43. Compression Fractures

The typical MR appearance of an acute, osteoporotic compression fracture is illustrated in Figure 43.1. 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. Figure 43.2 A-D illustrates 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 Figure 43.2 B, 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) FS CE T1WI show the fluid pocket as low SI surrounded by avidly enhancing tissue, the latter correlating with enhancement of the edema (with damaged, leaky capillaries) resulting from the fracture. 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 endplate to endplate, since the prior examination, and exhibits reduced height versus the other vertebrae in Figure 43.2—findings consistent with an interval but now chronic, benign compression fracture. Acute compression fractures can involve just the endplate or a portion thereof, leading to confusion with endplate degenerative changes or edema-like SI associated with a Schmorl's node (as in the inferior L5 vertebral body in Fig. 43.2). The presence of corresponding endplate SI changes in the immediately adjacent vertebra favors the latter two entities. In Figure 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 post-operative patient was

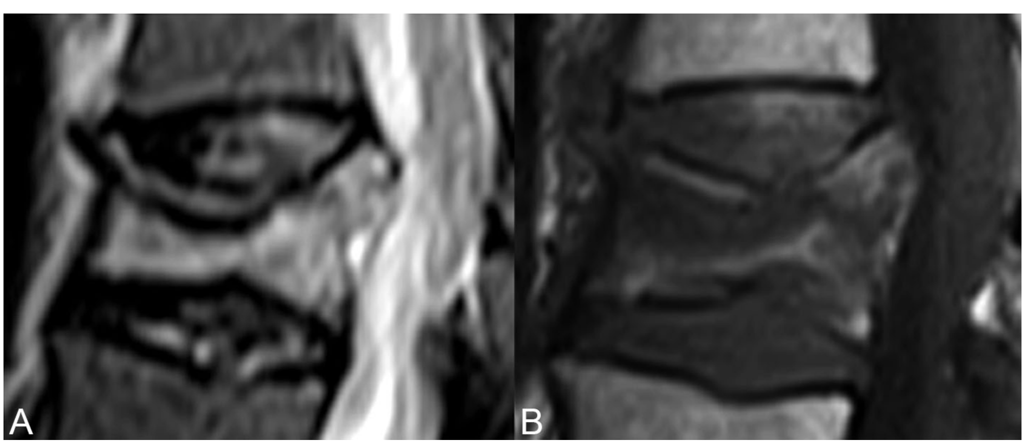

Fig. 43.1

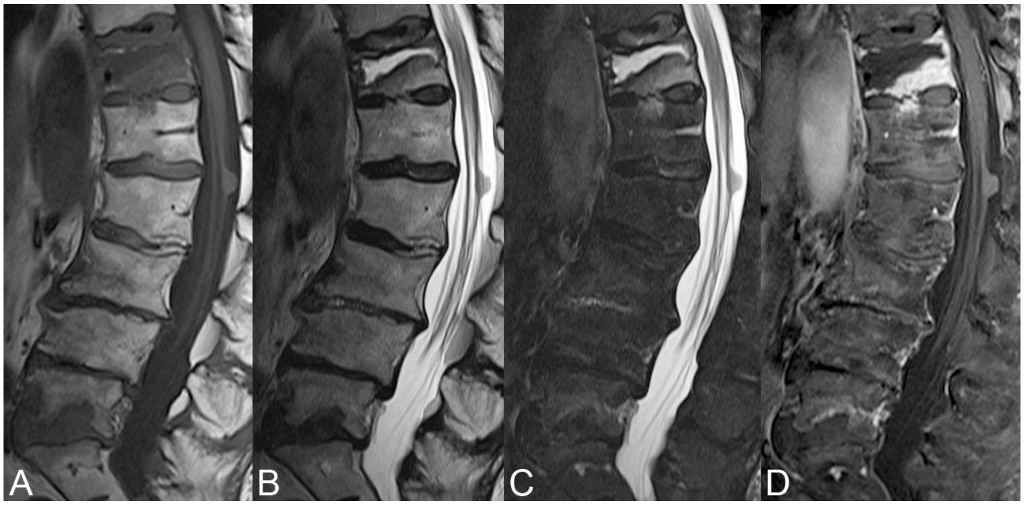

Fig. 43.2

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 T1 and T2WI. Rare complications from vertebroplasty are generally better visualized on CT, although infectious or soft tissue processes are better evaluated with MR.

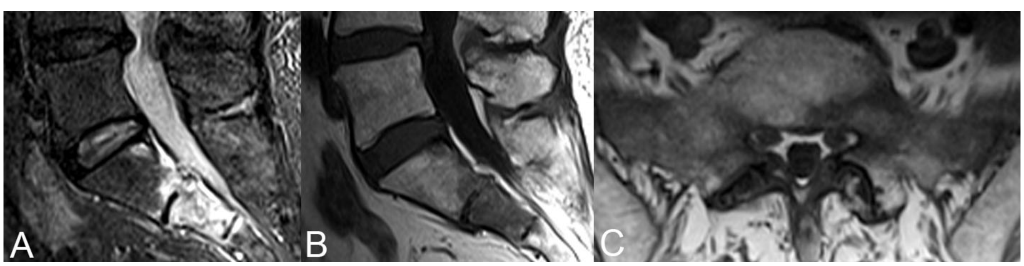

Fig. 43.3

Sacral insufficiency fractures may also occur in osteoporotic patients. These are at times overlooked on sagittal MR of the lumbar spine as they are located within the lower portion of the viewed images, and often only on the end slices (away from midline). Nevertheless, when attention is paid to this area, such lesions are readily visualized as, seen in Figure 43.3, (A) hyperintensity on STIR (or FS T2WI) and (B) hypointensity on T1WI. The lesion in Figure 43.3 involved the bilateral sacrum, which is common, as illustrated by bilateral marrow hypointensity on the (C) axial T1WI image.

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 Figure 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 cannot be reliably made (using just T1 and T2WI). 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, non-fractured vertebral bodies may be infiltrated with tumor in the latter case, making diagnosis more certain. Diffusion weighted imaging (DWI), using a high b value (1000 s/mm^2), in recent years has been shown to markedly improve the diagnostic accuracy in discrimination between osteoporotic and malignant compression fractures. The ADC values for osteoporotic fractures are significantly higher, with use of a cut off value (and choice therein) important. 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 (high ADC), whereas water protons within hypercellular, malignant fractures are restricted, demonstrating lower values on ADC maps and high SI on DWI.