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**RADIOLOGIC VIGNETTE NO. 1**

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# A RADIOLOGICALLY DISTINCTIVE CAUSE OF LOW BACK PAIN

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A 40-year-old obese female with diabetes mellitus that did not require insulin complained of low back pain, which radiated down the posterolateral aspect of the left lower extremity. She had no history of trauma, infection, or other musculoskeletal complaints. Physical examination showed minimal tenderness over the lower lumbar spine and a slightly reduced range of motion. She had no peripheral neuropathy. The erythrocyte sedimentation rate was normal.

Roentgenograms of 10/18/74 showed a circumscribed area of sclerosis in the anteroinferior part of L4 with a question of minimal sclerosis at the anterosuperior aspect of L5 (Figure 1A). There was slight periosteal bone apposition of L4, anteriorly, and the height of the disc space at L4-L5 was reduced. There was no bone lysis, fragmentation, or vertebral malalignment. Back discomfort was somewhat relieved with aspirin.

Reexamination on 2/11/75 showed no change, but laminagrams at this time confirmed the previous features and showed the sclerotic lesion in L5 more clearly (Figure 1B).

The most likely etiology for this lesion is

1. Discovertebral trauma
2. Metastatic carcinoma
3. Chronic infection
4. Diabetic axial neuroarthropathy
5. Osteoid osteoma.

This distinctive radiologic appearance represents reactive bone formation associated with discovertebral trauma (1). In this case the sclerosis of L4 was erroneously interpreted as probably representing metastatic carcinoma, and the patient underwent extensive clinical and radiologic evaluations. Roentgenograms on 8/6/75 showed the disc space narrowing at L4-L5 to have progressed slightly with a somewhat more marked reduction on the left side. The sclerotic areas in L4 and L5 also seemed more obvious on the left side (Figure 2). There was no clinical evidence of infection or neoplasm at the follow-up examination.

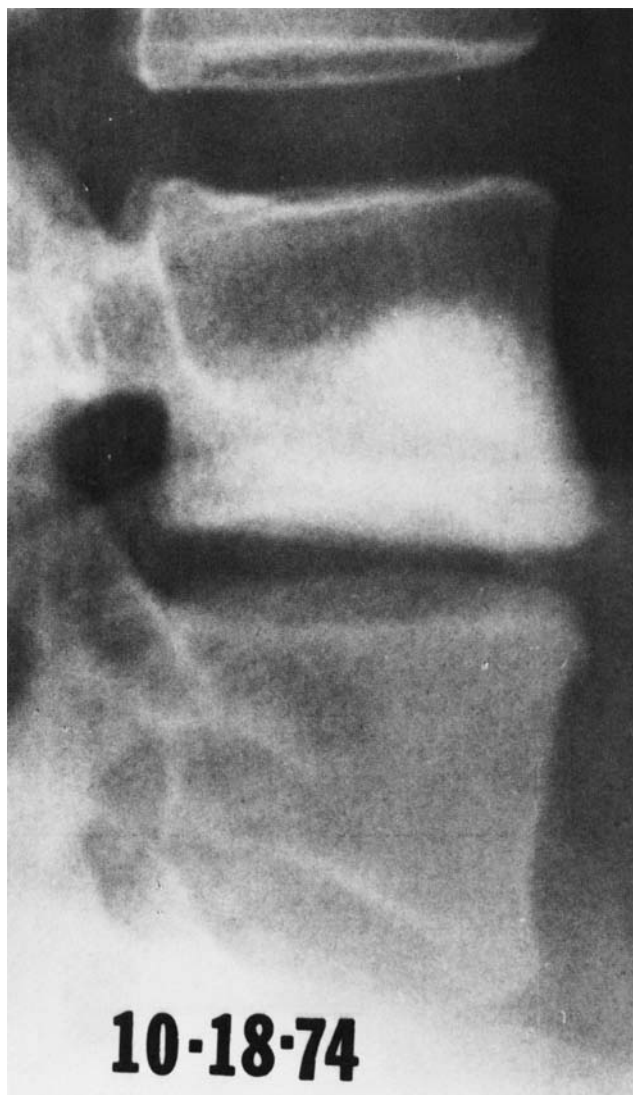
These lesions are most common in the lumbar spine. They usually affect a single disc level, but sometimes two levels are involved. There is a remarkable predilection for the inferior aspect of L4 and the adjacent vertebra frequently shows similar, less marked sclerosis. The sclerosis tends to affect the anterior part of the vertebral body rather selectively, and it may be eccentric with respect to the midsagittal plane (Figure 2). Anterior periosteal bone apposition is frequent but usually minimal. The height of the adjacent disc was reduced in all but 1 of 11 such cases. Usually there is little change over a period of months or years, although in 1 case the sclerosis regressed over 7 years (1).

