Treatment of Sciatic Scoliosis in a Patient with an Ipsilateral Shift Using the McKenzie Method: A Case Report

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Background and Purpose. Sciatic scoliosis is a clinical entity that is often found in patients with radicular pain, although it may also occur in patients with lumbar pain only. This condition is highly suggestive of a symptomatic disc lesion. Deviation of the lumbar spine, which is often transient, is usually the result of an acute onset of pain and is characteristically gravity induced. The purpose of this case report is to describe conservative management of a patient with sciatic scoliosis using the McKenzie method. Case Description. The patient was a 40-year-old female who complained of a 1 1/2-month history of left lumbar and calf pain. Her symptoms were intermittent, but were progressively worsening. In addition, she had a periodic left lateral shift deformity in the morning during the initial onset and when physical therapy was initiated, which progressed to a constant shift with focal muscle weakness of the left L4 and L5 myotomes. Intervention consisted of patient and therapist generated forces using the McKenzie method to redistribute nuclear material, thus resulting in the resolution of the deformity and a mitigation of symptoms. Outcomes. The patient was seen for a total of 17 visits over the course of 3 months. Upon discharge from physical therapy, the patient’s lateral shift deformity resolved, lumbar flexion AROM increased from 50% to 25% movement loss, calf symptoms improved markedly, and left L4 myotome (ankle dorsiflexion) and L5 myotome (hallux dorsiflexion) strength increased from 3+/5 to 5-/5 and 3/5 to 3+/5, respectively. The patient’s Oswestry score improved from 44% to 8% over the course of treatment. She returned to full-time employment as a home care physical therapist. Discussion. A trial of conservative treatment using the McKenzie method in patients with an ipsilateral shift deformity with hard neurological signs may be effective, even though this population is deemed to have a poor prognosis with mechanical therapy.

Key Words: Sciatic scoliosis, McKenzie Method, Ipsilateral Shift, Physical Therapy

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Introduction

Sciatic scoliosis, also known as trunk list, lateral shift deformity, and lumbosacral list is a clinical sign that is often found in patients with radicular pain (i.e., lumbar pain extending below the knee), but it also may occur in patients with back pain only.\textsuperscript{1,2} This deformity is strongly associated with symptomatic disc lesions.\textsuperscript{1} Lateral shift, as described by McKenzie\textsuperscript{2}, is a deviation of the trunk in relation to the pelvis in the frontal plane. This condition is often a transitory deviation of the lumbar spine resulting from an acute onset of pain and is characteristically gravity induced. While lying or hanging from a bar, the deformity is abolished.\textsuperscript{2,3} In very rare cases, sciatic scoliosis may result from non-mechanical back pain, such as osteoid-osteoma and discitis.\textsuperscript{4}

The incidence of lateral shift deformity within the back pain only and radicular pain population is uncertain, as there is extensive variability in its reported presence according to the literature.\textsuperscript{2} This variability is illustrated in Table 1.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Patient population</th>
<th>Total sample</th>
<th>N (%) with shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porter and Miller 1986</td>
<td>Back pain clinic in hospital</td>
<td>1,776</td>
<td>100 (6%)</td>
</tr>
<tr>
<td>Matsui et al 1999</td>
<td>Surgical cases</td>
<td>446</td>
<td>40 (9%)</td>
</tr>
<tr>
<td>Khuffash and Porter 1989</td>
<td>Back pain clinic</td>
<td>113</td>
<td>32 (28%)</td>
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<tr>
<td>O’Connell 1951</td>
<td>Surgical cases</td>
<td>500</td>
<td>40 (9%)</td>
</tr>
</tbody>
</table>

(From McKenzie RA, May S. The Lumbar Spine Mechanical Diagnosis & Therapy. New Zealand; 2003.)
Various methods are used to assess the presence and extent of a lateral shift. They include visual inspection alone, visual inspection with three vertical lines on the wall behind the patient, visual inspection with plumb line with adhesive markers on L1 and S1, and a Cobb angle measurement between L1 and L5 in an anteroposterior lumbar radiograph. In a study by Riddle & Rothstein, the percent agreement and Kappa values for detecting the presence of a lateral shift using visual inspection alone were 60% and .26, respectively. Whereas in a study by Razmjou et al, the percent agreement and Kappa values for detecting the presence of a lateral shift deformity using visual inspection with three vertical lines on the wall behind the patient were 78% and .52, respectively. Therefore, one can infer from these two studies that visual markers improve both the percent agreement and Kappa values.

