

#### 45. Postoperative Lumbar Spine

Gadolinium chelate contrast agents are routinely utilized in the MR evaluation of the postoperative spine to distinguish epidural fibrosis (scar) and recurrent disk herniations—both important etiologies of the failed back surgery syndrome. There is good specificity for this distinction utilizing CE scans acquired less than 20 minutes following contrast administration at 3 months or more after surgery. Figure 45.1 illustrates this use. On sagittal (A) T1 and (B) T2WI there is a defect in the right L5-S1 lamina as a result of prior posterior decompression surgery. In addition, a low to moderate SI focus of soft tissue protrudes posteriorly at the level of the L5-S1 disk. On the basis of these images alone, such a finding, which appears to extend from the desiccated, compressed L5-S1 intervertebral disk, might be mistaken for a disk herniation. (C) CE FS T1WI, however, shows this soft tissue focus to enhance uniformly following contrast administration—an appearance consistent with epidural fibrosis (scar). Axial (D) T1, (E) T2, and (F) CE T1WI more clearly demonstrate the partial right-sided facetectomy and laminectomy, with scar extending from the defect to the anterior epidural fat, crossing the midline to contact the left S1 nerve root. Sagittal CE T1WI illustrates envelopment of the low SI right S1 nerve root by the enhancing epidural fibrosis. The rationale for the enhancement of fibrotic tissue relates to extravasation of gadolinium chelates through leaky tight junctions in the vascular endothelium, leading to accumulation of such agents within the extracellular space. Fat may be grafted in the laminectomy bed to reduce epidural scarring with MR findings accordingly appearing as high SI foci on T1WI within the region of the posterior elements. In distinction to epidural fibrosis, a recurrent disk herniation will not enhance uniformly.

