



Original Article

Sciatic scoliosis: An easily misdiagnosed disease in adolescents and young adults

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ABSTRACT

Objective: This study aimed to analyze the clinical presentation and surgical outcome of scoliotic listing due to herniated intervertebral disc in adolescents or young adults, and making a differential diagnosis between sciatic scoliosis and idiopathic scoliosis.

Materials and Methods: This retrospective review focused on a group of five adolescents or young adults with herniation of the intervertebral disc who initially presented scoliotic posture between January 2005 and September 2011. The history, physical examination, imaging studies, and operative findings were recorded and analyzed.

Results: Three males and two females, with a mean age of 17.3 years (range, 14–24 years), were enrolled in our study. All of them had been misdiagnosed as having idiopathic scoliosis and had been treated for this for several months. All had a positive straight leg raising test (SLRT) result between 30° and 60° prior to surgery, which improved to 80° after surgery. In all five cases, the convexity of scoliosis was at the same side of the disc herniation. The Cobb angle in all patients improved after surgery (mean, 26.9° preop to 11° postop).

Conclusion: It is important to obtain a detailed history, and to perform a physical examination (positive SLRT) and imaging studies (lack of vertebral rotation in the standing anterior–posterior radiographs) in adolescents or young adults with painful scoliosis, which may help us make a differential diagnosis from idiopathic scoliosis.

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1. Introduction

Sciatic scoliosis is acknowledged as a nonstructural scoliosis reactive to nerve root irritation. In general, children and adolescents presenting with idiopathic scoliotic curves have no pain [1]. However, painful scoliosis can occur with disc herniation, spondylolisthesis [2], and tumor [3]. Therefore, once the offending painful stimulus is removed, the trunk list should improve. Residual structural scoliotic curves may remain, particularly when there is a long delay between diagnosis and treatment [4,5].

Patients affected by sciatic scoliosis are often adolescents or young adults who have a painful disc herniation. Signs and symptoms of disc herniation in adolescents and children may develop slowly and insidiously. The clinical presentation differs from the typical picture in the adult population. Adults may bend, list, or tilt in response to pain but seldom have nonstructural scoliosis. With

presentation of scoliotic curves on radiographs or gross appearance, the diagnosis is frequently missed or delayed, thus leading to mistreatment. The present study retrospectively reviewed five patients whose diagnosis had been delayed for months to a year. They were all cured by discectomy. Several distinct differences in clinical presentations and radiographic findings were identified between these patients and those with adolescent idiopathic scoliosis. Our result suggests that when painful scoliosis is present in adolescents or young adults, the clinician should look for an underlying pain source. Subsequently, the treatment should be directed at the pain source (i.e., disc herniation), and not at the scoliosis deformity *per se*.

2. Materials and methods

2.1. Patients

This review focused on a group of five adolescents or young adults with herniated intervertebral disc who initially presented scoliotic posture during January 2005 to September 2011. Their imaging studies, charts, and surgical records were reviewed. The

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Table 1
Data and brief history of the patients.

Patient	Age/sex	Time from symptom to diagnosis	Mechanism of the trauma
1	21/M	1 y	Fall
2	14/M	4 mo	Slip
3	16/F	3 mo	Motorcycle accident
4	24/F	6 mo	Fall
5	14/M	4 mo	Slip
Average	17.3	5.8 mo	

mechanism of trauma, duration between onset of scoliotic posture and presentation at our clinic, and findings of straight leg raising tests (SLRTs) prior to surgery were recorded.

2.2. Radiologic analysis and outcome evaluation

The pre- and postoperative whole spine posterior–anterior standing radiographs were examined. Magnetic resonance imaging (MRI) was performed to confirm the location of the herniated disc. The convexity of scoliosis and the Cobb angle from L1 to L5 was recorded. SLRT findings were also recorded on the day after surgery and during follow-up.