Three treatment approaches have been described in the literature for the conservative management of patients with sciatic scoliosis. One of those treatment methods is the autotraction system as developed by Lind and Natchev. In this method, the patient is placed on the side to which he lists. The traction table is initially adjusted to accommodate the deformity. Traction is then applied as the table slowly moves the patient’s torso to the opposite side; i.e., away from the side of the list. This procedure is used for patients in which the lumbar scoliosis is convex or concave toward the pathological side. Another is the application of unilateral traction as described by Saunders. This treatment technique is indicated for what Saunders refers to as protective scoliosis resulting from a herniated lumbar disc. This method is based on the belief that if the scoliosis can be maintained while unilateral traction is applied, a desired
result can be achieved.\textsuperscript{11} According to this method, patients who have a protective scoliosis away from the painful side should have the traction pull on the symptomatic side. Whereas patients who have a protective scoliosis toward the painful side should have the traction pull on the side opposite of the symptoms.\textsuperscript{11} Sanders\textsuperscript{11} believes that protective scoliosis and the condition McKenzie\textsuperscript{2} describes as lateral shift are two distinct clinical entities. With protective scoliosis, the patient volitionally positions himself in the least symptomatic position. Conversely, in a lateral shift, the list is mechanically induced and thus the patient is precluded from volitionally correcting the deformity. Saunders\textsuperscript{11} postulates that if a manual correction in weight bearing causes a peripheralization of symptoms, the condition is most likely a protective scoliosis and that unilateral traction is indicated.\textsuperscript{11} The third approach is the McKenzie\textsuperscript{2} method. In this system, manual and self-correction techniques in weight bearing are utilized to treat the lateral deformity. According to McKenzie,\textsuperscript{2} criteria for a relevant lateral shift include the following: upper body is visibly and unmistakably shifted to one side; onset of shift occurred with back pain; patient is unable to correct shift voluntarily; if patient is able to correct shift, he is unable to maintain correction; correction affects intensity of symptoms; and correction causes centralization or peripheralization of symptoms.\textsuperscript{2} Stages of treatment and procedures that may be utilized include the following: (1) correction of lateral deformity – side glide mobilization in standing using patient or therapist generated force followed by extension in standing or EIS with side gliding, (2) maintenance of correction – side gliding in standing against wall, (3) restoration of lumbar extension ROM – extension in lying with hips off centered progressing to extension in lying in sagittal plane, (4)
recovery of function – flexion in lying progressing to flexion in sitting, and (5) prophylaxis – postural education and lumbar extension in lying or extension in standing.²

In a search of the literature for physical therapy interventions to manage sciatic scoliosis, there was no evidence to support the efficacy of one treatment method over the other. Nor were there any studies that compared the prognoses or outcomes of patients with contralateral verse ipsilateral lumbosacral lists. According to anecdotal evidence, McKenzie² states that patients with an ipsilateral shift have a poor prognosis and are unlikely to respond to mechanical therapy. In addition, an ipsilateral shift is considerably less common as compared to a contralateral shift⁷,⁸ and is thus encountered less often in the clinical setting. Notwithstanding this patient being deemed to have a poor prognosis with conservative intervention by McKenzie², I chose the McKenzie² method for the following reasons: the lumbosacral list could not be volitionally corrected by the patient, thus deciding against unilateral traction; the lumbosacral list was abolished, albeit temporarily, and the most distal symptoms were decreased or centralized toward the lumbar spine with a manual correction in standing; and the unavailability of autotraction. The purpose of this case study is to discuss the use of the Mckenzie method in the treatment of a patient with an ipsilateral lumbar shift deformity with neurological signs.

