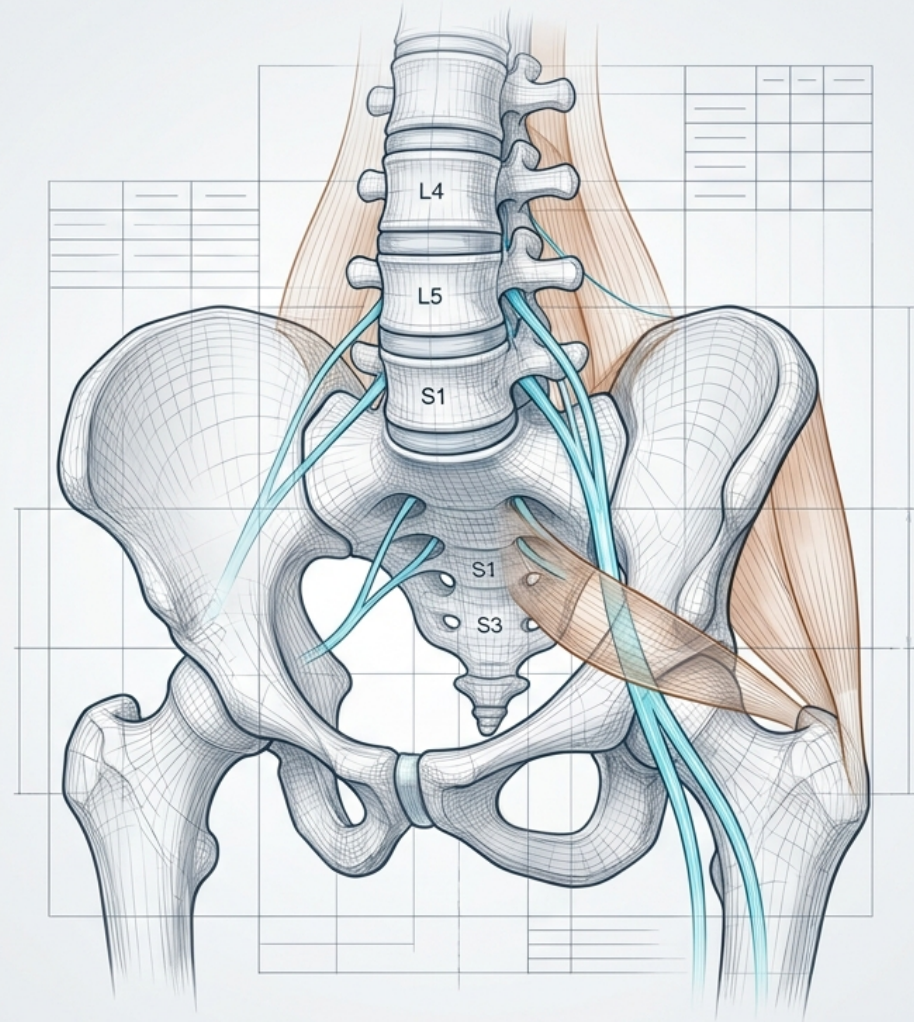


# Sciatica and Related Conditions Through a Neuromyofascial Science Perspective

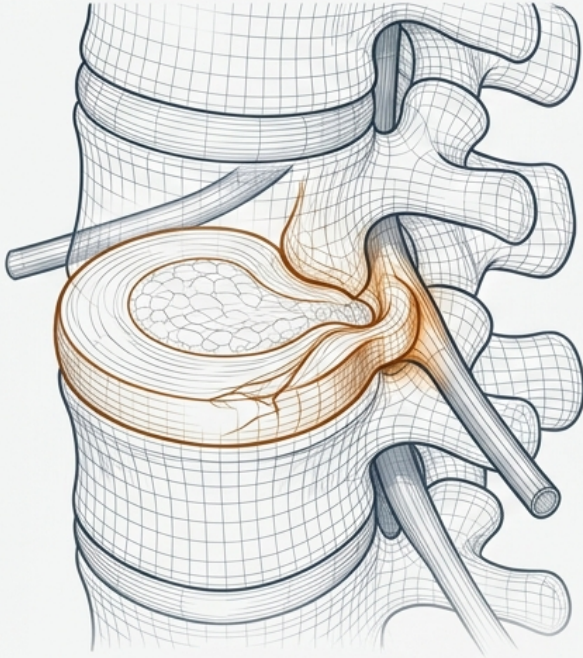
- Evaluating proximal neuromyofascial, neurogenic, mechanical, and hip-pelvis-spine contributors in lower-limb pain syndromes.
- An evidence-integrated framework for classical and non-classical presentations.