In some of these lesions there is a lytic area surrounded by sclerotic bone on one or both sides of the disc (Figure 3). As in the purely sclerotic lesions, there appears to be a predilection for the disc at L4-L5, particularly anteriorly. Differentiation from infectious spondylitis may be particularly difficult in such cases. However significant differential points include the absence of a paraspinous soft tissue mass (particularly with

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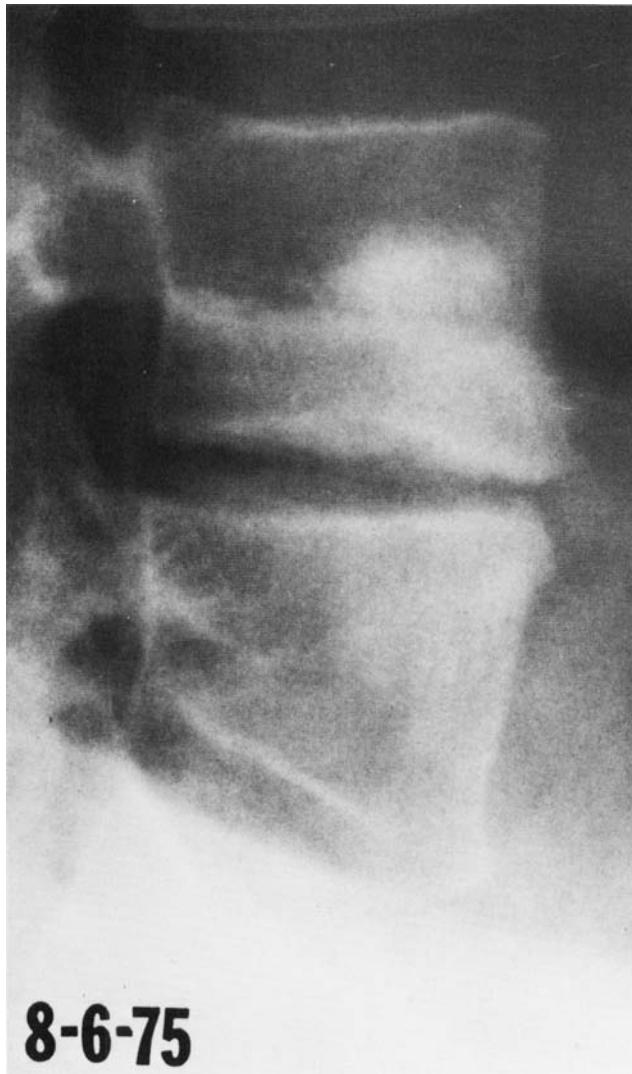


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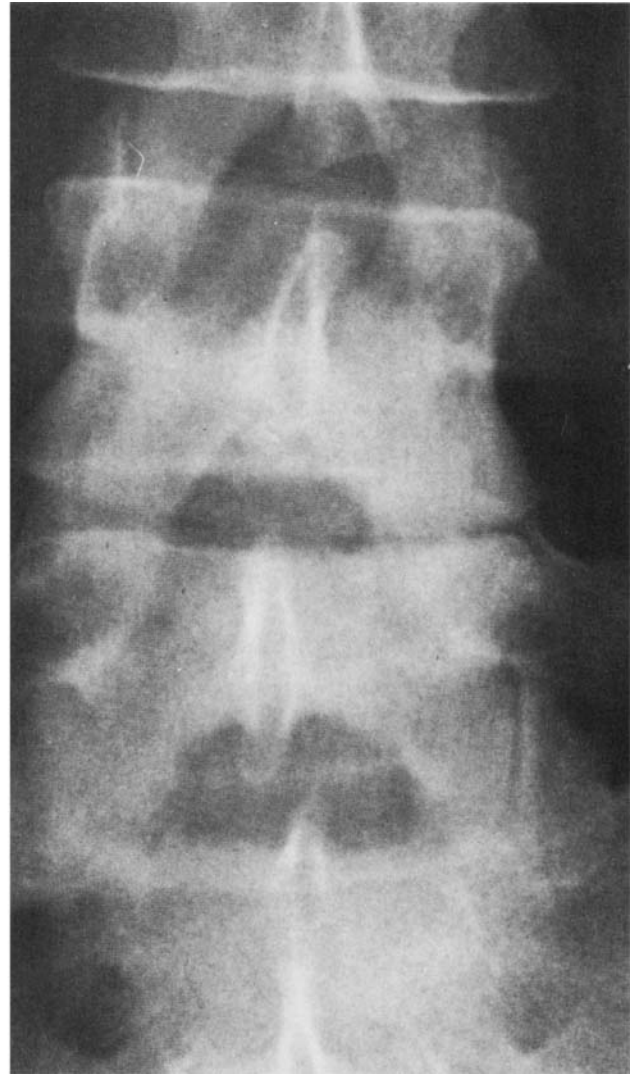
**Fig 1.** A 40-year-old woman with low back pain. **A.** 10/18/74. **B.** Midline laminogram on 2/11/75.

