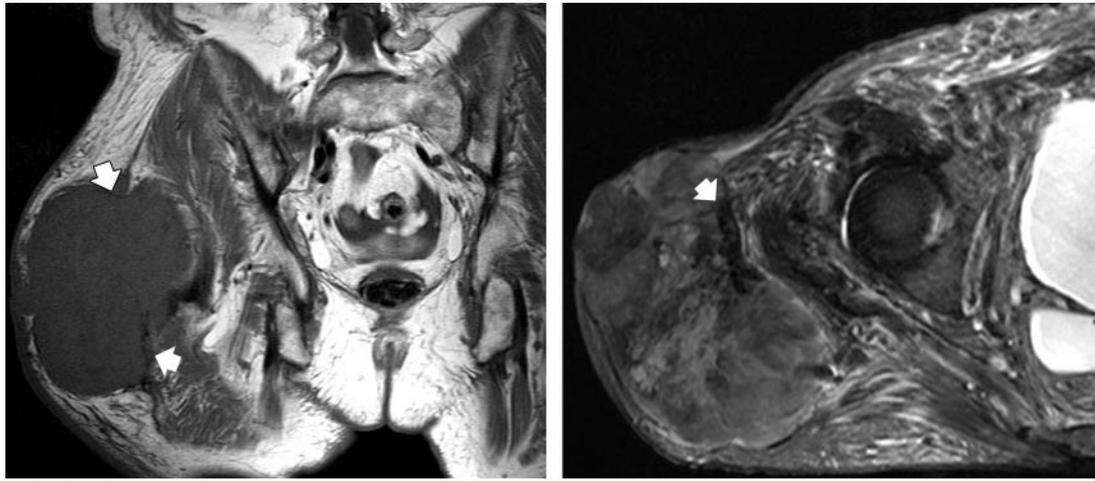

b.

c.

d.

Figure 7. Superficial malignant fibrous histiocytoma in the upper thigh of a 78-year-old man. **(a)** Coronal T1-weighted (700/13) SE MR image shows a large hypointense mass (arrows) that has arisen in the subcutaneous tissue and has invaded and penetrated the tensor fascia lata. **(b)** Axial T2-weighted (2540/80) SE MR image shows heterogeneously hypointense signal in the mass, as well as abnormal thickening of the tensor fascia lata (arrow).
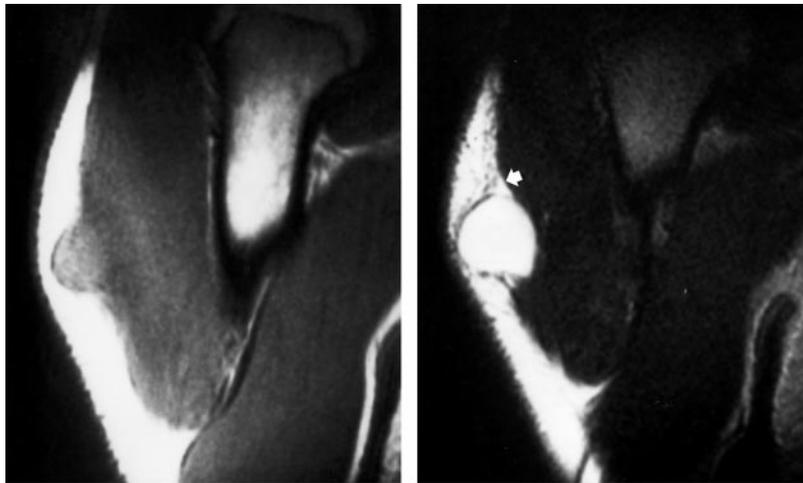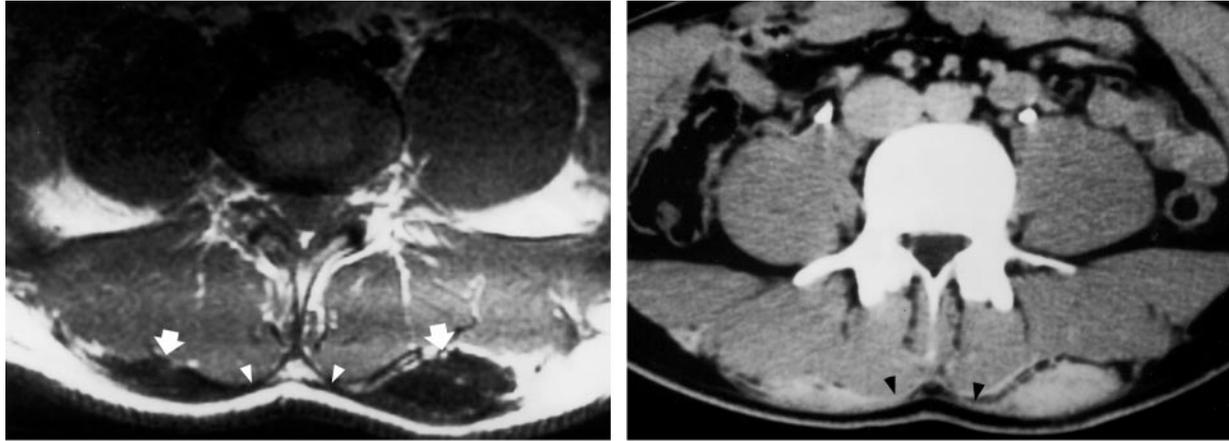

Figure 8. Nodular fasciitis in the upper arm of a 16-year-old boy. Coronal T1-weighted (600/20) **(a)** and coronal T2-weighted (2000/80) **(b)** SE MR images of the shoulder show a well-defined mass superficial to the deltoid muscle with a small linear area of extension in the proximal fascia (arrow in **b**).