# Moving Beyond the Isolated Disc Model

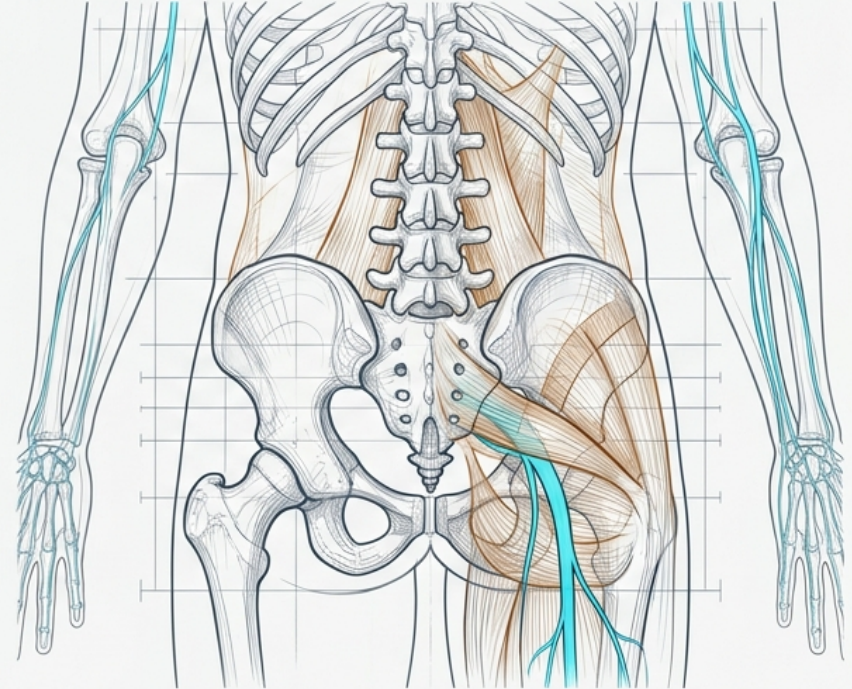
## Classical Model

Sciatica is strictly defined as a single herniated disc compressing a single nerve root (typically L4-L5 or L5-S1).

