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Pain Patterns in Adult Scoliosis

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Many patients present to their physician or surgeon with a scoliosis or kyphosis and complaints of back pain. Similarly, many patients without spinal deformity present because of back pain. In the patient with spinal deformity, it often is assumed that the deformity is the cause of the pain. In reality, however, there may be ordinary back pain in a patient with scoliosis and kyphosis and, thus, no cause-and-effect relationship exists. The purpose of this article is to describe some of the common, as well as less common, pain patterns seen in adults with scoliosis and to help the reader decide the location and relevance of the pain complaints.

UPPER BACK COMPLAINTS

Trapezius Area

A frequent area of adult pain complaint is in one or both trapezial areas. If on the same side as a major thoracic scoliosis, it is often thought to be related to the scoliosis. In reality, this pain virtually always comes from the cervical spine. Careful examination will show areas of tenderness and muscle spasm in the lower cervical spine and the pain usually can be reproduced by combined rotation and extension of the neck. This pain was noted by Moskowitz et al. to be frequent in patients having had scoliosis fusions 20 to 30 years previously[3] (Fig. 1).

Medial Scapular Border Area

This pain area also is a reflection of lower cervical spine problems and is frequently seen in conjunction with trapezius area pain. Because it is distinctly in the thoracic spine region, it can easily be thought to be due to a thoracic scoliosis, but is usually a referred pain. When it is located in the region of a previously inserted Harrington hook or upper end of a rod, it can easily be thought to be due to that hook or rod. Reproduction of the pain by certain neck motions tends to confirm its cervical origin. Injection of a local anesthetic around a tender rod tip or hook with complete relief of pain will tend to incriminate the hook or rod (Fig. 2).

MIDTHORACIC BACK COMPLAINTS

Thoracic Curve Convexity Area

Pain lateral to the spinal curvature and on its convexity usually is located in the paravertebral musculature. Palpation often will reveal localized areas of muscle spasm or tenderness. This pain usually is absent on arising, and becomes more intense as the day passes. It is worse with increased activity and better with rest. It seldom prevents the patient from performing the activities of daily life. It is more common in the young adult and is believed to be due to the overactivity of the musculature on the convex side of the curve. Electromyographic investigation has

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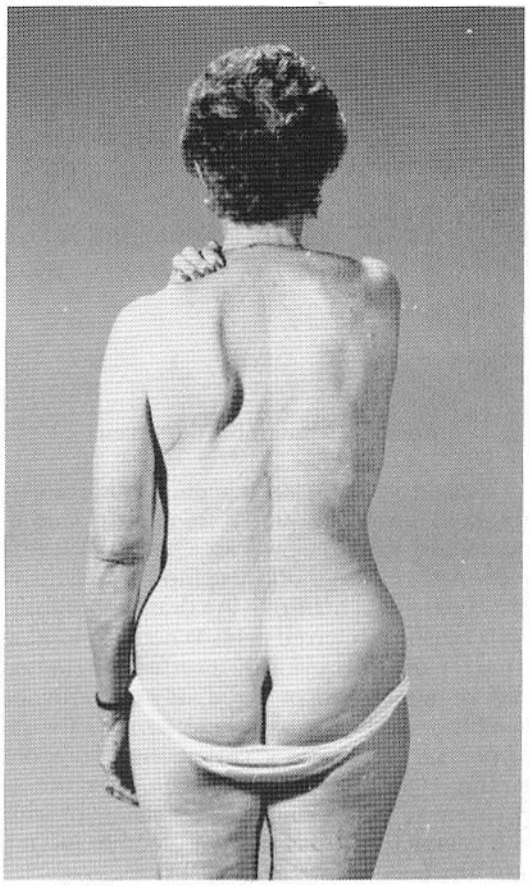

Figure 1. Pain in the trapezius area. This pain usually is referred from the cervical spine and is seldom from the thoracic spine itself.

consistently shown overactive convex musculature.[1] Most observers have thought this to be an attempt on the part of the body to "stabilize" the curve by muscular activity (Fig. 3).