3. Results

In our study, three males and two females, with a mean age of 17.3 years (range, 14–24 years), were enrolled (Table 1). All patients had a history of trauma. All of them had been misdiagnosed as having idiopathic scoliosis and had been observed for the same for months. The duration between the onset of scoliotic posture and the presentation at our clinic ranged from 3 months to 1 year (mean, 5.8 months).

All patients had a positive SLRT result between 30° and 60° prior to surgery, which improved up to 80° after surgery (Table 2). In all five cases, the convexity of scoliosis was at the same side of the disc herniation. The Cobb angle was much improved after surgery (mean, 26.9° preop to 11° postop). However, there still remained some residual deformity.

3.1. Details of two interesting cases

3.1.1. Case 1

A 21-year-old man was well until he suffered from lower back pain after a fall, with radiation to the right lower leg and progressive trunk listing to the left side for 1 year (Fig. 1A). He had visited several hospitals where he was diagnosed with lumbar scoliosis and deformity correction with fusion was suggested. He came to our hospital where physical examination showed a strong positive SLRT result of 30°. Anterior–posterior standing radiograph showed a 43° right lumbar curve (L1–5) (Fig. 1B). MRI revealed a massive L5/S1 disc herniation with impingement of the right S1 nerve root

(Fig. 1C and 1D). Immediately after surgery, pain subsided and the sciatic list improved (Fig. 1E). At 6 months, the curve improved to 15° (Fig. 1F).

3.1.2. Case 2

A 14-year-old boy denied any history of lower back pain or listing posture. A slip on the stairs made him suffer from lower back pain with listing and awkward gait (Fig. 2A) for 4 months. He was brought to a large medical center, where he was diagnosed with scoliosis. In our office, he could not elevate his left leg above 50° due to severe painful radiation. X-Ray showed a right thoracolumbar curve of 32° (T8–L2) (Fig. 2B). MRI revealed a central L5/S1 herniated disc (Fig. 2C and 2D). Discectomy was performed, and the scoliotic list improved to 19° at 4 weeks postoperatively (Fig. 2E and 2F).

4. Discussion

Lumbar disc herniation is uncommon in pediatric and adolescent populations, and its true incidence is not known. A sudden onset of a scoliotic deformity with production of concurrent lumbar and/or lower extremity pain is highly suggestive of a disc lesion. At this age, the nucleus pulposus is more expansible and disc herniation does not usually occur unless the annulus fibrosus is damaged in trauma. This explains why all of our five patients had traumatic events or sports-related trauma. An estimated 1% of patients operated on for disc herniation are between the ages of 10 and 20 years [6].

The incidence of structural changes resulting from disc herniation in this population is reported to be 20–24% [7]. Although the mechanisms are not well understood, it is widely believed that these postural changes occur to protect the spinal nerves from further damage [8]. Besides, Hirayama et al [9] found that the pattern of electromyographic activity of the trunk muscles evoked by sciatic nerve stimulation coincided with the typical direction of sciatic scoliosis in patients with lumbar disc herniation. The low incidence of lumbar disc herniation and high incidence of structural change frequently lead to misdiagnosis or delayed diagnosis. All five cases were adolescents or young adults with a mean age of 17.3 years. All patients were diagnosed with a delay of at least 3 months, and structural changes were noted in all.

The reasons for delayed diagnosis of sciatic scoliosis or its misdiagnosis as idiopathic scoliosis in adolescent patients or young adults are multifold. These patients are often shy or reluctant to report pain to their parents or doctors; thus, the “sciatic pain” is often masked by the more apparent listing or scoliotic curve. Therefore, the doctor should “trigger” the symptoms using some methods, such as SLRT. This is well verified in our five patients. A highly positive SLRT result was elicited, although painful radiation down to the lower legs was not their chief complaint.

To avoid misdiagnosis or delayed diagnosis, the treating surgeon should be aware of the radiographic differences between sciatic and idiopathic scoliosis. The unique deformity in sciatic scoliosis is caused by a listing posture reactive to pain. Thus, the rotational

Table 2
Pre- and postoperative data of the patients.