Epithelioid sarcoma, conversely, is a rare sarcoma that is seen predominantly in male adolescents and young adults (ages 10–35 years). It is manifested as a firm, solid single nodule or multiple nodules that most commonly are located on the forearms, hands, or fingers (6). Although epithelioid sarcoma comprises only approximately 1%–2% of all soft-tissue sarcomas, it represents 21%–29% of all malignant lesions of the hand and wrist in patients between the ages of 16 and 35 years. At radiography, epithelioid sarcoma may appear as a soft-tissue mass with occasional speckled calcification, cortical thinning, and osseous erosion (6).

It is especially noteworthy that a superficial lesion that extends through the fascia is more likely to be a malignancy (Fig 7) (7).

Nodular fasciitis and fibromatosis are two entities that may arise in the fascial layer. Nodular fasciitis is a pseudosarcomatous benign fibrous tumor that is thought to be reactive in etiology and, therefore, to be self-limiting. It is primarily located in the upper extremities in young adults (ages 20–40 years) (6). At MR imaging, nodular fasciitis demonstrates a nonspecific signal intensity. After the administration of contrast material, there is usually diffuse enhancement. An important diagnostic feature at MR imaging is the linear extension of the lesion along the fascia (fascial tail sign), which also may appear enhanced (Fig 8). Fibromatosis is a locally aggressive benign tumor

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Figure 9.   Musculoskeletal fibromatosis in the paraspinal region in a 20-year-old man. **(a)** Axial T1-weighted (800/20) SE MR image shows markedly decreased signal intensity within a well-defined mass (arrows), a finding indicative of a densely collagenous hypocellular lesion. The mass extends across the midline (arrowheads). T2-weighted images (not shown) also showed decreased signal intensity in the mass. **(b)** Corresponding contrast-enhanced CT image shows enhancement of the lesion and small fascial "tails" (arrowheads).

a.   b.

Table 2
Skin Appendage Lesions

Diagnosis	Classification	Patient Age	Comments
Epidermal inclusion cyst	Cutaneous (dermal)	Adults	Most common dermal cyst, often an incidental finding at imaging
Pilomatricoma	Cutaneous (dermal)	Bimodal: children and adults	Benign calcifying tumor
Cystadenoma	Cutaneous (dermal)	Adults	Cystic ectasia of the dermal portion of the eccrine duct
Cylindroma	Cutaneous (dermal)	Adults, mostly women	Occurs on head, neck, and scalp
Syringoma	Cutaneous (dermal)	Adults	Occurs on eyelids and upper cheeks

that typically is seen in adults and that has low to intermediate signal intensity on MR images (Fig 9).

Skin Appendage Lesions

Skin appendage lesions originate in the epidermis and dermis (Table 2). They are typically subcategorized as proliferations of follicular lineage or eccrine-apocrine differentiation. The lesions are typically small and, consequently, are diagnosed clinically. Imaging features are not usually specific, and imaging is reserved for unusually large or atypical lesions; however, such lesions often are incidental findings at imaging.

The most common of these is probably the infundibular cyst, or epidermal cyst. This simple epithelial cyst is lined with infundibular or epidermal-like cells that keratinize (8). The term *sebaceous cyst* is a misnomer and should be avoided, because these cysts are not of sebaceous differentiation and their imaging characteristics vary according to their internal contents. Large lesions may contain dependent debris. Most frequently, lesions are small and unilocular; however, large multiloculated lesions may be manifested with a rim of peripheral enhancement (9). At US, the cyst appears as a circumscribed circular or oval hypoechoic mass, often in association with a hair follicle. The lesion has attenuation that is similar to that of skeletal muscle on CT images and MR signal that is isointense or slightly hypointense compared with the signal in skeletal muscle on T1-weighted MR images and hyperintense compared with that on T2-weighted MR images (Fig

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Figure 10. Infundibular cysts at MR imaging and US. **(a, b)** Axial T1-weighted (600/20) **(a)** and axial T2-weighted (2500/80) **(b)** SE MR images of the knee of a 45-year-old man with a history of a mass for approximately 30 years show a well-defined but nonspecific mass (∗) in the subcutaneous adipose tissue. The lesion contents appear heterogeneous on the T2-weighted image, with debris in the dependent aspect. **(c)** US image in a different patient shows an infundibular cyst located in the skin (arrow) and two hairs (arrowheads) emerging from the cyst.

