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Postoperative Fractures of Lumbar Articular Facets:
Occult Cause of Radiculopathy

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Fracture of the inferior lumbar articular facets after laminectomy with facetectomy is a relatively common but unrecognized cause of radiculopathy. Although not all patients may be symptomatic from the fractures, some may have radiculopathy or back pain caused by displacement of the fracture fragment. In a series of 400 postoperative spinal computed tomographic (CT) scans, 25 patients were found who had fractures through the base of the inferior facets. Axial scans revealed no abnormality other than slight widening of the joint on the affected side. Sagittal views demonstrated a lucent defect similar to a pars interarticularis fracture, whereas coronal views showed the fracture at a different location in the base of the facet. Typically patients become symptomatic after a period of postsurgical well-being. A new pain pattern, local tenderness, pain on unusual movements, and relief with recumbency help suggest facet fracture versus recurrent disk herniation.

There is a disturbingly high incidence of residual or recurrent symptoms after all types of lumbar spine surgery. The most common causes for the "failed-back syndrome" are unrecognized canal stenosis, foraminal stenosis, recurrent disk herniation, and postsurgical scar. Another less well known cause of recurrent back pain and radicular pain is postoperative fracture of the base of an inferior articular process. Twenty-five patients with this disorder have been recognized by sagittal computed tomographic (CT) reformations. Selected case histories and CT scans from this group of patients make up the basis of this report.

Materials and Methods

As part of a general review of a series of 400 lumbar spine CT scans from patients who had previous lumbar spine surgery, 25 patients were found to have fractures of the base of one or both inferior articular processes at the level of the laminectomy and facetectomy. Facet fracture was identified as a linear lucency on sagittal and coronal views. To be accepted as a fracture, bony defects had to be identified on two nonaxial perpendicular projections. All scans were obtained on a GE 8800 scanner using 5-mm-thick axial slices with 2 mm of overlap. These data were reformatted, producing sagittal, coronal, and, on occasion, curved coronal images. The exact details of this technique have been reported [1–3].

Representative Case Reports

Case 1

A 55-year-old woman underwent laminectomy, diskectomy, and facetectomy because of pain radiating down the right leg. After the initial surgery, she had relief of her original symptoms. Several months before the CT study, she began experiencing a tight, viselike pain in her calf that progressed to the right hip with radiation into the groin. The pain was accentuated by standing and walking and was relieved by lying down. She had a right foot drop and mild quadriceps weakness. Her knee reflex was diminished. CT (fig. 1) revealed a fracture of the inferior facet with retrolisthesis of L4 on L5. The neural foramina on both sides
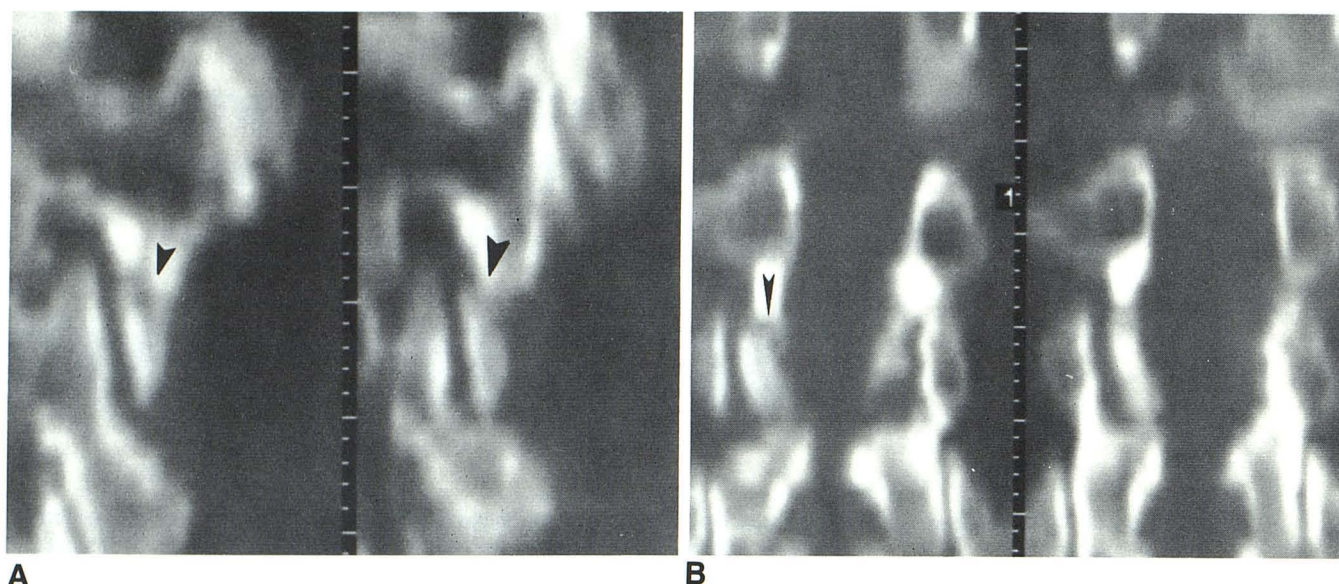
Fig. 1.—Case 1. Facet fracture after laminectomy and facetectomy. **A,** Sagittal reformations through left articular processes. Slightly displaced fracture of base of L4 inferior facet (*arrowheads*). **B,** Coronal reformations also show fracture (*arrowhead*). Inferior part of fragment is retracted medially and rotated.