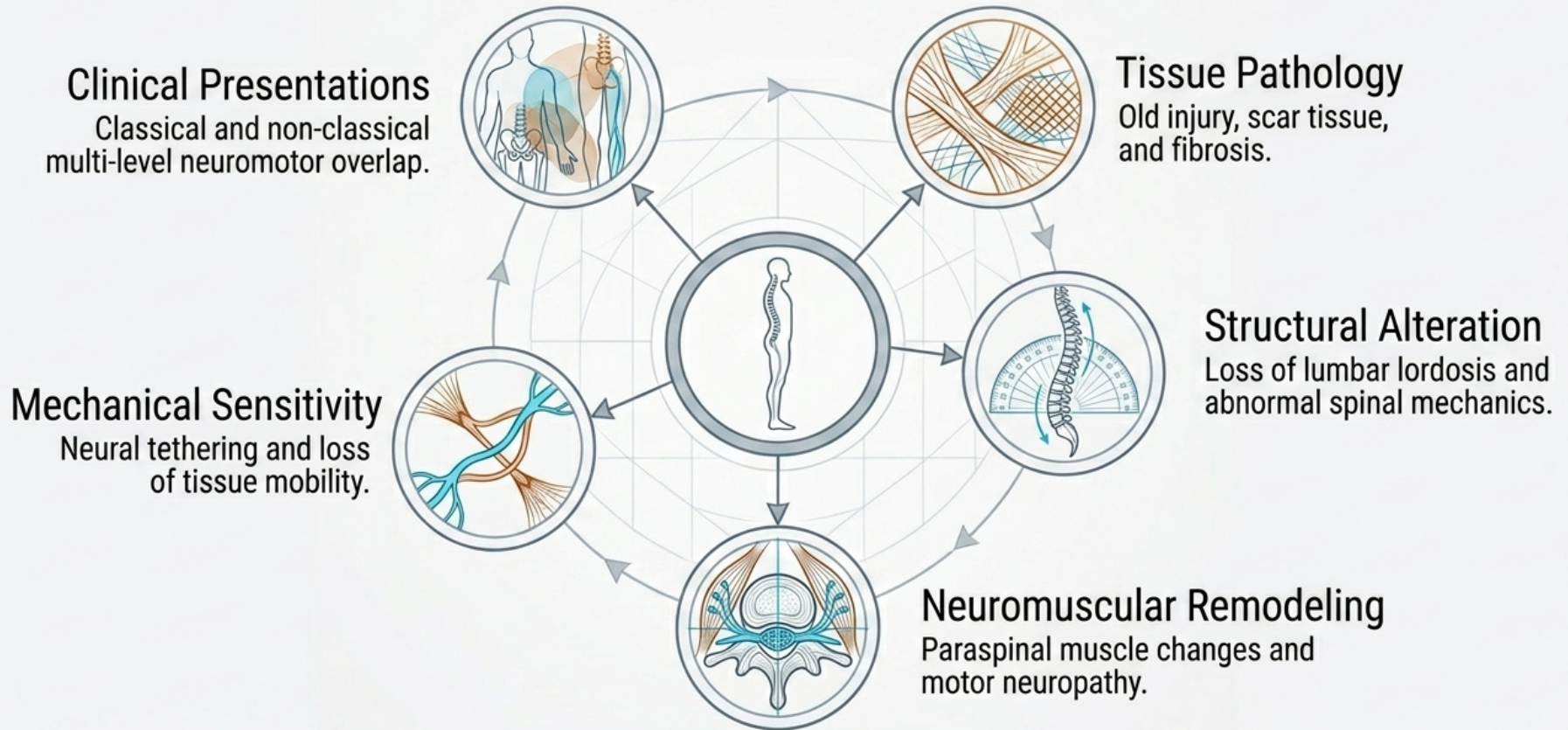


## The Clinical Question

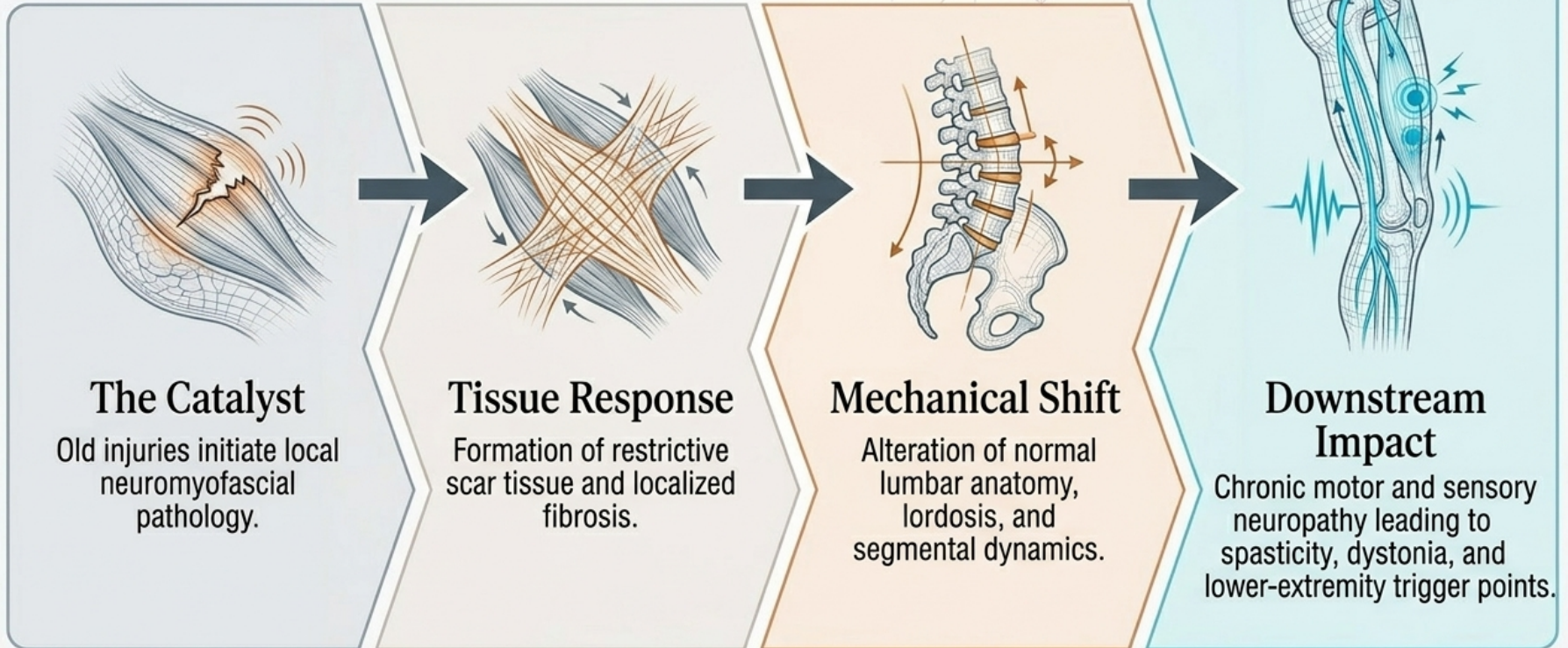
Is persistent sciatica always an isolated compressive event, or does it reflect a broader, subgroup-based neuromyofascial process?



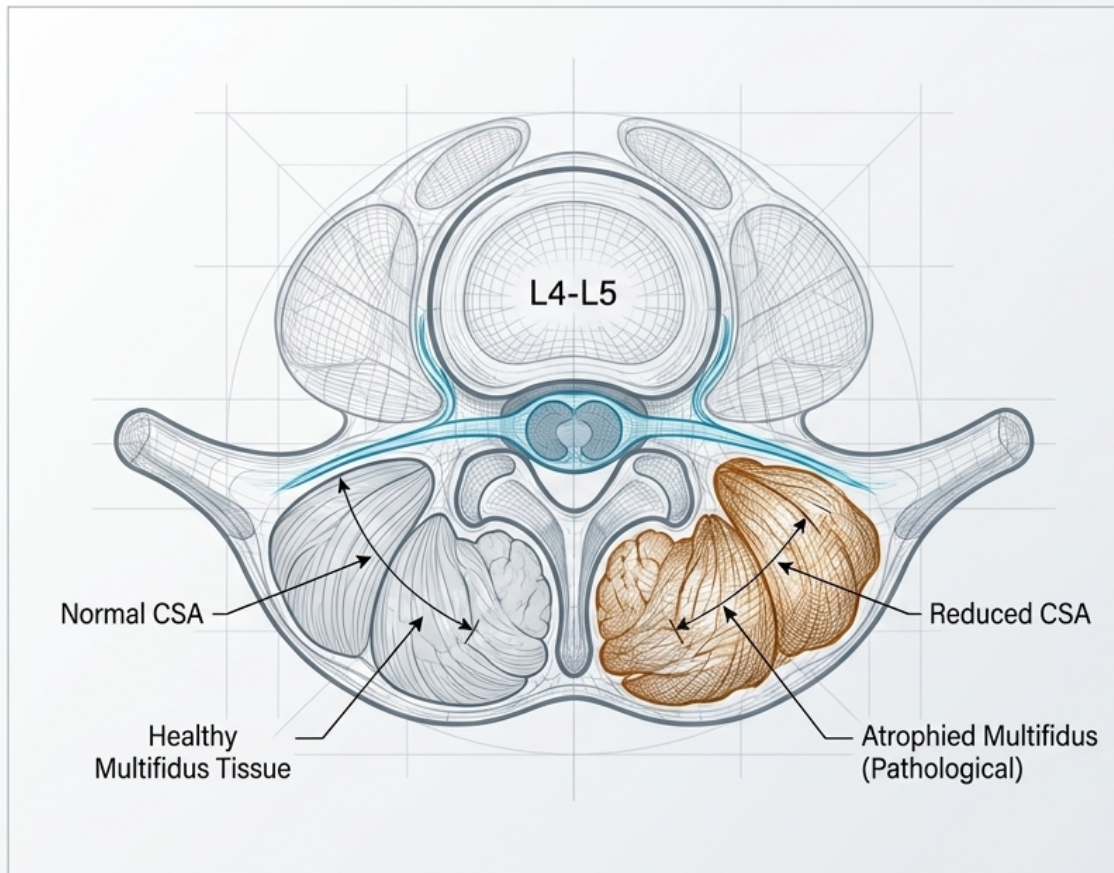
# The Integrated Neuromyofascial Framework