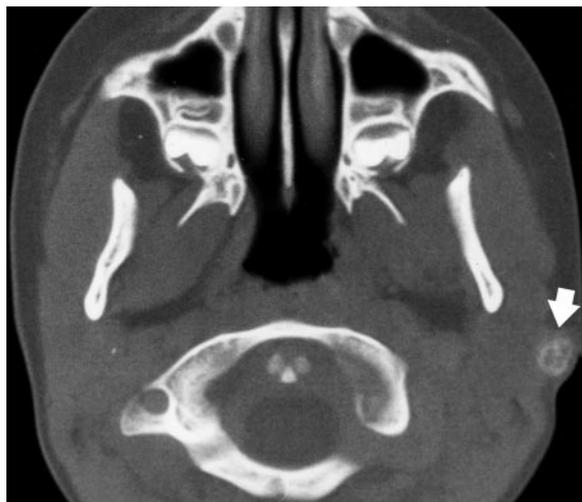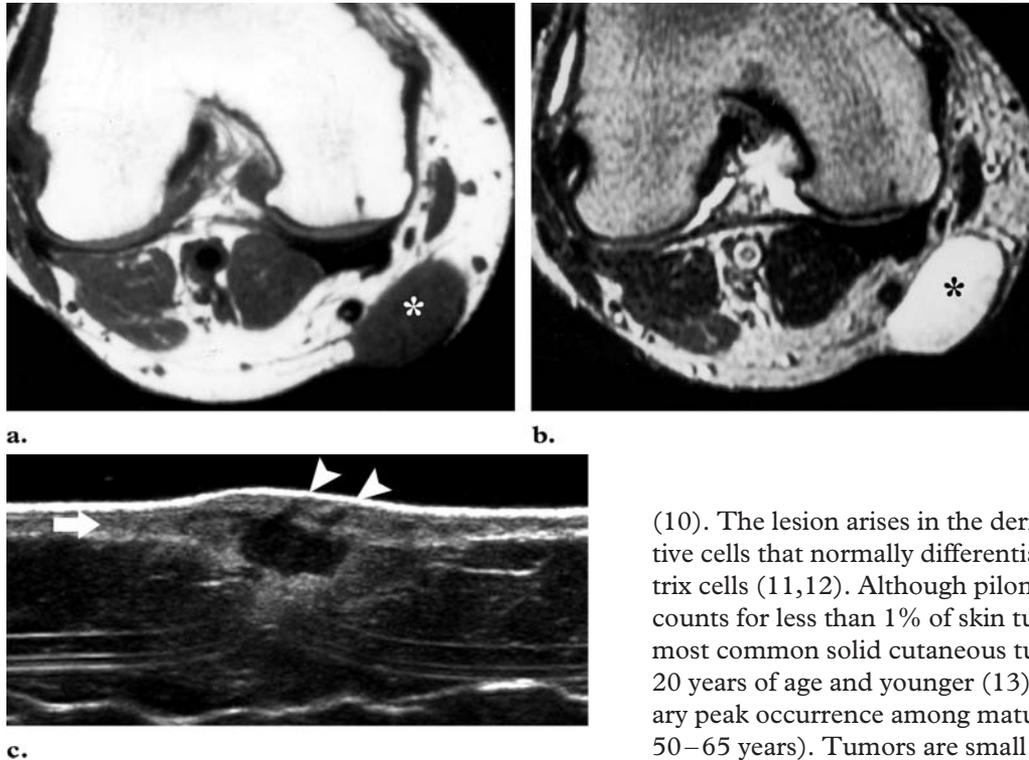a.   b.

c.

Figure 11. Pilomatricoma in the neck of a 7-year-old boy. Axial contrast-enhanced CT image obtained with bone window settings shows a mineralized mass (arrow) with delicate ossification that is more prominent peripherally.

10). No appreciable enhancement of the lesion should be seen.