were narrowed due to downward displacement of L4 on L5 with migration of the left superior facet of L5 into the neural foramen. Instability and neural compression was increased by hyperextension. This was confirmed on upright lateral metrizamide myelography.

Case 2

A 60-year-old man had surgery originally because of left leg pain. His knee and ankle reflexes were absent. At follow-up 1 month later, his signs and symptoms had greatly diminished and his knee reflex was normal. Eight months after the initial surgery, the patient developed a new symptom complex that included severe pain and tingling in his left leg. This was aggravated by standing and walking and relieved by lying down. A CT scan revealed bilateral fractures of the base of the inferior articular process with severe foraminal stenosis.

Case 3

A 33-year-old woman underwent decompressive laminectomy and facetectomy because of a long history of neurogenic claudications. Numbness and paresthesias disappeared after surgery. In the immediate postoperative period leg weakness worsened, but strength gradually returned. Three months after surgery straight-leg raising caused pain when elevated to an angle of 45°; there was disproportionate pain and tenderness localized over the L4–L5 area. A CT scan demonstrated fractures of the base of the inferior articular processes bilaterally (fig. 3).

Case 4

A 48-year-old man underwent the first of three surgical procedures because of right leg pain. He was asymptomatic for several months but experienced a severe acute recurrence of his symptoms while lifting a heavy object. CT demonstrated recurrent disk herniation at L5–S1 and a posteriorly displaced fracture of the base of the inferior articular process of L5 (fig. 4). A second decompressive exploration of the disk space confirmed the presence of a large disk fragment; exploration and a laminectomy were also carried out at L4–L5. There was only slight relief of symptoms after the second surgery. Repeat CT (figs. 4C and 4D) revealed a new fracture of the base of the L4 inferior facet. The previously noted herniated disk had been surgically removed. Because of continuing symptoms, lumbar fusion was performed and the instability of the facet was documented surgically.

Results

In an attempt to define the incidence of postoperative fractures, 50 consecutive patients were reviewed who had previously undergone laminectomy and facetectomy. It is in this subset of patients that facet fractures were found to occur. Of these 50 sequential laminectomy and facetectomy patients, eight (16%) were noted to have facet fractures. A total of 25 patients has been collected to date.

