

Mechanical Diagnosis and Therapy of an Adherent Lumbar Nerve Root

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MECHANICAL DIAGNOSIS and Therapy (MDT) of lumbar spine dysfunction, also known as the McKenzie method, has been the focus of extensive research in recent years. Traditional spinal evaluation methods have focused on identification of anatomic pathology through physical examination and imaging studies. Treatment selection has been

based on the identified pathology. Mechanical diagnosis focuses on the patient's symptomatic and mechanical responses to the systematic application of repetitive end-range movements. Evaluation of the patient's history, pain patterns, and responses to movements provide the basis for categorization of the condition into one of three mechanical syndromes: derangement, dysfunction, or postural (Table 1).¹

Exercise selection is based on the ability to improve the symptomatic and mechanical presentation. In general, a mechanical evaluation differentiates chemical pain from

mechanical pain, determines if the patient's condition is appropriate for mechanical therapy, and identifies a preferred direction of movement for future therapeutic exercise.¹

MDT is widely associated with the application of extension loading strategies in the initial treatment of spinal derangement syndrome.¹ The McKenzie classification method identifies approximately 80-90% of lumbar patients with derangement syndrome.¹ The majority of such patients will exhibit a directional preference for extension or a combination of extension and lateral movements. Approximately 7% of patients respond to flexion procedures.² Within this group are patients diagnosed with an adherent nerve root, which is a type of dysfunction that affects only 1% of mechanical diagnoses.^{3,4} The purpose of this case review is to highlight the application of MDT for an adherent lumbar nerve root in a high school football player.

Case History

A 16-year-old male football linebacker reported a three-month history of pain in the low back and left buttock. Symptoms developed while performing resisted squatting exercises during off-season workouts, which included constant low back pain that

KEY POINTS

Mechanical Diagnosis and Therapy (MDT) focuses on symptomatic and mechanical response to movements.

The majority of MDT patients initially treated with extension maneuvers also require flexion prior to full recovery.

Pain classification systems are useful in identifying treatment options and monitoring patient progress.

Physical conditions evolving and focusing on continual assessment, rather than treatment, is needed to ensure improvement.

TABLE 1. DEFINITIONS AND OPERATIONAL TERMS

Directional Preference	The propensity of mechanical back and referred pain to lessen if movements or positions in one direction are performed and to worsen if movements or postures in the opposite direction are performed.
Derangement Syndrome	Variable mechanical and symptomatic responses caused by an articular displacement that causes a disturbance within the joint. The only McKenzie syndrome that exhibits the centralization and peripheralization phenomenon in response to repeated movements.
Dysfunction Syndrome	Consistent mechanical and symptomatic responses caused by normal stresses applied to abnormal tissues such as scarring, contraction, adherence and imperfect tissue repair. End-range movements produce local pain only, with the exception of an adherent nerve root, and display consistent motion restrictions.
Postural Syndrome	Mechanical deformation of normal tissues arising from prolonged postural stresses. Syndrome symptoms are not affected by repeated movements and do display motion restrictions.
Centralization	The phenomenon by which distal limb pain emanating from the spine appears to progressively retreat in a proximal direction in response to the deliberate application of loading strategies.
Peripheralization	The phenomenon when pain emanating from the spine spreads distally into, or further down, the limb.
Adherent Nerve Root	A form of dysfunction that presents with a history of sciatica that has improved but is now unchanging. Conceptually, a nerve that has adhered to a healed disc. Symptoms are intermittent, with consistent production of concordant pain at end-range standing flexion. Lying flexion does not produce distal symptoms and there is no rapid reduction or abolition of symptoms and no lasting production of distal symptoms.

peripheralized to the left buttock during flexion activities. MRI revealed a minor L4-L5 disc herniation, and the athlete was referred for physical therapy. Treatment consisted of moist heat packs, interferential stimulation, and prone extension exercises. At the conclusion of a 3-week treatment period that included seven therapy sessions, the patient experienced intermittent central low back pain and left leg aching. The patient was instructed to continue extension exercises to maintain centralization of symptoms. He was compliant with the prescribed home exercise program, and he refrained from participation in summer football training sessions. Upon return to school two months after discharge from the physical therapy program, the patient reported to the athletic trainer with complaints of left lower leg pain and a deep ache during running activities.