laminography), no clinical evidence of sepsis, and lack of the type of progression which one expects in infectious spondylitis. Occasionally one endplate is extensively involved and the adjacent one, bordering on the same disc, is completely spared. Such complete sparing of one side of the disc is unusual in infectious lesions. When both endplates are affected, a portion of the endplate may be severely eroded, whereas the adjacent cortex, usually situated posteriorly, is completely spared (Figure 3). Finally, cultures of biopsy material for aerobic and anaerobic organisms are negative.

These cases showing both sclerotic and lytic components are admittedly controversial. In one series in which antibiotic treatment had not been given, the view was taken, despite persistently negative cultures for infectious organisms, that these nevertheless probably represented low-grade infections (2). However it is important to recognize that these lesions need not be due to infection, although it may be difficult to exclude this possibility on the basis of a single radiologic examination in cases showing both sclerosis and lysis. An interesting feature is that these lesions—both sclerotic



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B

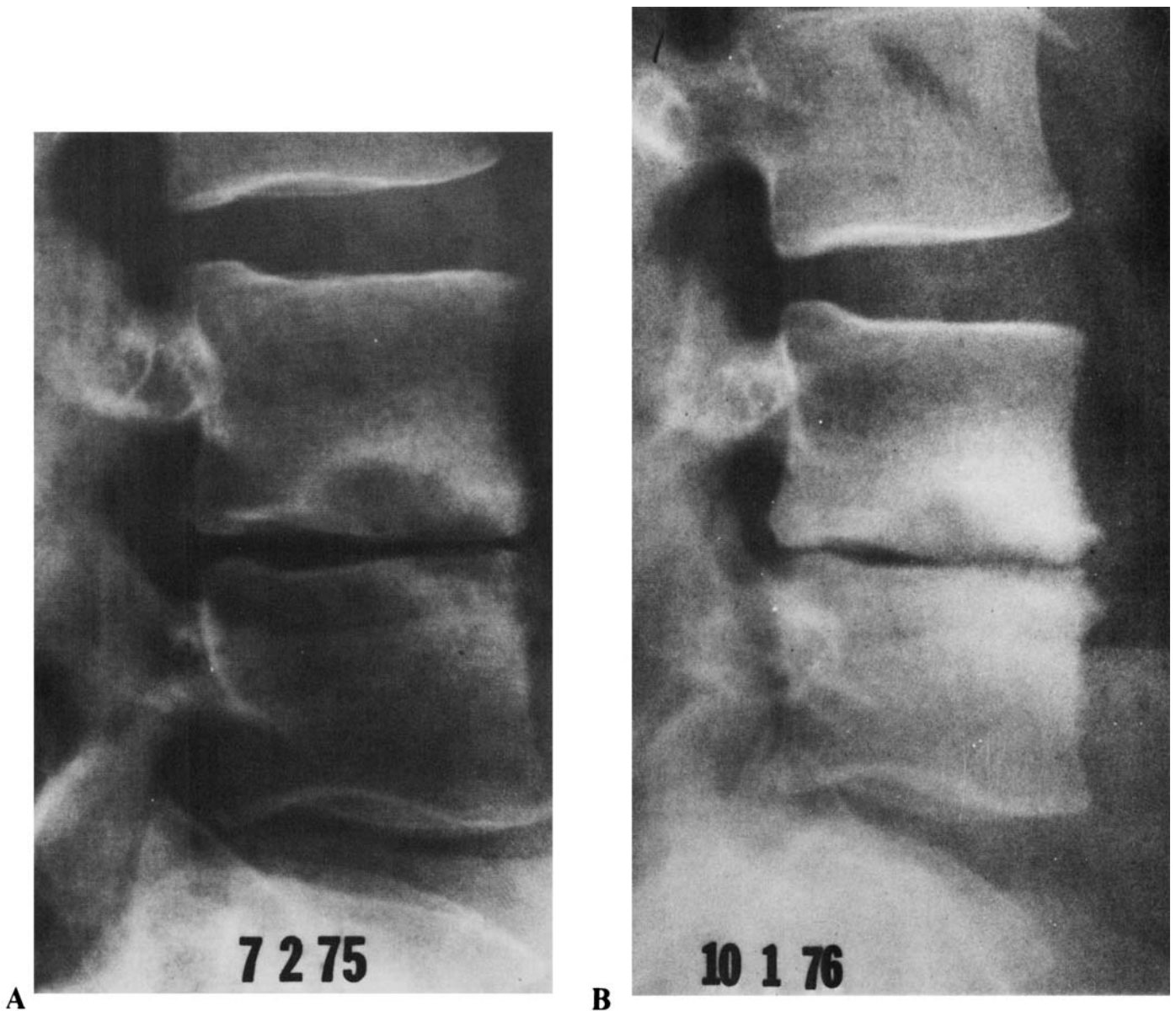
**Fig 2.** The same patient on 8/6/75. **A.** Lateral. **B.** Antero-posterior. The disc space at L4-L5 has diminished further and is somewhat narrower on the left. The sclerosis in L4 and L5 is slightly more prominent on the left and is more apparent in L5 than on 10/18/74. The sclerotic zone in L4 (A) is essentially unchanged from that in Figure 1A, if one allows for differences in technique.