**Case Description**

**History**

The patient was a 40-year old female with chief complaints of 1½-month history of left lumbar and calf pain. She reported that her symptoms are intermittent, but have been
worsening. In addition, she reported having a periodic (L) lateral shift in the morning. She stated that her symptoms are produced or worsened with sitting, forward bending, and lying and better with standing and walking. Complaints of bladder or bowel dysfunction were denied. Gait was reported to be normal. The patient reported an 11-year history of episodic LBP with 1 episode of (L) buttock, lateral thigh, and leg pain with a concurrent shift deformity occurring 1 ½- year ago. No imaging studies were performed prior to the initial evaluation. Her physician gave her a prescription for Percocet and physical therapy.

**Examination**

Medical Screening – medical history screening was negative for disease or red flags suggestive of systemic pathology.

Objective findings at initial physical examination - normal lumbar lordosis, no lateral shift, lower extremity MMT: L3-S1 myotomes 5/5 bilaterally, L4 and S1 DTR 2+ bilaterally, (-) SLR, 50% movement loss in lumbar flexion with no curve reversal of the lumbar spine, no movement loss in lumbar extension and right and left side gliding, and repeated movement testing of the lumbar spine results were as follows:

- Flexion in standing – increased (L) lumbar pain that did not remain worse after completion of the test movement. No change in ROM.
- Extension in standing – decreased (L) lumbar pain that remained better after completion of the test movement. No change in ROM.
- Flexion in lying – increased (L) lumbar pain that remained worse after completion of the test movement. No change in ROM.
• Extension in lying – decreased (L) lumbar pain that remained better after completion of the test movement. No change in ROM.

• Right and left side gliding – no symptomatic response.

SI joint testing: (-) thigh thrust, (-) compression, (-) distraction, and (-) sacral compression.

Hip A/PROM was grossly WNL.

Negative hip scouring.

No production of pain with resisted movement testing of the hip.

Pain rating: 6/10 at its worst and 0/10 at its best

Functional limitations – Unable to lift child or groceries, difficulty with bending and prolonged sitting, and disturbed sleep.

Disabilities – unable to work as a home care physical therapist or participate in recreational activities.

Pain intensity and functional impairments – a score of 44% was received on the Oswestry low back pain disability questionnaire12 (40-60% = severe disability). This questionnaire provides a reliable, valid, and sensitive measurement of a patient’s perception of pain, functional limitations, and disability.12

On her second visit (day 7), she presented with a marked left lumbosacral list. During her seventh session (day 20), she had focal muscle weakness of L4 myotome (ankle dorsiflexion) 3+/5 and L5 myotome (hallux dorsiflexion) 3/5 in addition to a lateral shift deformity.
Evaluation, Prognosis, and Diagnosis

Based on an evaluation of the initial examination findings, it was hypothesized that the symptoms were of discogenic origin and that the disc protruded posterolaterally. This conclusion was reached by the presences of the following subjective complaints and objective findings: an intermittent lateral shift deformity, symptoms distal to the knee, and a directional preference for lumbar extension. According to Gillian et al,\textsuperscript{1} a lateral shift deformity is highly suggestive of a disc lesion. Furthermore, back pain with symptoms extending below the knee is associated with nerve root compression. A directional preference is defined as a situation in which movement in one direction improves pain and limitation of motion, and movement in the opposite direction causes symptoms to worsen.\textsuperscript{13} Centralization, a more specific term under the broader category of directional preference, is a hallmark sign of a disc derangement according to McKenzie.\textsuperscript{2} Centralization is defined as the abolishment of pain or paresthesias or the migration of symptoms from an area more distal or lateral in the buttocks and/or lower extremity to a location more proximal or closer to the midline of the lumbar spine after a repeated end-range movement.\textsuperscript{2} Patients who exhibit a directional preference or centralization during repeated movement testing have a better prognosis than those without centralization.\textsuperscript{14,15}