# The Pathological Cascade of Downstream Disability



# Segmental Paraspinal Involvement in Persistent Sciatica



## Framework Pillar

Sciatica involves local spinal soft-tissue and motor-system changes, extending beyond isolated disc compression.

## Literature Integration

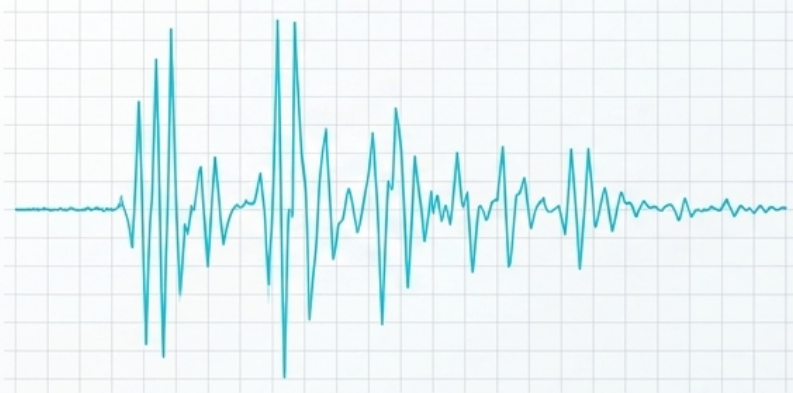
Kim et al., 2011

**Finding:** Persistent unilateral sciatica ( $\geq 3$  months) is associated with significant ipsilateral multifidus atrophy.

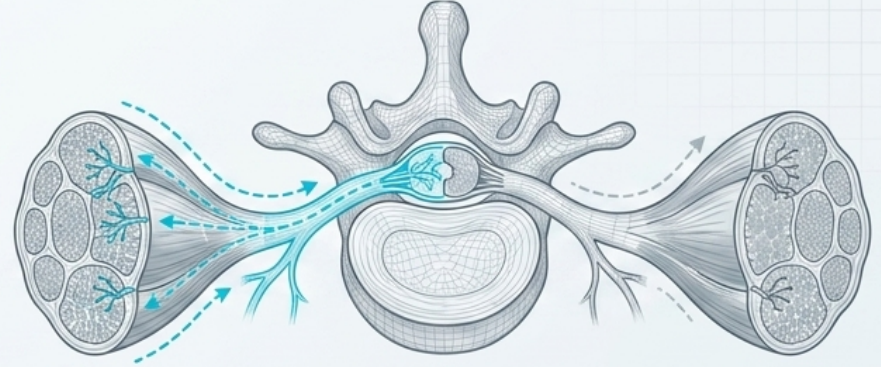
**Context:** Acute cases ( $\leq 1$  month) demonstrated no significant muscular asymmetry.

# Radiculopathy as a Motor-Neuropathic Process

EMG Waveform (Neurogenic)



L5 Motor Pathway & Paraspinal Innervation



## Framework Pillar

Chronic radiculopathy drives neurogenic motor-unit remodeling in the surrounding musculature.

## Literature Integration

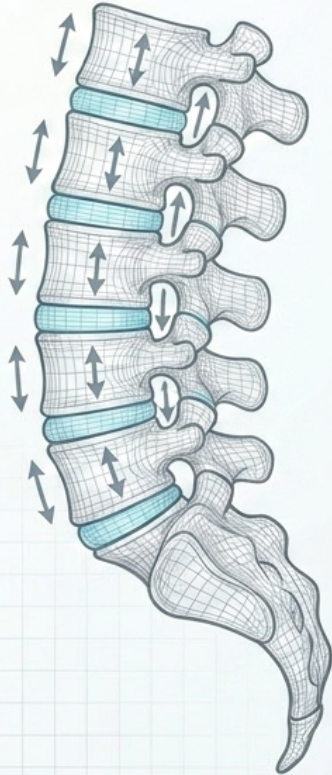
Seliverstova et al., 2024

Finding: EMG confirms neuropathic motor-unit action potentials are common in L5 radiculopathy.