Thoracic Curve Concavity Area

Pain along the curve but in the concavity is more frequent in the older adult and is not uncommon to see in a person who had previously had curve convexity pain. At surgery, the concave facets are arthritic, with spur formation and cartilage degeneration. Some patients, especially those with severe (90-degree plus) scoliosis, may go on to spontaneous facet ankylosis, in which case the facets become nonpainful in the areas of ankylosis (Fig. 4).

Anterior Thoracic Pain

This is a rare pattern of pain compared with those previously discussed and can easily be confused with nonspinal causes of thoracic area pain. It appears to be due to compression of a thoracic intercostal nerve by hypertrophic spurs at the foraminal level. One patient in our practice even had a cholecystectomy before the true cause of the problem was detected. Her problem was completely solved by posterior spine fusion with concave foramenotomy (Fig. 5).

LUMBAR AND LUMBOSACRAL PAIN COMPLAINTS

Mid-Lumbar Convex Curve Pain

This is a frequent complaint in our experience. When asked where the pain is, the patient will place one or two fingertips precisely on the rotational prominence of the lumbar curve. Because most idiopathic lumbar curves are convex to the left, the pain is usually left-sided. Similar to the convex thoracic curve pain, this pain is absent on arising, gets worse during the day, is

Figure 2. Pain in the medial scapular border area. This pain is similar to trapezius area pain and usually is referred from the cervical spine. When a hook or rod tip exists in the same area, diagnostic confusion can exist.

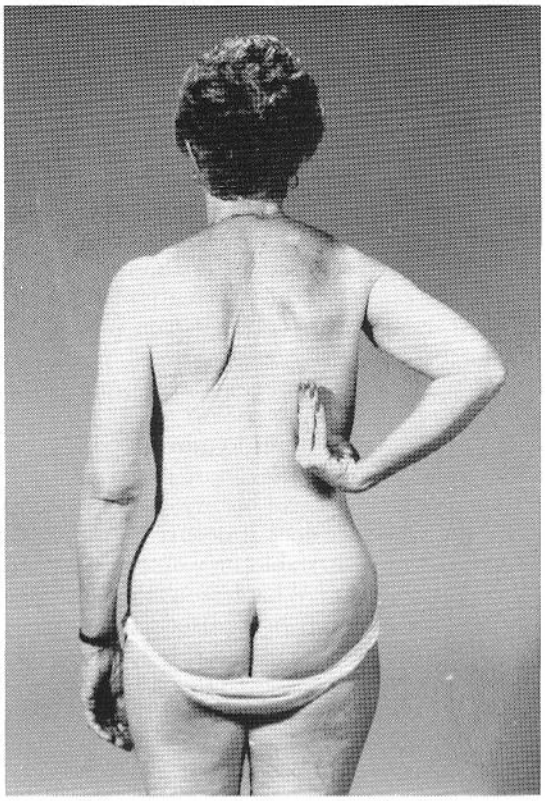

Figure 3. Pain in the thoracic curve convexity area. This pain usually is due to muscular overactivity in the paravertebral muscles on the curve convexity.

alleviated by rest, and seldom prevents a normal day's activity. Many patients do, however, comment that, although they get a "usual" day's work done, they have little energy left for a social or athletic evening.

This is a muscle "overactivity" discomfort and thus is aggravated by lumbar muscle exercises, aerobic dancing, and other forms of increased muscle activity exercise. It responds well to elimination of these "hyperactive" exercises, to temporary brace support, and to institution of active programs not requiring abnormal use of these painful segments, eg, swimming.

If these modalities fail, and especially if the curve is showing increasing deformity, arthrodesis may be necessary. Pain in the apex of a lumbar curve, in the absence of lumbosacral pain, responds to fusion of the curve itself. Fusion to the sacrum is not necessary[5] (Fig. 6).

