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Physiotherapy Management of Lumbar Spondylosis Using Core Stabilization and Spiral Chain Exercises: A Case Report

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ABSTRACT

Background: Lumbar spondylosis is a frequent degenerative disorder of the lumbar spine characterized by disc degeneration, the development of osteophyte, and arthritis of the facet joints, potentially resulting in low back pain, stiffness, and compression of nerve roots. Physiotherapy is essential in management, utilizing extension-focused and core stability exercises to alleviate pain, enhance spinal mobility, and regain function. Spiral chain workouts improve postural stability, dynamic control, and neuromuscular coordination, correcting muscle imbalances and enhancing functional movements.
Case Description and Intervention: A six-week physiotherapy regimen comprising lumbar traction, core stabilization, flexion-based exercises, spiral chain exercises, and modalities was administered to a 65-year-old male patient with L4–L5 degenerative alterations.
Results: Improved lumbar mobility and functional performance were accompanied by a considerable reduction in pain (VAS 7–8/10 to 2–4/10).
Conclusion, spiral chain exercises combined with physical therapy may successfully lessen lumbar spondylosis discomfort and enhance function.

Keywords: core stabilization, low back pain, spiral chain exercises, lumbar spondylosis, and physical therapy

BACKGROUND:

Lumbar spondylosis is a frequent degenerative disorder of the lumbar spine characterized by disc degeneration, the development of osteophytes, and arthritis of the facet joints, potentially resulting in low back pain, stiffness, and compression of nerve roots. It usually starts after the age of thirty and escalates with advancing years, impacting both genders, particularly those engaged in strenuous physical jobs, frequent lifting, or having bad posture. Numerous older individuals exhibit radiological alterations, yet they might remain symptom-free.

Clinically, individuals demonstrate persistent low back pain worsened by activity, limited lumbar extension, tenderness, muscle spasms, and sometimes neurological deficits.

Physiotherapy is essential in management, utilizing extension-focused and core stability exercises to alleviate pain, enhance spinal mobility, and regain function. Spiral chain workouts improve postural stability, dynamic control, and neuromuscular coordination, correcting muscle imbalances and enhancing functional movements.

Recognizing how these interventions impact pain, functionality, and spinal stability is crucial for enhancing conservative treatment in lumbar spondylosis.

INTRODUCTION:

Lumbar spondylosis refers to degenerative changes of the lumbar spine involving intervertebral disc degeneration with secondary osteophyte formation and facet joint arthritis**,** which may result in back pain and nerve root compression.(1) Lumbar spondylosis is a degenerative condition of the lumbar spine characterized by age-related changes such as intervertebral disc degeneration, osteophyte (bony spur) formation, and facet joint arthritis, which may lead to back pain, stiffness, and sometimes nerve root compression.(2)

Epidemiology of Lumbar Spondylosis: Lumbar spondylosis is a common age-related degenerative disorder of the spine. Degenerative changes usually begin after the third decade of life and increase progressively with advancing age. Radiological evidence of lumbar spondylosis is present in a large proportion of individuals over 60 years, although many are asymptomatic. It affects both sexes, with a slight male predominance, particularly in those exposed to heavy physical work. The condition is more prevalent in people involved in manual labor, repetitive lifting, prolonged standing, or exposure to vibration. Other associated factors include obesity, poor posture, sedentary lifestyle, and genetic predisposition. It occurs worldwide and shows no specific racial predilection. (1)

Lumbar spondylosis commonly presents with chronic, dull aching low back pain which is often aggravated by prolonged standing, walking, bending, or physical activity and relieved by rest. Patients frequently complain of morning stiffness of the lower back that improves with movement. In some cases, pain may radiate to the buttock or lower limb (sciatica) due to nerve root compression by degenerative changes. Paraesthesia, numbness, or tingling in the lower limbs may be present. On clinical examination, there is restriction of lumbar spine movements, especially extension, along with localized tenderness and paraspinal muscle spasm. In advanced cases, neurological deficits such as sensory loss, muscle weakness, or diminished reflexes may be observed, and some patients may develop neurogenic claudication.(1)