Pilomatricoma is a benign calcifying tumor that is thought to arise from skin appendages (10). The lesion arises in the dermis from primitive cells that normally differentiate into hair matrix cells (11,12). Although pilomatricoma accounts for less than 1% of skin tumors, it is the most common solid cutaneous tumor in patients 20 years of age and younger (13), with a secondary peak occurrence among mature adults (ages 50–65 years). Tumors are small (usually less than 3 cm in diameter), grow slowly, are confined to the subcutaneous tissue (10,11), and are seen most commonly on the face, neck, and arms. Calcification, which is more typically central, is seen in about 85% of lesions (Fig 11).
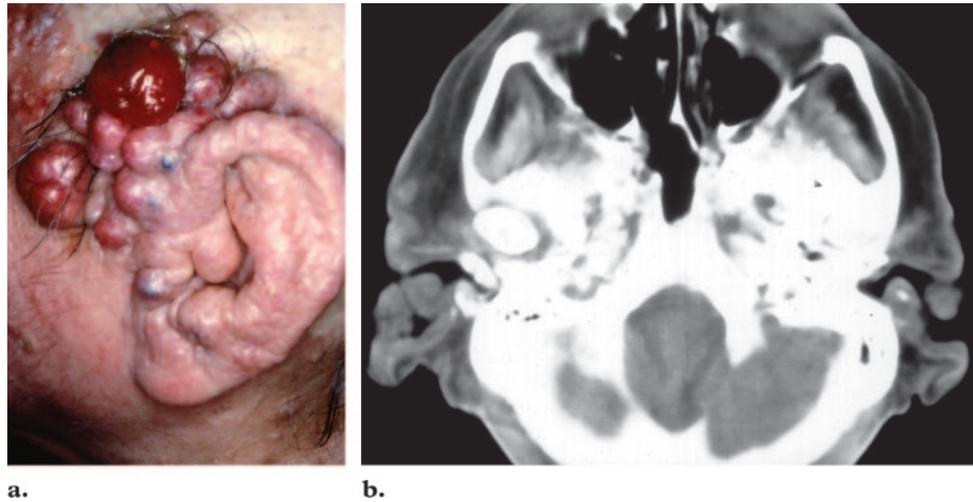
Large lesions that arise in association with eccrine (sweat) glands also may be manifested as soft-tissue masses. Eccrine cystadenoma (eccrine hidrocystoma) arises because of cystic ectasia of the dermal portion of the eccrine duct, which results in retention of secretions within simple cysts. A large lesion of this type may be manifested as a lobulated cystic mass. Contrast-enhanced MR imaging has been reported to show enhancement of the cyst wall with occasional small enhancing papillary areas that projected into the lumen (14).

Cylindroma and syringoma are dermal tumors of apocrine differentiation. They are characterized by their clinical appearance and are not likely to be encountered by a musculoskeletal specialist. Cylindromas are seen primarily on the head, neck, and scalp in women (Fig 12). Syringomas are also predominantly found on the head in adults, specifically on the eyelids and upper cheeks.

Figure 12.   Multiple facial cylindromas in a 79-year-old woman. **(a)** Clinical photograph of the patient's ear shows numerous soft-tissue masses. **(b)** Axial unenhanced CT image shows multiple isoattenuating cutaneous masses that involve both ears.

a.   b.

Table 3
Metastatic Tumors

Diagnosis	Classification	Patient Age	Comments
Carcinoma	Cutaneous	Adults	5%–10% of all cancers; most common on the chest, abdomen, and scalp
Melanoma	Subcutaneous	Adults	Seen in 30% of patients with metastatic melanoma; internal hemorrhage not uncommon
Myeloma	Cutaneous, subcutaneous	Adults	Soft tissue is a frequent site of extraosseous involvement

Table 4
Other Tumors and Tumorlike Lesions

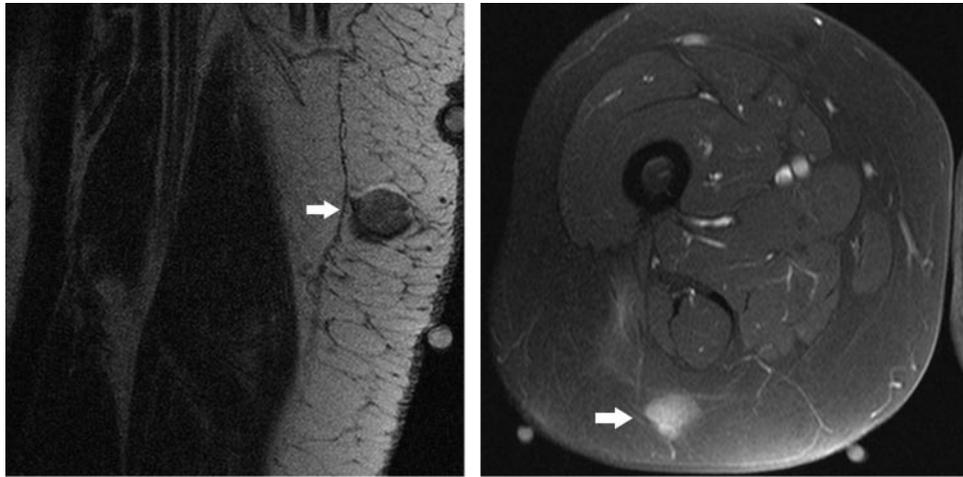| Diagnosis	Classification	Patient Age	Comments
Myxoma	Cutaneous, subcutaneous	Adults	Characterized by fluidlike signal intensity, variable enhancement
Lymphoma	Cutaneous, subcutaneous	Adults	Primary soft-tissue lymphoma is rare
Granuloma annulare	Cutaneous, subcutaneous	Adults (cutaneous); children, adolescents (subcutaneous)	Subcutaneous form may be manifested as a soft-tissue mass; decreased signal intensity at MR imaging

Metastatic Tumors

Soft tissue is relatively resistant to metastasis; although soft tissue accounts for about 40% of total body weight, soft-tissue metastases are very rare. However, any malignancy may disseminate to the skin, and 5%–10% of all cancer patients develop skin metastases (Table 3). At clinical examination, numerous small, hard or rubbery nodules are found, typically on the chest, abdomen, or scalp of an adult older than 40 years. Skin involvement typically occurs near the site of the primary tumor. Because of overall disease prevalence, breast cancer is the most common primary lesion that metastasizes to the skin in women (15). In men, skin metastases from malignant melanoma are most common, followed by those from lung cancer (15). Cutaneous metastases are frequently identified in clinical practice, but they are uncommonly subjected to radiologic imaging.