Mid-Lumbar Concave Curve Pain

Similar to concave thoracic curve pain, this pattern is almost always related to degenerative facet changes in the concavity of the lumbar curve. This pain is usually in the older adult (40 years or more) and is often preceded by the convex muscular pain pattern. Motion or vertical loading exercises always aggravate this pain. Gentle, nonloading and nonstressful exercise, such as swimming, can help, as can nonsteroidal anti-inflammatory medications. Bracing is definitely helpful, but is not a good long-term solution.

Some patients also may develop radicular pain from concave facet joint hypertrophy and foraminal narrowing. Because the most-compressed foramina are the L2–L3 and L3–L4, it is the L2 and L3 roots on the concavity of the curve that are most likely to be involved. This will give anterior or lateral thigh pain and perhaps a decreased knee reflex. The patient posing for the photographs in this article had a painful, arthritic lumbar curve with L3 root compression. Her problem was solved by a posterior spine fusion down to L4. Foramenotomy was not necessary because her root compression symptoms had been easily solved in a preoperative orthosis (Fig. 7).

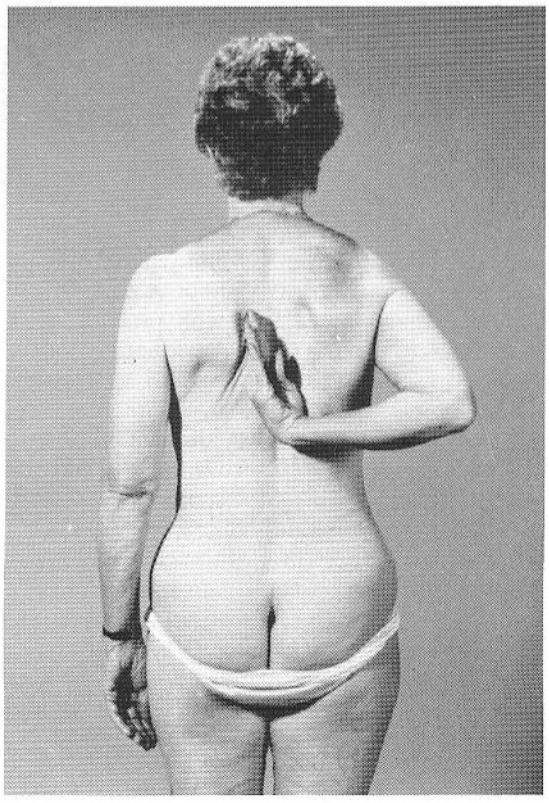

Figure 4. Thoracic curve concavity area pain. This pain usually is due to degenerative facet joint disease in the curve concavity.

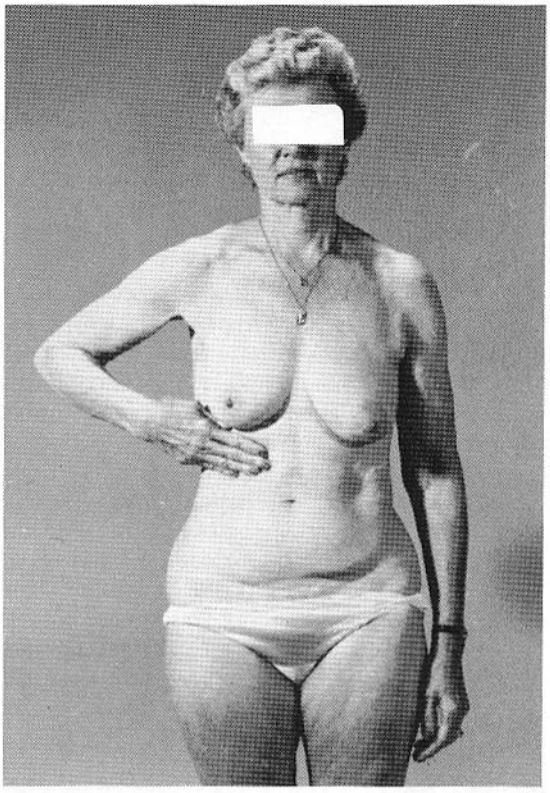

Figure 5. Anterior thoracic pain. This pain syndrome is rare, but can occur because of nerve root compression at the foraminal level.