Physiotherapy is well-established in conservative management of lumbar spondylosis.(3,4) Therapeutic modalities (heat, TENS, manual therapy) and graded exercises help reduce muscle spasm and nociceptive pain.(4) Flexion-based exercises increase intervertebral foraminal and canal space, reducing compressive symptoms.(3) Strengthening deep trunk musculature (transversus abdominis, multifidus, pelvic floor) improves segmental control and reduces abnormal loading on degenerated joint(4) Correct posture minimizes lumbar extension stress, crucial in spondylosis with canal narrowing/stenosis. Exercise restores muscle endurance and movement patterns, improving activities of daily living.(3,4) Spiral chain patterns activate coordinated muscle groups across the trunk, pelvis, and lower extremities, enhancing dynamic control of the lumbar spine.(5) Exercises that engage diagonal/spiral muscle chains help balance muscle activation, reduce asymmetry, and promote efficient functional movement.(6) By emphasizing integration rather than isolated muscle strengthening, spiral chain exercises reduce over dominance of superficial muscles and improve deep segmental support. Spiral exercises (cross body patterns) reflect natural movements used in daily activities and sports, helping patients retrain gait and posture.(5,6)

The purpose of this study is to evaluate the effects of physiotherapy interventions, including exercises**,** on pain relief, functional flexion-based exercises and spiral chain improvement, and spinal stability in

patients with lumbar spondylosis. Specifically, the study aims to assess the reduction in low back pain and ridiculer symptoms following structured physiotherapy. Examine the improvement in lumbar mobility, flexibility, and functional activities. Investigate the role of spiral chain exercises in enhancing postural control, core stability, and neuromuscular coordination. Provide evidence for effective conservative management strategies to improve quality of life in patients with degenerative lumbar spine conditions.

PATIENT INFORMATION

The patient is a 65-year-old male with a history of intermittent low back pain and a fall from a bike. He currently presents with chronic low back pain for the past two years, gradually increasing in intensity, with occasional radiation to the posterior aspect of the thigh. The pain is described as dull and aching, aggravated by prolonged standing, walking, bending, and heavy lifting, and partially relieved by rest. He frequently engages in heavy lifting and manual work, repairing cars, bikes, fans, and other equipment, despite his primary occupation as a businessman, which appears to worsen his symptoms. He reports morning stiffness lasting 15–20 minutes. There is no numbness, tingling, or other dermatome-related symptoms. Lifestyle factors include periods of sedentary activity, and he is overweight (BMI: 30.2 kg/m^2).

MRI findings reveal lumbar spondylosis with L4–L5 disc bulge, left paracentral herniation, facet joint arthropathy, and mild spinal canal narrowing, consistent with degenerative changes. Functionally, the patient experiences difficulty with bending, lifting, and prolonged standing, but is able to perform daily activities with some discomfort.

CLINICAL FINDINGS

Patient having tenderness over the lower lumbar vertebrae, restricted lumbar extension, mild limitation in flexion, and paraspinal muscle spasm. Neurological assessment shows no sensory, motor, or reflex deficits.

On observation, the patient exhibits a body type with mixed features of mesomorphic and endomorphic traits, reflecting both muscular development from manual work and increased body fat. His gait is slightly limping, likely due to pain, but he is able to walk independently. Postural assessment reveals a slightly increased lumbar lordosis, while no limb shortening is observed.

Active movements of the lumbar spine, including flexion, extension, and lateral flexion, were slightly restricted and painful at the end of the range of motion. Detailed measurements before and after treatment are presented in Table 1. Manual Muscle Testing (MMT) was performed within the available range of motion and the grading before and after treatment is summarized in Table 2.

