43 Compression Fractures

The typical MRI appearance of an acute, osteoporotic compression fracture is illustrated in Figs. 43.1A,B. On (A) sagittal FS T2WI, high SI edema is present throughout the vertebral body, while the normal high vertebral SI on (B) T1WI is replaced by low SI edema. Superior end plate compression deformity and resultant height loss is also present. Figures 43.2A through 43.2D illustrate a less common appearance of such fractures. Here, the T12 vertebral body demonstrates height loss, low SI within the marrow due to edema, and a pocket of low SI fluid on (A) T1WI. Due to the use of FSE technique, vertebral body SI appears almost normal in the T2WI of Fig. 43.2B, although the fluid pocket is better visualized. On (C) FS T2WI the fluid pocket is again well seen, together with the edema within the adjacent marrow. (D) Contrast-enhanced FS T1WI show the fluid pocket as low SI surrounded by avidly enhancing tissue, the latter likely correlating with damaged, leaky capillaries resulting from the fracture present. Chronic, benign fractures lack edema and may be somewhat subtle (reflected by height loss alone). The L5 vertebral body in this case had demonstrated a loss of height, from end plate to end plate, since the prior examination, and exhibits reduced height versus the other vertebrae in Fig. 43.2—findings consistent with an interval but chronic, benign compression fracture. Acute compression fractures can involve just the end plate or a portion thereof, leading to confusion with end plate degenerative changes or edema-like SI associated with a Schmorl node (as in the inferior L5 vertebral body in Fig. 43.2).

The presence of corresponding end plate SI changes in the immediately adjacent vertebra favors the latter two entities. In Fig. 43.2, a nodular lesion is also incidentally noted within the cauda equina, with considerations including ependymoma (i.e., myxopapillary type), schwannoma, neurofibroma, and metastatic lesions. This particular lesion was stable over several years, and in this postoperative patient was felt to represent a surgical granuloma. Fractured vertebrae may be injected with polymethylmethacrylate—a type of cement often infused into fractured vertebrae during minimally invasive interventional procedures aimed at relief of pain from benign and malignant fractures. The compound quickly (<1 hour) polymerizes from a liquid to solid state upon injection. The solidified cement appears black (an absence of SI) on T1WI and T2WI. Rare complications from vertebroplasty are generally better visualized on CT, although related infectious or soft tissue processes are better evaluated with MRI. Sacral insufficiency fractures may also occur in osteoporotic patients. These are at times overlooked on sagittal MRI of the lumbar spine as they are located within the lower portion of the viewed images, and often only on

Fig. 43.1 (A,B)
the end slices (away from midline). Nevertheless, when attention is paid to this area, such lesions are readily visualized as, seen in Fig. 43.3, (A) hyperintensity on STIR (or FS T2WI) and (B) hypointensity on T1WI. The lesion in Fig. 43.3 involved the bilateral sacrum, which is common, as illustrated by bilateral marrow hypointensity in (C) axial T1WI.

The crucial consideration in evaluation of any compression fracture is whether its etiology is benign (i.e., osteoporotic) or malignant (i.e., pathologic). The acute compression fracture involving the L1 vertebral body in Fig. 43.1 was benign in etiology. On T1WI however, extensive edema replacing the high SI fatty marrow may be confused with the appearance of metastatic tumor. As such, the distinction between benign and malignant acute fractures is not reliably made on conventional MRI. The presence of an adjacent soft tissue mass or substantial posterior extension of abnormal soft tissue signifies a malignant etiology. Chronically, the vertebral body SI abnormalities associated with benign vertebral body fractures resolve, whereas abnormal marrow SI remains present in malignant fractures due to underlying tumor. Other, nonfractured vertebral bodies may be infiltrated with tumor in the latter case, making diagnosis more certain. Diffusion weighted imaging (DWI) has shown promise in discriminating between benign and metastatic vertebral body fractures, although such images are not routinely acquired for this purpose and techniques utilized for such imaging vary. The theoretical basis of DWI is that water protons undergo random (Brownian) motion, and restrictions in such motion lead to increased SI on images acquired to provide contrast on this basis. Edema associated with benign fractures is freely diffusable and thus of low SI on DWI, whereas water protons within hypercellular, malignant fractures are restricted, demonstrating lower values on ADC maps and high SI on DWI.