Degenerative spondylolisthesis at the L4–L5 in a 32-year-old female with previous fusion for idiopathic scoliosis: A case report

RB Winter
Clinical Professor, University of Minnesota, Minneapolis, United States

BJ Silverman
Private practice, Miami, Florida, United States

ABSTRACT

We report a case of degenerative L4–L5 spondylolisthesis in a 32-year-old female who had undergone thoracic (lower level T12) fusion as a teenager. All other levels in the lumbar spine were normal on magnetic resonance imaging. Subsequent fusion of L4–L5 led to improvement in function and alleviation of pain for more than 4 years. The possible relationship between the previous fusion and degenerative spondylolisthesis is discussed.

Key words: degenerative spondylolisthesis; scoliosis; spinal fusion

INTRODUCTION

The relationship between previous spinal fusion for idiopathic scoliosis and subsequent degenerative changes in the lumbar spine has been a very controversial topic. It is considered by some that the superior fusion causes the inferior degeneration, while others have argued that the inferior degeneration is merely a part of the natural degeneration of the human spine. This case report may shed some light on this controversy.

CASE REPORT

A female patient underwent posterior spinal fusion with Harrington instrumentation for progressive adolescent idiopathic scoliosis at the age of 11 years. The extent of the fusion was T1–T12. The curve was 59° preoperatively, and was corrected to 31° with a single Harrington distraction rod. A cast was worn for 8 months.

At the age of 16 years, the patient began having mild and intermittent lower back pain, without radiculopathy. There had been no precipitating traumatic event. The pain gradually worsened and began to be associated with left leg radicular pain. Chiropractic treatments were of no benefit. She was seen by the second author (BS) and prescribed a lumbo-sacral brace, which helped alleviate her symptoms. However, she was no longer able to perform vigorous social dancing, an important activity in her life. The pain was localised predominantly in the back (90%...
back, and 10% leg), and was taking Percocet (oxycodone hydrochloride; paracetamol) in varying doses, plus ibuprofen, as symptomatic treatment.

Radiographs taken at 32 years of age, including flexion and extension views, showed degenerative changes at L4–L5, with slight forward subluxation. Previous radiographs were accessed, and a lateral radiograph including the lumbar spine, taken when aged 22 years, showed a normal L4–L5 disc space although she was having mild back pain symptoms at that time. Magnetic resonance imaging (MRI) in 1993 showed disc degeneration at L4–L5, a mild forward slip of L4 on L5, posterior bulging of the L4–L5 disc, and mild foraminal narrowing, worse on the left than the right. The other discs were normal (Fig. 1).

In the same year, the patient was referred to the senior author (RW) for treatment, having received conflicting surgical options from several surgeons in her local area. Physical examination showed a slender female, a midline thoracic scar and iliac crest donor site scar from her previous fusion, and localised tenderness at L4–L5. The straight leg–raising test was normal bilaterally. There was no evidence of motor or sensory loss. Reflexes were normal and calf circumferences were equal.

A combined anterior and posterior arthrodesis of L4–L5 with internal fixation posteriorly was completed in December 1993. Through a muscle-splitting left flank incision, the L4–L5 disc space was exposed retroperitoneally by a general surgeon, and the disc removed. A tear in the posterior annulus could be seen

Figure 1  (a) Lateral X-ray of the lumbar spine in 1983 at age 22, 7 years after the patient's thoracic fusion. Note the totally healthy L4–L5 disc space; (b) lateral X-ray of the lumbar spine in 1993, 10 years later. Note the narrowing of the L4–L5 disc space and the forward listhesis of L4 on L5 on this standing, neutral view.
from the front. After end-plate preparation, 2 tricortical iliac allografts were driven into place and the flank closed. Blood loss was 50 mL. The patient was then placed in the prone position and the same levels exposed. A small laminectomy was performed. The annulus was flat and tight, with no tear visible. The nerve roots were explored, and found to be clear and free of compression (100% reduction had been achieved by the anterior distractive fusion). Pedicle screws and rods were inserted. An autogenous iliac bone graft was added. Blood loss was 300 mL.