Metastatic melanoma may be manifested with a similar pattern of multiple subcutaneous nodular lesions, and its presence must be considered in a patient who presents with multiple subcutaneous nodules (16).
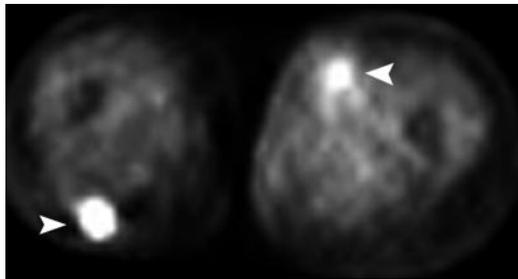
Teaching Point

Figure 13. Subcutaneous metastatic melanoma in a 68-year-old woman. **(a, b)** Sagittal T1-weighted (406/17) **(a)** and axial gadolinium-enhanced T1-weighted (433/17) fat-suppressed **(b)** SE MR images show a well-defined subcutaneous solid mass (arrow) in the posterior aspect of the right thigh. Intense homogeneous enhancement of the mass is seen in **b**. **(c)** Axial positron emission tomographic image of the thighs shows two hypermetabolic foci (arrowheads) that correspond to melanoma metastases. The lesion in the right thigh correlates with that in **a** and **b**.
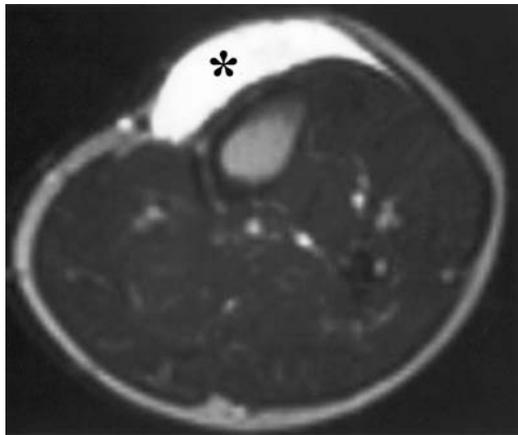

a.

b.

c.

Figure 14. Subcutaneous myxoma in the lower leg of a 32-year-old man. Axial T2-weighted (2500/90) SE MR image shows a well-defined subcutaneous mass (∗) anterior to the tibia. The large size of the lesion makes it difficult to determine whether its origin is in subcutaneous tissue or the aponeurosis.

Such nodules are seen in more than 30% of patients with metastatic melanoma, usually in those with Clark level IV or V disease (tumor invasion of the deep dermis or subcutaneous fat), and they may be the only radiologic manifestation of metastatic disease (Fig 13) (16).

Extraosseous manifestations of multiple myeloma are found in less than 5% of patients and are associated with more aggressive disease (17). In patients with extraosseous disease, the typical manifestation is a cutaneous or subcutaneous nodule or nodules (17).

Other Tumors and Tumorlike Lesions

Myxoma is a benign lesion characterized by an abundant myxoid matrix and a paucity of spindle-shaped stromal cells. Perceived as rare, these lesions are more common in surgical series and represent approximately 3% of all benign tumors subjected to biopsy. According to a report from the Armed Forces Institute of Pathology about approximately 200 myxomas of various anatomic sites, 15% of the lesions arose in the cutaneous tissue and 22% in the subcutaneous and aponeurotic tissues (3,18,19). Myxoma typically shows a homogeneous fluidlike signal intensity (Fig 14, Table 4). At contrast-enhanced imaging, lesions show variable enhancement. Occasionally, extensive heterogeneous enhancement is seen.
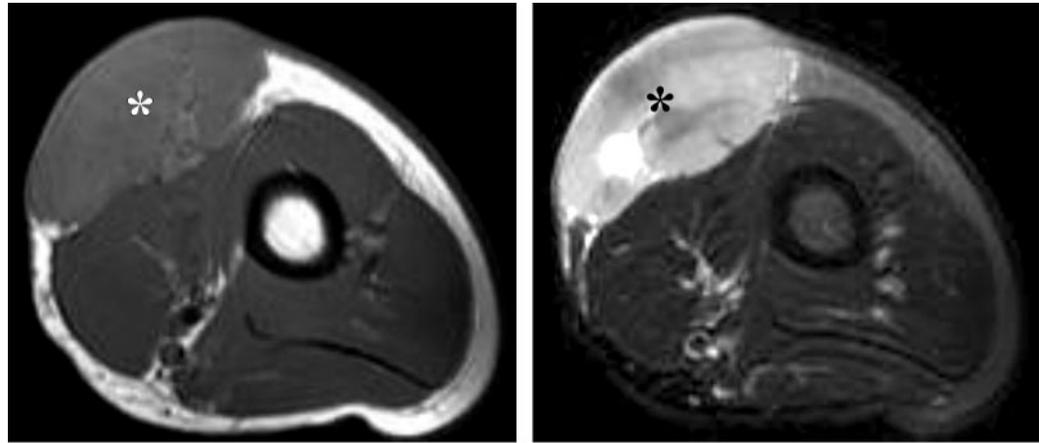
a.   **b.**