Table 1. Range of motion

Movement	Pre-rehab active ROM	Pre-rehab passive ROM	Post-rehab Active ROM	Post-rehab passive ROM
Lumbar Flexion	0-30	0-35	0-55	0-60
Lumbar Extension	0-10	0-15	0-20	0-25
Left Lateral Flexion	0-10	0-15	0-20	0-25

Right Lateral Flexion	0-10	0-15	0-20	0-25
Hip Flexion	0-80	0-90	0-100	0-120
Hip Extension	0-10	0-15	0-20	0-25
Hip Abduction	0-30	0-40	0-40	0-50
Hip Adduction	0-20	0-30	0-25	0-30
Knee Flexion	0-120	0-140	0-130	0-140

Table 2. Manual muscle testing
(Pre and post rehabilitation grades)

Muscles	Pre-rehab grade	Post-rehab grade
Lumbar Spine Flexor	3	4+
Lumbar Spine Extensor	3	4+
Lumbar Spine rotator	3	4

The Slump test, Straight leg raise test was performed and outcome is negative. Gaenslen test and Facet joint provocation test was also performed and outcome is positive. Gaenslen test indicate right side SI joint pain while facet joint provocation test indicate facet joint involvement.
Outcome measure VAS (visual analogue scale) was on 8.
Pain Assessment:
Pre-rehab VAS: 7/10 at rest, 8/10 on slight movement.
Post-rehab VAS: 2/10 at rest, 4/10 on slight movement.
Neurologic Examination was done where Dermatomes and myotomes was evaluated and there were no diminished or absent sensation, nerve roots were intact. Reflexes were intact.
The SF-36 questionnaire was administered before treatment to assess baseline quality of life and again after treatment to determine treatment-related changes.

INTERVENTION:
Patient was not taking any medication. And Physical therapy started, we took the patient's follow-up regularly

DESCRIPTION:
Week 1-2:
On the initial period we gave hot pack, it reduce pain and spasm, it induces muscle relaxation and increase efficiency of muscle action. Moist heat was applied for 10 minutes. Ask patient to take excessive bed rest as much as possible to avoid spine movement, appropriate deformity and minimize mechanical forces.
Transcutaneous electrical nerve stimulation (TENS) is was used for pain relief. The influence of TENS on treatment of acute pain in lower back is helpful. TENS with100-150 Hz frequency, 1230 milliampere amplitude microsecond pulse width. And 100-500 microsecond pulse width.

Lumbar traction: Sustained traction is given to the axial spine using a longitudinal force while using a lower rib cage and brace secured to the iliac crest to reduce chronic low back pain. Pressures that hold open intervertebral space and minimize spinal lordosis are updated in terms of both degree and length and can be closely measured in testing and bed rest schemes. Provisional Realignments in the spine likely improve health complications associated with degenerative discs disease by healing mechanical stress, Compartment syndrome and adhesion of both the facet and annulus, and even disrupting symptoms of nociceptive pain. It also relieves the pressure on the nerve roots. [15]

Week 2-4:

All above modalities were continued in this week. Exercise was taught for lumbar spondylosis such as muscle strengthening exercises to reduce pain. Core exercise are prescribed and is performed under the observation initially such as Abdominal draw in, kegal exercise, cat and camel, cervical-abdominal curl up, side plank, core stability exercises in sitting. And spiral chain exercises include

Spiral chain exercises were included to activate diagonal myofascial chains, improve segmental spinal mobility, enhance core stability, and facilitate functional movements required for ADLs. It is given in the form of:

Exercise 1: Diagonal Upper–Lower Limb Activation

Position: Crook lying

Movement: Patient performed contra lateral upper limb flexion with diagonal reach combined with opposite lower limb extension.

Dosage: 10 repetitions × 2 sets

Progression: Increased range and controlled speed

Purpose: To facilitate diagonal trunk activation and reduce lumbar stiffness

Exercise 2: Seated Trunk Rotation

Position: Sitting with feet supported

Movement: Controlled trunk rotation to right and left within pain-free range

Dosage: 10 repetitions each side × 2 sets

Purpose: To improve lumbar rotational mobility and oblique muscle activation

Exercise 3: Diagonal Resistance Band Pull

Position: Standing

Movement: Resistance band pull from lower to opposite upper quadrant (chop/lift pattern)