Lumbosacral Pain

This is probably the most difficult pain pattern to analyze because lumbosacral pain is so common in the population as a whole. A patient with a purely thoracic scoliosis who presents with lumbosacral pain has a problem that should be analyzed as though there were no scoliosis. Is the lumbosacral pain due to myoligamentous factors, psychosomatic factors, discogenic causes, or a spondylolisthesis? There is, incidentally, no increase of spondylolysis or spondylolisthesis in patients with idiopathic scoliosis.

Surgical treatment of the thoracic scoliosis will not alter the lumbosacral pain problem. Each must be evaluated on its own merits. It is perfectly possible for a patient with thoracic scoliosis to develop a herniated lumbosacral disc. If the proper indications are present, then discectomy might be the treatment of choice.

We have seen patients in whom there was a progressive thoracic scoliosis needing fusion, plus a painful lumbosacral spondylolisthesis also needing fusion. In such cases, both fusions can be done at one time or in the same hospitalization so that only one recuperation time is needed. At least three motion segments should be retained between the two areas of fusion.

The major difficulties come when there is lumbosacral pain in the presence of a lumbar curve, either single or in combination with another major thoracic curve (Fig. 8). Is the lumbosacral pain due to disc degeneration? Is it due to facet joint degeneration because of the altered biomechanics? Is it due to lumbosacral nerve root compression in the concavity of the lumbosacral fractional curve? Is it pain presenting the lumbosacral area as a referred pain, but really emanating from degenerative processes in the major lumbar curve above?

To evaluate this pain syndrome properly, many different modalities must be used. First, of course, is an accurate history. Exactly where is the pain? When does it occur? When did it begin? Is the pain stable or worsening? What aggravates the pain? What lessens the pain? Are analgesic medications being used? How much? Has a brace been worn? Did it help? Is it only back pain or does it radiate down one or both legs? Is there numbness or tingling in the legs

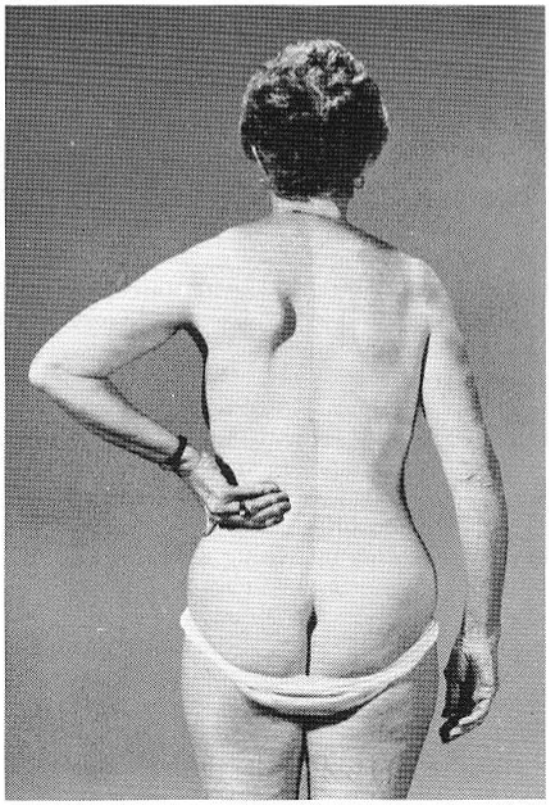

Figure 6. Mid-lumbar convex curve pain. This pain is over the convex paraspinal muscles of a lumbar scoliosis.

