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Effect of Multimodal Physiotherapy Including Electrotherapy on Functional Recovery After Cervical Laminectomy: A Case Study

Dhiraj Kumar Yadav

Physiotherapy

Abstract

The growing elderly patient population is increasing the global burden of cervical spinal disorders. This trend is likely to lead to a rise in surgical procedures in the near future. Effective cervical rehabilitation is vital for a successful recovery after cervical spine surgeries. However, there is no consensus in the existing research on the best postsurgical rehabilitation program. This review evaluates the optimal rehabilitation strategies for adult patients following cervical lamina surgeries.

Materials and Methods: This review looks at daily living activities and includes various treatment methods, such as physiotherapy, specialized tools, and guidance for everyday tasks. The content is organized into historical perspectives, patient-reported functional outcomes, and both general and disease-specific rehabilitation. Results: Rehabilitation programs are determined based on patient-reported outcomes, performance tests, and disease prognosis. Strengthening the neck and shoulder muscles affected by surgery is crucial for improving physical function, daily activity performance, and overall quality of life. The rehabilitation process should include both general and disease-specific exercises. Current rehabilitation protocols often emphasize muscle strengthening but may overlook spinal balance. It is important to give equal attention to muscle reinforcement and spinal balance after cervical laminectomy.

Keywords: cervical laminectomy, rehabilitation, physiotherapy, muscle exercise

Introduction

Cervical laminectomy is a common surgical procedure that relieves spinal cord pressure in patients with conditions like cervical spondylotic myelopathy, spinal stenosis, and degenerative disc disease. While the surgery often successfully alleviates neural compression, patients often face postoperative issues such as pain, decreased cervical mobility, muscle weakness, and functional limitations that can significantly affect their quality of life.

Postoperative rehabilitation is crucial for optimizing recovery and regaining functional independence. Physiotherapy not only helps manage pain but also improves joint mobility, muscle strength, neuromuscular control, and overall functional performance. Without proper rehabilitation, patients may experience chronic pain, ongoing disability, and delays in returning to daily and work activities.

In recent years, interest in multimodal physiotherapy approaches has increased. These approaches combine various therapeutic techniques, including electrotherapy, manual therapy, and structured exercise programs. Electrotherapy methods, such as Transcutaneous Electrical Nerve Stimulation (TENS),

Interferential Therapy (IFT), and therapeutic ultrasound, effectively reduce pain, enhance circulation, and aid tissue healing. These techniques are often combined with exercise to improve rehabilitation results.

Exercise therapy is essential in managing physiotherapy after spinal surgery. Starting controlled range-of-motion exercises early helps prevent joint stiffness and improves circulation, while progressive strengthening exercises restore muscle support and spinal stability. Moreover, correcting posture and providing ergonomic training is important for preventing symptom recurrence and improving long-term functional outcomes.

Manual therapy techniques, such as soft tissue mobilization and joint mobilization, further support rehabilitation efforts by relieving muscle tension, improving tissue flexibility, and enhancing joint function. When paired with patient education and functional training, these techniques create a comprehensive recovery plan.

Despite the acknowledged importance of physiotherapy, there is limited high-quality evidence examining the effectiveness of combined multimodal rehabilitation protocols after cervical laminectomy. Most studies focus on single interventions rather than integrated approaches, showing a research gap in this area.

This case study seeks to evaluate the effectiveness of a structured multimodal physiotherapy program that combines electrotherapy, manual therapy, and progressive exercise therapy to improve pain, mobility, strength, and functional independence in a patient who has undergone cervical laminectomy. The findings may add to the growing body of evidence supporting effective rehabilitation strategies for spinal surgery recovery.

Cervical laminectomy is commonly performed to relieve spinal cord compression, particularly due to conditions like cervical spondylotic myelopathy. While surgery addresses neural compression, patients often face postoperative challenges including pain, stiffness, reduced mobility, and functional impairments.

Physiotherapy is crucial in postoperative recovery; however, evidence supporting multimodal approaches remains limited. This case study aims to assess the effects of a structured physiotherapy program incorporating electrotherapy, manual therapy, and exercise therapy on functional recovery.