Dosage: 8–10 repetitions × 2 sets

Purpose: To strengthen spiral muscle chains and enhance postural control

Exercise 4: Gait Training with Arm Swing Emphasis

Position: Standing / Walking

Movement: Patient encouraged to walk with exaggerated reciprocal arm and leg movements

Duration: 5–7 minutes

Purpose: To integrate spiral chain activation into functional activities

Exercise therapy seems to have been marginally successful in decreasing discomfort and improving the function of depressive symptoms. The fitness program begins with stationary exercise followed by movements and concludes with workouts that cause discomfort. The stretching was performed for tight muscle such as piriformis. Hamstring, adductor stretching to reduce the radiating pain and tightness. Extension exercise are avoided.[2] Flexion exercise decreases articular weight bearing resistance to the facet joint and elongate the dorsolumbar membrane. Ultrasound therapy could promote collagen

extensibility. Initially start with isometric then with isotonic exercise with effort directed at concentric strengthening. Dynamic activity maximizes synchronized muscle cohort movements contributing to locomotion as well as the integration of muscle control with spine flexibility. Enhancements of specific coronary heart disease, patient were also advised to remain healthy and to start aerobic walking program and use of static bicycles. Spine manipulation were performed in low velocity, Beyond the accustomed, long lever joint manipulation,, but not range of motion anatomical. [17]

Week 4-6:

For Lumbar support the lumbar belt was given. It is aimed at reducing spine movement, stabilize, completely accurate deformity and decrease compressive load. Lumbar traction is found good to improve lumbar motion.

RESULT:

Patient found relief after 6 week of treatment. The radiating pain was reduced and advised for regular exercise at home.

LIMITATION:

This is only one patient, so the results may not apply to everyone.
There was no comparison group to see which treatment worked best.
The follow-up was short, so we don't know if the improvements will last long.
No follow-up MRI was done to check the spine after treatment.

DISCUSSION:

On the first day of physiotherapy, the patient received moist heat, lumbar traction, and TENS therapy. After TENS was applied, his pain reduced noticeably. Gradually, he started doing muscle strengthening and stretching exercises, which helped reduce pain even more. Later, he was given a lumbar belt to support his spine and reduce pressure on the back. [15]

Lumbar traction helped relieve his symptoms by gently stretching the spine. A brace attached to the iliac crest was used during traction to provide support and reduce low back pain. Exercise therapy followed a graded plan, with exercises adjusted based on his daily activities, pain levels, and how long he had symptoms. Programs that were personalized, focusing on stretching and muscle strengthening, and done regularly with low intensity were found to be the most effective.

Trunk stabilization exercises also helped improve stability and reduce pain in conditions like spondylolysis and spondylolisthesis. Spiral chain exercises, which involve coordinated diagonal movements of the trunk and limbs, were found to be very effective in improving balance, posture, and the ability to perform daily activities (ADLs).[16] Research shows that a combination of exercises, bracing, awareness training, and spiral chain exercises can improve spinal mobility, reduce discomfort, and help patients regain independence in daily life.[13,14]

Several studies have supported these findings. Research by Bhaisare et al. [10] Gaidhane et al.[11], and Khanam et al. [12] also reported that exercise therapy, spinal stabilization, and functional movement exercises like spiral chain training are effective in improving back function and overall quality of life.

CONCLUSION:

Lumbar spondylosis is not easy to diagnose. It is a condition where the spine slowly wears down, and

different studies explain it in different ways. In this case, the patient showed good recovery after physiotherapy, which helped reduce his pain. He was eventually able to do simple daily activities without much difficulty. Exercise therapy played an important role in reducing pain and improving the movement of his spine. The exercises were done in different ways, with varying intensity, time, and frequency. As he continues with these exercises, her quality of life is expected to improve even more.

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18. Likely to have **chronic low back pain with intermittent leg symptoms**.
19. **Good response expected to physiotherapy focusing on flexion exercises and stabilization.**
20. Neurological symptoms may improve or stabilize, but close follow-up is necessary.
21. Long-term self-management, lifestyle modification, and periodic physiotherapy can maintain function and reduce flare-ups.
22. **Oswestry Disability Index (ODI):** Measures impact of low back pain on daily activities.