Based on the signs and symptoms at the initial examination, the patient’s mechanical diagnosis was as follows: McKenzie classification – derangement → unilateral/asymmetrical with symptoms below knee extension responder. Quebec Task Force classification #3 (lumbar pain with radiation to distal extremity).
When the patients lateral shift deformity became constant on her second visit (day 7), it was hypothesized that her disc protrusion became more pronounced. Since the list was toward the side of pain, the deformity was classified as an ipsilateral shift. Finneson hypothesized that when a disc lesion causing radicular symptoms is lateral to the nerve root, the list is toward the opposite side of the sciatica in an attempt to unload the nerve root. Conversely, when the disc lesion is located medial to the nerve root, the list is toward the same side of the sciatica to decompress the nerve root (Figure 1). This hypothesis, however, was refuted in studies by Matsui et al. and Suk et al. A significant statistical association between the direction of the scoliosis and the anatomic location of the disc lesion was not demonstrated. Finneson’s hypothesis was correct in 12 of 35 patients (34%) in the study by Matsui et al. and in 11 of 20 patients (55%) in the study by Suk et al. The direction of the list does suggest to be related to the side of the disc lesion, for 80% and 67% of the subjects in the studies by Matsui et al. and Suk et al. respectively, listed to the contralateral side of pain. Therefore, it can be concluded that the side of the disc lesion or symptoms (i.e., right or left) is a more accurate predictor of the direction of the list as compared to the anatomic location of the disc lesion in respect to the nerve root. An alternative explanation for an ipsilateral shift would be a protruded disc with an incompetent annulus where the nucleus extends outside the joint margin causing the disc to collapse on the side of the disc lesion. Since the patient no longer demonstrated a directional preference for lumbar extension, frontal plane movements were investigated. It was found that there was a directional preference for right side gliding. In a study by Long et al. it was found that only 7% of subjects with a directional preference had a preference for lateral movements. Treatment of patients with a
directional preference for frontal plane movements include repeated end-range side

gliding exercises or traction (mechanical or autotraction).\textsuperscript{18}

\textbf{FIGURE 1.} Patient listing as a result of medial and lateral disc protrusions. A, protrusion lateral to the nerve root causes the patient to list away from the painful lower extremity. B, protrusion medial to the nerve root causes the patient to list toward the painful lower extremity. (from McNab I: \textit{Backache}. Baltimore, Williams & Wilkins, 1977.)

\textbf{Intervention}

The patient was seen in physical therapy for a total of 17 visits over the course of 3 months. She was educated regarding the mechanical diagnosis and the intervention approach. After the initial physical examination on 10/24/06, the patient was advised to perform extension in standing or lying 10x every other waking hour and to avoid forward bending. In addition, she was advised to maintain lumbar lordosis while sitting. When she returned on 10/30/06, she reported that she had been shifted to the left for the last few days (Figure 2). She c/o (L) lumbar, buttock, and posterior thigh pain. On visual inspection, she presented with a marked left lumbosacral shift. A right side glide mobilization in standing was performed followed by extension in standing while maintaining an overcorrected position (Figure 3 and 4). Upon completion of these
techniques, the shift was corrected. The correction, however, was transient, for the patient quickly returned to a left trunk list. She then performed right side gliding against the wall (Figure 5) and lay on her right side with a pillow under her pelvis. She was advised to defer extension exercises and to perform right side gliding against the wall at home 10x every other hour. Her mechanical diagnosis was changed to unilateral/asymmetrical with symptoms below the knee with lateral shift deformity using the McKenzie classification and Quebec Task force classification #3. On 10/31/06, she reported that she was unable to sleep the previous night. She reported left lumbar, buttock, and lateral calf pain. Her left lateral shift deformity persisted. Neurological testing was as follows: L4 and S1 2+ bilaterally and L3-S1 myotomes 5/5 bilaterally. She received the same treatment as the previous day in an attempt to correct the lateral shift deformity and centralize the most distal symptoms. The lateral shift was easily corrected and the symptoms centralized to the buttock, although the correction of the list and centralization of symptoms were transient.

