Case 2.1

Osteoblastoma of the Rib

Fig. 2.1.1

Fig. 2.1.2

Fig. 2.1.3

Fig. 2.1.4
An 18-year-old man consulted for recurrent attacks of left back pain during the previous year. The episodes were occasionally associated with abdominal pain, mainly localized in the left hypochondrium. At physical examination, tender swelling was noted below the left scapula. After chest X-ray, a bone tumor was suspected at the level of the left fifth rib and CT and MRI studies were requested.

Osteoblastoma is a rare benign osteoid-producing bone neoplasm accounting for approximately 1% of primary bone tumors. Conventional and aggressive types of osteoblastoma have been described. Osteoblastomas are commonly located in the posterior elements of the spine (34%) and long bones (30%). The ribs are only affected in 4% of cases. Most lesions are intramedullary; however, intracortical and periosteal tumors can occur. The lesion is observed most frequently in individuals younger than 30 years of age. Local pain is a common manifestation. Worsening of pain at night and amelioration with salicylates are inconstant clinical features.

The diagnosis of osteoblastoma may be suggested by direct visualization on X-ray or CT studies of an expansile, circumscribed lytic lesion with variable reactive sclerosis and central calcification. Cortical expansion, cortical destruction, and periosteal reaction can occur.

MRI provides information on the extent of the lesion, but the MRI appearance of low signal intensity on T1- and mixed to high signal intensity on T2-weighted images is also nonspecific. MRI is the most accurate technique in evaluating the surrounding edema, which may be prominent.

Scintigraphic bone scans show intense focal radiotracer accumulation.

Other diagnoses that share similar clinical and radiographic features with conventional osteoblastoma include osteoid osteoma, giant cell tumor, and fibrous dysplasia. Osteoid osteoma and osteoblastoma are thought to be variant manifestations of the same osteoblastic process. The tendency of osteoblastoma to form a less sclerotic, more expansile mass and its size (by definition greater than 2 cm) are the two major differences between these two entities. Aggressive osteoblastomas may disrupt cortex and have a soft-tissue component, mimicking malignant tumors, such as osteosarcoma.

Chest X-ray shows an expansile lytic lesion with well-demarcated margins and some cortical erosion involving the posterior shaft of the left fifth rib (Fig. 2.1.1). On each side of the tumor, the rib is broadened and sclerosed. Internal calcifications are seen within the lesion (open arrow) (Fig. 2.1.2).

CT scan (Fig. 2.1.3) confirms the presence of a well-circumscribed osteolytic lesion with surrounding sclerosis. Central ossification is prominent. The posterior cortex of the rib is diffusely thinned with an expanded contour and focal disruption, but no soft-tissue mass is observed.

Axial STIR MR image (Fig. 2.1.4) demonstrates a well-demarcated intermediate signal intensity lesion with central calcifications. Prominent reactive marrow edema (open arrow), solid anterior periosteal reaction (arrow), and mild surrounding soft-tissue edema (open arrowhead) are also observed.
Case 2.2

Ewing’s Sarcoma
A 22-year-old man presented with pain in his right knee 1 year after anterior cruciate ligament reconstruction with a patellar tendon autograft.

Ewing's sarcoma is the sixth most common malignant tumor, accounting for approximately 11–12% of all malignant bone tumors. The tumor is derived from red bone marrow.

Ewing's sarcoma usually occurs in young people (4–25 years) and the mean age of presentation is 13 years. The tumor has a decisively male predominance. Patients typically present systemic symptoms (fever, anemia, and leukocytosis) and a painful mass.

Ewing's sarcoma can occur in both long (60%) and flat (40%) bones. The long bones are more commonly affected in younger patients. The most common sites are the femur, tibia, and humerus. The most commonly affected flat bones (typically in older patients) are the pelvis and the ribs. In the long bones, the tumor almost always affects the metaphysis or the diaphysis.

Although Ewing's sarcoma presents multiple radiological appearances, it is typically based within the medullary cavity, metadiaphyseal in location, and poorly delineated, with aggressive periosteal reaction and a large associated soft-tissue mass. Commonly, there is a permeative lytic pattern.