Discussion

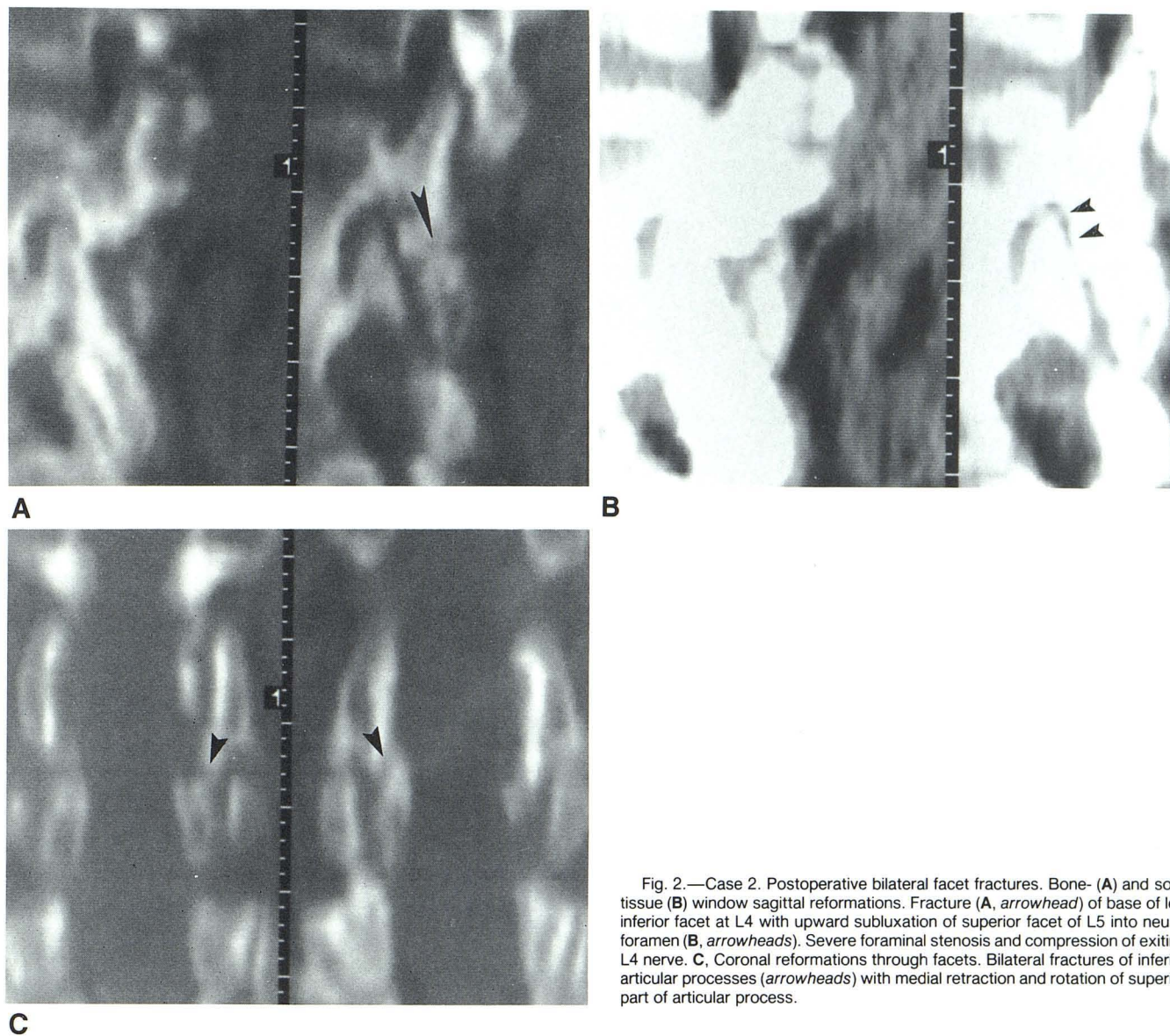Postoperative facet fractures almost uniformly occur at the base of the inferior articular process. The fracture line is

A

B

C

Fig. 2.—Case 2. Postoperative bilateral facet fractures. Bone- (**A**) and soft-tissue (**B**) window sagittal reformations. Fracture (**A**, *arrowhead*) of base of left inferior facet at L4 with upward subluxation of superior facet of L5 into neural foramen (**B**, *arrowheads*). Severe foraminal stenosis and compression of exiting L4 nerve. **C**, Coronal reformations through facets. Bilateral fractures of inferior articular processes (*arrowheads*) with medial retraction and rotation of superior part of articular process.

parallel to the plane of the axial section and therefore is unrecognizable on axial CT scans. Recognition is usually made on sagittal images by seeing a lucent line just below the pars interarticularis. On sagittal views it is usually impossible to distinguish the true postoperative fracture from the more common pars interarticularis bony defect. The frontal projection does allow differentiation. The lucency in patients with spondylolisthesis occurs in the pars, which is considerably higher than the fracture. Figure 5 compares two similar but different situations: one with typical bilateral L3 pars

interarticularis defects and the other with fracture of the base of the articular process.

