35. Metastatic Disease

Of sites of skeletal metastasis, the vertebral column is the most common, and herein lung cancer is the most frequent culprit. Pre-contrast FSE T1WI is the preferred sequence for the detection of such metastases. As demonstrated in the sagittal images of Figure 35.1 A, infiltration of the vertebral body with tumor results in loss of the high SI of the fatty marrow. Typically, metastatic lesions will demonstrate SI equal to or less than the intervertebral disks on T1WI. This becomes especially important in cases of diffuse metastatic disease, whereby the vertebral body SI may be uniformly abnormal. Only by comparison with the disk SI can diffuse disease be diagnosed. An occasional hemorrhagic metastasis may appear as high SI on T1WI. Unfortunately, FSE T2WI do not typically display most vertebral body metastases well (Fig. 35.1 B), due to the relatively high normal marrow SI (see Chapter 48). Even when fat suppression techniques are used, as in Figure 35.1 C, the conspicuity of metastases on T2WI can remain less than that on T1WI, despite their relative high SI compared to the suppressed fatty SI of the vertebral bodies. With the presence of a single vertebral lesion, reliable differentiation is not possible between metastasis and primary bone tumor. The presence of multiple lesions, however, strongly suggests metastatic disease. The most urgent complication from vertebral body metastases is compromise of the spinal canal and resulting cord compression. Since the hyperintensity of CSF on FSE T2WI allows excellent delineation of the subarachnoid space, this sequence is typically more useful for canal compromise, as illustrated by a sagittal T2WI in Figure 35.2 A. Here, however, thecal sac compromise and cord compression are so severe that they are well-seen on (B) precontrast T1WI. As evident from Figure 35.2 C, axial imaging allows optimal evaluation of canal and cord compromise which is, in this case, severe.

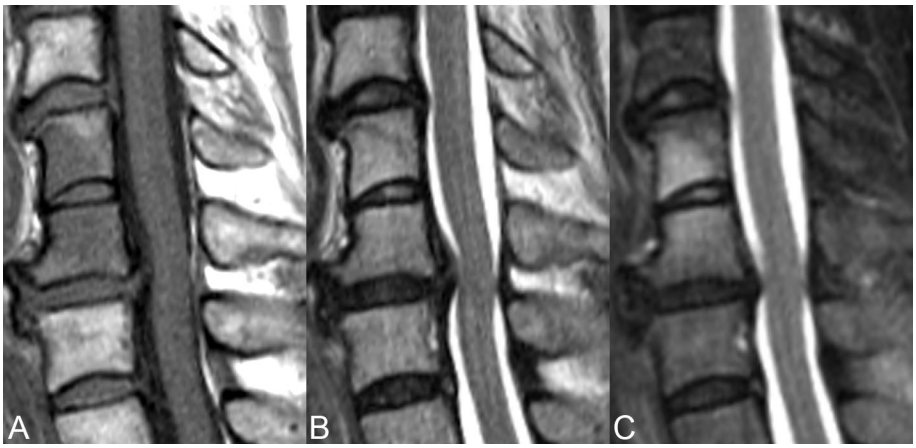

Fig. 35.1

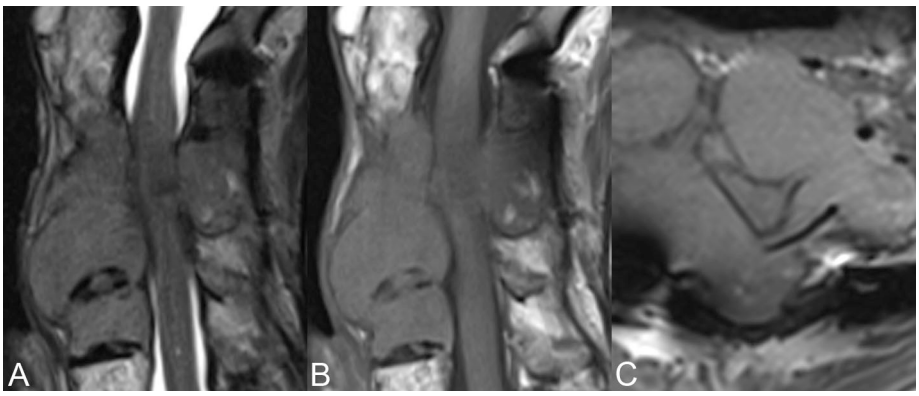

Fig. 35.2

In patients with uniformly diminished marrow SI—for example, children in which red marrow predominates or in patients with anemia of chronic disease or sickle cell (in which vertebral bodies are also classically H-shaped)—detection of metastatic lesions on T1WI may be problematic. Contrast administration in the setting of suspected vertebral body metastases, while not commonly performed, may nevertheless greatly improve tumor visualization. Although marrow SI is not diffusely abnormal in Figure 35.3 A, there is a large vertebral metastasis seen on the pre-contrast T1WI as an area of low SI against the higher SI fatty marrow of the T1 vertebral body. Visible, but much more subtle lesions are seen within the bodies of C7, T2, and the spinous process of T1. With contrast administration on (B) spectral fat suppressed T1WI, however, the visualization of these brightly enhancing lesions (white arrows) is greatly improved. Importantly, without some

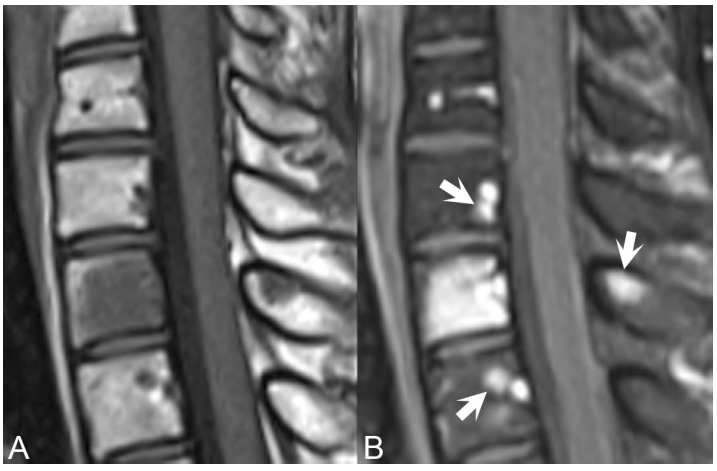

Fig. 35.3

means of fat suppression, enhancing tumor will not appear distinct from the high SI of surrounding marrow fat. STIR and spectral fat saturation are discussed in more detail in Chapters 34 and 48, respectively; however it is important to note that the inversion pulse

used in STIR suppresses SI from tissues with short T1 comparable to that of fat. Gadolinium chelates diminish tissue T1, thus ordinarily increasing SI on T1WI. When STIR is utilized, however, often the reduced T1 obtained with gadolinium chelates is similar to that ordinarily suppressed through the inversion pulse in STIR. Thus, lesions that ordinarily enhance on T1WI may demonstrate lower (due to suppression) SI on STIR T1WI. A final clinical scenario in vertebral metastases involves distinguishing between fractures related to benign osteoporotic and neoplastic causes. This distinction is discussed in more detail in Chapter 43.