
RADIOLOGIC VIGNETTE NO. 3

SPINAL PSEUDOARTHROSIS

A COMPLICATION OF ANKYLOSING SPONDYLITIS

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Fracture of the cervical spine is a recognized complication of advanced ankylosing spondylitis (1). Such fractures occur after relatively minor trauma and may appear to be spontaneous. They are characteristically seen long after the cervical apophyseal joints have fused and vertebral osteoporosis has developed. This complication is consistent with the mechanically unstable situation that develops late in the disease: the heavy weight of the head is seated on an atrophic column of bone with numerous weak areas represented by the fused apophyseal joints and atrophic intervertebral discs. Such fractures, usually attended by neurologic complications, are often fatal.

It is not widely appreciated that in this disease fractures may also occur in the lower spine. Unlike the cervical fractures, these are often clinically unrecognized but may cause pseudoarthrosis of a discovertebral joint which results in extensive bone resorption. Such lesions may have neurologic consequences, depending on the level of involvement. The following case illustrates the early and late roentgen features of this complication and documents its progressive nature over a 5-year period.

CASE REPORT

The patient, a 40-year-old white male in whom the diagnosis of ankylosing spondylitis had been made 18 years

ago, complained for approximately 2 years of mid-back ache that had become worse in the past several months. He had paresthesias in the paraspinal regions near the costal margins for 8 weeks. Physical examination disclosed marked spinal rigidity and diminished chest expansion characteristic of advanced ankylosing spondylitis. Spinal tenderness was present at the level of T12 but there were no neurologic deficits.

Radiologic examination showed fusion of the sacroiliac and apophyseal joints throughout the spine, uniform narrowing of most of the intervertebral discs associated with syndesmophyte formation, and vertebral osteoporosis (Figure 1). Disc calcification was present at many levels. There was marked bone resorption and sclerosis of the inferior portion of the body of T11 and the superior part of the body of T12 (Figure 2). Irregular lucencies within the soft tissues between these vertebral bodies were considered to represent gas secondary to a vacuum phenomenon (2). These lucencies were accentuated in extension. The dorsolumbar spine appeared rigid except for slight motion at T11-12 (Figure 3). Bilateral ununited fractures were present on the posterior elements of T11. On the left side the fracture was irregular and involved the apophyseal joint of T11-12 with resorption of the contiguous bone margins. The fracture on the right, just below the pars interarticularis, was associated with sclerosis and irregular bone formation characteristic of a long-standing nonunion.

These features were corroborated by laminography (Figure 4). In addition, the height of the disc at L5-S1 was not reduced, as were the others, and the subadjacent cortices appeared slightly dense and indistinct. There was no bony ankylosis of the left apophyseal joint at this level and there was a suggestion that the right one, though not clearly seen, was likewise unfused (Figure 1).

Review of the patient's earlier medical records showed that he had backache and tenderness in the region of T12 in 1972. Roentgenograms at that time showed diffuse ankylosis of the spine, but in retrospect, there also was relative widening