Case Description

A 55-year-old male office worker was referred to the physiotherapy department three weeks after a C4–C6 cervical laminectomy for cervical spondylotic myelopathy. Before surgery, he had worsening neck pain, upper limb weakness, and trouble with fine motor tasks, greatly impacting his daily and work activities. Although neural decompression was achieved, he continued to experience moderate to severe neck pain, stiffness, and reduced functional ability.

During the physiotherapy consultation, the patient reported difficulties maintaining the prolonged sitting position needed for desk work and discomfort during neck movements. He also noted reduced endurance in upper limb activities. He was using a cervical collar occasionally for support and worried about returning to work. There was no history of postoperative complications like infection or neurological issues. The patient was eager to engage in rehabilitation and had no significant health issues affecting recovery.

Assessment

In the subjective assessment, the patient reported a pain intensity of 8/10 on the Visual Analog Scale (VA

S), mainly in the posterior cervical area, worsened by movement and prolonged sitting but relieved by rest. Observation showed a guarded posture with forward head alignment and limited spontaneous neck movements, indicating fear-avoidance behavior.

On palpation, tenderness of grade 2 was detected in the cervical paraspinal muscles, along with mild muscle spasm. Active cervical range of motion was significantly restricted, with flexion limited to 30 degrees, extension to 20 degrees, and both rotations reduced, all causing discomfort. Muscle testing indicated weakness in the cervical muscles scored at 3/5, while upper limb strength was slightly reduced to 4/5, especially in proximal muscle groups.

Assessment Table

Parameter

Pre-Treatment

Post-Treatment

Pain (VAS)

8/10

2/10

Flexion

30°

50°

Extension

20°

45°

Muscle Strength

3/5

4+/5

The patient faced challenges with daily living activities, such as prolonged sitting, overhead reaching, and sustained hand activities. His Neck Disability Index (NDI) score was 60%, indicating severe disability. Overall, the assessment highlighted postoperative pain, decreased mobility, muscle weakness, and functional limitations negatively impacting quality of life.

Intervention

The patient took part in a structured multimodal physiotherapy program over four weeks, attending five sessions each week. The rehabilitation method aimed to manage pain, enhance mobility, restore muscle strength, and improve functional independence through a mix of electrotherapy, manual therapy, and therapeutic exercises.

Electrotherapy methods were started early in the rehabilitation process to control pain and support tissue healing. TENS was applied for 20 minutes to reduce pain perception, while IFT was used to ease muscle spasm and enhance local circulation. Therapeutic ultrasound was administered over the cervical paraspinal area to aid soft tissue healing and decrease inflammation.

At the same time, a progressive exercise program was initiated. Gentle active range-of-motion exercises for the cervical spine were introduced within pain-free limits to prevent stiffness and improve mobility. Following this, isometric strengthening exercises targeting cervical muscles were included to enhance stability without stressing healing tissues. As the patient advanced, dynamic strengthening exercises for cervical and upper limb muscles were added using resistance bands.

Manual therapy techniques, like soft tissue mobilization, aimed to reduce muscle tightness and improve tissue flexibility. Gentle cervical mobilizations (Grade I–II) were performed cautiously to alleviate pain and restore joint play. Postural correction strategies were highlighted throughout treatment, including ergonomic advice tailored to the patient's workstation to avoid recurring symptoms.
Functional training was a crucial aspect of rehabilitation, focusing on gradually reintegrating into daily and work activities. The patient received education on modifying activities, pacing strategies, and maintaining proper posture during prolonged sitting. This systematic approach ensured a thorough recovery that addressed both impairments and functional limitations.

Neck and Shoulder Muscle Strengthening

Strengthening deep neck muscles is linked to better NDI scores and reduced neck and upper extremity pain. Strengthening starts with non-resistance exercises and progresses to isometric and resistance exercises, showing a strong connection between deep neck and trapezius muscle weakness and axial neck pain following cervical laminectomy. Therefore, postoperative muscle strengthening is vital for better outcomes. Early isometric exercises of the neck and trapezius muscles not only promote muscle growth but also improve local blood flow, leading to favorable effects on muscle swelling and pain sensitivity at the surgical site.