The patient had no postoperative complications, and was discharged in a lumbar brace, which she wore for 3 months. By 6 months postsurgery, a radiographically solid fusion mass was evident. Follow-up at 1 year, 3 years, and 4 years revealed a solid fusion, absence of pain (lower back or leg), and a return to her full dancing regime. At 8-year follow-up, recurrence of some lower back pain and bilateral leg pain was reported for which the patient was taking ‘over-the-counter’ analgesics (Fig. 2).

**DISCUSSION**

This patient exhibited marked degeneration and spondylolisthesis at L4–L5 at the age of 32 years. Although her problem was distal to a previous scoliosis fusion, that fusion ended at T12 and the intervening 4 discs were normal on radiographs and MRI. It would thus seem reasonable to assume that the previous fusion had no causal relationship to the L4–L5

![Figure 1](c) lateral X-ray in flexion taken at the same time. There is no increase in listhesis, but the anterior disc space is more narrowed, and (d) magnetic resonance image showing marked degeneration at L4–L5, disc space narrowing, and posterior disc bulging. The other discs are normal or nearly normal.
If she had had a previous fusion down to L4 and then appeared at age 32 with degenerative spondylolisthesis at L4–L5, this would suggest that the previous fusion caused the degeneration. Although tempting to make this connection, this represents a good example of the familiar Latin logic error “Ad hoc, ergo propter hoc” (“after the fact, therefore because of the fact”).

Perhaps of greater interest is the question of why this 32-year-old woman developed degenerative spondylolisthesis. She had a normal L5–S1 articulation and disc (no increased stress on L4–L5). There is a great deal of literature on degenerative spondylolisthesis, but it is routinely described as a problem in geriatric or older adult populations. Reporting on 20 skeletons and 200 patients, Rosenberg noted that degenerative spondylolisthesis occurred 4 times more frequently in females, 6 to 9 times more frequently at L4–L5, 3 times more frequently in blacks than Caucasians, and 4 times more frequently if the 5th lumbar vertebra was sacralized. The condition was not evident before the 5th decade of life. Herkowitz, in a 1995 review article on degenerative lumbar spondylolisthesis, stated that it was most common at L4–L5, in females, and in patients over 40 years.

The question arises as to whether there is any correlation between our patient’s idiopathic scoliosis and her degenerative disc. The recent publication by Danielsson and Nachemson was informative in this regard. They reviewed 156 patients with idiopathic scoliosis and posterior spinal fusion, 127 patients with idiopathic scoliosis with brace treatment, and

Figure 2  (a) Lateral standing radiograph of the lumbar spine 1 year after surgery, centred at L4–L5, showing a solid anterior interbody fusion, complete reduction of the listhesis, restoration of the intervertebral height, and clear, open foraminae at the L4–L5 level. The pedicular fixation is clearly seen; (b) standing posteroanterior full spine radiograph shows the old T1–T12 fusion, the Harrington rod, and the L4–L5 fusion with pedicular internal fixation. The patient is decompensated 4.0 cm to the right, but is unaware of this clinically.
compared those patients to a matched group of individuals without scoliosis. Both the fusion group and brace group were studied 22 years after their treatment. MRI evaluation showed that 24% of patients with spinal fusion had degenerative changes in the lumbar spine, 16% of those who underwent brace treatment, and none of the group of controls.

These findings suggest that patients with idiopathic scoliosis may be inherently more prone to developing disc degeneration than individuals without scoliosis. Greater certainty would require more extensive MRI evaluations of larger numbers of controls and patients with idiopathic scoliosis. This case report of degenerative spondylolisthesis at L4–L5 in a 32-year-old female with a previous thoracic spinal fusion, suggests that further attention to the issue of disc degeneration distal to an adolescent spine fusion is indicated.

REFERENCES