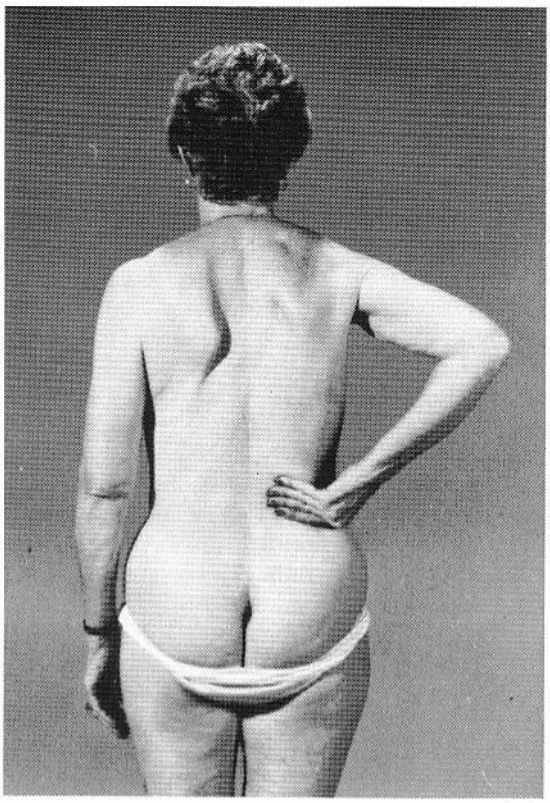

Figure 7. Mid-lumbar concave curve pain. Like the thoracic area, this pain usually is due to degenerative facet joint disease in the concavity of the lumbar curve.

or feet? Is the pain aggravated by coughing or sneezing?

The physical examination must not only look at the curvature, but especially at the pain problem. Is there an area or areas of localized tenderness? Is there palpable muscle spasm? Is the patient compensated or decompensated? Is the normal lumbar lordosis present or absent? Is the straight leg raising test normal or abnormal? Are the reflexes altered? Is there any motor or sensory deficit? What motions reproduce the pain?

Routine radiographs must include upright anteroposterior and lateral spine views to evaluate the curvature in its three dimensions. Supine bending films will evaluate the curve's flexibilities. These should include a bending film for the lumbosacral fractional curve. These films should be reviewed carefully for the magnitude of the curve, the flexibility of the curve, and the presence or absence of subluxation, arthritis, disc degeneration, and facet joint sclerosis.

After review of these routine radiographs, it may be necessary to order special views of the lumbosacral area, including spot obliques of the lumbosacral area (not of the lumbar spine generally), a Ferguson view (anteroposterior of the lumbosacral area with the radiograph tube tilted to parallel the lumbosacral disc), and a spot lateral of the lumbosacral area to evaluate for spondylolisthesis.

If surgical treatment is to be considered, a more detailed evaluation usually is necessary. This is based on the very critical decision as to whether only the major curve is to be fused or whether the curve plus the lumbosacral area need to be fused. To make this important decision, several special techniques of investigation may be necessary.

Myelography can be used to evaluate the cauda equina and its various nerve roots. It is of particular value in patients with nerve root symptomatology and findings. A herniated disc can be well seen, as can root impingement at the foraminal level.[4]

CT scans, particularly when combined with myelography, can give important information about spinal canal stenosis, lateral recess stenosis, foraminal stenosis, and far lateral disc herniation. In the patient with a large scoliosis,