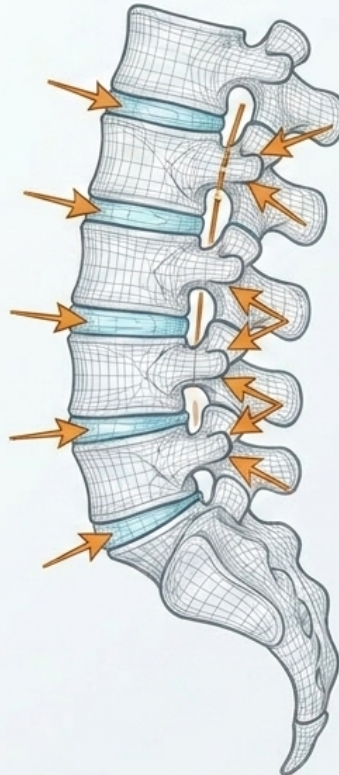
Key Distinction: Paraspinal fatty infiltration and neurogenic remodeling may coexist, but operate as independent clinical processes.

# Altered Lumbar Mechanics and Vertebral Alignment

Normal Lordosis



Attenuated Curve



## Framework Pillar

Neuromyofascial pathology can drive the straightening of the lumbar spine, fundamentally altering segmental pressure.

## Literature Integration

Chun et al., 2017

**Finding:** Meta-analysis reveals a strong association between low back pain and decreased lumbar lordotic curvature.

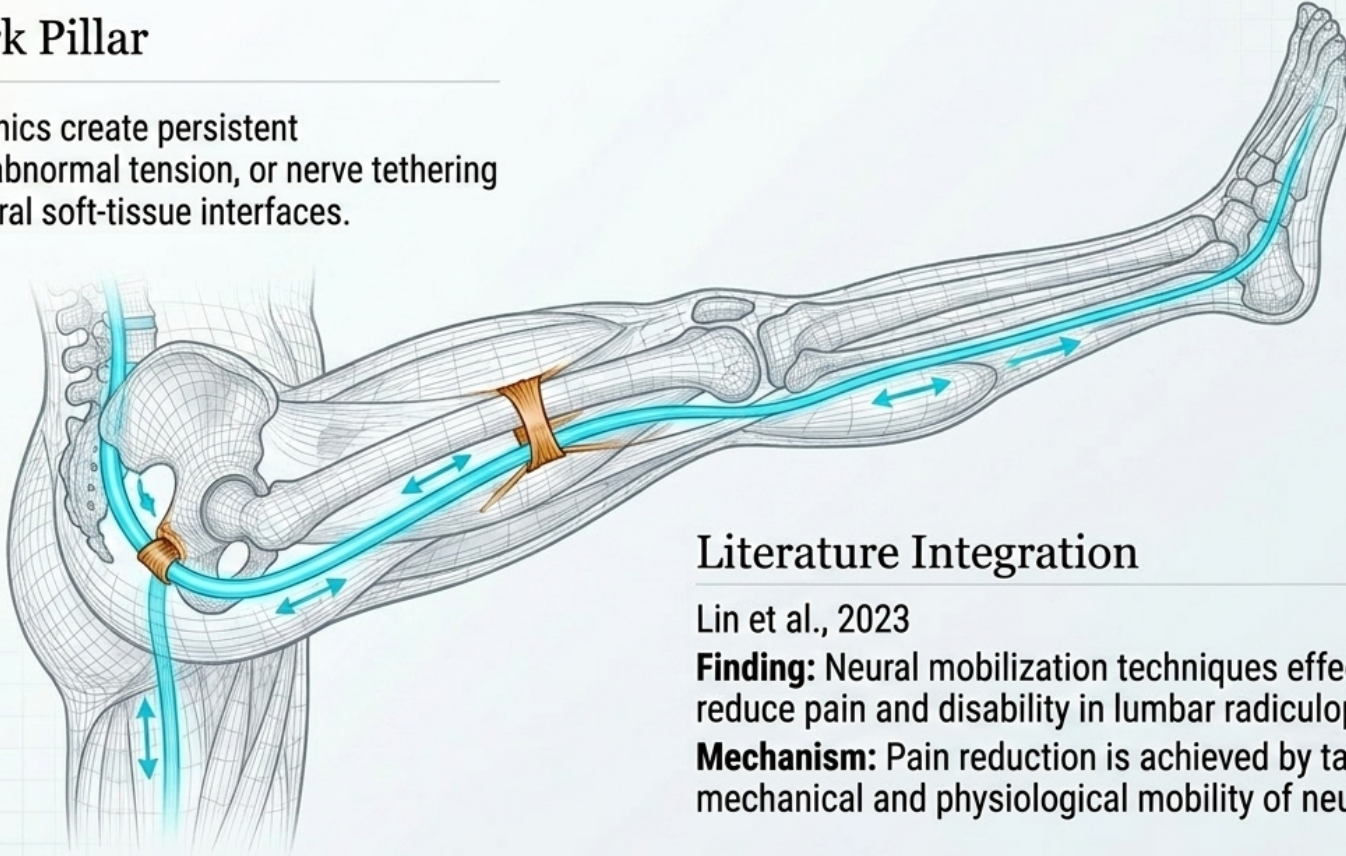
**Subgroup Focus:** The loss of lordosis is particularly pronounced in disc herniation and degeneration subgroups.

