31. Disk Herniations

Disk herniations (focal disk protrusions and extrusions) in the cervical spine occur most frequently between the 4th and 7th vertebral bodies due to the greater mobility of the spinal column in this region. Optimal imaging technique is essential for detection of these and other cervical spine abnormalities, as the structures being evaluated are small and artifacts related to patient motion are common. Motion artifact due to swallowing is frequent but correctable with saturation pulses or through changes in the direction of the phase encoding gradient. CSF pulsation artifact, when present on fast spin echo T2-weighted images, may be reduced by employing gradient moment nulling and/or cardiac gating. The small size of intervertebral disks warrants selection of a slice thickness of 3 mm or less, and for this reason imaging at 3 T—where a 3 mm slice thickness is standard—is imperative. Routinely acquired sequences for the evaluation of cervical disk herniations include sagittal and axial T1, sagittal fast spin echo (FSE) T2, and axial gradient echo (GRE) T2WI. Whereas in the lumbar spine T1WI may detect the displacement of high SI epidural fat, indicating the presence of herniation, the lack of such fat in the cervical region renders this pulse sequence less useful. On FSE T2WI a herniated disk may be difficult to distinguish from an osteophyte (which will have low SI). Thus (axial) GRE T2WI is the preferred sequence for evaluation of cervical disk herniations. GRE lacks the refocusing pulses present in spin and fast spin echo sequences and is thus more sensitive to T2* (magnetic susceptibility) effects. The higher SI of the disk, due to water content therein, is typically well-seen against the dense cortical bone, the latter exhibiting very low SI. 3D acquisitions offer smaller voxel sizes (and thus a thinner slice thickness) and are employed in some centers, as well as oblique (45 degree) sagittal views for improved foraminal assessment (either reconstructed from a 3D scan or acquired as a supplemental scan).

Disk herniations are described in terms of their location, chronicity, and mass effect on the cord. Figure 31.1 A, C demonstrates the typical appearance of a central cervical disk herniation (at C3-4) on sagittal FSE and axial GRE T2WI, respectively. Mild cord flattening is present without any evidence of edema. The posterior longitudinal ligament (PLL) and dura are apparent as a single rim of low SI along the perimeter of the herniated disk (Fig. 31.1 C). The C5-6 herniation in Figure 31.1 B, D not only exerts mass effect upon the cord but also extends into the left neural foramina, impinging the exiting 6th cervical nerve. Each cervical spinal nerve (8 in total) exits the spinal column above the correspondingly numbered cervical vertebral body (7 in total), except for the eighth nerve which exits above the T1 vertebrae. Impingement of these roots causes radicular pain in the corresponding sensory dermatome. The C6 dermatome consists of the lateral arm, thumb,

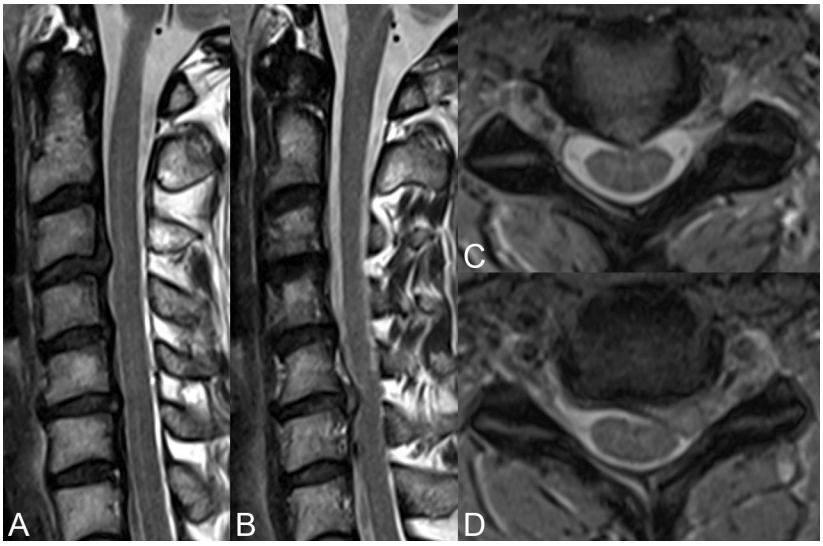

Fig. 31.1

and index finger, the C7 of the central hand and middle finger, and the C8 of the fourth and fifth fingers along with the medial arm. A foraminal herniation may be difficult to identify, and specifically to distinguish from normal epidural venous plexus, as both are found in a similar location and exhibit slight hyperintensity on GRE T2WI. Post-contrast T1WI can help delineate the brightly enhancing plexus from the non-enhancing disk. Contrast enhancement of a foraminal mass favors a nerve sheath tumor over a simple foraminal herniation. Enhancement is also seen in disk space infection and facet joint synovitis. Both of the disk herniations in Figure 31.1 are acute, although this cannot be definitively proven on a single MRI. Clinically, acute herniations occur in active, middle-aged patients with new onset pain often in precise dermatomal distributions. The presence of supra- or subjacent osteophytes implies herniation chronicity.

Figure 31.2 A-C demonstrates a left foraminal herniation with (B) high SI disk surrounded by a low SI rim of ligament and dura on GRE. This herniation is flanked superiorly by an osteophyte that is visible on both (A) sagittal FSE T2WI and on (C) axial GRE as an area of uniformly low SI. PLL thickening (present somewhat here) and calcification may further compress the cord. A calcified herniation can appear similar to an osteophyte, confounding the diagnosis. Finally Figure 31.2 D, E demonstrates a small central herniation on GRE T2WI and T1WI, respectively. The herniation effaces the ventral subarachnoid space but does not contact the cord. Adjacent axial images (not shown) demonstrated the presence of surrounding osteophytes, implying chronicity.

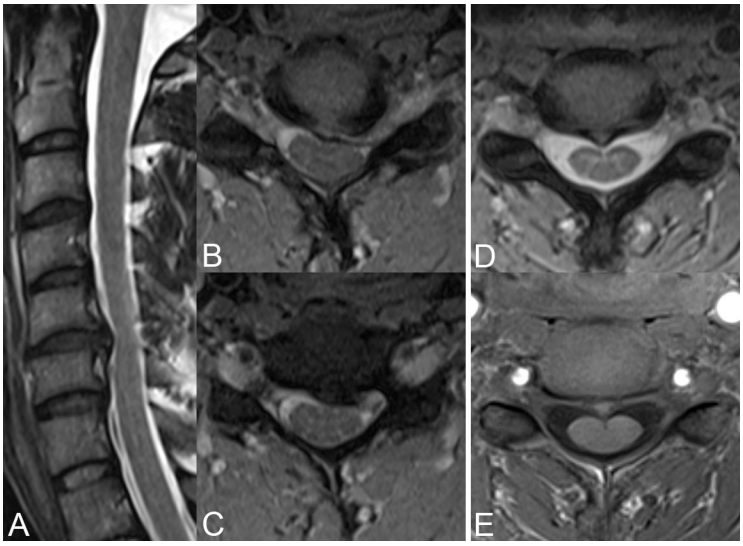

Fig. 31.2