MRI is essential to evaluate the bone marrow and soft-tissue extent of the tumor. The typical MRI appearance of Ewing's sarcoma includes low signal on T1-weighted sequences, high signal on T2-weighted sequences, and heterogeneous contrast enhancement.

MRI provides useful information for preoperative planning and posttreatment follow-up.

The differential diagnosis should include osteomyelitis, lymphoma, chondrosarcoma, Langerhans cell granuloma, and osteosarcoma. It is important to remember that age is the most important factor for narrowing the differential diagnosis for bone tumors.

Lateral plain-film radiograph of the distal femur (Fig. 2.2.1) shows a permeative lytic pattern of bone destruction.

Sagittal T1-weighted MRI demonstrates the intraosseous and extraosseous extent of the tumor and the disruption of the cortex (open arrow) (Fig. 2.2.2). The tumor has lower signal intensity than normal marrow fat in this pulse sequence. Notice the hyperintensity of the patellar tendon from which the ACL graft was taken.

Coronal fat-suppressed T2-weighted MRI shows a heterogeneous high signal intensity lesion within the medullary cavity and a soft-tissue mass (arrow) (Fig. 2.2.3).

Axial fat-suppressed T2-weighted MRI (Fig. 2.2.4) shows the intramedullary lesion and the soft-tissue mass extending to the cortex.
Case 2.3

Intraosseous Lipoma

Fig. 2.3.1

Fig. 2.3.2

Fig. 2.3.3

Fig. 2.3.4
A 51-year-old man presented with a 6-month history of intermittent localized right heel pain, sometimes exacerbated by activity. Physical examination revealed tenderness at the medial aspect of the right heel, but no swelling. Plain-film radiographs of the right heel showed a lytic lesion in the calcaneus and a CT scan was done to characterize the lesion.

Intraosseous lipoma is a rare benign primary bone tumor. Lipomas are categorized by their relation to bone as either intraosseous, intracortical, or parosteal. Intracortical lipoma is extremely rare. Multiple osseous lipomas have been described in patients with type IV hyperlipoproteinemia.

Intraosseous lipomas may be diagnosed at any age, but they are most common in the fourth through sixth decades. No significant sex predominance has been noted. While these tumors may be asymptomatic, localized pain and/or soft-tissue swelling is reported in up to two-thirds of patients. The long tubular bones are most commonly affected. The fibula (20% of cases), femur (15%), and tibia (13%) are frequently involved. Another common site of involvement is the calcaneus, which accounts for 15% of cases. Other reported sites include the ilium, skull, mandible, maxilla, ribs, spine, sacrum, coccyx, and the bones of the hands and feet.

Plain films can suggest the diagnosis of intraosseous lipoma when a well-circumscribed radiolucent lesion with a thin sclerotic border is visualized in the calcaneus. A central ossified nidus may be present and lobulation or internal osseous ridges can often be seen. Cortical bone and periosteum are preserved.

CT scans confirm the fat density of the mass and may demonstrate the central ossified component, if present.

MRI can also be used to confirm the fatty nature of the mass, which displays fat signal intensity on all pulse sequences. Chemical shift imaging may be helpful.

The diagnosis of an intraosseous lipoma in the calcaneus can be suggested by the plain-films. However, its radiographic appearance may be similar to unicameral bone cysts, which usually appear in the same location as lipomas, in the anteroinferior portion of the calcaneus, an area free from the main stress lines. The differential diagnosis may also include normal variations of the trabecular pattern of the calcaneus, which may produce the appearance of “pseudotumor of the calcaneus,” secondary to atrophic bone trabeculae. Other, less frequent, entities that should be considered in the differential diagnosis include posttraumatic cyst, chondroblastoma, fibrous dysplasia, giant cell tumor, osteoblastoma, and desmoplastic fibroma.

Plain-film radiographs of the right heel (Figs. 2.3.1 and 2.3.2) show a well-circumscribed lytic lesion with a thin, sclerotic border and a lobulated appearance in the calcaneus. No cortical destruction or periosteal reaction is present. Lateral projection shows the location of the lesion in the triangular region of the calcaneus, between the major trabecular stress lines (Fig. 2.3.2).