Mechanical Diagnosis and Therapy

Mechanical diagnosis evaluated movement and symptom response to repeated standing flexion and extension, as well as supine flexion and prone extension (Figures 1-4). Repeated standing flexion revealed a deviation to the left (Figure 5) with consistent reproduc-

tion of leg pain with symptoms subsiding upon return to the starting position. Prone extensions (press-ups) produced only mild low back pain. Repeated standing extension and supine flexion were unremarkable. Mechanical evaluation revealed a history of active derangement and ruled out nerve root entrapment. (Tables 2 & 3).¹

The patient was instructed to perform ten repetitions of step-standing flexion (Figure 6) to remodel tissue that had adaptively shortened and adhered to the disc during the repair process. Ten repetitions of prone extension press-ups were performed afterward to offset flexion stresses placed on the disc by the flexion exercise. The exercises were repeated every three hours. The patient was instructed to flex to the point of symptom reproduction to ensure that remodeling stress would be applied to the adhered tissues. The patient was instructed to avoid exercising in the morning, when high disc pressure exists. The patient exhibited minimal improvement at ten days after initiation of treatment and was referred to a physical therapist with an advanced certification in MDT. The diagnosis was confirmed, and a recommendation was made to replace step-standing flexion exercise with

supine flexion exercise. The morning exercise restriction and the prone extension follow-up exercise were maintained. Within two weeks, the patient reported a significant decrease in symptoms during flexion activities and light jogging. Reevaluation revealed an increased symptom-free flexion range. The exercise frequency was increased to every two hours. A gradual transition to standing flexion, and eventually

step-standing flexion, was made as the patient's symptom-free range of motion improved. Reconditioning was implemented as tolerated. After seven weeks of treatment, the patient was symptom free and able to return to unrestricted football participation. Exercises were continued before and after practice sessions. One year later, the patient remained symptom free during participation in football and track.



Figure 1 Standing flexion priority.



Figure 2 Standing extension priority.

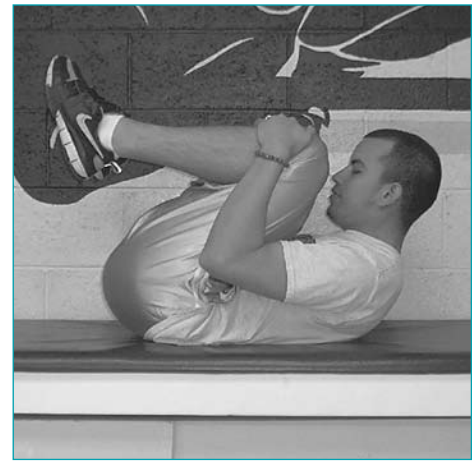


Figure 3 Supine flexion priority.



Figure 4 Prone extension priority.



Figure 5 Flexion deviation priority.

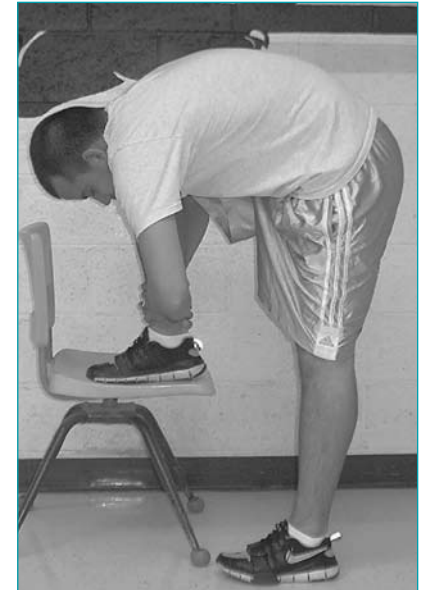


Figure 6 Step-standing flexion priority.

TABLE 2. SYMPTOMATIC ALGORITHM FOR DIFFERENTIATING SCIATICA

Symptomatic Presentation	Derangement	Adhered Nerve Root	Nerve Root Entrapment
Stage	Acute to chronic	Chronic	Chronic
Status	Improving/worsening/unchanging/ varying	Unchanging	Unchanging
Symptoms	Constant/intermittent	Intermittent	Constant
Symptom behavior	Consistent/inconsistent/variable/ centralizing/peripheralizing	Consistent	Consistent/activity increases symp- toms/no lasting effect.
Aggravating factors	Flexion activities or flexion and extension activities	Tension positions	All activities produce temporary aggravation.