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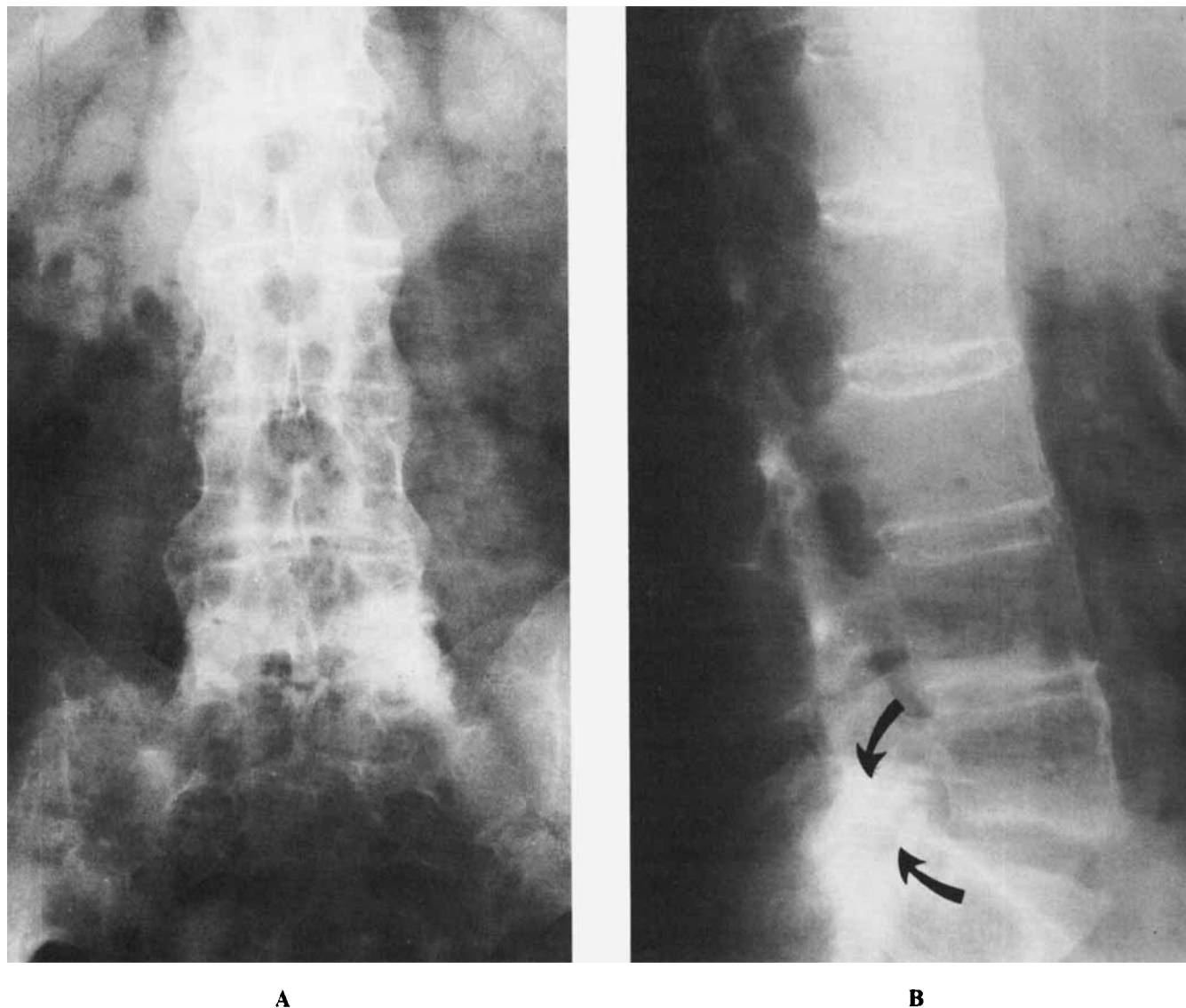


Figure 1 A. Anteroposterior view. B. Lateral view. Note bony ankylosis of the sacroiliac and lumbar joints associated with osteoporosis and intervertebral disc narrowing. There is bony resorption of the bodies of T11 and T12 associated with sclerosis and a "vacuum phenomenon." Note the relatively wide disc space at L5-S1, the indistinctness of the vertebral end-plates, and the evidence that the apophyseal joints at this level are unfused (left joint, lower arrow; right joint, upper arrow).

of the intervertebral space at T11-12 associated with sclerosis and indistinctness of the intervertebral cortices at this level (Figure 5). This finding suggested that a pseudoarthrosis was present at that time and a fracture of one of the posterior elements of T11 was faintly visible on lateral projection. The height of the discovertebral joint at L5-S1 was essentially the same as in 1977, but the subadjacent vertebral cortices were sharper on the earlier film (Figure 6). The apophyseal joints at this level were not well demonstrated. The subtle change in the appearance of these discovertebral margins over this interval

suggested that a second pseudoarthrosis was developing at this level. Unfortunately, neither laminograms nor films of this region in flexion and extension were obtained to more fully evaluate this possibility.

The disc space at T11-12 was curretted and spinal fusion was performed. No paravertebral soft tissue mass was evident. The fractures of the posterior elements were verified and culture of the currettings from the intervertebral space were negative. The L5-S1 level was not evaluated during the postoperative period.

Figure 2. Cone-down, lateral view of T11-12. The lesion at T11-12 with gas within the soft tissues between the vertebral bodies due to "vacuum phenomenon" is shown. Note the fractures of the posterior elements on the left (oblique arrow) and right (vertical arrow).

