

## Pseudoarthrosis in Ankylosing Spondylitis Mimicking Infectious Diskitis: MR Appearance

Pseudoarthrosis of the thoracolumbar spine is an important complication of ankylosing spondylitis [1]. Although radiographic [2–4] and CT findings [1] of pseudoarthrosis have been reported, they may be confused with diskitis. We present the MR appearance of pseudoarthrosis in a symptomatic patient with long-standing ankylosing spondylitis.

### Case Report

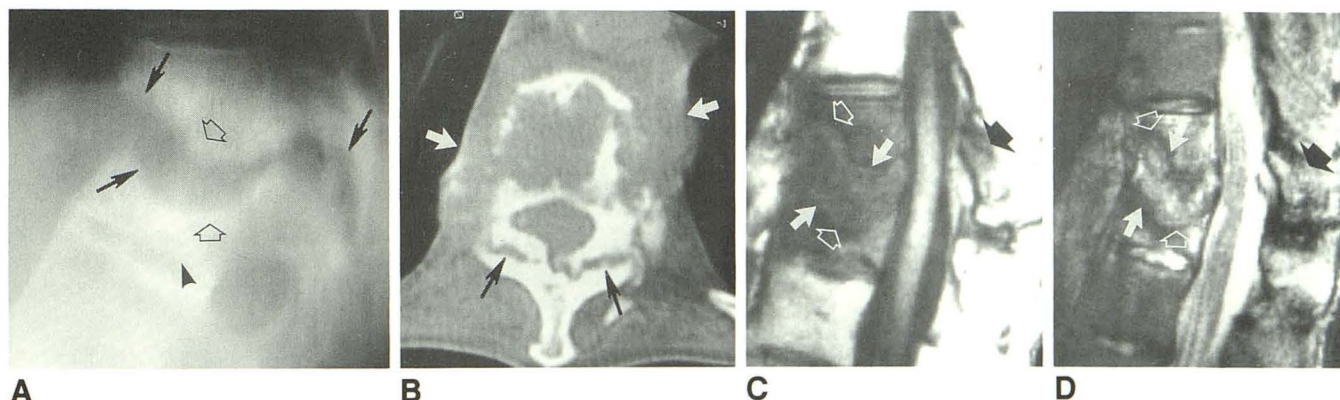
A 73-year-old woman with suspected infectious diskitis was transferred to our institution. She had a 10-year history of ankylosing spondylitis and had had progressive kyphosis with intermittent pain in the thoracolumbar region for almost a year. She had no history of trauma, and her spine was nontender. She was afebrile, and her WBC count was normal.

Plain films and tomograms of the thoracolumbar spine (Fig. 1A) showed a large zone of destruction involving the T11–T12 disk and adjacent vertebral bodies contiguous with a fracture through the posterior elements of T11. CT (Fig. 1B) confirmed these findings and, in addition, showed paraspinal soft-tissue swelling. MR (Figs. 1C and 1D) showed the signal characteristics of the involved region. Cultures of material obtained percutaneously and intraoperatively from the fibrous disk space were negative for bacteria, fungi, and mycobacteria. The destructive changes have not progressed during the 2 years since posterior spinal fusion, and the patient remains asymptomatic.

### Discussion

Spinal pseudoarthrosis is the most important biomechanical complication of long-standing ankylosing spondylitis [1]. Usually found in the lower thoracic or upper lumbar regions, the pseudoarthrosis is a mobile nonunion created by an attempted fibrous connective tissue repair of a stress fracture, which is often occult [1, 2]. This occurs at a segment retaining a slight degree of mobility in a rigid spinal column fixed by fusion of the bodies and posterior elements. Movement of the entire spine is then concentrated on this fractured segment, producing reactive sclerosis in vertebral bodies adjacent to a widening area of destruction across the fractured, ankylosed disk. The fracture extends through the posterior elements, often producing an angular kyphosis. Destruction of vertebral endplates in pseudoarthrosis begins anteriorly with minor corner erosions, progressing to osteolytic erosion of the entire endplate and adjacent vertebral bodies [2–4].