# Neural Mechanosensitivity and Tissue Tethering

## Framework Pillar

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Altered mechanics create persistent compression, abnormal tension, or nerve tethering across peripheral soft-tissue interfaces.



## Literature Integration

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Lin et al., 2023

**Finding:** Neural mobilization techniques effectively reduce pain and disability in lumbar radiculopathy trials.

**Mechanism:** Pain reduction is achieved by targeting the mechanical and physiological mobility of neural tissue.

# Diagnostic Complexity in Non-Classic Presentations

## Atypical Presentation

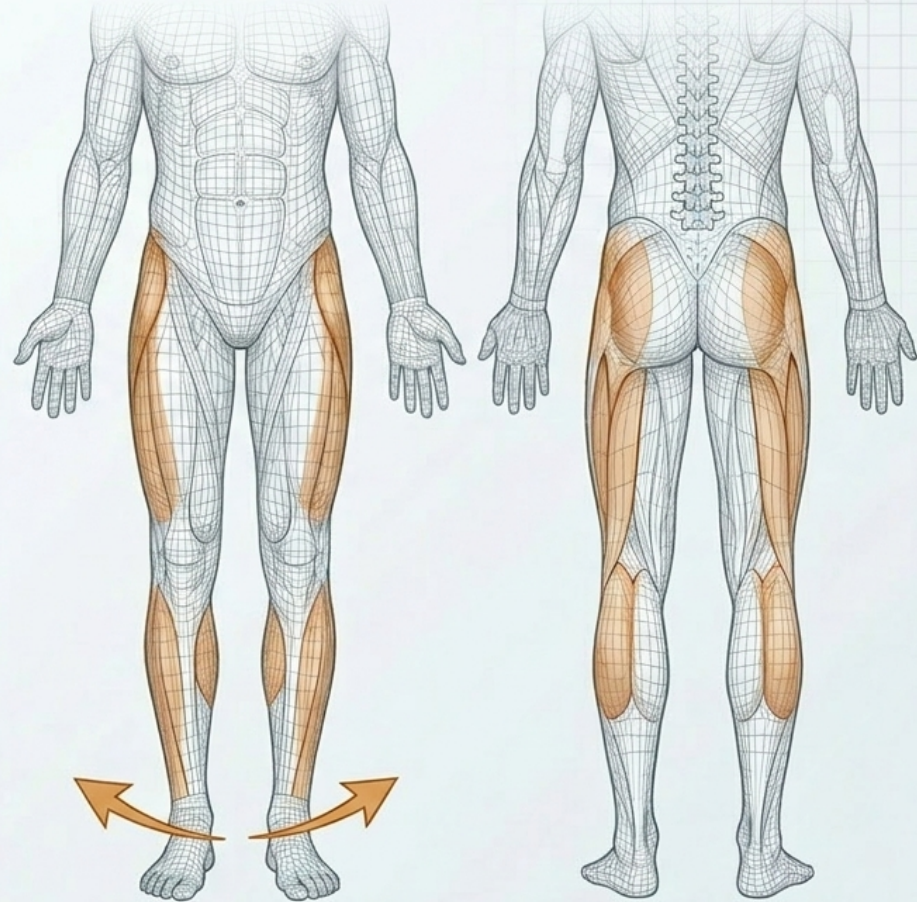
Pain along lateral thigh/calf without classic foot neuropathy; external foot rotation during gait; concurrent hip/upper lumbar pain.

## Underlying Pathology

Co-occurring thoracic and lumbar injuries driving multi-level neuropathies.

## Motor & Sensory Impact

- Muscle dystonia across the pelvis, hip, thigh, and calf.
- Leg heaviness, coordination deficits, and unexpected “giving-way” during ambulation.



