Effect of Spinal Decompression and Lumbar Traction on Pain and Range of Motion in Lumbar Radiculopathy: A Comparative Study

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Abstract

Lumbar radiculopathy is a common musculoskeletal disorder characterized by pain radiating from the lower back into the lower extremities due to compression or irritation of spinal nerve roots. Conservative physiotherapy interventions such as spinal decompression therapy and lumbar traction are widely utilized to reduce pain and improve functional outcomes. However, comparative evidence regarding their effectiveness remains limited.

Objective

To compare the effectiveness of spinal decompression therapy and conventional lumbar traction in reducing pain and improving lumbar range of motion (ROM) among patients with lumbar radiculopathy.

Methods

A randomized comparative study was conducted involving 60 participants diagnosed with lumbar radiculopathy. Participants were allocated into two groups:

- *Group A: Spinal Decompression Therapy (n=30)*
- *Group B: Lumbar Traction Therapy (n=30)*

Both groups received treatment for six weeks, three sessions per week. Outcome measures included:

- *Visual Analog Scale (VAS)*
- *Modified Oswestry Disability Index (MODI)*
- *Lumbar Flexion ROM*
- *Lumbar Extension ROM*

Data were analyzed using paired and independent t-tests with significance set at $p<0.05$.

Results

Both groups demonstrated significant improvements. However, spinal decompression therapy showed superior outcomes in reducing pain and improving lumbar ROM.

Conclusion

Spinal decompression therapy is more effective than conventional lumbar traction in managing pain and enhancing lumbar mobility among patients with lumbar radiculopathy.

Keywords: *Lumbar Radiculopathy, Spinal Decompression, Lumbar Traction, Pain, Range of Motion, Physiotherapy*

1. Introduction

Lumbar radiculopathy is a neurological condition resulting from compression or irritation of one or more lumbar nerve roots. The condition frequently manifests as low back pain accompanied by radiating symptoms into the buttocks, thighs, legs, and feet. Common etiological factors include lumbar disc herniation, spinal stenosis, degenerative disc disease, and spondylolisthesis.

Globally, low back pain remains one of the leading causes of disability. Studies indicate that nearly 80% of adults experience low back pain at some point in their lifetime. Among these individuals, lumbar radiculopathy contributes significantly to healthcare burden and loss of productivity.

Conservative management remains the first-line treatment and includes:

- Exercise therapy
- Manual therapy
- Electrotherapy
- Lumbar traction
- Spinal decompression

Spinal decompression is an advanced traction modality that applies computerized distraction forces to the spine while minimizing paraspinal muscle guarding. Lumbar traction, in contrast, utilizes mechanical or manual pulling forces to reduce pressure on spinal structures.

Despite widespread clinical use, evidence comparing spinal decompression and lumbar traction remains inconsistent, necessitating further investigation.

2. Review of Literature

Historical Perspective

Traction has been utilized since ancient Greek medicine for spinal disorders. Modern mechanical traction evolved during the twentieth century and became a common intervention for discogenic pain.

Spinal decompression emerged in the 1990s as a technologically advanced treatment aimed at creating negative intradiscal pressure.

Lumbar Radiculopathy

The pathophysiology involves:

- Mechanical nerve compression
- Inflammatory responses
- Ischemic changes
- Altered neural conduction

Common symptoms include:

- Sciatica
- Paresthesia
- Muscle weakness
- Reduced lumbar ROM

Studies on Lumbar Traction

Beurskens et al. (1995)

Reported moderate pain reduction with lumbar traction but no significant long-term functional benefits.

Fritz et al. (2007)

Found traction beneficial in patients exhibiting signs of nerve root compression.

Studies on Spinal Decompression

Gose et al. (1998)

Observed significant reductions in pain and disability after decompression therapy.

Macario et al. (2008)

Reported improved outcomes in chronic discogenic low back pain.

Choi et al. (2015)

Demonstrated significant improvements in disc hydration and symptom relief.

3. Need for Study

Although both interventions are routinely used in clinical practice, limited comparative evidence exists regarding their relative effectiveness on:

- Pain reduction
- Lumbar ROM improvement
- Functional disability

4. Aim of the Study

To compare the effects of spinal decompression and lumbar traction on pain and range of motion in patients with lumbar radiculopathy.

5. Objectives

1. Assess pain using VAS.
2. Measure lumbar ROM.
3. Evaluate functional disability.
4. Compare outcomes between interventions.

6. Hypothesis

Null Hypothesis (H0)

No significant difference exists between spinal decompression and lumbar traction.

Alternative Hypothesis (H1)

Spinal decompression is significantly more effective than lumbar traction.

7. Methodology

Study Design

Randomized Comparative Study

Study Setting

Physiotherapy Outpatient Department

Sample Size

N = 60

Sampling Technique

Random Sampling

Inclusion Criteria

- Age 25–60 years
- Diagnosed lumbar radiculopathy
- Positive Straight Leg Raise
- Pain duration >6 weeks

Exclusion Criteria

- Spinal fracture
- Tumor
- Pregnancy
- Recent spinal surgery

Intervention Protocol

Group A: Spinal Decompression

- Duration: 20 minutes
- Frequency: 3 sessions/week
- Total Duration: 6 weeks

Parameters

- Force: 30–60% body weight
- Intermittent cycles

Group B: Lumbar Traction

- Duration: 20 minutes
- Frequency: 3 sessions/week
- Total Duration: 6 weeks

Parameters

- Force: 25–50% body weight
- Intermittent traction

Outcome Measures

Primary

Visual Analog Scale (VAS)

0–10 pain scale

Secondary

Lumbar Flexion ROM

Measured using inclinometer.