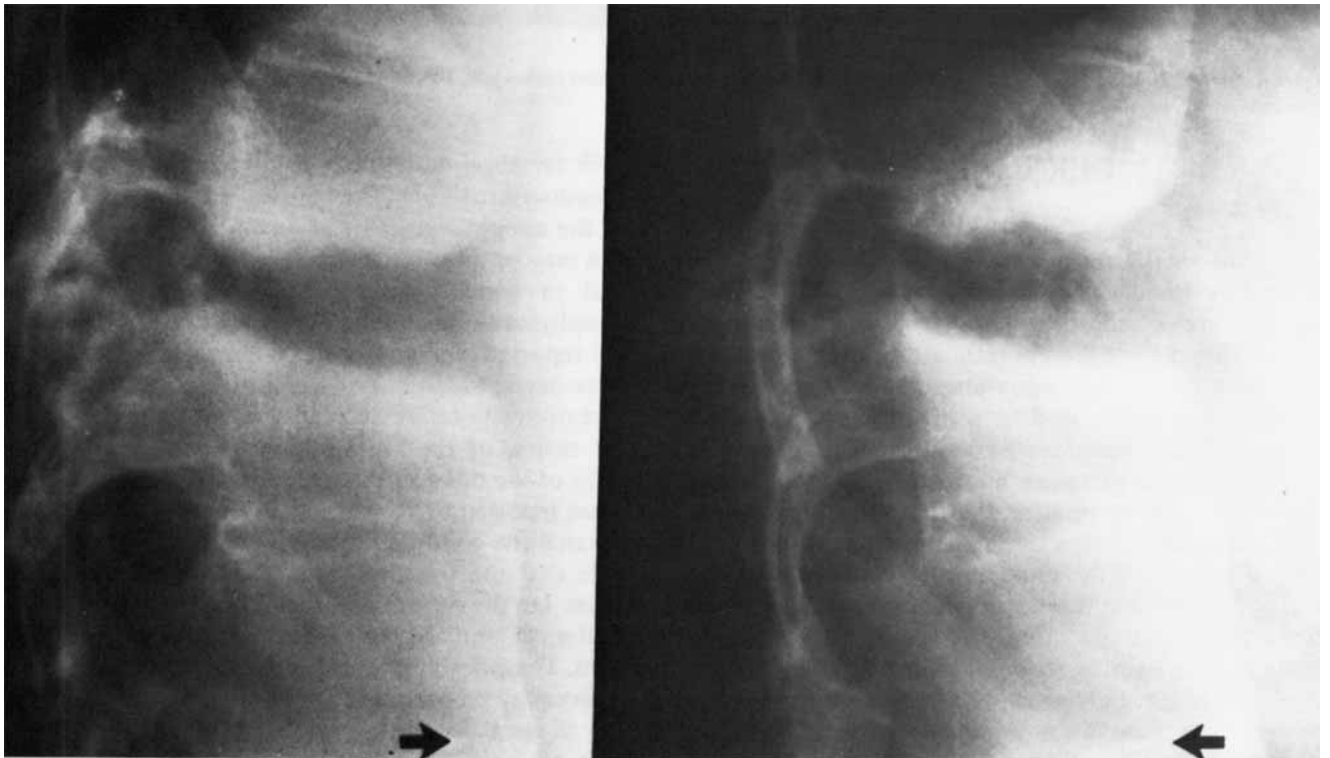
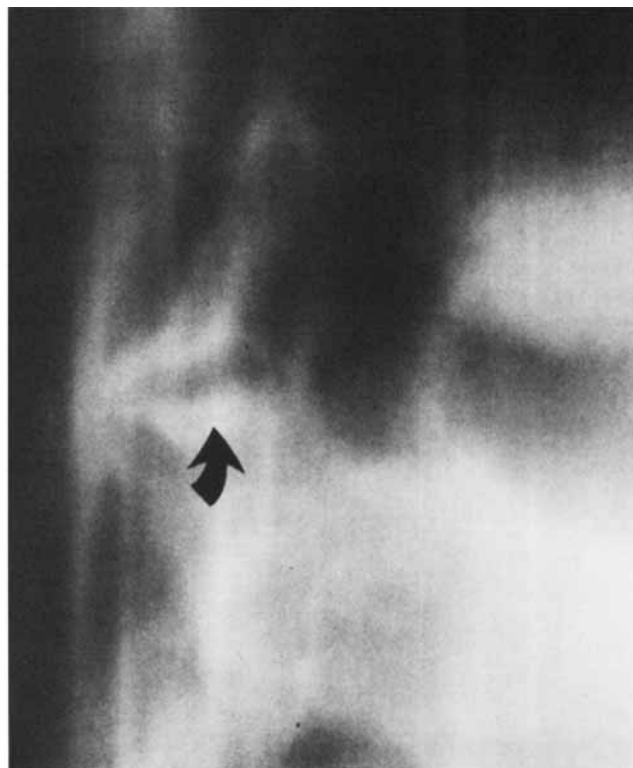