CT scan (Fig. 2.3.3) confirms the well-circumscribed hypodense mass, with negative Hounsfield unit values (Fig. 2.3.4), suggesting a fatty lesion.
Case 2.4

Giant Cell Tumor of Bone

Fig. 2.4.1

Fig. 2.4.2

Fig. 2.4.3

Fig. 2.4.4
A 43-year-old man presented with localized pain in his left knee that was exacerbated with movement. He had no history of trauma. At clinical examination, local swelling and tenderness were noted.

Radiographs, CT, and MRI of the left knee were performed.

Giant cell tumor of bone (GCT) accounts for approximately 5–9% of primary bone tumors and 20% of benign bone tumors. GCT occurs only after the epiphyseal plates have closed. It most commonly presents in patients between the ages of 25 and 40 and has a slight female predominance. GCT can arise in any bone of the skeleton, but is most frequently detected around the knee (50%); it involves the epiphyseal regions of the distal femur and proximal tibia, although it originates in the metaphysis. GCT is a locally aggressive, generally benign lesion; however, 10% are malignant with local spread or metastases, generally to the lungs.

On radiologic study, typical GCT is usually easily distinguished from other bone tumors. GCT is lytic, subarticular, and eccentric, and often lacks a sclerotic rim. Prominent trabeculation may be seen. No internal mineralization is present.

CT usually adds little diagnostic information to the radiographic findings, although it is useful in regions with complex anatomy, such as the vertebrae or pelvic bones. Marginal sclerosis, cortical destruction, and soft-tissue masses are better assessed with CT scans than with radiographs. Fluid-fluid levels are seen occasionally, but are nonspecific.

MRI characteristics include low to intermediate signal intensity on T1-weighted images and heterogeneous high signal intensity on T2-weighted images. Fluid levels may be demonstrated within the tumor. Peritumoral edema is uncommon in the absence of a fracture. The tumor usually enhances heterogeneously with intravenous administration of contrast medium. MRI is sensitive for the detection of soft-tissue changes, intraarticular extension, and marrow changes. MRI is the best method for assessing subchondral breakthrough and extension of tumor into an adjacent joint. The diagnostic accuracy of MRI is high, especially when it is interpreted in conjunction with plain radiographs.

Bone scintigraphy is not usually required, except for the evaluation of suspected multicentric GCT.

Some conditions such as aneurysmal bone cyst, intraosseous ganglion, chondroblastoma, osteosarcoma, and giant cell reparative granuloma may resemble GCT on plain-film radiographs and should be considered in the differential diagnosis.

Plain-film radiographs of the left knee (Figs. 2.4.1 and 2.4.2) show a well-defined expansile eccentric radiolucent lesion in the proximal lateral tibia condyle. No sclerotic margins or periosteal reaction is present.

CT scanning (Fig. 2.4.3) demonstrates a large osteolytic lesion with marked thinning of the cortex. MRI shows a well-circumscribed lobulated lesion of low to intermediate signal intensity on T1-weighted images (not shown) and high signal intensity on T2-weighted images (Fig. 2.4.4).
Case 2.5

Skeletal Muscle Metastases

Fig. 2.5.1

Fig. 2.5.2

Fig. 2.5.3

Fig. 2.5.4

Fig. 2.5.5
A 56-year-old man diagnosed with stage IV cholangiocarcinoma 2 months before presented with a palpable mass in the posterior aspect of his left thigh. The mass was painful at palpation and surrounding soft-tissue inflammation was noted. Plain-film radiographs of the thigh showed no abnormalities. Axial T1- and T2-weighted, axial and coronal STIR, and dynamic contrast-enhanced MRI sequences were obtained. Subsequently, contrast-enhanced thoracoabdominal CT scanning was carried out to evaluate and restage the primary tumor.

Skeletal muscle is a rare site of metastasis. Most muscle metastases occur in the abdominal, pectoral, deltoid, psoas, and thigh muscles. The neoplasms with the highest incidence of metastasis to muscle are carcinoma, leukemia, and lymphoma. Muscle metastases are often considered a sign of generalized tumor spread; the number and the location of the lesions are important for the patients' clinical outcome. An intramuscular mass is first suspected to be a primary tumor rather than a metastasis. In oncologic patients with pain in large muscles and no radiographic or scintigraphic evidence of bone metastasis, soft-tissue metastases are suspected.