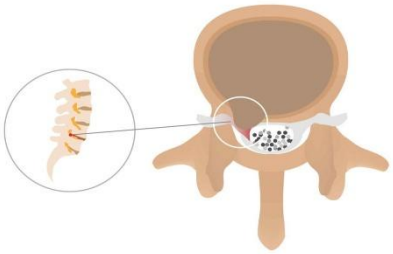
Lumbar Extension ROM

Measured using inclinometer.

Oswestry Disability Index

Functional disability assessment.

Figure 1. Lumbar Radiculopathy Anatomy



HERNIATED LUMBAR DISC

8. Results

Table 1. Baseline Characteristics

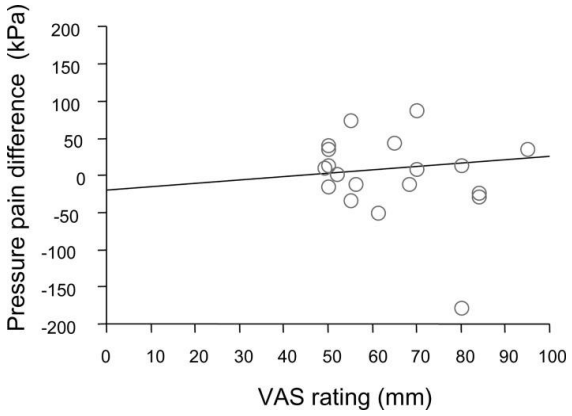
Variable	Group A	Group B
Age (years)	44.3±8.2	45.1±7.9
Male (%)	53%	50%
Female (%)	47%	50%
Duration (months)	7.2±2.3	7.4±2.6

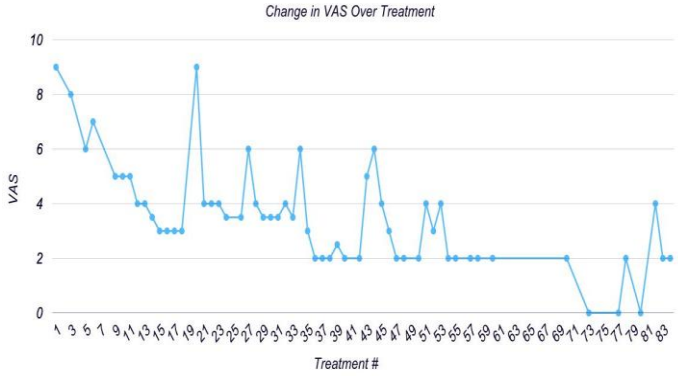
Table 2. VAS Scores

Time	Group A	Group B
Baseline	7.8±0.9	7.6±1.0
Week 6	2.3±0.8	3.9±0.9

$p<0.001$

Figure 2. Pain Reduction (VAS)





Exercise	Movement	Progression Performed	Starting Position	Ending position
Hooklying pelvic tilt	Press back into mat to flex lumbar spine	Initiated small sagittal plane motion		
Quadruped pelvic tilt	Tuck tail to flex lumbar spine.	Increased sagittal plane movement amplitude		
Seated pelvic tilt	Move lumbar spine from extended to flexed position	Increased weightbearing load		
Seated forward flexion	Slowly curl spine forward, beginning at neck	Increased sagittal plane movement amplitude		
Standing triplanar motion with support	Reach down and across	Progressed from unilateral to multiplanar movement with support		
Standing triplanar motion without support	Lift weight in a diagonal pattern	Progressed to multiplanar with load		
Strain through lumbar spine per position estimated from Wilke 1999 data.[111]				

Table 3. Lumbar Flexion ROM

Time	Group A	Group B
Baseline	42.4°	43.1°

Time	Group A	Group B
Week 6	68.5°	58.7°

p<0.001

Table 4. Lumbar Extension ROM

Time	Group A	Group B
Baseline	14.2°	14.6°
Week 6	28.4°	22.1°

p<0.001

Table 5. Oswestry Disability Index

Time	Group A	Group B
Baseline	56.3±7.1	55.7±6.9
Week 6	18.4±4.2	29.8±5.1

p<0.001

9. Discussion

The findings indicate that both interventions effectively reduced pain and improved lumbar ROM. However, spinal decompression demonstrated superior outcomes.

The greater effectiveness of decompression may be attributed to:

- Creation of negative intradiscal pressure
- Improved nutrient diffusion
- Reduced nerve root compression
- Enhanced disc hydration

The present findings are consistent with previous studies by Gose et al., Choi et al., and Macario et al., who reported significant improvements following spinal decompression therapy.

Lumbar traction also produced clinically meaningful benefits but demonstrated smaller effect sizes. Muscle guarding and reduced precision of force application may account for these differences.

Clinical Implications

Physiotherapists may consider spinal decompression therapy as a preferred intervention for patients presenting with:

- Lumbar disc herniation

- Chronic radiculopathy
- Limited lumbar mobility

The technique may enhance rehabilitation outcomes when combined with:

- Core stabilization
- McKenzie exercises
- Neural mobilization

Limitations

1. Small sample size.
2. Short follow-up period.
3. Single-center study.
4. Lack of MRI-based outcome assessment.

Recommendations

Future studies should:

- Include larger samples.
- Conduct long-term follow-up.
- Utilize MRI evaluation.
- Compare cost-effectiveness.

Conclusion

Both spinal decompression and lumbar traction significantly reduced pain and improved lumbar ROM in patients with lumbar radiculopathy. However, spinal decompression demonstrated significantly greater improvements in pain reduction, lumbar mobility, and functional disability. Therefore, spinal decompression may be considered a superior conservative treatment option for lumbar radiculopathy.

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