Patient	Final diagnosis (HIVD)	Convexity of scoliosis	Preoperative Cobb angle (L1–L5)	Postoperative Cobb angle (L1–L5)	Location of the herniated disc	SLRT (preop)	SLRT (postop)
1	Rt L5/S1	Rt	43	15 (6 mo)	Axilla	30	80
2	Lt L5/S1	Lt	32	19 (4 wk)	Axilla	50	85
3	Rt L4/5	Rt	24	3 (10 mo)	Shoulder and axilla	45	80
4	Lt L4/5	Lt	17	6 (1 mo)	Axilla	50	85
5	Lt L4/5	Lt	18.5	12 (1 y)		60	90
Average			26.9	11			

HIVD = Herniation of intervertebral disc; Lt = left; Rt = right; SLRT = straight leg raising test.

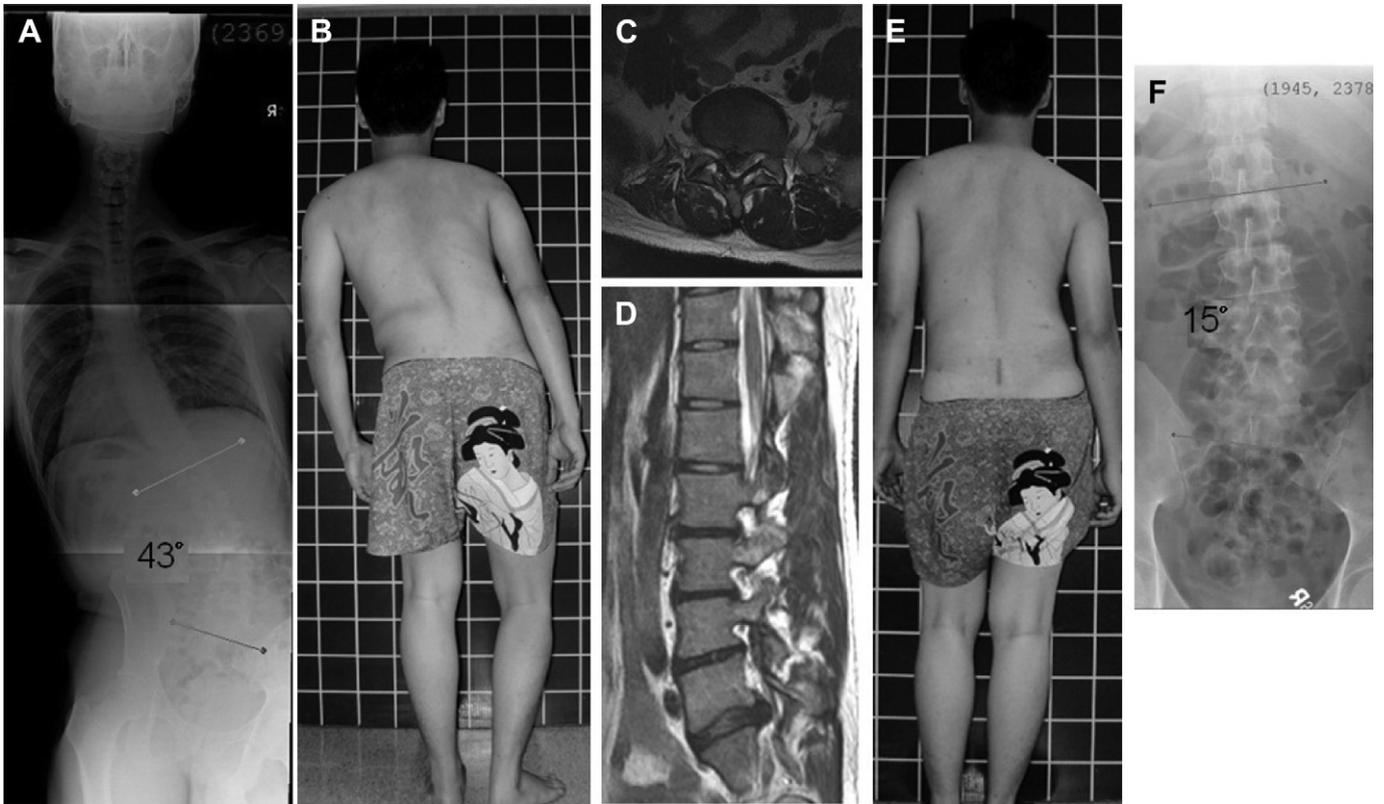


Fig. 1. Clinical presentation and imaging studies for Case 1 (see text).