Phase 1: First 1-2 weeks (protect healing, gentle mobility)

- Walking: Start with short walks (5-10 min), increase gradually. This helps circulation and prevents stiffness.
- Diaphragmatic breathing: Lie on your back with your knees bent. Inhale deeply through your nose and exhale slowly. Do this 10 times.
- Ankle pumps: Move your feet up and down. Do 20 repetitions.
- Gentle pelvic tilts: Lie on your back with your knees bent. Flatten your lower back gently into the bed or floor. Hold for 3-5 seconds. Repeat 10 times.
- Log rolling: Practice getting in and out of bed safely without twisting.

Phase 2: Weeks 2-6 (core activation + flexibility)

- Transverse abdominis activation: Pull your belly button gently toward your spine. Hold for 5-10 seconds and repeat 10 times.
- Glute sets: Squeeze your buttocks and hold for 5 seconds. Repeat 10-15 times.
- Heel slides: Slide your heel toward your buttocks while lying down. Do 10 reps for each leg.
- Hamstring stretch: Use a gentle stretch only. Hold for 20-30 seconds.
- Knee-to-chest stretch (only if approved): One leg at a time. Avoid this if it increases symptoms.

Phase 3: Weeks 6-12 (strengthening)

- Bridging: Lift your hips while lying on your back. Hold for 5 seconds and repeat 10 times.
- Bird-dog: On your hands and knees, extend one arm and the opposite leg while keeping your spine neutral. Do 10 reps.
- Wall squats: Use a partial range only. Do 10 reps.
- Standing hip strengthening: Perform hip abduction and extension.

Phase 4: 3 months+
Gradual return to:
Swimming
Stationary cycling
Light yoga (modified)
Functional lifting training
Avoid at first:

- Heavy lifting
- Repeated bending/twisting
- High-impact exercise
- Sitting for prolonged periods
- Aggressive forward bending stretches.

Results

After four weeks of a multimodal physiotherapy program, the patient showed significant improvements across all areas. Pain intensity decreased from 8/10 to 2/10 on the Visual Analog Scale, showing a clear reduction in symptom severity.

Cervical range of motion improved significantly in all directions, with increases of 20-28°, indicating better joint mobility and less neuromuscular restriction. Muscle strength improved from 3/5-4/5 to near-normal levels (4+/5-5/5), showing better muscle performance and cervical stability.

Functional disability, measured by the Neck Disability Index, went down from 60% to 18%, marking a change from severe to mild disability. These improvements led to a meaningful recovery, allowing the patient to regain independence in daily activities and return to work successfully.

Overall, these findings highlight the effectiveness of a structured multimodal physiotherapy approach in supporting quick and complete recovery after cervical laminectomy.

Discussion

This case demonstrates that a multimodal physiotherapy program can aid recovery after cervical laminectomy. Pain, neck movement, strength, and daily function all improved following treatment.

Pain relief may be due to electrotherapy, while enhanced movement and strength likely resulted from exercises and early mobilization. Posture training and functional exercises helped the patient return to normal activities and work.

However, this is a single case with a short follow-up and no control group. Further studies are needed to confirm these results.

Limitations of the Case Study

While the results of this case study were encouraging, certain limitations should be noted. As this is a single-case report, the findings cannot be generalized to a larger population. Individual differences in healing capacity, motivation, and follow-through with therapy may have affected the results seen in this patient.

Additionally, the follow-up lasted only four weeks, focusing mainly on short-term recovery. Long-term outcomes, such as reoccurrence of symptoms or lasting functional improvement, were not evaluated. The

lack of a control or comparison group also limits the ability to attribute improvements solely to the multimodal physiotherapy intervention, as natural healing after surgery may have played a role.
Moreover, some outcome measures, such as pain and functional disability, depended on subjective reporting, which could be swayed by patient perception. Despite these limitations, the case offers valuable insights into the potential benefits of a structured multimodal rehabilitation approach following cervical laminectomy and emphasizes the need for more research with larger sample sizes and extended follow-up periods.

Conclusion

This case shows that a structured multimodal physiotherapy program can greatly improve recovery after cervical laminectomy. There were clear advancements in pain, mobility, strength, and daily function. The combined use of electrotherapy, exercise, and posture training supports faster and more complete recovery. While findings are limited to a single case, they emphasize the clinical value of early and comprehensive rehabilitation. More research is needed to confirm these outcomes in larger groups.

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