The imaging approach to a suspected soft-tissue mass begins with a plain-film radiograph to exclude a bone lesion or deformity that could simulate a soft-tissue tumor.

On unenhanced CT, muscle metastases can appear hypodense or isodense with the surrounding muscle and may only be noticed as a muscle asymmetry when compared with the opposite side. After intravenous contrast administration, muscle metastases usually present rim enhancement with central hypodensity.

The advantages of MRI over CT for evaluating soft-tissue masses include multiplanar acquisition and better soft-tissue contrast resolution. MRI findings of multiple muscle lesions displaying low to intermediate signal intensity on T1-weighted images and high signal intensity on T2-weighted images can suggest the diagnosis of skeletal muscle metastases, but are not pathognomonic. The use of intravenous gadolinium facilitates differentiation between tumor, muscle, and edematous tissue, and provides information on tumor vascularity.

The differential diagnosis includes soft-tissue sarcomas, hematomas, and abscesses. MRI findings, together with the clinical history, should point to the correct diagnosis.

Axial T2-weighted MRI (Fig. 2.5.1) shows two soft-tissue masses, one intramuscular mass located between the vastus lateralis muscle fibers in the anterolateral aspect of the left thigh (open arrow) and the other penetrating the superficial fascia of the posterolateral aspect of the left thigh (arrow). Both lesions are surrounded by extensive edema, highlighted in the STIR image (Fig. 2.5.2). Dynamic contrast-enhanced MRI (Figs. 2.5.3 and 2.5.4) shows strong, early rim enhancement (open arrows).

Contrast-enhanced abdominal CT (Fig. 2.5.5) shows a nodular lesion with rim enhancement and central hypoattenuation in the left psoas muscle (open arrow). Other nodular lesions were depicted in the right psoas and in the abdominal wall muscles (not shown); these findings supported the initial diagnosis.
Case 2.6

Synovial Sarcoma
A 39-year-old man presenting with a tender, palpable mass in the anterior aspect of the right leg and ankle that had gradually increased in size over 10–12 months and moderate weight loss over the same time period underwent MRI on a 1.5-T unit.

Synovial sarcoma is a malignant neoplasm of mesenchymal origin that accounts for 8–10% of all soft-tissue sarcomas. It is the fourth most common type of soft-tissue sarcoma and usually occurs in adolescents and young adults. It predominantly affects the extremities (80–95% of cases), usually the lower limbs, and particularly the popliteal fossa in the knee. Despite its name, the lesion occurs primarily in the para-articular regions, usually close to tendon sheaths, bursal structures, and joint capsules. Patients usually present with a slow-growing palpable soft-tissue mass or swelling. Pain and/or neurogenic dysfunctions can occur. The duration of symptoms before diagnosis varies widely, with an average of 2–4 years.

Radiographic findings of a soft-tissue mass near, but not within, a joint in a young patient are very suggestive of synovial sarcoma, particularly if calcification is present.

Typical cross-sectional imaging features of synovial sarcoma include multilobulated morphology and marked heterogeneity. The most common CT appearance is a soft-tissue mass isodense or slightly hypodense to muscle. CT is especially useful for detecting soft-tissue calcifications and cortical bone involvement.

MRI findings of synovial sarcoma often include a well-defined juxta-articular mass with mainly intermediate signal intensity on T1-weighted images and intermediate to high signal intensity on T2-weighted images. Marked heterogeneity, consisting of hyperintense, hypointense, and isointense intermixed areas (the “triple signal” sign), with presence of fluid levels, hemorrhage, and septa (the “bowl of grapes” sign) on T2-weighted images is the rule in large lesions. Intense but heterogeneous enhancement is seen after intravenous gadolinium injection. Although it is not possible to make a specific diagnosis with MRI, this technique is the optimal imaging modality for assessing the extent and intrinsic characteristics of synovial sarcomas.

Scintigraphic evaluation of synovial sarcomas may show increased radiotracer uptake, revealing their hypervascularization.