Since the fractured facet is free of all bony attachment it tends to rotate, producing asymmetric widening of the joint space. Occasionally the superior part of the fragment rotates laterally (case 2) and sometimes the inferior part rotates laterally (case 1). This is well seen on the coronal views. Often the axial CT images will reveal subtle asymmetry of the joint space. This finding should strongly suggest a fracture (fig. 6), and reformation should be performed to confirm the finding.
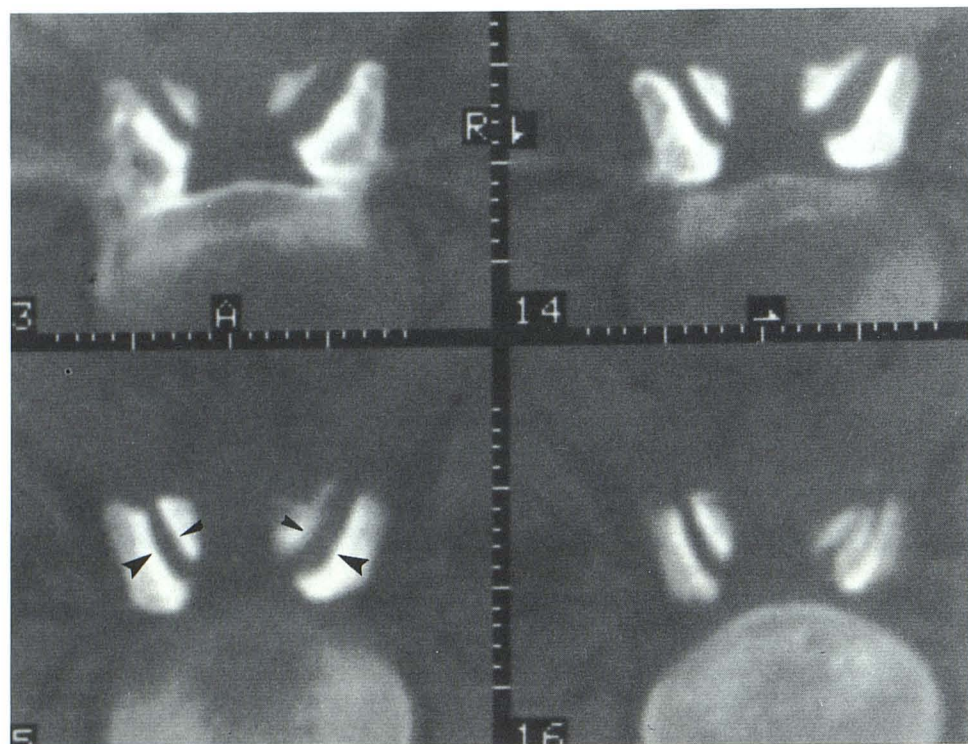
Fig. 3.—Case 3. Facet fracture after laminectomy and facetectomy. **A,** Axial scans. Bilateral widening of joint space at L4–L5 (*arrowheads*). **B,** Sagittal reformation. Fracture of inferior facet (*large arrowhead*) with posterior displacement of left inferior