Figure 65–1 depicts a right paracentral disk herniation at L5–S1 that impinges upon the S1 nerve root just subsequent to its exit from the thecal sac: (A, B) are T2- (TA 4:55, voxel size of 0.8 × 0.5 × 4 mm³) and T1- (TA 2:45, 0.9 × 0.6 × 4 mm³) weighted images at 1.5 T; (C, D) are the corresponding T2- (TA 1:56, 0.6 × 0.5 × 4 mm³) and T1- (TA 2:42, 0.9 × 0.6 × 4 mm³) weighted images at 3 T. What is again seen, as in Case 64, is the relative equivalence of the depiction of pathology at the two field strengths. This is confirmed on the comparison of sagittal T2-weighted images (Fig. 65–2) from the same patient at (A) 1.5 and (B) 3 T. The equality of the images is largely related to SAR limitations at 3 T (at the time these images were acquired), with a subsequent software upgrade implementing several of the SAR reduction approaches currently under development. Yet, even without these advances, if one limits the extent of the exam to the level of disk pathology, the SAR limitations are bypassed, permitting acquisition of thin, high-resolution images with a scan time and quality not possible at 1.5 T.
This approach is illustrated in Fig. 65–3 on T2-weighted images (four adjacent slices are shown) acquired at 3 T (TA 4:28, voxel dimensions of $0.6 \times 0.5 \times 2.4 \text{ mm}^3$). Due to the use of thin sections, depiction of the disk herniation and its impingement on S1 is improved. Thus a clear current advantage of 3 T over 1.5 T in the lumbar spine is the capability for thin-section imaging, revealing detail concerning nerve root compression. Incidentally seen in this image is an example of a dielectric effect (arrow), seen as a shading of CSF signal intensity from right to left within the thecal sac. This effect is more noticeable at 3 T secondary to increased $B_1$ field inhomogeneity, leading to signal attenuation. Further studies are in place to deal with RF field homogeneity, including the use of dielectric pads, optimization of RF transmitter coil arrangements, and normalization filters (see Case 8).

Figure 65–4 further demonstrates with T1-weighted axial images (eight contiguous slices are illustrated) at 3 T (TA = 4:31, $0.9 \text{ mm} \times 0.6 \text{ mm} \times 2 \text{ mm}^3$) the exquisite detail regarding the disk herniation and resultant nerve compression afforded by thin-section imaging. These 2-mm sections allow for close examination of an affected
level not afforded by 1.5 T, which permits only slice thicknesses in the range of 3 to 4 mm (in a reasonable scan time). Thin-section imaging at higher field will provide the film reader with a combination of improved image quality, better structural detail, and increased ability to define and detect small lesions.

Figure 65–5 presents T2-weighted sagittal sections (four adjacent slices are illustrated) at 3 T using a 2.4-mm slice thickness (TA 5:58, 0.6 × 0.5 × 2.4 mm³), demonstrating the same disk herniation presented in Fig. 65–2 but in much greater detail.
Characterization of the herniation and its relationship to adjacent nerves is possible from the multiple sections that detail the pathology, which is more difficult to do at 1.5 T. The best section width attained at 1.5 T was 4 mm, which allowed for visualization of the disk herniation itself on only a single slice.

Figure 65–5