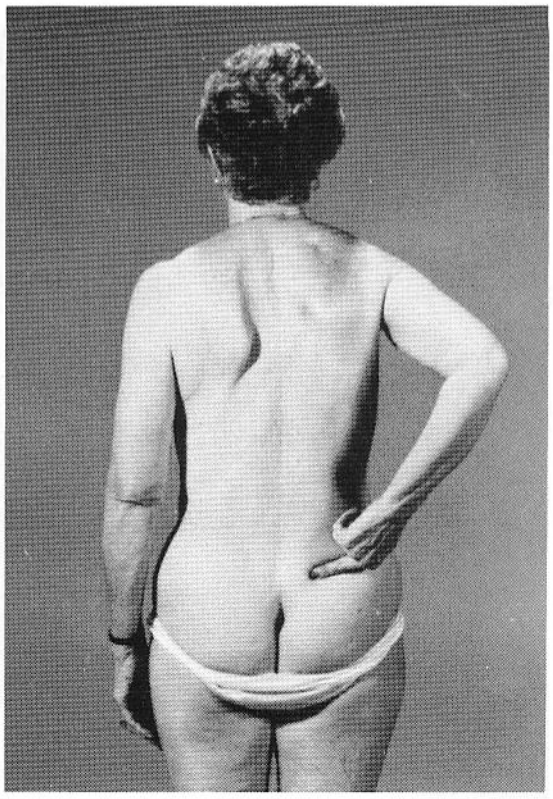

Figure 8. Lumbosacral pain. This is the most complex pain pattern to analyze because of the large number of possible causes.

computed tomography (CT) scans become less valuable because of the distortion of the cuts.

Magnetic resonance imaging (MRI) scans are proving valuable in determining disc degeneration. They do not prove a degenerated disc to be symptomatic.

Discography can be especially valuable, as shown by Kostuik.[2] Injection of the L3–L4, L4–L5, and L5–S1 discs can reveal whether the patient's pain pattern is or is not reproduced. It must be emphasized that it is not the radiographic appearance of the disc that is important, but rather the fact that injection of the disc space reproduces or does not reproduce the patient's clinical pain pattern (Fig. 9).

Some surgeons have recommended the use of a trial period in a cast. Unfortunately, a cast may immobilize both the lumbar and the lumbosacral area and may therefore fail to provide the information necessary to distinguish between lumbar and lumbosacral pain.

Finally, injection of local anesthetics into the facet joints at the L4–L5 and L5–S1 can help to distinguish facet joint pain from discogenic pain.

In summary, facet joint injection, coupled with discography, CT, and myelography can usually distinguish between facet joint arthritic pain and discogenic pain.

If the patient has a significant lumbar curve with curve pain, but not lumbosacral pain, then fusion of the curve may solve the patient's problem. If, however, the pain is more in the lumbosacral area than in the lumbar curve area, and discography and facet joint injection show the major problem to be at the lumbosacral area, then fusion to the sacrum is needed (Fig. 10).

SUMMARY

Adult patients with scoliosis often have back pain, but that pain may or may not be due to the curvature. A careful history, physical examination, routine radiographic examination, and, on some occasions, specialized radiographs, CT, myelography, discography, and facet joint injection will help the physician or surgeon separate out those pain syndromes owing to the