Figure 15. Superficial B cell lymphoma in the forearm of a 53-year-old man. Axial T1-weighted (716/9) **(a)** and axial T2-weighted (2350/80) fat-suppressed **(b)** SE MR images show a large homogeneous mass (∗) with nonspecific features in the cutaneous and subcutaneous compartments. The mass demonstrated signal intensity slightly higher than that in skeletal muscle at T1-weighted imaging, high signal intensity at T2-weighted imaging, and intense homogeneous enhancement at gadolinium-enhanced MR imaging.

Table 5
Inflammatory Lesions

Diagnosis	Classification	Patient Age	Comments
Cellulitis	Cutaneous, subcutaneous	All ages	Skin thickening with reticulated fluidlike signal intensity in the subcutaneous tissues
Fasciitis	Fascial	All ages	Fascial thickening and enhancement
Adenitis	Subcutaneous	Children, adolescents	Signal intensity is typically intermediate on T2-weighted, non–fat-suppressed images
Abscess	Subcutaneous	All ages	Fluidlike signal intensity, rim of enhancement

Cutaneous lymphomas may be broadly classified as primary (with no evidence of extracutaneous involvement) or secondary (with evidence of simultaneous or previous extracutaneous involvement). They may be further subclassified according to cell type: B cell, T cell, histiocytic, and other (rare) (15). Primary lymphoma of soft tissue is exceedingly rare, and patients often present with a palpable mass that simulates a soft-tissue sarcoma. At imaging, associated abnormalities in adjacent osseous structures or lymph nodes often are identified, and such findings allow the inclusion of lymphoma in the differential diagnosis.

When lymphoma is manifested as an isolated soft-tissue or subcutaneous mass, the imaging features are nonspecific (Fig 15) (3).