articular process and widening of facet joint (*small arrowheads*). **C,** Coronal reformation. Medial displacement of fractured inferior articular process on right side (*arrow*). Facet joint space is markedly widened (*arrowheads*).
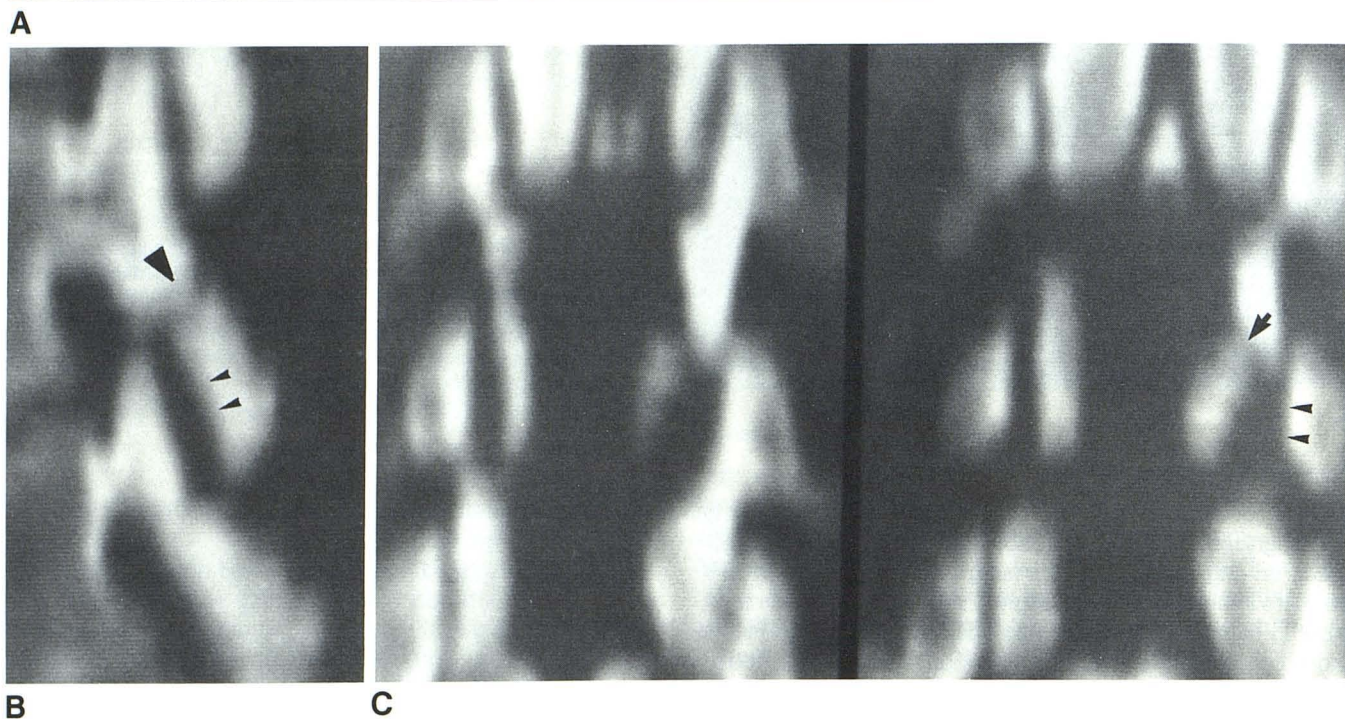
We believe it is important to require two perpendicular nonaxial projections for diagnosis. There are two main reasons: (1) Since the articular processes are sloping, curved structures, sagittal reformations at their lateral edges may suggest a fracture when none is really present; and (2) it is important to distinguish postoperative fracture from typical spondylolisthesis, which is generally considered to result from stress fractures of childhood and adolescence. This distinction can only be made from a frontal section.