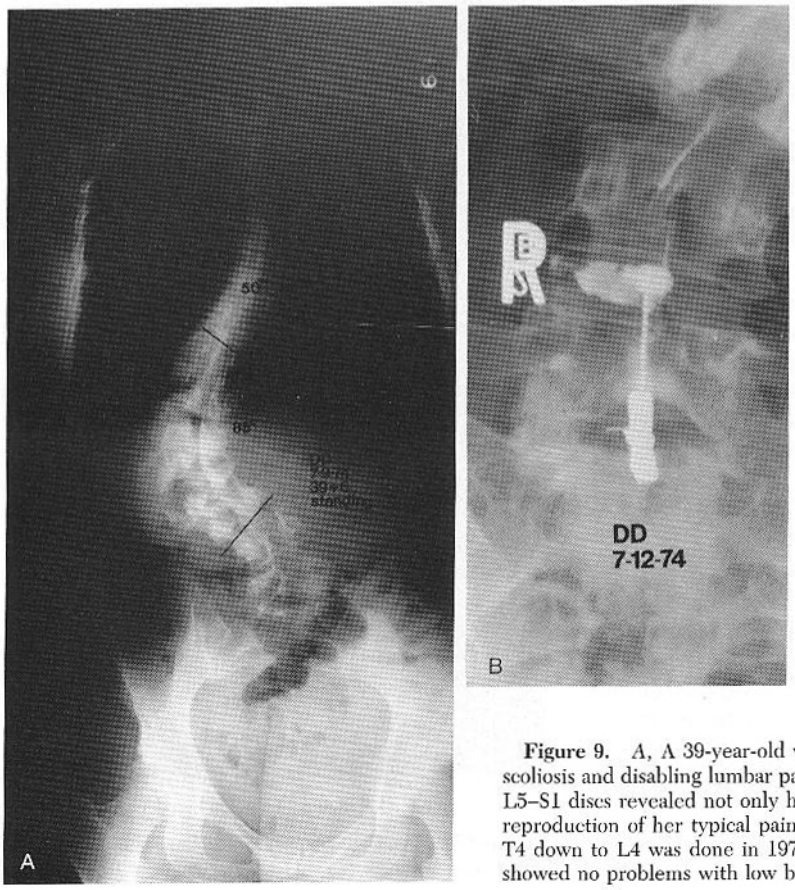

Figure 9. *A*, A 39-year-old woman with documented progressive scoliosis and disabling lumbar pain. *B*, Discography of the L4–L5 and L5–S1 discs revealed not only healthy-appearing radiographs, but no reproduction of her typical pain pattern. Correction and fusion from T4 down to L4 was done in 1974. Follow-up 12 years later (in 1986) showed no problems with low back pain.

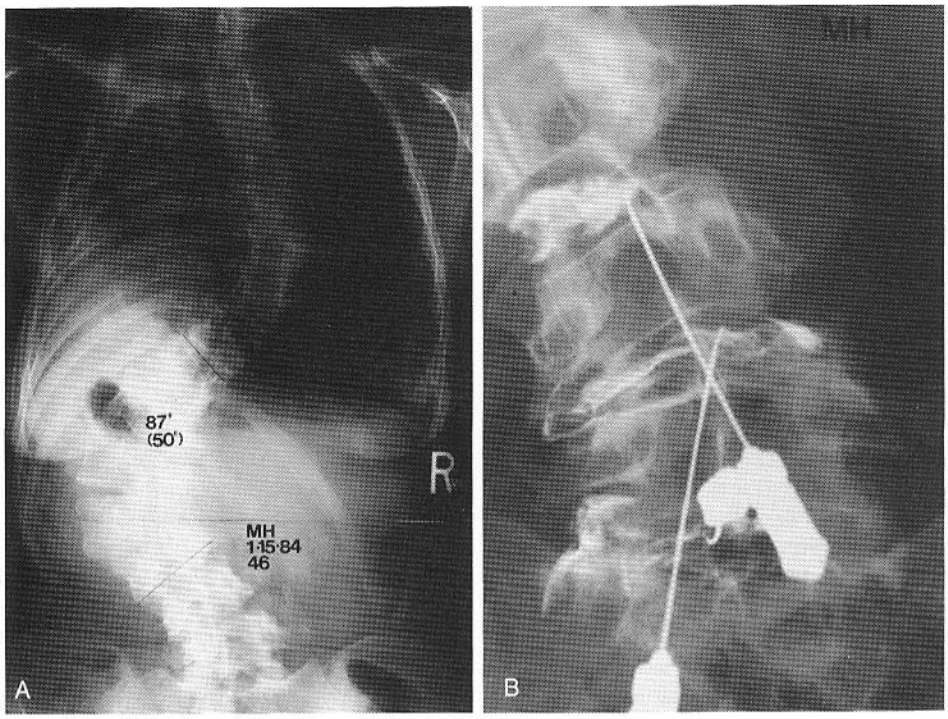

Figure 10. *A*, This 46-year-old woman presented with a similar curve pattern, with lumbar pain, lumbosacral pain, and with left leg sciatica. *B*, Discography of the L3–L4, L4–L5, and L5–S1 discs showed a healthy L3–L4 disc, but degenerative and painful L4–L5 and L5–S1 discs. It was injection of the L5–S1 disc that reproduced her sciatica. Fusion of both curves to the sacrum was thought necessary and was done. A 2-year follow-up showed 95 per cent pain relief.

curvature versus those not owing to the curvature. Only after these critical evaluations have been done can a decent decision be made as to the area of the spine to be treated, either surgically or nonsurgically.

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