The differential diagnosis of synovial sarcoma should mainly include other sarcomas such as soft-tissue chondrosarcoma, parosteal osteosarcoma, and malignant fibrous histiocytoma. Other disorders such as myositis ossificans, pigmented villonodular synovitis, or juxtacortical chondroma should also be considered. It is important to remember that smaller, well-defined, homogeneous lesions are more prone to mimicking cystic or solid benign lesions.

Axial (Fig. 2.6.1) and sagittal T1-weighted images (Fig. 2.6.2) show a heterogeneous multilobulated mass isointense to muscle tissue with areas of high signal intensity consistent with hemorrhage (open arrows). A pseudocapsular appearance is seen at the superior margin of the lesion (arrow). On T2-weighted images (Fig. 2.6.3), the lesion appears heterogeneous, with hyper-, hypo- and isointense areas relative to fat, creating the triple signal sign. Hemorrhagic components and fluid-fluid levels are also detected.

MRI sequence acquired after intravenous injection of contrast material (Fig. 2.6.4) shows heterogeneous enhancement of the mass.
Case 2.7

Synovial Hemangioma
A 23-year-old woman underwent MRI to investigate longstanding pain in the medial compartment of her right knee.

Synovial hemangiomas are rare. As in this case, the clinical history usually includes pain or other longstanding joint symptoms. Synovial hemangiomas typically present during early childhood, adolescence, or young adulthood. They most commonly involve the knee, followed by the elbow and wrist. They may appear in bursa adjacent to a joint, although hemangiomas not confined by a synovial structure should be excluded from this group, as should those arising from tendon sheaths or the intramedullary compartments of bone or skeletal muscle. The origin and pathogenesis of synovial hemangiomas are related to those of true neoplastic vascular proliferations or to the late stages of a posttraumatic lesion. The most common histological subtype is cavernous. Synovial hemangiomas are a common cause of intraarticular bleeding, which can lead to an appearance similar to pigmented villonodular synovitis or hemophilia-related arthropathy. Preoperative assessment with MRI and arthroscopy allows accurate classification and appropriate management. Well-circumscribed masses can be excised arthroscopically, but a wide, open excision is necessary in cases of diffuse synovial hemangioma.

Like hemangiomas in other locations, synovial hemangiomas typically show serpentine vascular spaces, intratumoral fat content, and increased vascularization. Focal limb enlargement due to increased vascularization has been reported in some cases of synovial hemangioma. Plain films may be unremarkable or show subtle changes like capsular thickening, phleboliths, soft-tissue density, or bone erosion. Angiography has proven useful in the evaluation of this vascular lesion, allowing the identification of fine-caliber vessels with contrast pooling in dilated vascular spaces and early visualization of venous structures. Embolotherapy has proven effective in treating synovial hemangioma.

Although CT is able to detect intratumoral fat, calcifications, and enhancement, MRI’s superior soft-tissue contrast makes it the preferred imaging modality for the detection and characterization of synovial hemangiomas. Histological analysis remains necessary to confirm the diagnosis. The imaging differential diagnosis of synovial hemangioma includes pigmented villonodular synovitis, nonspecific synovitis, and lipoma arborescens. MRI is able to differentiate between these entities in most cases.

MRI shows a 50-mm intrasynovial anteromedial mass with well-defined borders and multiple internal septa. On T2-weighted sequences (Fig. 2.7.1), the mass is hyperintense with low signal septa; on fat-suppressed T1-weighted TSE sequences (Fig. 2.7.2), it showed intermediate signal intensity. After contrast administration (Fig. 2.7.3), the mass shows intense heterogeneous enhancement. In the high b-value diffusion-weighted MRI (Fig. 2.7.4) and apparent diffusion coefficient map (Fig. 2.7.5), the mass shows moderate restriction of free water movement. No hemorrhage, fat content, or infiltration of adjacent structures was demonstrated. Intraarticular fluid and enhancing synovial hypertrophy were additional features. Histological analysis confirmed the imaging suspicion of synovial hemangioma.
Case 2.8

Brown Tumor

Fig. 2.8.1

Fig. 2.8.2

Fig. 2.8.3

Fig. 2.8.4

Fig. 2.8.5

Fig. 2.8.6
A 47-year-old man with a history of giant cell reparative granuloma in his left patella resected 2 years before presented progressive pain at the symphysis pubis.