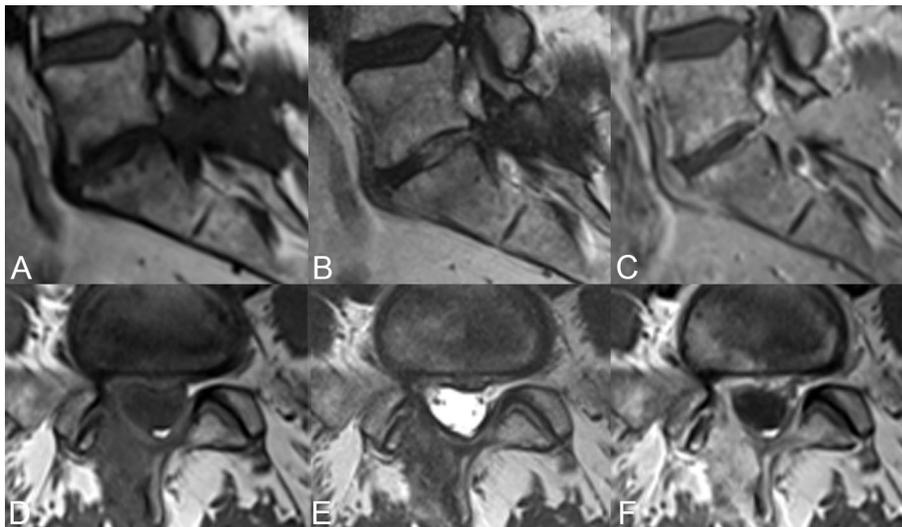


Fig. 45.1

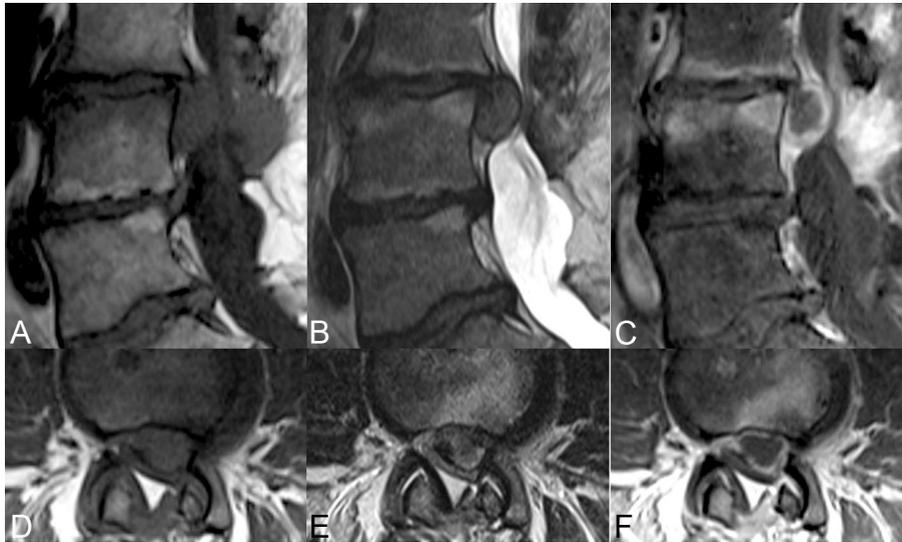


Fig. 45.2

Figure 45.2 illustrates sagittal and axial images from a patient that, in addition to the degenerative findings present, has undergone bilateral L3-4 laminectomies. A large low SI lesion is present within the spinal canal on (A) T1 and (B) T2WI. The latter scan clearly depicts marked compression of the thecal sac. While such an appearance could represent epidural fibrosis, the pattern of enhancement on (C) sagittal CE T1WI is diagnostic for a recurrent, inferiorly migrated disk extrusion at the site of prior surgery. Axial (D) T1 and (E) T2WI illustrate the post-operative posterior element defect and localize the extrusion to a left paracentral location. (F) CE T1WI again illustrates rim-like enhancement of the disk herniation, correlating with surrounding scar tissue. Early post-operative imaging of the spine however should be considered with caution, due to prominent soft tissue edema present immediately (< 6 weeks) following surgery, and the difficulties thus encountered in image interpretation.

Characterization of operative procedures is typically readily accomplished by MR. Findings associated with vertebroplasty are discussed in Chapter 43. Discontinuity in the low SI ligamentum flavum is often useful in detecting a site of operative intervention. In a laminectomy, the entire spinal lamina is removed along with the ligamentum flavum. Defects from discectomy may also be seen as may osseous spinal fusions of the articular processes.

Additional complications of lower back surgery include arachnoiditis (see Chapter 48), radiculitis, postoperative infection, and pseudomeningocele. Radiculitis can be diagnosed on MRI due to nerve root enhancement, best seen within the thecal sac. It needs to be noted however that enhancement is seen normally in the dorsal root ganglia, which lack the equivalent of a blood-brain barrier. Findings of post-operative infections within the spine

*Essentials of Clinical MR, 2<sup>nd</sup> edition*

are similar to those described in Chapter 48. In the post-operative patient, however, a concurrent paravertebral infection will often be present. Such pathology is well depicted on STIR or FS T2WI as hyperintense, and on CE T1WI as heterogeneously enhancing, soft tissue. Since similar changes may be seen as a result of normal inflammation in the early postoperative patient, MRI must be interpreted with caution in this setting. A pseudomeningocele is a non-enhancing, CSF SI fluid collection communicating with the thecal sac but not lined with meningeal tissue.

In the presence of metal hardware used in spine surgery, evaluation of the spine may be limited due to susceptibility artifacts. Susceptibility is an intrinsic physical property referring to the ability of an object to become magnetized thus resulting, in the context of MRI, in inhomogeneity of the main magnetic field, leading to the appearance of artifact. If all other scan parameters are equal, effects from susceptibility result in greater artifact at 3 T than at 1.5 T. Gains in SNR with 3 T, however, allow utilization of techniques that diminish artifacts from susceptibility while preserving SNR levels equal to or above that achievable at 1.5 T, and thus diagnostic quality post-operative spine MR is well-performed at both field strengths.