On 11/2/06, a right side glide mobilization was attempted, although pain was peripheralized from the thigh to the calf. As an alternative technique, she performed right side gliding with her hands on the plinth first in slight flexion and then in erect standing (Figure 6). After this procedure, the symptoms were centralized from the calf to the thigh and the deformity was decreased. At the conclusion of treatment, she lay in right side lying with a pillow under her pelvis. Hard neurological signs were negative. During her visits on 11/6/06 and 11/8/06, she received the same treatment as 11/2/06 with the addition of right side glide mobilization in slight flexion and in erect standing, followed
by extension in standing in an overcorrected position. Extension in lying with a right side glide was also initiated on 11/8/06. The lateral shift deformity persisted, but its degree had improved moderately. On 11/14/06, she reported an inability to walk on her heels secondary to weakness of the left leg. She reported that the shift deformity had improved and denied any worsening of the left lower extremity pain. She presented with focal muscle weakness of left L4 (ankle dorsiflexion) and L5 (hallux extension) myotomes. The patient also had a f/u visit with her MD on this date and was given a prescription for a medrol dose pack. Her mechanical diagnosis at this time was unilateral/asymmetrical with symptoms below the knee with lateral shift deformity using the McKenzie classification and Quebec Task force classification #4 (lumbar pain with radiation to distal extremity with neurological signs).

On 11/21/06, she reported an improvement in strength in ankle dorsiflexion. Visual inspection revealed a left lateral shift. Ankle dorsiflexion MMT had increased from 3+/5 to 4/5, although strength in hallux extension remained unchanged. Treatment was initiated as previously. On 11/28/06, she reported: “I feel like I’m pretty straight most of the time.” Visual inspection did not reveal a shift deformity. There was no movement loss in lumbar extension and right and left side gliding. Treatment consisted of extension in standing and lying. She was advised to perform extension in standing or lying every two hours (Figure 7). If the lateral shift returned, she was advised to perform right side gliding against the wall and to defer extension exercises. On 12/5/06, she stated: “I’m so much better.” She reported a MRI revealed a left sided L4/L5 HNP. In addition, she denied any episodes of lateral shift deformity since her last visit and stated that calf
symptoms were infrequent. She was advised to continue with extension in standing and lying and to avoid forward bending. On 12/15/06, she continued to report an improvement in symptoms. Left lower extremity MMT were as follows: hallux extension 3+/5 and ankle dorsiflexion 4+/5. Transverses abdominis strengthening exercises were initiated with the spine in a neutral position using the magic circle, foam roll, and reformer. On 12/15/06 and 12/29/06 core-strengthening exercises in a neutral position were further progressed. In addition, slouch/overcorrect was added on 12/29/06 to initiate lumbar flexion. On 1/8/07 core-strengthening exercises were again further progressed and lumbar flexion in lying was added. During 1/8/07, 1/16/07, 1/23/07, and 1/30/07 dynamic stabilization exercises with the above apparatuses were performed; i.e., core strengthening with movement of the spine. Upon discharge, the patient received a score of 8% on the Oswestry low back pain disability questionnaire.\textsuperscript{12}

\textbf{FIGURE 2.} Left sciatic scoliosis – ipsilateral if the pain is on the left contralateral if the pain is on the right.

\textbf{FIGURE 3.} Right side glide in standing – manual technique to correct left sciatic scoliosis.
Figure 4. Lumbar extension in standing with right side glide – manual technique to correct left sciatic scoliosis.

Figure 5. Right side gliding in standing in slight flexion – self-technique to correct left sciatic scoliosis.

Figure 6. Right side gliding in standing in slight flexion – self-technique to correct left sciatic scoliosis.