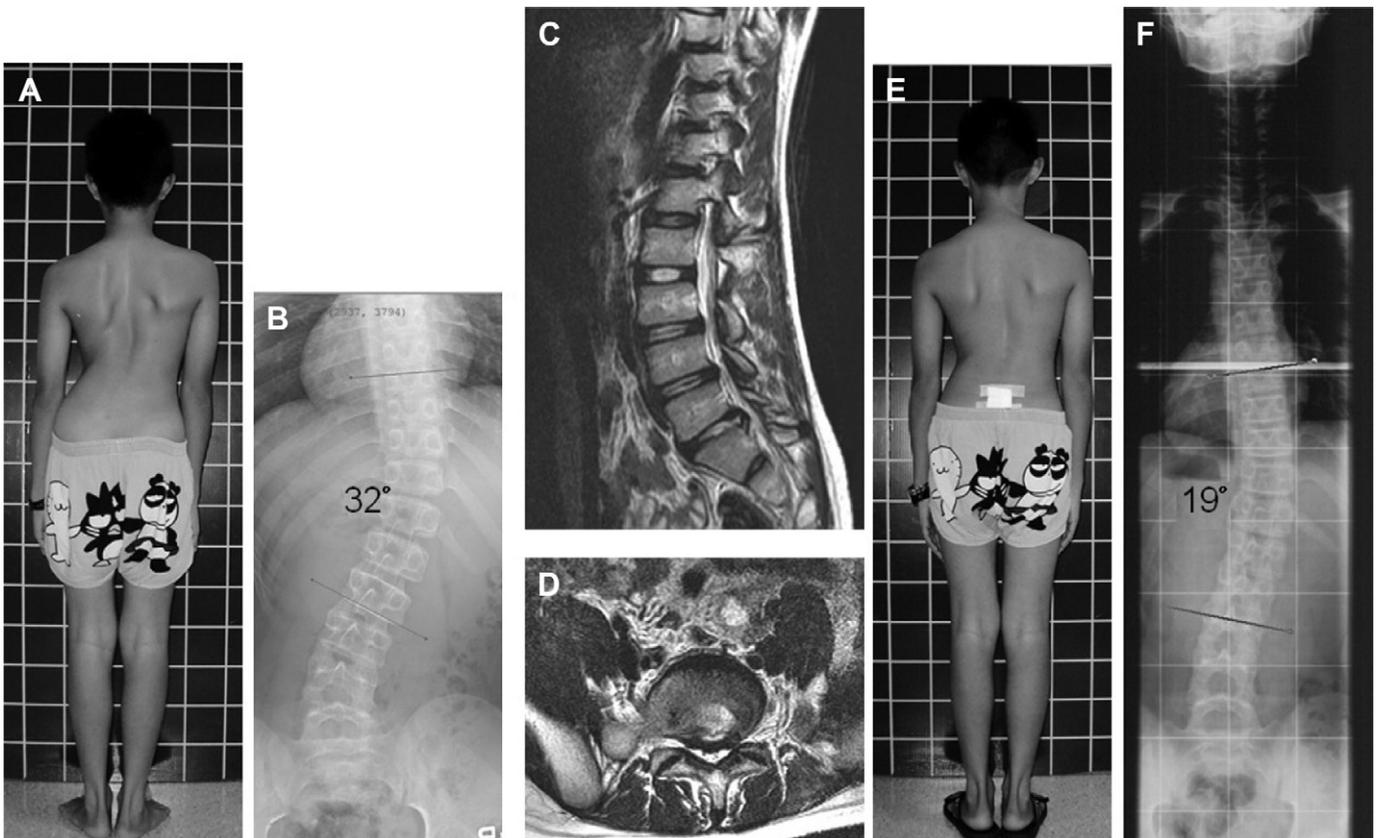


Fig. 2. Clinical presentation and imaging studies for Case 2 (see text).



Fig. 3. (A) Anterior–posterior standing radiograph of a patient with sciatic scoliosis (Case 2). Lateral curvature only; no rotational deformity is present. (B) Anterior–posterior standing radiograph in a 14-year-old girl with adolescent idiopathic scoliosis. There is marked vertebral rotation in addition to the lateral curvature.

component in the anterior–posterior standing radiograph, as seen in adolescent idiopathic scoliosis, is very minimal [10] (Fig. 3). This could also explain why rib hump was not detected in our patients when performing Adam's forward bending test.

The relation between the direction of scoliosis and the side of disc herniation has also been reported. Finneson [11] and Matsui et al [8] reviewed 40 patients and found that 80% had a lumbar disc herniation on the convex side of scoliosis, which was not related to the topographic location. Suk et al [12] also found a statistically significant association between the direction of scoliosis and the side of the disc herniation, but no statistically significant relation was observed between the direction of scoliosis and the anatomic location of disc herniation. In a recent article, Zhu et al [13] reviewed 26 adolescents with lumbar disc herniation, and reported that the direction of lumbosacral curve and trunk shift was related to the side of the disc herniation. In our series, all five patients bent to the side of the sciatica, which was compatible with the conclusion of Matsui et al and Suk et al.

Treatment of sciatic scoliosis in these younger patients must be directed at the pain generator (i.e., the herniated disc), and not at the deformity *per se* [4]. If disc herniation is diagnosed, conservative treatments such as physical therapy and manipulation are often unsuccessful to correct scoliosis and relieve symptoms. Surgical indications for herniated intervertebral disc are identical in children, adolescents, and adults.