Our case illustrates the MR appearance of pseudoarthrosis. Radiographs showed a well-defined, widened zone of destruction at T11–T12 with erosions and sclerosis of the adjacent residual vertebral bodies. On T1-weighted MR images, the residual vertebral bodies and disk area both had decreased signal intensity. The pseudoarthrosis was composed of (1) vascular and edematous granulation tissues that were hyperintense on T2-weighted images and (2) areas consisting mostly of fibrous tissue that were hypointense. This produced a heterogeneous appearance [3, 5]. Narrow sclerotic regions in the vertebral bodies surrounding the pseudoarthrosis had low signal intensity on both T1- and T2-weighted images. However, the



**Fig. 1.**—Pseudoarthrosis in ankylosing spondylitis mimicking infectious diskitis.  
**A,** Lateral tomogram of T11–T12 shows diskovertebral destruction (*solid black arrows*) and acute kyphotic angulation. Pseudoarthrosis extends into posterior elements. Thin rim of sclerosis (*open arrows*) is seen in residual vertebral bodies adjacent to pseudoarthrosis. Loss of inferior endplate of T12 posteriorly (*arrowhead*), with erosive changes and surrounding sclerosis, is evident.  
**B,** Axial CT scan through pseudoarthrosis at T11–T12 shows an irregular fracture (*black arrows*) through laminae, vertebral body destruction, fragmentation, and exuberant formation of fibrous tissue. Paravertebral soft-tissue swelling (*white arrows*) accompanies pseudoarthrosis.  
**C,** Sagittal T1-weighted (500/20) MR image shows low signal intensity of well-defined pseudoarthrosis (*solid white arrows*) between T11 and T12. Sclerotic regions of residual vertebral bodies adjacent to pseudoarthrosis have low signal intensity (*open white arrows*). Pseudoarthrosis extends into posterior elements (*black arrow*). Marked tissue proliferation was seen on paramedian images (*not shown*).  
**D,** Sagittal T2-weighted (2500/90) MR image shows pseudoarthrosis (*solid white arrows*) has a predominantly bright, heterogeneous signal. Sclerotic regions of residual vertebral bodies surrounding pseudoarthrosis maintain a very low signal (*open white arrows*); remainder of involved vertebral bodies have an increased signal intensity, likely due to edematous changes. Pseudoarthrosis extends into posterior elements (*black arrow*), with similar increase in signal intensity. At T12–L1, the disk, which is of high signal intensity and widened posteriorly, shows loss of intranuclear cleft. These changes likely represent the early stages of a second destructive lesion.

remaining areas of the involved vertebral bodies had increased signal intensity on T2-weighted images, likely due to edematous changes.

Diskovertebral destruction may occur at multiple levels [2, 3], as suggested in this case. Tomograms also showed posterior erosion of the inferior endplate of T12 and surrounding sclerosis without apparent fracture. T1-weighted images showed formation of tissue in the T12-L1 interspace that had increased homogeneous, low signal intensity, most prominent posteriorly. This tissue became bright on T2-weighted images, and loss of the intranuclear cleft was evident. These changes on MR corresponded to the tomographic abnormalities and the erosive changes on the CT scan at that level, and most likely represented formation of a second destructive lesion.

In cases of infectious diskitis, the vertebral body typically has decreased signal intensity on T1-weighted images and hyperintensity on T2-weighted images. The infected disk generally appears narrowed and ill-defined on T1-weighted images and has increased signal intensity on T2-weighted images or a mixture of high and low signal [6, 7]. Paraspinal soft-tissue swelling may be seen in both infection and pseudoarthrosis [1, 6, 7]. A gallium scan may be helpful to distinguish infectious diskitis from a noninfected pseudoarthrosis. The role of gadolinium in differentiating diskitis from pseudoarthrosis is uncertain.

It may not be possible to distinguish pseudoarthrosis from diskitis on the basis of the former's signal characteristics on MR. However, patients with ankylosing spondylitis have MR findings that correlate with the diagnostic features of plain radiographs and tomograms. One suggestive finding on MR is the marked degree of diskovertebral destruction with the exuberant, well-defined pseudoarthrosis extending to the posterior elements. Also, a narrow band of very low signal is seen in the vertebral bodies abutting the pseudoarthrosis, corresponding to the sclerosis typically seen at this site on radiographs.

In summary, pseudoarthrosis is an important complication of ankylosing spondylitis. Because the MR appearance of pseudoarthrosis is quite similar to that of infectious diskitis, it is necessary to consider the former in patients who have ankylosing spondylitis and to correlate the MR findings with the plain film findings, which are diagnostic.

David J. Eschelman

G. Jerome Beers

Allan Naimark

Isadore Yablon

Boston University Medical Center  
Boston, MA 02118

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