and sclerotic-lytic—almost always occurred in females, and all patients were over age 40 (1). Such sex and age predilection may not be true of patients in whom similar lesions develop after surgery for herniated intervertebral discs (2).

The microscopic features in these cases will vary with the age of the lesion and tissue sampled. They have been described as “dense bone,” “reactive granulation tissue with microscopic bone fragments,” and “dense granulation tissue.” The tissue is frequently characterized as having relatively few inflammatory cells (1), a

feature which again strongly supports the concept that these are noninfective lesions.

The sclerosis is not confined to the endplate, but usually involves a broad area adjacent to it. Its anterior location may be related to the attachment of the longitudinal ligament and the relation of the vertebra to Sharpey’s fibers. The latter form tight connections between the bony rim, annulus fibrosus, and hyaline cartilage plate. It may be postulated that acute trauma or chronic, mechanical stress causes subtle fractures of the vertebral endplates and irreversible alterations in the



**Fig 3. A.** 7/2/75. A 45-year-old woman with an 11-month history of low back pain but no traumatic history. The lesion at L4-L5 simulates infectious spondylitis in that there is disc space narrowing with bone lysis and sclerosis involving both vertebral endplates. Percutaneous trochar biopsy showed no inflammation, and cultures of disc material were negative. Note that the lesion is anterior, and the posterior portions of the vertebral endplates are spared. **B.** 10/1/76. The disc space has diminished further, but there is no added bone destruction. The sclerotic areas in L4 and L5 have increased, as has the anterior bone production. The patient received no antibiotic therapy.

disc. The latter lead to localized mechanical instability, which in turn stresses the fibro-osseous attachments leading to reactive osteitis. Furthermore, loss of such stability could lead to additional attrition of the cartilage and to replacement of the disc by fibrous tissue.

Vertebral endplate fractures may permit varying

degrees of intravertebral disc herniation, which could account in part for the lytic component in some of these lesions. In the later stages the disc loses its resilience and ability to withstand compressive and rotational forces. Direct bony contact between opposing vertebral surfaces, uncushioned by disc substance, also stimulates

osteogenesis. This process is analagous to the subchondral sclerosis that occurs in the appendicular joints following destruction of the articular cartilage.

It is recognized in autopsy material that disc degeneration is most common at L5-S1. L4-L5 is the second most severely affected site. Then why is the latter the more frequent site of these lesions? Farfan *et al* (3) stated that the anatomy of the lumbosacral joint provides resistance to the effects of torsion, whereas this is not true of L4-L5. Conceivably, rotational stress is greatest at L4-L5, inasmuch as this appears to be close to the apex of lumbar lordosis in the upright position (1).

These lesions may be confused with metastatic neoplasm (4), infectious spondylitis (2), axial neuroarthropathy (5), and rheumatoid discitis (6). Disc space narrowing is rarely associated with metastatic neoplasm. It is occasionally seen in patients with multiple myeloma and Hodgkin's disease of the spine, but in these cases there is apt to be more obvious vertebral destruction unrelated to the joints. Sclerosis involving two adjacent vertebrae with narrowing of the intervening disc and no other sclerotic lesions, as in this case, is clearly inconsistent with metastatic neoplasm. As has been noted, infection may be difficult to exclude on the basis of a single radiologic examination in instances in which both bone lysis and sclerosis exist on both sides of a narrowed disc space. Axial neuroarthropathy is characterized by progressive joint damage which is associated with bone fragmentation and more uniform subchondral sclerosis. Furthermore, this damage usually

involves more than a single disc level. Discovertebral destruction in rheumatoid arthritis is well known in the cervical spine. Similar lesions sometimes occur in the dorsal and lumbar segments. The latter may be due in some cases to chronic endogenous trauma, associated with vertebral instability, rather than to "rheumatoid discitis" (1).

### ACKNOWLEDGMENT

Figures 1A, 1B, and 3A have been published previously (1).

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