Brown tumors are expansile bone lesions typically associated to hyperparathyroidism. Their most frequent locations are the mandible, pelvis, ribs, and femora, although potentially any bone may be involved. Intratumoral hemorrhage, necrosis, and cyst formation are the hallmarks of these tumors. Brown hemorrhage stroma and giant cell formation are also common pathological findings. Recently, a progressive increase in echo time on T1-weighted sequences has been used to detect magnetic susceptibility artifacts secondary to the hemorrhagic content of brown tumors. Brown tumors appear as expansile lytic lesions with slight trabeculation, uncommon periosteal reaction, and increased activity on scintigraphic bone scans. Nowadays, it is uncommon for brown tumors to be detected as the first sign of hyperparathyroidism, as in the case presented. These tumors are destructive and may be associated to pathological fractures. They usually heal with new formation of dense bone after removal of the cause of hyperparathyroidism.

Brown tumors cannot be differentiated from reparative giant cell granuloma on the basis of histological and imaging findings. In this clinical setting, correlation with analytical and clinical features to rule out hyperparathyroidism is critical for correct diagnosis and therapeutic management. This is not uncommon when dealing with bone tumors or even soft-tissue tumors, as histological analysis does not always ensure the correct diagnosis. Radiologists should be aware of this fact and integrate imaging findings with clinical and analytical data. In this case, the presence of several lytic lesions is the differentiating feature, as reparative giant cell granulomas are rarely multiple and they have not been reported in pelvic bones.

An expansive lytic lesion was detected in the right superior pubic ramus at plain-film (not shown). CT (Fig. 2.8.1.) confirmed a multiseptated expansive lytic lesion with cortical rupture and detected another lytic lesion in the posterior aspect of the contralateral superior pubic ramus. MRI showed hypointensity on both T2-weighted sequences (Fig. 2.8.2) and T1-weighted (Fig. 2.8.3) sequences, with moderate enhancement after contrast administration (Fig. 2.8.4). Additional features seen on MRI were absence of soft-tissue extension and another lytic lesion in the right femoral head. The presence of multiple lytic lesions and the personal history of reparative giant cell granuloma raised the suspicion of brown tumors. Laboratory tests showed hypercalcemia; later, primary hyperparathyroidism and the diagnosis of multiple brown tumors were confirmed. Review of the pathological specimen from the previously resected patellar tumor concluded that it also corresponded to a brown tumor. After resection of a parathyroid gland adenoma, the brown tumors partially regressed and showed a more fibrotic appearance, as seen in the 5-year follow-up MRI (Figs. 2.8.5 and 2.8.6, axial pre- and postcontrast T1-weighted TSE sequences, respectively).
Case 2.9

Intramuscular Myxoma

Fig. 2.9.1

Fig. 2.9.2

Fig. 2.9.3

Fig. 2.9.4
A 47-year-old man presented nonspecific progressive posterior thoracic pain during the nine months prior to consultation.

Intramuscular myxoma (IM) is a benign intramuscular neoplasm composed of fibroblasts and abundant myxoid stroma. This tumor usually arises in the proximal large muscles of the extremities. It is more prevalent in women and most commonly presents in the fourth and fifth decades. Clinically, it usually presents as a nonpainful palpable mass. At histological examination, it appears macroscopically as a well-circumscribed, loculated, gelatinous mass; most lesions are less than 10 cm in diameter. The classic histological description is a hypocellular, hypovascular tumor with no mitoses, composed of bland spindle cells embedded in a rich myxoid extracellular matrix. This tumor lacks a true capsule. An excisional biopsy is necessary for definitive diagnosis, since it is difficult to make an accurate evaluation with fine-needle aspiration due to its scant cellularity and nonspecific cytologic features. The association between IM and fibrous dysplasia is known as Mazabraud’s syndrome.

MRI features for IM include intramuscular location, well-circumscribed margins, homogeneous hypointense signal compared to muscle on T1-weighted images, homogeneous hyperintense signal on T2-weighted images, and inhomogeneous enhancement. This tumor usually shows fine linear stranding within the tumor, representing thin fibrous septa. It is also common to find perilesional edema, which represents portions of the tumor merged into the adjacent muscle separating the fibers, which become atrophic. Another frequent finding is the presence of fat around both poles of the lesion; this finding correlates with histological findings of fatty muscle atrophy due to the infiltrative pattern of slow growth of IM.