Figure 7. Lumbar extension in lying – self-technique to reduce posterior derangement or for prophylaxis.
Outcomes

After 12-weeks of physical therapy, the lateral shift deformity had resolved. Focal muscle weakness persisted, although left L4 myotome (ankle dorsiflexion) and L5 myotome (hallux dorsiflexion) strength had increased from 3+/5 to 5-/5 and 3/5 to 3+/5, respectively. The frequency and intensity of left calf symptoms had markedly improved. The patient’s Oswestry score improved from 44% (40 - 60% = severe disability) to 8% (0-20% = minimal disability) during the course of treatment. An improvement of 82%.

In a study by Childs et al\textsuperscript{19} during the development of a clinical prediction rule for spinal manipulation, patients whose Oswestry score improved by 50% or greater were deemed to have a successful outcome. She returned to work as a home care physical therapist, but was restricted in performing transfers. She is able to lift her child or groceries with no difficulty. Pain rating: 0/10 at its best, 3/10 at its worst.

Discussion

The purpose of this case study was to describe a manual physical therapy management strategy for a patient with an ipsilateral sciatic scoliosis. The side glide mobilizations, as incorporated in the McKenzie method, with both patient and therapist generated forces were effective in correcting the patient’s sciatic scoliosis and decreasing the frequency and intensity of lower extremity pain. This was presumably achieved by causing a reductive force on the deranged disc and thus decompressing the nerve root. The techniques, however, needed to be modified as the patient’s presentation changed. A reductive force in this context means a mechanical force that moves the protruded disc away from the nerve root—thus mechanically altering the disc. In the case of an
ipsilateral sciatic scoliosis, one may conjecture that the reductive force generated by a side glide mobilization separates the vertebra on the concave side (symptomatic side) and at the same time tightens the annulus allowing the protruded nucleus to move within the joint margin resulting in a normalization of posture (Figure 8). An alternative explanation for this patient’s progress would be the natural history or the Medrol dose pack and that the physical therapy intervention was of little or no value. Notwithstanding this patient having hard neurological signs and an ipsilateral shift, which according to McKenzie\(^2\) indicates a poor prognosis, I believe that she had a fairly good outcome for the following reasons: her lateral shift deformity resolved, the most distal symptoms improved markedly, her Oswestry score improved significantly, and the strength of L4 and L5 myotomes had steadily improved.

A plausible explanation for an ipsilateral lumbosacral shift would be a protruded disc with an incompetent annulus where the nucleus extends outside of the joint margin causing the disc to collapse on the side of the disc lesion or the concave side of the deformity (Figure 9) (Table 1). Conversely, a likely reason for a contralateral lumbosacral shift would be a protruded disc with a competent annulus where the nucleus does not extend outside the joint margin causing the vertebra above and below to separate on the side of the lesion or the convex side of the deformity (Figure 10) (Table1). In this condition, a reductive force produced by a side glide mobilization would cause the protruded disc away from the nerve root by approximating the lateral aspect of vertebra from above and below in a weight bearing position—hence centralizing or decreasing the leg pain and normalizing posture (Figure 11).
In various studies, the terms disc protrusion, HNP, and disc lesion are used interchangeably. Various degrees of disc displacement are recognized; Protrusion – displaced nuclear material that causes a bulge in the annulus, but no material escapes through the annular fibers. Extrusion – displaced nuclear material presents in the spinal canal through disrupted fibers of the annulus, but remains connected to material persisting within the disc. Sequestration – nuclear material escapes into the spinal canal as free fragments, which may migrate to other locations (Table 2).²⁰ Perhaps if these specific terms were used in research studies, an association between the degree of disc displacement and the direction of the sciatic scoliotic list (i.e., contralateral or ipsilateral) might be demonstrated.