Figure 3. Flexion (left) and extension (right) views show slight motion at T11-T12. More gas within the intervertebral soft tissues is evident in extension.



A



B

Figure 4. Lateral laminograms. A. Irregular fracture involving left apophyseal joint (arrow). B. Disunited fracture on the right, just below pars interarticularis (arrow).

DISCUSSION

The significant mechanical stresses to which the totally ankylosed spine is invariably subjected suggest that fractures of the dorsolumbar spine may be more common than has been appreciated. Conceivably some of these fractures heal spontaneously whereas others, which do not unite, lead to progressive vertebral destruction. These pseudoarthroses are most common in the lower dorsal or upper lumbar segments, although they also occur at or near the lumbosacral junction. They are almost always associated with solid fusion of most, if not all, of the spine both above and below the level of involvement. Pseudoarthroses generally develop over a period of many months or years and characteristically involve a single vertebral level. The erosion tends to be most marked anteriorly. All these features support the view that these are not manifestations of "discitis" but rather a pseudoarthrosis (3).

In 1969 Rivelis and Freiberger called attention to

such vertebral destruction as a manifestation of spinal pseudoarthrosis (4). They attributed it to lack of fusion of the apophyseal joints at an isolated level. Although this may be the mechanism in some cases, it seems likely that in many cases fractures occur through fused apophyseal joints or the adjacent bone (3). Little *et al.* (5) reported similar lesions in spondylitis patients who were asymptomatic. For this reason and because fracture of the posterior elements was not detected on "careful review of the radiographs," Little and colleagues were of the opinion that their cases differed from those cases reported by Rivelis and Freiberger; thus they designated the condition "spondylodiscitis." It is conceivable that the fractures had healed in the Little *et al.* cases. On the other hand, such fractures may be difficult to detect simply by retrospective examination of routine films. Cone-down views, special projections, or laminography may be necessary. Finally, in my experience it is not unusual for such pseudoarthroses to be relatively asymptomatic.

Spinal pseudoarthrosis is not a rare complication



A



B

Figure 5. Lower dorsal spine, 1972. **A.** Anteroposterior view. **B.** Lateral projection. There is relative widening of the disc space at T11-12 with sclerosis and indistinctness of the vertebral end-plates. The fracture in one of the posterior elements is not clearly visible. The appearance, nevertheless, suggests an early pseudoarthrosis.

of ankylosing spondylitis. The characteristic radiologic appearance and manner of evolution of pseudoarthrosis and its frequent association with fractures of the posterior elements make diagnosis possible in most cases. However, it is often necessary to obtain special views on laminograms to establish the existence of the posterior fractures or unfused joints and vertebral instability. Generally a single level of the spine is affected. The present case is of interest because the findings suggest that a second pseudoarthrosis at L5-S1 was developing on the basis of unfused apophyseal joints. Unfortunately, the radiologic anatomy of this region was not well demonstrated. If the fusion at T11-12 is successful,

it is likely that the pseudoarthrosis at L5-S1 will progress.

Recognition of this complication will reduce the likelihood of confusion with infectious spondylitis. Paravertebral soft tissue masses have not been described in association with these pseudoarthroses. Spondylodiscitis is another feature of ankylosing spondylitis with which these lesions may be confused. Spondylodiscitis, also characterized by vertebral end-plate erosions, usually occurs during the early inflammatory phase of the disease. It usually affects multiple levels simultaneously, shows limited progression, and generally results in bony ankylosis (3).

