

# Clinical Rehabilitation Approach for L4-L5 Anterolisthesis with L5-S1 Disc Protrusion: A Physiotherapy Case Report

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**Abstract:** *This case report examines the effectiveness of structured physiotherapy rehabilitation in a patient with Grade I L4-L5 anterolisthesis and L5-S1 disc protrusion presenting with chronic low back pain and functional limitation. A 42-year-old female underwent a comprehensive rehabilitation program including electrotherapy, manual therapy, and progressive therapeutic exercises over 15 sessions. Clinical outcomes were assessed using Numeric Pain Rating Scale, Oswestry Disability Index, Roland Morris Disability Questionnaire, range of motion measurements, and manual muscle testing. Post intervention results demonstrated significant improvement, with pain reduced from 8 to 2, functional disability scores improved, lumbar mobility increased, and muscle strength enhanced across all tested groups. The findings support the role of individualized physiotherapy in improving functional outcomes and reducing disability in low-grade spondylolisthesis with disc involvement. Early conservative intervention may reduce progression and need for surgical management.*

**Keywords:** Anterolisthesis, Lumbar disc protrusion, physiotherapy, low back pain, case report

## 1. Introduction

Spondylolisthesis is a common spinal disorder affecting nearly 20% of the adult population and is frequently associated with low back pain [1]. It is characterized by the anterior displacement of one vertebral body over another, with degenerative spondylolisthesis most commonly occurring at the L4–L5 level [2].

Degenerative changes in facet joint articulation are the primary cause of anterolisthesis, whereas intervertebral disc degeneration contributes to anterolisthesis and spinal canal narrowing [3]. Clinically, patients present with pain in the paraspinal region, gluteal area, and posterior thighs, along with reduced lumbar range of motion, muscle spasm, and altered gait patterns such as short-stride walking and pelvic instability [4]. Epidemiological data suggest that the prevalence of spondylolisthesis increases with age and is more common in women, with a reported ratio of 6:1 compared to men [5]. Contributing factors include disc degeneration, facet joint arthritis, ligamentous instability, trauma, and insufficient muscular support [6].

Lumbar disc protrusion, often coexisting with degenerative spinal conditions, is a major contributor to low back pain, affecting 60–80% of individuals, particularly those aged 25–55 years with prolonged sitting or standing occupations [7]. It involves displacement of disc material beyond its normal boundaries, leading to altered spinal biomechanics and functional impairment [8]. Management of these conditions is primarily conservative, including physiotherapy, exercise-based rehabilitation, medication, and lifestyle modification, with surgical intervention reserved for cases unresponsive to non-operative treatment. Evidence strongly supports physiotherapy as an effective intervention for improving pain and functional outcomes in patients with spondylolisthesis

and disc-related disorders, which may reduce the surgery rate [9].

## 2. Case Report

A 42-year-old female, homemaker by occupation and right-side dominant, presented with complaints of low back pain of gradual onset. The pain was described as tingling and sharp shooting in nature. Initially, she consulted a physician and was prescribed analgesics, which provided temporary relief. However, symptoms worsened over time, particularly during walking and activities of daily living, prompting further evaluation.

X-ray of the lumbar spine in lateral view demonstrated loss of normal lumbar lordosis with Grade I anterolisthesis of L4 over L5. MRI findings confirmed Grade I anterolisthesis at L4–L5 along with L5–S1 disc protrusion and associated spinal canal narrowing.

On clinical examination, the patient was conscious, oriented, and cooperative. Informed consent was obtained prior to assessment. The examination was conducted in supine and prone positions. On palpation, tenderness (Grade 3) was noted in the lumbar region. Special tests including Straight Leg Raise (SLR) and the Passive lumbar extension test (PLET) was positive. Sensory examination revealed intact dermatomes with preserved sensation, and bowel and bladder functions were normal and independent.



Figure 1 : MRI of Spine

Pre-intervention assessment of lumbar range of motion using the modified Schober test showed reduced mobility. Lumbar flexion was 3.5 cm, extension was 1 cm, right lateral flexion was 3.5 cm, and left lateral flexion was 4 cm. Manual Muscle Testing (MMT) demonstrated decreased muscle strength, with lumbar flexors graded at 3, extensors at 2, lateral flexors at 3, and rotators at 3.

Based on these findings, the patient was referred for physiotherapy rehabilitation with goals of pain reduction, improvement in range of motion, reduction of muscle tightness, restoration of functional mobility, and enhancement of overall quality of life.

The coexistence of anterolisthesis and lumbar disc protrusion posed a significant challenge to rehabilitation, as both conditions presented overlapping yet sometimes conflicting clinical manifestations. During the course of treatment, improvement in symptoms related to anterolisthesis was occasionally associated with exacerbation of disc-related symptoms, indicating a complex interaction that required careful progression of therapeutic interventions.

In this case, a structured physiotherapy exercise program was implemented focusing on short and long-term goals. Initially, the intervention aimed at reducing pain, improving lumbar range of motion, and enhancing lumbar muscle strength. Activity modification strategies were advised to minimize strain on the lumbar spine during daily activities. Additionally, patient education was provided regarding proper body mechanics, posture correction, and the importance of adherence to the rehabilitation program.

As the patient progressed, the focus of rehabilitation shifted toward long-term goals, including improving lumbar muscle endurance and aerobic capacity, restoring functional mobility, and preventing further progression of the condition. Emphasis was also placed on correcting posture and improving gait patterns to ensure optimal functional recovery, minimize the risk of recurrence, and reduce the likelihood of surgical intervention.