A study was performed by Gillian et al¹ to assess the efficacy of the McKenzie method in the resolution of trunk list and the perceived disability of patients with this condition. In this study, 40 patients with an acute episode (<12 weeks duration) of LBP only or lumbar pain radiating to the thigh or lower leg and a lateral shift of the lumbosacral spine were recruited into the study and randomized into 2 groups. The control group received standard back care advice, while the experimental group received treatment using the McKenzie method. After 28 days, statistical significance was not demonstrated between the two groups in regard to the trunk list; i.e., 50% and 64% of the patients in the control group and experimental groups, respectively, had resolution of the deformity. Statistical significance in regard to resolution of trunk list, however, was demonstrated after 90 days in patients receiving the McKenzie method. In the experimental group, trunk list had resolved in 91% of the patients compared to 50% in the control group. Both groups
Oswestry scores improved significantly after 28 and 90 days. There was no significant
difference, however, in the Oswenstry scores between those patients whose list resolved
and those patients whose list did not resolve at 90 days. Nor was there a significant
difference in scores at 90 days between the control and experimental groups. A limitation
of this randomized controlled trial was that 7 of the subjects in the control group and 8
subjects in the experimental group did not complete the 90-day study period. Key
outcomes should be obtained from greater than 85% of subjects allocated to groups. In
this RCT, only 14/21 (67%) of the subjects in the control group and 11/19 (57%) in the
experimental group completed the study. This lack of follow up among subjects
diminishes the credibility of the study. In addition, it is unclear if the subjects in this
study had protruded, extruded, or sequestered discs. Perhaps if subjects were placed in
subgroups according to the degree of disc displacement, the McKenzie method might
have demonstrated to be more effective than standard spine care for a particular group. It
is my belief that patients with sciatic scoliosis with a protruded disc will have better
outcomes with the McKenzie approach and that patients with sciatic scoliosis with an
extruded or sequestrated disc will have better outcomes with unilateral traction. The latter
condition is what I believe Sanders is referring to as protective scoliosis. Autotraction
might be useful in patients with an ipsilateral shift deformity to initiate a shift correction
in an unloaded position before proceeding with a shift correction in weight bearing.

In asymptomatic individuals, the transverses abdominis (TrA) functions tonically and is
noted to be the first trunk muscle activated during an anticipated perturbation of the
spine. In patients with LBP, however, the anticipatory activation of the TrA becomes
either delayed or absent.\textsuperscript{21} Therefore, the rationale for initiating TrA training after correction of the lateral shift deformity was to retrain this muscle to function tonically—not phasically. Since sciatic scoliosis is often found in patients with radicular symptoms, it is incumbent upon physical therapists treating patients with spinal disorders to be skilled in the assessment and treatment of this condition.

\textbf{FIGURE 8.} Theoretical model for the correction of a left ipsilateral shift deformity using a side glide mobilization – as the hips are pulled to the left and the torso is pushed to the right, the vertebra on the symptomatic side (concave side) separate and the annulus becomes taut allowing the protruded disc to move within the joint margin.
FIGURE 9. Theoretical model for a left ipsilateral sciatic scoliosis – a protruded disc with an incompetent annulus where the nucleus extends outside the joint margin causing the disc to collapse on the side of the lesion or the concave side of the deformity.

FIGURE 10. Theoretical model for a left contralateral sciatic scoliosis – a protruded disc where the nucleus does not extend outside the joint margin causing the vertebra above and below to separate on the side of the lesion or the convex side of the deformity.

FIGURE 11. Theoretical model for the correction of a left contralateral shift deformity using a side glide mobilization – as the hips are pulled to left and the torso is pushed to the right the vertebra on the symptomatic side (convex side) approximate causing a mechanical reduction of the protruded disc.
<table>
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<tr>
<th>Term</th>
<th>Pathology</th>
<th>Hydrostatic mechanism</th>
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<tr>
<td>Protrusion</td>
<td>Intact and competent annular wall</td>
<td>Intact</td>
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<tr>
<td>Protrusion</td>
<td>Intact annular wall, but so attenuated as to be incompetent</td>
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<td>Sequestration</td>
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(From McKenzie and May: The Lumbar Spine Mechanical Diagnosis & Therapy)
References


