95. Musculoskeletal Neoplasms

The distinction between benign and malignant bone tumors is frequently not possible on MRI, although benign lesions generally possess well-defined peripheral margins, lack adjacent soft tissue masses, and spare cortical bone. The high SI of cartilage on T2WI aids in the identification of chondroid lesions. Osteochondromas are the most common benign osseous tumor, the cortex of these lesions being continuous with the parent bone. A cartilaginous cap greater than 1 cm in thickness, continued growth following skeletal maturation, and a change in the calcified matrix, osseous destruction, or an accompanying soft tissue mass suggest a chondrosarcoma. Enchondromas (a benign tumor of hyaline cartilage occurring in medullary bone) may also degenerate into chondrosarcomas—indicated by adjacent soft tissue, epiphyseal, or cortical invasion—although those outside the appendicular long bones and axial skeleton tend to be benign.

Fig. 95.1

The classic fluid-fluid level of an aneurysmal bone cyst involving the talus is illustrated on FS T2 (A) and T1WI (B) of Figure 95.1. The fluid-fluid level is a result of differences in densities and MR SI appearances of cystic fluid contents, relating to the stage of blood products within. This finding is also associated with telangiectatic osteosarcoma but can be seen in other entities as well, including giant cell tumors. A fluid-fluid level is present on the sagittal T2WI of the lumbar spine in Figure 95.1C. Here, it is associated with an

expansile, enhancing osteoblastoma arising from the posterior elements of a lumbar vertebral body, well seen on the CE T1WI of Figure 95.1D.
An osteoid osteoma is a benign tumor, consisting of a small enhancing nidus with adjacent reactive changes. These include marrow edema, which can be extensive, and adjacent reactive soft tissue, causing confusion with primary tumors if the nidus is missed or not well seen.

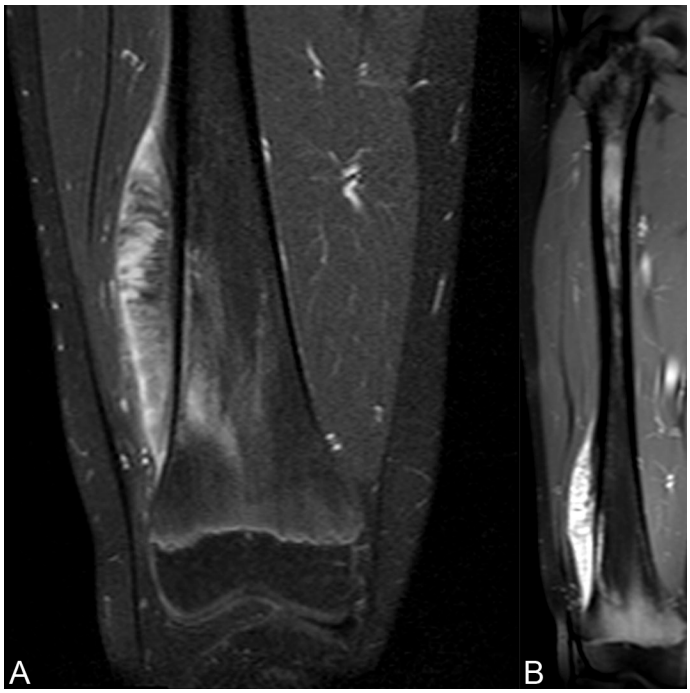

Fig. 95.2

The MR appearance of benign soft tissue tumors/masses can be more specific for certain lesions: lipomas and subacute hematomas demonstrate hyperintensity on T1WI, reflecting fat in the former and methemoglobin in the latter. Soft tissue hemangiomas often contain foci of high SI on T1WI due to fat or slowly flowing blood, and rapidly enhance due to their high vascularity. Hemosiderin in pigmented villonodular synovitis leads to low SI within the synovium on T2WI, which is accentuated on T2-weighted GRE sequences.
Osteosarcoma is the most common primary malignant tumor of bone. The characteristic sunburst appearance is demonstrated in the CE FS T1WI of Figure 95.2A, with hypointense rays of osteoid matrix oriented perpendicular to the low SI osseous cortex, well-visualized against the background of enhancing abnormal soft tissue. As seen here, MR is useful in demonstrating the extension of osseous neoplastic lesions into nearby soft tissue and in delineating intramedullary extension—indicated both by disruption of the normally low SI bone cortex on T2 or CE T1WI and by abnormal medullary soft tissue. The presence of skip lesions is easily detected on MR and as such the entirety of the involved bone should be imaged. The CE T1WI of Figure 95.2 B was obtained one year after (and with a larger field of view than) that in Figure 95.2 A, and demonstrates a skip lesion within the proximal femur.

Ewing's sarcoma may originate from bone or soft tissue. A particularly aggressive, heterogeneously enhancing lesion is illustrated in the CE FS T1WI of Figure 95.3. Multiple enhancing lesions are seen throughout the visualized pelvis and proximal femurs, consistent with widespread metastatic disease. The origin of the lesion in Figure 95.3 could not be definitively localized and thus, in this child, a primary differential consideration was rhabdomyosarcoma (the most common malignant soft tissue tumor in children), which demonstrates similar nonspecific SI characteristics.

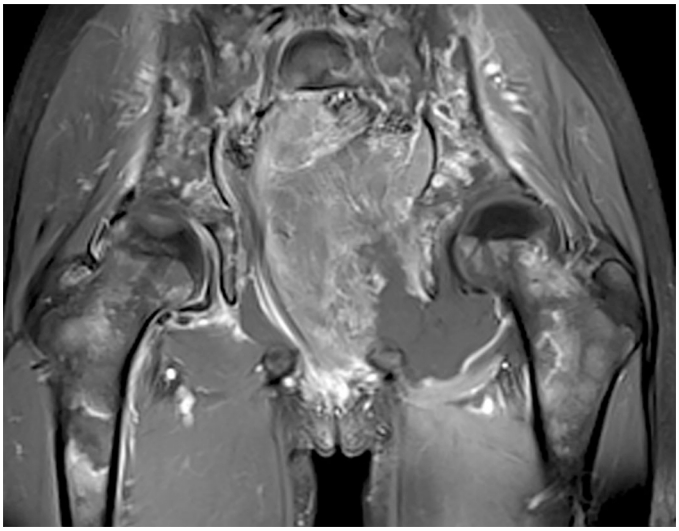

Fig. 95.3