Although the diagnosis of postoperative fracture is easy when appropriate films are produced, deciding the clinical significance of the fracture may be difficult. In at least one
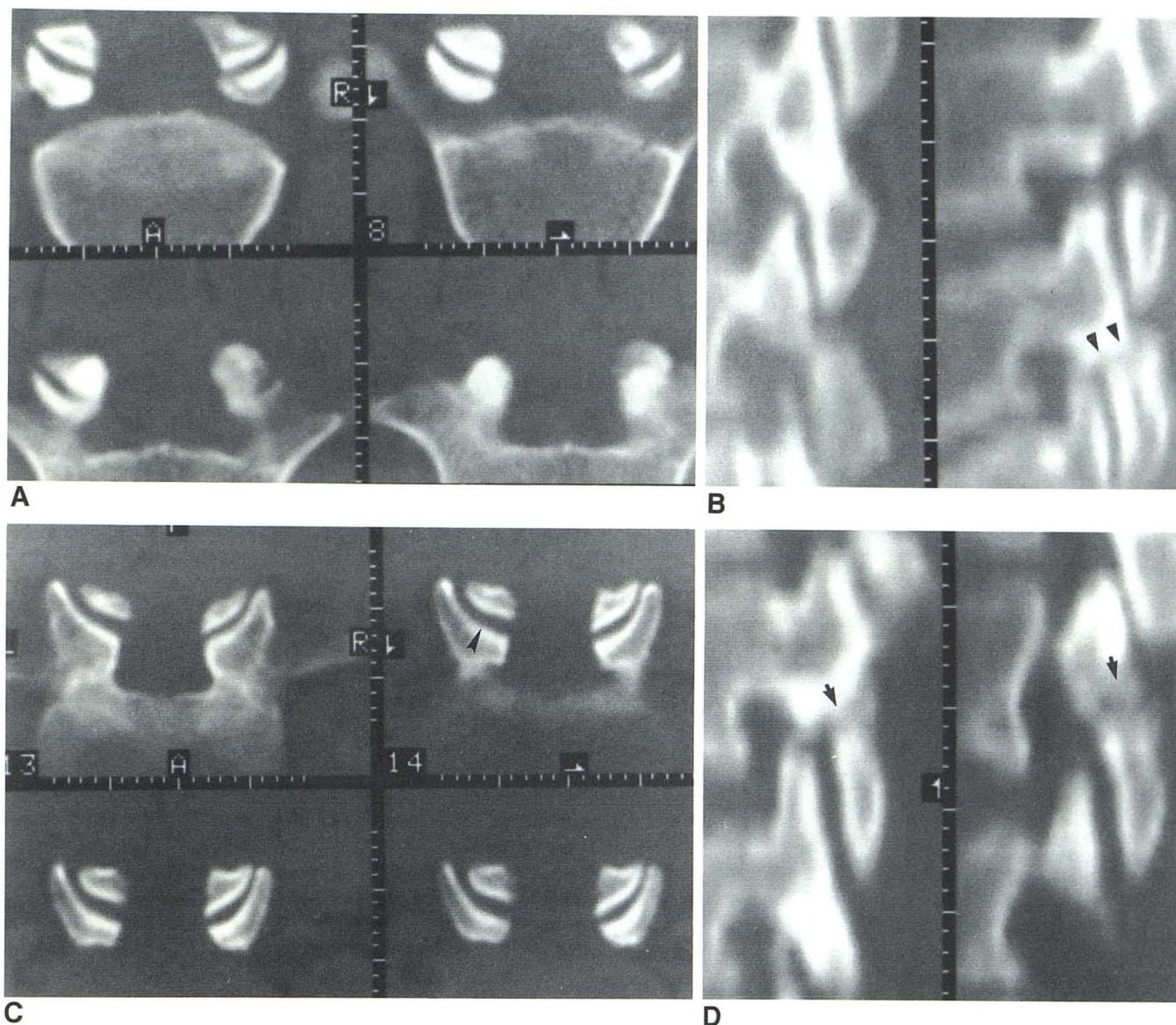
Fig. 4.—Case 4. Recurrent postsurgical facet fracture. **A**, Axial CT scans at L5–S1 level. Bilateral laminectomies. Facet joints are otherwise unremarkable. **B**, Sagittal reformation. Slightly displaced fracture of left inferior facet of L5