# The Multifactorial Mechanics of Spinal Stenosis

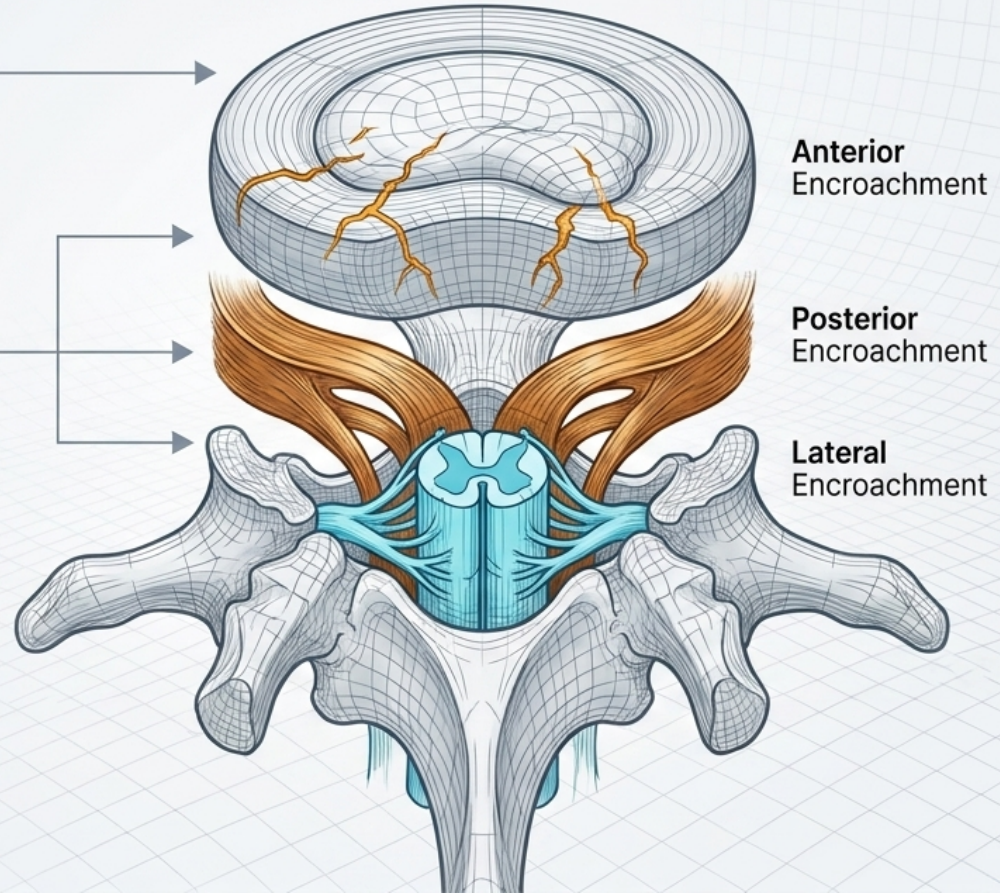
## Framework Pillar

Stenosis is a dynamic 'squeeze' causing a jagged spinal pathway, driven by abnormal movement, disc protrusion, and thickened connective tissues.

## Literature Integration

Yoshiiwa et al., 2016

Finding: Ligamentum flavum thickening is significantly driven by segmental instability, disc degeneration, and facet osteoarthritis.



# Regional Interdependence: Hip-Spine Syndrome

## Framework Pillar

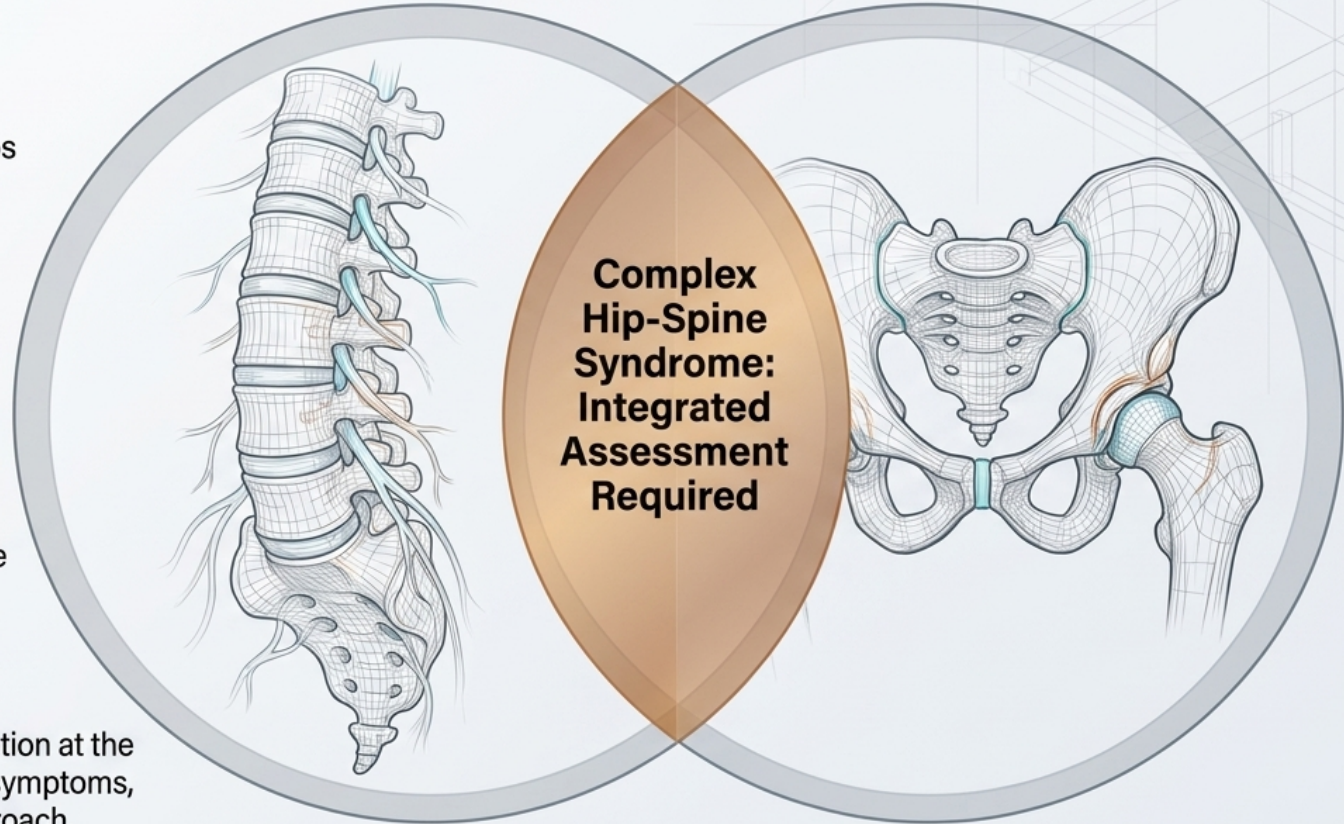
The lumbar spine, pelvis, and hips must be evaluated collectively due to overlapping, overlapping, continuous neuromyofascial structures.