Postcontrast images commonly show a rim of peripheral enhancement, although most reported cases evaluated with contrast media had either heterogeneous internal enhancement or peripheral enhancement with occasional fine internal septa. Areas without any internal enhancement are present in about 50% of cases, corresponding to cystic areas. A complete absence of internal enhancement is possible but rare.

CT (Fig. 2.9.1) shows a well-defined hypodense mass (open arrow) located in the left thoracic paravertebral soft-tissue. MRI confirms the presence of the mass (arrow), which is hyperintense on T2-weighted sequences (Fig. 2.9.2) and homogeneously hypointense (open arrowhead) on T1-weighted sequences (Fig. 2.9.3). After contrast administration, heterogeneous internal enhancement indicates its solid nature (Fig. 2.9.4). Additional detectable features were peritumoral edema in the adjacent soft-tissue and fat around the lesion. Histological examination after resection confirmed the diagnosis of IM.
Case 2.10

Soft-Tissue Liposarcoma

Fig. 2.10.1

Fig. 2.10.2

Fig. 2.10.3

Fig. 2.10.4
A 22-year-old man presented with a painless tender mass in the upper left supraclavicular region.

Liposarcoma is a malignant tumor of mesenchymal origin. The term liposarcoma does not imply that the tumor is derived from fat, but rather that the tumor contains differentiated adipose tissue. Liposarcoma is the second most common soft-tissue sarcoma seen in adults (10–18%) after malignant fibrous histiocytoma. Liposarcomas are classified into four histologic subtypes: well-differentiated, myxoid, round cell, and pleomorphic.

Well-differentiated liposarcoma is synonymous with atypical lipoma. Between 40 and 65% of liposarcomas of the extremities occur in the thigh. Other common sites, in order of descending frequency, are the upper arm and shoulder, popliteal fossa and lower leg, buttocks, and forearm. Clinically, these tumors manifest as painless masses.

The radiological features of a liposarcoma depend on its histologic type and tend to reflect its degree of differentiation. CT or MRI findings for well-differentiated liposarcomas closely resemble those of subcutaneous fat or a simple lipoma. They are frequently composed of more than 75% fat, while the other types usually have less than 25%.

On CT, a well-differentiated liposarcoma may appear as a well-delineated mass, with attenuation values equal to those of simple fat, mimicking a benign lipomatous tumor.

On MRI, a well-differentiated liposarcoma shows some thickened linear or nodular soft-tissue septa that enhance after intravenous administration of contrast material.

These small nonlipomatous components have low signal intensity on T1-weighted images and increased signal intensity on fat-suppressed T2-weighted images.

Features for discriminating a well-differentiated liposarcoma from a simple lipoma include a deep (intramuscular) rather than subcutaneous location, a size of more than 10 cm in maximum diameter, the presence of nodular non adipose components or thick septa, high signal intensity of septa or nodular soft-tissue areas on T2-weighted fat suppression or STIR images, and contrast enhancement of non adipose components (best seen on fat-suppressed T1-weighted images).

MRI is the most specific modality for diagnosing liposarcoma. Figure 2.10.1 shows an axial T1-weighted image of a large mass located in the left supraclavicular region, posterior to the sternocleidomastoid muscle and medial to the scalene muscles and brachial plexus. The tumor is predominantly isointense to subcutaneous fat. Multiple thickened septa extend throughout the tumor (open arrow).

Axial T2-weighted MRI (Fig. 2.10.2) shows the tumor with signal intensity similar to that of subcutaneous fat and the presence of thick, low signal intensity septa (arrow).

Coronal STIR MRI (Fig. 2.10.3) shows the non adipose areas with increased signal intensity relative to fat (open arrowhead).

Axial fat-suppressed T1-weighted MRI (Fig. 2.10.4) obtained after contrast administration shows moderate heterogeneous enhancement of the non adipose areas (arrowhead).
Further Reading

Books

Web-Links
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