(*arrowheads*). **C**, Axial CT scans at L4–L5 level. Very subtle widening of facet joint (*arrowhead*) objectively is within normal limits. **D**, Sagittal reformation. New fracture of left inferior facet of L4 (*arrows*).

instance the diagnosis of an L2–L3 facet fracture with rotatory subluxation was made, but the clinical symptoms were confined to the S1 nerve root. Case 4 was typical of another subgroup that had obvious fractures but also had symptomatic disk herniation at the same level.

Several clinical hints may be useful in distinguishing radiculopathy caused by disk herniation from that caused by fracture. Patients with fracture tend to have localized tenderness at the affected level. Tenderness and back pain are sometimes made worse by minor rotation. This is atypical for patients with disk herniation. Radiculopathy, when caused by posterior subluxation and upward migration of an unopposed

superior facet (cases 1 and 2), tends to mimic neurogenic claudications of spinal stenosis in that it is accentuated in the upright position and made worse by walking. This is almost certainly due to compression of the exiting nerve root between the pedicle and the tip of the superior articular process.

One can only speculate as to the cause of the fracture. On occasion surgeons report breaking the facet at the time of surgery, but in most instances this is not the case. We believe that the most likely explanation is that the weakened articular process undergoes stress fracture when the patient returns to upright position. This would explain the typical history of a period of well-being after the original surgery before symp-
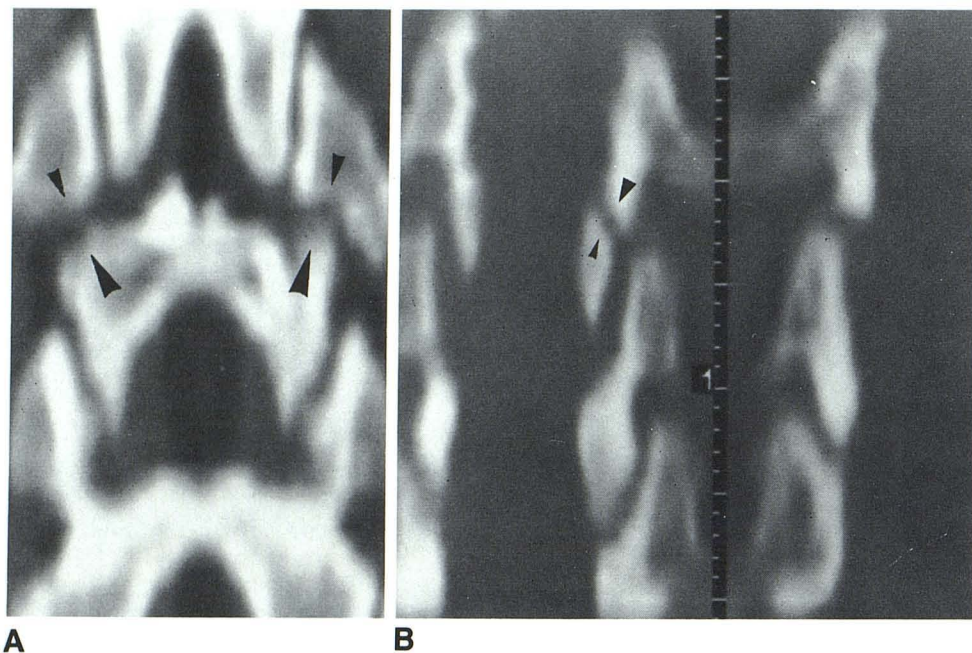
Fig. 5.—Comparison of pars interarticularis defects and facet fractures. Coronal reformations. **A**, Typical bilateral pars interarticularis defects at L3 (*arrowheads*). **B**, Unilateral displaced postoperative fracture (*arrowheads*). Pars interarticularis defects occur much higher up on posterior arch.
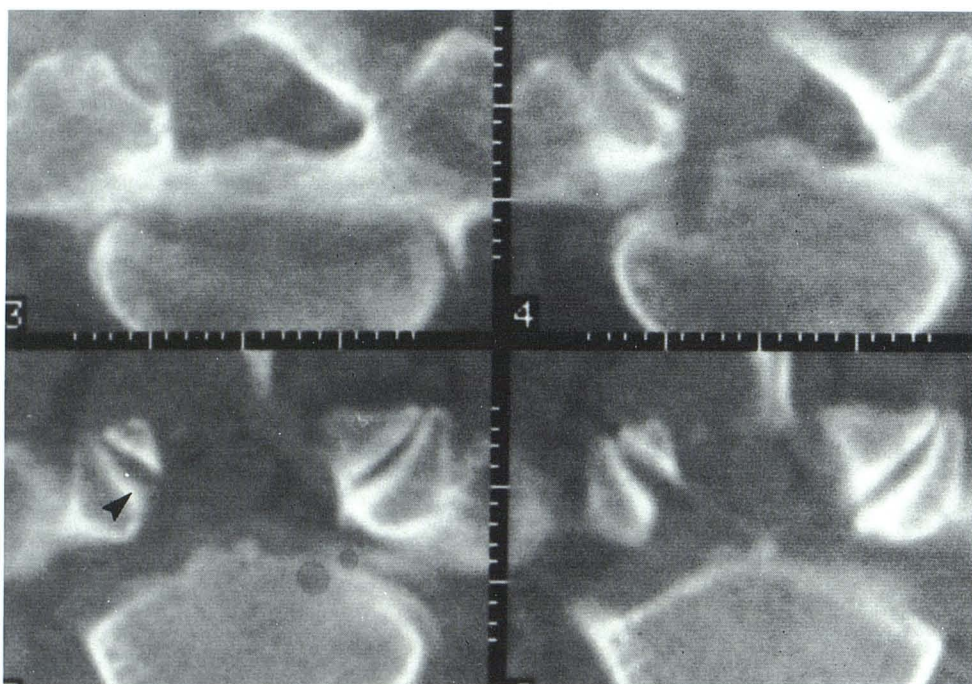

Fig. 6.—Axial CT images. Subtle abnormal rotation of inferior facet with unilateral asymmetric widening of joint space (*arrowhead*).

toms recur. Hyperextension motions would be expected to place severe stress on the surgically weakened articular process. Once the facets break, the motion segment can sublux, producing root entrapment.

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