## Literature Integration

Offierski & MacNab, 1983

**Finding:** Concurrent hip and spine pathology frequently produces confusing, overlapping profiles of disability.

**Implication:** Deformity or dysfunction at the hip can actively aggravate spinal symptoms, requiring a unified diagnostic approach.



# Literature Synthesis: Defining the Academic Boundaries

Pillar of NMF Model	What Published Studies Support
Paraspinal Musculature	Atrophy occurs in persistent radiculopathy.
Motor Neuropathy	EMG confirms independent motor-unit remodeling.
Lumbar Mechanics	Disc-related pain correlates with lordosis loss.
Neural Mobility	Mobilization improves clinical outcomes.
Spinal Stenosis	Connective tissue and instability drive narrowing.

# Advancing a Systems-Based Treatment Logic

## Beyond the Segment

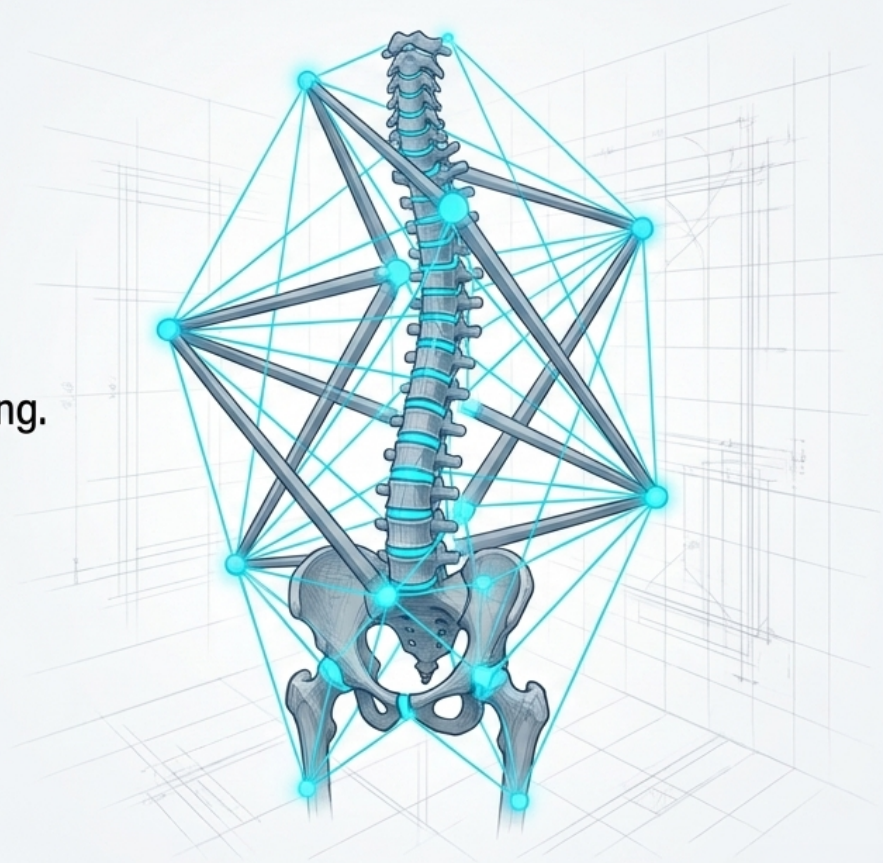
Expanding the treatment focus from a single compressed spinal level to regional mechanics.

## Addressing the Soft-Tissue Interface

- Reducing neural tension and pathological tethering.
- Restoring mobility across soft-tissue interfaces.

## Integrated Rehabilitation

Intervening at the thoracic spine, lumbar spine, pelvis, hips, and lower extremities concurrently to reestablish equilibrium.



# Clinical Implications for Complex Patient Presentations

**Core Insight:** Disc compression is frequently only a single variable within a broader clinical equation.

## Comprehensive Evaluation Protocol for Persistent Symptoms:



Assess paraspinal stabilizer dysfunction and atrophy.



Evaluate altered spinal alignment and biomechanics.



Test for mechanical nerve sensitivity and mobility restrictions.



Screen for hip-spine mechanical overlap.



Identify downstream motor adaptations (dystonia, spasticity, heavy leg).



## The Paradigm

Sciatica, radiculopathy, and lumbar stenosis represent complex, multifactorial syndromes.

## The Evidence

Peer-reviewed literature supports the clinical plausibility of paraspinal, neuropathic, mechanical, and connective-tissue contributors.

## The Future

An interconnected, whole-system evaluation provides the clearest path forward for resolving persistent downstream disability.