TABLE 3. MECHANICAL ALGORITHM FOR DIFFERENTIATING SCIATICA

Mechanical Presentation	Derangement	Adhered Nerve Root	Nerve Root Entrapment
Standing flexion	Worsens or peripheralizes/pain during movement/end-range pain/decreased ROM	End-range symptom pro- duction/no lasting effect/no change in ROM	Increase pain/no lasting effect/ no change in ROM or decrease pain/no lasting effect/increase ROM/no lasting effect
Standing extension	Symptoms better or central- ization/increased ROM or symptoms worse or peripheril- ize decreased ROM	No effect or produced back pain/no lasting effect/no change in ROM	Increase pain/no lasting effect/ no change in ROM
Supine flexion	Similar response to standing flexion but less severe	Same as standing extension	Increase pain/no lasting effect/ no change in ROM or decrease pain/no lasting effect/increase ROM/no lasting effect
Prone extension (press-ups)	Same as standing extension	Same as standing extension	Same as standing extension
Flexion deviation	Variable	Yes / toward affected side	Variable

Discussion

Recovery of Function

Functional rehabilitation is widely recognized as a critical component of the process of preparing athletes for return to sport participation and preventing reinjury. The McKenzie method for management of lumbar dysfunction progressively reintroduces movements that were initially problematic. This approach improves strength and restores full range of motion. The patient in this case review had avoided flexion activities for ten weeks during the summer, which probably had

an adverse effect on injured tissues during the healing process. Inclusion of flexion exercises, neural tension movements, and general physical activity could have minimized adaptive shortening and adhesions of neural tissue and surrounding structures.^{5,6} Development of an adherent nerve root may be prevented by motion that counteracts the process by which a nerve root becomes tethered to a healing disc.^{1,5,7}

A common misconception is that the McKenzie MDT method is biased toward emphasis on spine extension exercises. Actually, the patient's response to the mechanical evaluation determines directional preference. Although the majority of patients initially

respond to an extension exercise strategy, complete treatment progression also addresses the need for restoration of lost flexion mobility.

Directional Preference

Establishing a directional preference is essential in MDT. Although the athlete's initial directional preference was extension (based on the ability to centralize initial derangement symptoms), reevaluation revealed that the condition had developed into an adherent nerve root that required flexion exercise for symptom resolution. An adherent nerve root is the only mechanical diagnosis for which peripheral symptoms are purposely reproduced through flexion exercise as a part of the treatment process. Similar findings in a related evaluation system, utilizing treatment responses to classify patient conditions, support the use of flexion activities in the treatment of inactive lesions demonstrating positive tension signs.⁵ This case demonstrates the need for continual reevaluation of baseline clinical observations to determine the appropriate directional preference.

Progression of Force

A gradual progression in force application is important. The performance of step-standing flexion, prior to the rehabilitation program modification that replaced it with supine flexion, probably created excessive stress that hindered the athlete's progress. Stretching an adhered nerve root should begin with supine flexion. The purpose is two-fold: (a) active derangements are exposed through symptomatic and mechanical response, and (b) a safety mechanism is maintained that ensures a progressive reintroduction of flexion. Once an active derangement is ruled out and initial improvement has plateaued, force progressions can be addressed.^{1,7}

Prognosis

Patients with an adherent nerve root often show significant improvements within the first two weeks after initiation of treatment.³ The subject of this case review demonstrated rapid improvement in pain-free range of motion after the appropriate sequence of flexion exercises were initiated. He exhibited slower progress in symptom resolution over the ensuing weeks, but full return to football was possible after a period of seven

weeks.³ Similarly, patients with nerve root entrapment who have excellent outcomes are likely to recover in an average of eight weeks.⁸ Additionally, those with active lifestyles at the time of mechanical diagnosis have a greater chance of full recovery. The outcomes of this case study support existing research and demonstrate a possible relationship between excellent outcomes for nerve root entrapment and those for adherent nerve roots.

Conclusion

Lumbar nerve root adherence in an adolescent athlete is rare, but incomplete mechanical diagnosis and treatment of an internal derangement can lead to shortening of connective structures and neural tension. With accurate diagnosis and treatment of an adherent nerve root, a positive outcome can be expected for an active patient. ■

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