The detailed physiotherapy intervention was given in the below table.

Session No.	Electro Therapy /Exercise Therapy	Dosage
1 to 7	Ultrasound	7 minutes
	TENS	15 minutes
8	1.Lumbar Mobilization (L5- S1)	10 repetition
	2. Myofascial trigger point release	10 minutes
9	1.Lumbar Mobilization (L5-S1)	10 repetition
	2. Myofascial trigger point release	10 minutes
10	1.SLR	10 repetition
	2.Heel Slides	10 repetition
	3.Ankle toe movements	10 repetition
	4.Ankle Circles	10 repetition
11	1.SLR	10 repetition
	2.Heel Slides	10 repetition
	3.Ankle toe movements	10 repetition
	4.Ankle Circles	10 repetition
12	1.Single leg knee to chest	10 repetition
	2.Double leg knee to chest	10 repetition
	3.Dynamic Quads	20 repetition
	4. Seated marching	20 repetition
	5.Sit-to-stand	5 repetition
13	1.Single leg knee to chest	10 repetition
	2.Double leg knee to chest	10 repetition
	3.Dynamic Quads	20 repetition
	4. Seated marching	20 repetition
	5.Sit-to-stand	5 repetition
14	1. Gait training	10 minutes
	2. Posture correction	10 minutes
	3. Cardiovascular endurance training	5 minutes
	4. Breathing exercises	5 minutes
15	Patient education	Positioning
	Exercise prescription	Twice/day
	Follow up informed	After 10 days

Following completion of the treatment, the patient was followed up for a period of 10 days to assess the effectiveness of the intervention. During this period, the patient was encouraged to maintain adherence to the prescribed therapeutic exercise program. She was also advised to report to the physiotherapist in case of any recurrence of symptoms or need for further guidance. At the end of the follow-up period, the rehabilitation session was formally concluded.



Figure 2: Single-leg knee-to-chest

### 3. Discussion

In this study, a structured and individualized physiotherapy program was implemented, with continuous monitoring and adjustment based on the patient's clinical presentation. Outcome measures demonstrated substantial improvements across multiple domains.

Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS), decreased markedly from 8 to 2, indicating significant analgesic benefit. Functional disability was evaluated using the Oswestry Disability Index (ODI) that improved from 45 to 33 while the Roland–Morris Disability Questionnaire (RMDQ), scores decreased from 17 to 8. Collectively, these findings show enhanced functional independence and reduced disability.

The findings of the present case are consistent with existing literature where Nedelea et al. reported that approximately 69% of patients with Grade I and Grade II spondylolisthesis achieved significant pain relief through non-surgical physiotherapy, with only 10–15% requiring surgical intervention after six months [10].

The coexistence of intervertebral disc prolapse (IVDP) and anterolisthesis presented a complex clinical scenario, as symptom manifestation varied depending on movement patterns and mechanical loading during exercise.

The tailored exercise regimen yielded notable improvements in spinal mobility. Lumbar flexion increased from 3.5 cm to 5.5 cm, extension from 1 cm to 2.5 cm, and lateral flexion improved bilaterally (right: 3.5 cm to 6 cm; left: 4 cm to 7 cm). These gains suggest restoration of spinal flexibility and improved segmental mobility.

Sinaki et al., have demonstrated that flexion-based exercises result in superior recovery rates (58%) compared to extension-based exercises (6%) in patients with spondylolisthesis-related low back pain [11]. Furthermore, evidence from narrative reviews indicates that targeted interventions—such as lumbar flexion exercises, hamstring and hip flexor stretching, and thoracic mobilization—are more effective in reducing pain and disability than generalized exercise programs [12].

Muscle strength assessments further supported these findings, demonstrating improvements in core musculature. Lumbar flexors progressed from grade 3 to grade 4, extensors from grade 2 to grade 3, and lateral flexors and rotators from grade 3 to grade 4. Strengthening of these muscle groups is critical for enhancing spinal stability, reducing mechanical stress on degenerative structures, and alleviating symptoms.

The long-term data from evidences suggest that comprehensive conservative management can achieve pain relief rates as high as 73.6%, while maintaining relatively low surgical conversion rates (21.6–31.3%) over a three-year period [11].

Overall, the present findings reinforce the growing body of evidence supporting conservative physiotherapy as an effective primary management strategy for low-grade

spondylolisthesis. Early intervention, individualized exercise prescription, and continuous clinical monitoring are key factors contributing to successful outcomes.

### 4. Conclusion

This case report demonstrates that a structured and individualized physiotherapy rehabilitation program can significantly reduce pain, improve functional mobility, enhance muscle strength, and restore lumbar range of motion in patients with low-grade spondylolisthesis and disc protrusion.

The integration of manual therapy and targeted exercise interventions effectively addressed biomechanical impairments and contributed to functional recovery. These findings support the role of early conservative physiotherapy as a primary management strategy, potentially reducing disease progression and the need for surgical intervention.

#### Author Contribution

All authors contributed equally.

#### Conflict of Interest

There is no conflict of interest in this case report.

#### Acknowledgement

The authors sincerely acknowledge and express their gratitude to the patient for participation in the study. The authors also extend their appreciation to the management and the Head of the Department for their support in conducting this study.

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