30. Trauma

MRI offers superior evaluation of soft tissue and cord injuries and is preferred to CT for this purpose in the setting of trauma. The sagittal fat saturated T2WI in Figure 30.1 A demonstrates compression of the cervical spinal cord by a small surrounding epidural fluid collection (white arrows). SI characteristics of this lesion on accompanying sequences helped identify it as an epidural hematoma. In the spine, these result from the tearing of the epidural venous plexus. The SI of these hematomas varies with the age of their constituent blood products. A traumatic disk herniation (black arrow) at the C6-7 level is demonstrated in Figure 30.1 B, C on sagittal FSE T2WI and axial GRE T2WI, respectively. The axial image demonstrates a broad-based central and left paracentral disk herniation (black arrow), with associated mild cord flattening. Traumatic herniations may arise secondary to osseous injury as in the T2WI of Figure 30.2 A. Here the anterior subluxation of C4 relative to C5 has led to a disk protrusion with mild to moderate compression of the cord. A perched facet (white arrow) is also visible on the left parasagittal image in Figure 30.2 B. Pure disk injury may be seen as asymmetry of or high SI (on T2WI) within the disk. Occasionally damage to the cord may occur without direct evidence of concurrent osseous or soft tissue injury. The T2WI of Figure 30.2 C demonstrates longitudinally extending cord edema (black arrows) with no other evidence of traumatic injury. In some cases, edema may result in cord enlargement, and distinguishing pure edema from a hemorrhagic lesion is crucial given the poor prognosis with the latter. The typical pattern consists of a spindle-shaped region of hemorrhage surrounded longitudinally by edema. The SI of the hemorrhagic component varies with blood product age (see Chapter 8) but with a markedly delayed progression versus that of blood products in the brain. Because of this delay, deoxyhemoglobin (low SI on T2WI) is the dominant acute species. GRE T2WI may aid in the detection of this and other blood products (as low SI) within the cord. In chronic cord injury, myelomalacic changes predominate with cystic necrosis—visualized as high and

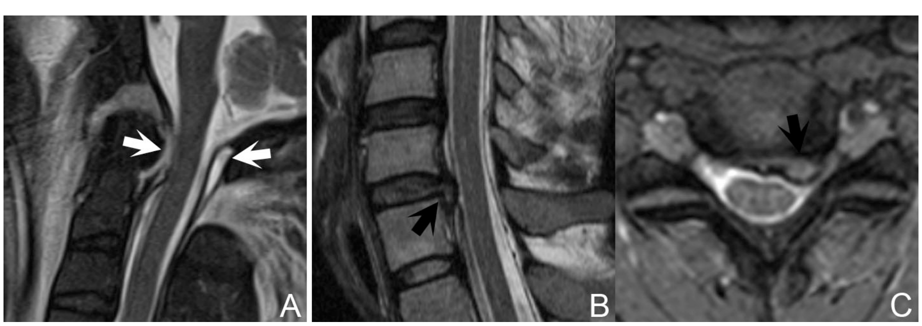

Fig. 30.1

low SI on T2 and T1WI respectively—eventually progressing to syrinx formation and cord atrophy.

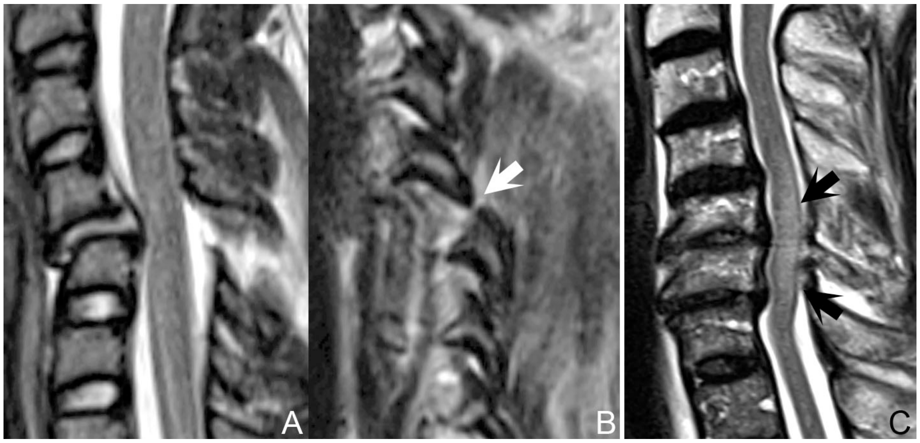

Fig. 30.2

Specific osseous injuries to the cervical spine include atlanto-occipital dislocation, Jefferson's fracture (a burst fracture involving the anterior and posterior arches of C1), Hangman's fracture (a fracture of C2 and C3 that extends through the C2 pedicles), and clay shoveler's fracture (spinous process avulsion of C6 or C7). Odontoid fractures may affect the superior portion (Type 1) or body (base) of the dens (Type 2), or extend into the C2 body (Type 3). A vertebral body may wedge anteriorly in flexion and break into fragments. Compression (burst) fractures, such as those resulting from excess axial load, are the most common traumatic injury in the thoracic spine. These may manifest as a loss of vertebral body height, as seen in the T3 vertebral body in Figure 30.3 (lower white arrow). Oftentimes, however, body height may be maintained, rendering visualization of these microfractures impossible on plain film or CT. With MRI, however, these fractures are clearly seen as an area of edema-like SI, as illustrated on the T1WI of Figure 30.3 involving C7 (upper white arrow).

MRI is the only modality allowing direct visualization of ligamentous injury. The dense avascular ligaments surrounding the spine appear as low SI on all pulse sequences. The anterior longitudinal ligament—commonly damaged in extension injury—is normally seen on sagittal images as a continuous thin band of low SI anterior to the vertebral bodies. Edema or discontinuity within this band signifies injury. In distinction, the posterior longitudinal ligament (which can be injured due to either flexion or extension) normally appears discontinuous due to variability in its width (thicker posterior to the disks but thinner posterior to the vertebral bodies). Flexion injury may damage the interspinous ligaments as in Figure 30.2 A, where there is edema posteriorly at the C4-5 level and splaying of the spinous processes. The use of fat saturation (with FSE T2WI) or STIR (see Chapter 34) improves the visualization of edema within the soft tissues. In the setting of spinal trauma, vascular structures—particularly the vertebral artery as it courses through the foramen transversum—must also be evaluated on MR for the presence of dissection or occlusion.


Fig 30.3