Granuloma annulare is a benign inflammatory dermatosis, with a common cutaneous form found in adults and an uncommon subcutaneous form found in children and adolescents. The cutaneous form is diagnosed clinically and therefore is rarely encountered by the radiologist, whereas the subcutaneous form may be manifested as a superficial mass. Radiographs show a circumscribed nodular mass that is localized to the subcutaneous tissues, with an absence of both bone involvement and mineralization. The mass shows decreased signal intensity at MR imaging and variable enhancement after the administration of contrast material (Fig 16).
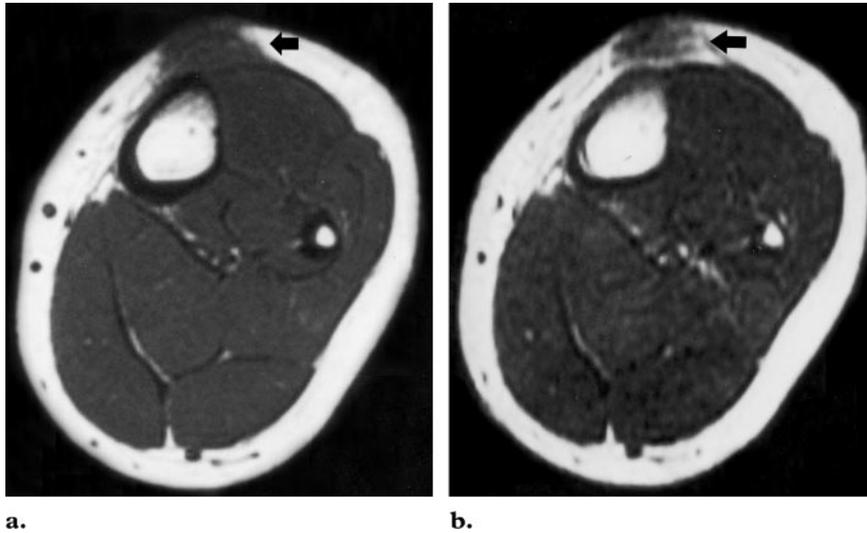
Figure 16. Granuloma annulare in the lower leg of a 5-year-old girl. Axial T1-weighted (500/20) **(a)** and axial T2-weighted (2000/80) **(b)** SE MR images show a mass in the subcutaneous tissue of the anterior part of the leg (arrow). The lesion had decreased signal intensity and a somewhat indistinct margin on all MR images.
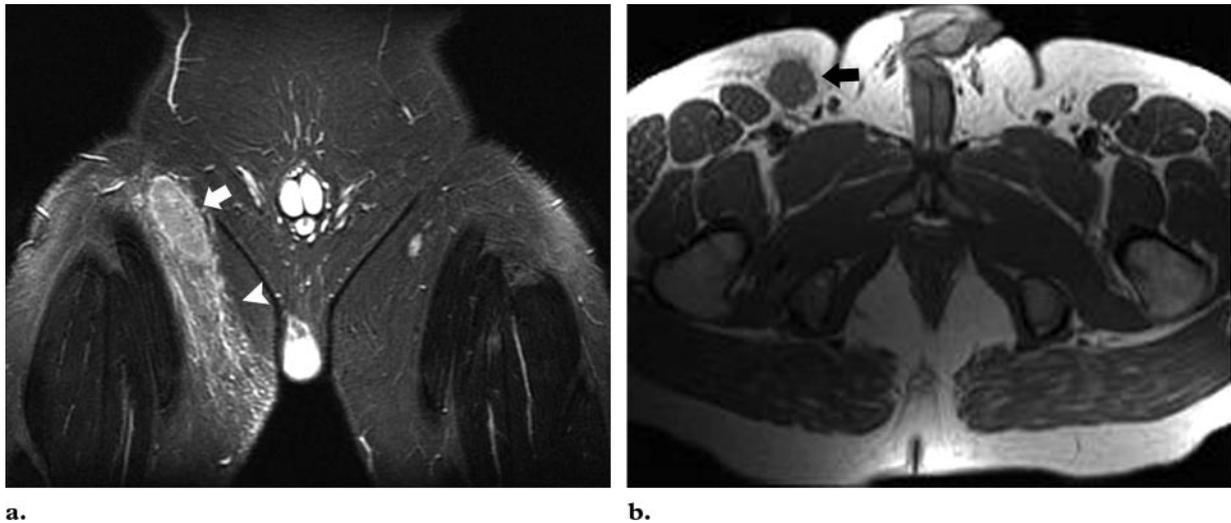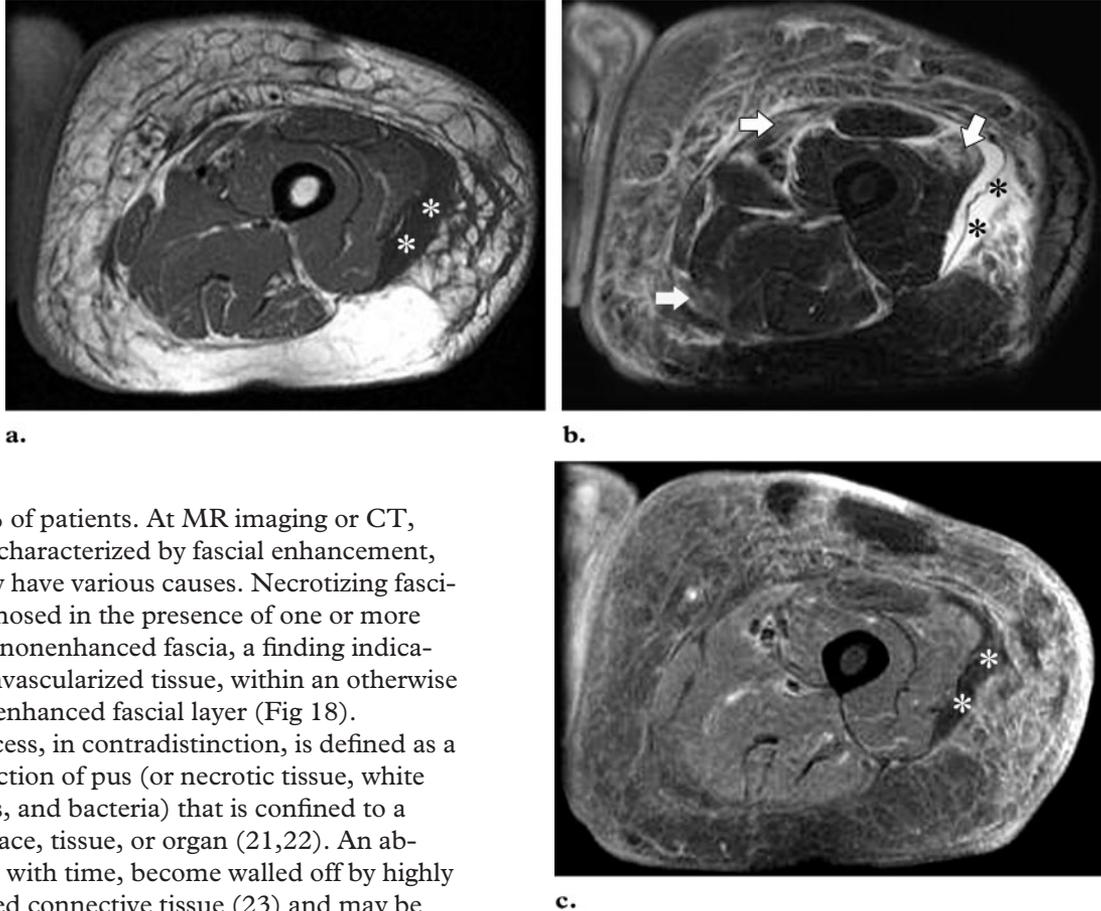