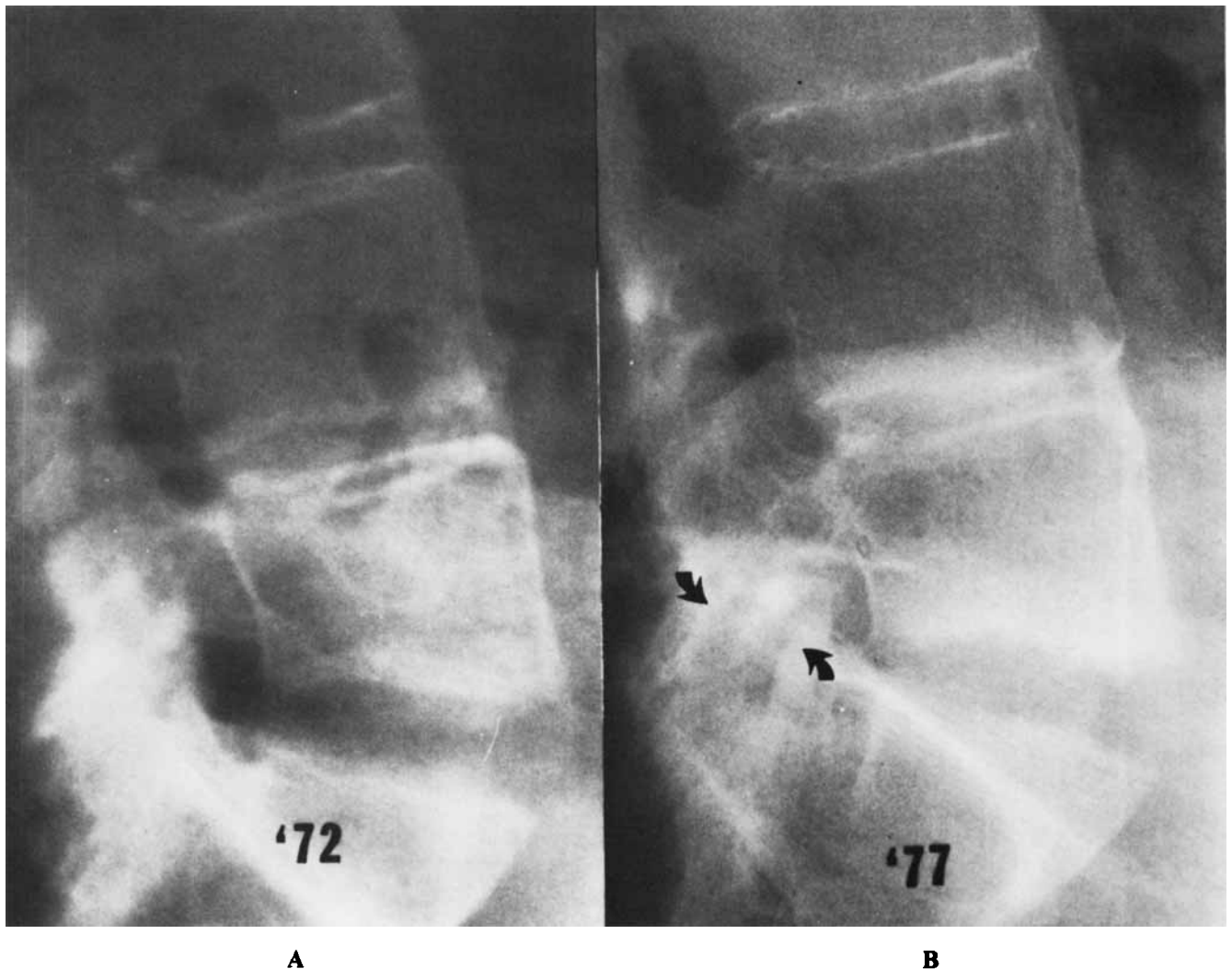


Figure 6. Lumbosacral junction. **A.** 1972. **B.** 1977. The disc at L5-S1 is wider than at other levels and the vertebral end-plates at this level are somewhat more sclerotic and indistinct in 1977 than in 1972. The apophyseal joints at this level are seen in **B** (arrows) but are not clearly visualized in **A**.

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