Messerschmitt and Stambough [4] hypothesized that with a short interval between symptoms and the definitive management, the patient is at less risk for developing fixed rotatory

deformities, which may lead to a persistent scoliotic curve. In the studies of Matsui et al [8] and Suk et al [12], the sciatic list disappeared (Cobb angle $<3^\circ$) after operation in 45–68.9% of cases. However, the aforementioned studies had preoperative Cobb angles of 10.7° and 9.8° only [12], much less than those in our five cases (average 26.9°). In the study of Zhu et al [13], a residual deformity with a Cobb angle of 10.5° was also noted because of a large preoperative Cobb angle. A residual angle of 11° was noted in our five patients, presumably as a result of relatively larger preoperative Cobb angles and longer delays in accurate diagnosis than in the aforementioned studies.

5. Conclusion

Back pain is uncommon in children, adolescents, and young adults. In general, idiopathic scoliosis is painless. Therefore, if pain and scoliosis develop concomitantly, the source of the underlying pain should be sought thoroughly. To avoid misdiagnosis, in adolescents or young adults with a scoliotic curve and a history of fall or trauma, SLRT should be routinely performed to trigger the sciatic pain. Furthermore, the lack of vertebral rotation in standing anterior–posterior radiographs also implies “sciatic” instead of “idiopathic” etiology. If disc herniation is diagnosed, surgical intervention is usually required to eliminate the pain generator. Delayed diagnosis or mistreatment will result in a fixed residual deformity. We conclude that it is important to perform a detailed history taking, physical examination, and imaging studies in adolescents or young adults with painful scoliosis.

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