Figure 17. Cat-scratch disease in a 26-year-old man with a rapidly growing, painful mass in the groin. **(a)** Coronal T2-weighted (5950/68) SE MR image shows a nodal mass (arrow) in the right side of the groin, with prominent associated edema (arrowhead). **(b)** Axial T1-weighted (600/15) SE MR image shows a large right inguinal node with surrounding edema (arrow). On MR images obtained after contrast material was administered, the node demonstrated mild heterogeneous enhancement. The findings were indicative of lymphadenopathy.

Inflammatory Lesions

In general, the term *cellulitis* is used to describe an inflammation or infection of the cutaneous and subcutaneous tissues, without gross suppuration (Table 5). Fasciitis is inflammation or infection of the fascia, and adenitis is inflammation or infection of one or more lymph nodes. Cat-scratch disease is a common and benign form of regional lymphadenitis that is associated with exposure to cats. The condition is caused by infection with *Bartonella henselae*, a Gram-negative bacillus. Most of those affected are young; two-thirds of cases occur in patients between the ages of 5 and 21 years (20). MR imaging shows regional lymphadenopathy with surrounding edema (Fig 17) (20). Involvement of a single node is seen in

Figure 18.   Necrotizing fasciitis in a 51-year-old diabetic man with rapidly progressing pain and swelling in the thigh. **(a, b)** Axial T1-weighted (716/15) **(a)** and axial fat-suppressed T2-weighted (6566/105) **(b)** SE MR images show a reticulated pattern of abnormal signal intensity within the subcutaneous tissues, a pattern suggestive of cellulitis; an extensive region of abnormal signal intensity (∗) centered on the fascia, a finding indicative of fasciitis; and areas of abnormal signal intensity in the adjacent muscle (arrows in **b**), features indicative of associated myositis. **(c)** Axial T1-weighted (650/15) SE MR image obtained after the administration of intravenous gadolinium shows nonenhanced fascial tissue laterally (∗) and anteriorly. Necrosis of the fascia (necrotizing fasciitis) was identified at surgery.

a.

b.

c.

44%–85% of patients. At MR imaging or CT, fasciitis is characterized by fascial enhancement, which may have various causes. Necrotizing fasciitis is diagnosed in the presence of one or more regions of nonenhanced fascia, a finding indicative of nonvascularized tissue, within an otherwise markedly enhanced fascial layer (Fig 18).

An abscess, in contradistinction, is defined as a focal collection of pus (or necrotic tissue, white blood cells, and bacteria) that is confined to a specific space, tissue, or organ (21,22). An abscess may, with time, become walled off by highly vascularized connective tissue (23) and may be associated with diffuse inflammation.

At MR imaging, the appearance of a soft-tissue abscess varies with the virulence of the organism and the host's reaction to the organism. In general, areas of suppuration demonstrate signal intensity similar to that of fluid, and the internal contents of the lesion appear relatively homoge-

neous. However, the degree of homogeneity and the signal intensity vary, depending on the amount of internal proteinaceous debris, necrosis, foreign matter, and gas (24). MR images depict a lesion with a peripheral rim of variable signal intensity that is markedly enhanced after the administration of intravenous gadolinium (24). A

discrete abscess may be differentiated from a diffuse inflammatory process (phlegmon) in that the latter appears as a poorly defined region with increased signal intensity on T2-weighted images and with an indistinct margin (an edema-like pattern), but without the internal high signal intensity typically seen in a focal fluid collection.

Conclusions

Soft-tissue malignancies are relatively uncommon, in comparison with the large number of benign lesions that may be seen in the superficial tissue. The imaging appearance of a superficial mass often yields limited information to help narrow the differential diagnosis. Therefore, not only the imaging appearance but also the lesion location and the patient's age should be considered when evaluating a superficial mass.

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Superficial Soft-Tissue Masses: Analysis, Diagnosis, and Differential Considerations

Francesca D. Beaman, MD et al

Page 512
Lipomas are by far the most frequently encountered subcutaneous masses.

Page 515
It is especially noteworthy that a superficial lesion that extends through the fascia is more likely to be a malignancy.

Page 516
The most common of these [skin appendage lesions] is probably the infundibular cyst, or epidermal cyst. This simple epithelial cyst is lined with infundibular or epidermal-like cells that keratinize (8). The term sebaceous cyst is a misnomer and should be avoided, because these cysts are not of sebaceous differentiation and their imaging characteristics vary according to their internal contents.

Page 518
Metastatic melanoma may be manifested with a similar pattern of multiple subcutaneous nodular lesions, and its presence must be considered in a patient who presents with multiple subcutaneous nodules.

Page 522
At MR imaging, the appearance of a soft-tissue abscess varies with the virulence of the organism and the host's reaction to the organism.