

Clinical Outcomes of Chin Tuck Exercise and TENS in Cervical Disc Herniation: A Case Report

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Abstract

Background: Cervical disc herniation is a degenerative cervical spine disorder that may cause neck pain, muscle spasm, restricted mobility, and functional limitations. Conservative physiotherapy interventions such as Transcutaneous Electrical Nerve Stimulation (TENS) and Chin Tuck Exercise are commonly used to reduce symptoms and improve function.

Objective: To describe the clinical outcomes of a physiotherapy program consisting of TENS and Chin Tuck Exercise in an older adult with cervical disc herniation.

Methods: This case report involved a 64-year-old male farmer presenting with recurrent neck pain radiating to the shoulder and upper extremity, forward head posture, cervical muscle spasm, and functional disability. The patient received four physiotherapy sessions over one month consisting of conventional TENS (80–100 Hz, 15 minutes) and Chin Tuck Exercise (8–10 repetitions, 3 sets, 5–10-second hold). Outcomes were assessed using the Numeric Rating Scale (NRS) and Neck Disability Index (NDI) from baseline (T1) to the final evaluation (T4).

Results: Resting pain decreased from 3/10 to 1/10, pressure pain from 5/10 to 2/10, and movement-related pain from 6/10 to 3/10. The NDI score improved from 28/50 to 14/50, representing a 50% reduction in disability. Reduced cervical muscle spasm and improved daily functional activities were also observed. No adverse events were reported.

Conclusion: Combined TENS and Chin Tuck Exercise were associated with improvements in pain intensity and functional disability in this patient with cervical disc herniation. However, findings from a single case should be interpreted cautiously and require confirmation through controlled studies.

Keywords

Cervical Disc Herniation; Transcutaneous Electric Nerve Stimulation; Exercise Therapy; Neck Pain; Activities of Daily Living

Introduction

Cervical disc herniation (CDH) is a degenerative disorder of the cervical spine characterized by displacement of the nucleus pulposus through the annulus fibrosus, which may result in compression of cervical nerve roots or the spinal cord. This condition commonly manifests as neck pain, muscle spasm, restricted cervical mobility, sensory disturbances, and functional limitations that interfere with daily activities and occupational performance. The development of CDH is closely associated with progressive degenerative changes within the intervertebral disc, including dehydration, loss of disc height, annular weakening, and osteophyte formation, which collectively contribute to mechanical instability and neural compression.¹

The global burden of cervical spine disorders continues to increase alongside population aging. Degenerative cervical changes are frequently observed in individuals over 60 years of age and are recognized as an important contributor to disability and reduced quality of life.^{2,3} In Indonesia, the growing elderly population has been accompanied by an increasing prevalence of musculoskeletal disorders, including cervical degenerative conditions that affect mobility, work productivity, and independence in daily living.³ Age-related degeneration may be further accelerated by occupational exposures involving repetitive loading, prolonged neck flexion, manual material handling, and sustained static postures. These risk factors are particularly relevant among agricultural workers, who often perform physically demanding tasks that place substantial mechanical stress on the cervical spine over many years.⁴

Patients with CDH commonly experience neck pain radiating to the shoulder, scapular region, or upper extremity, frequently accompanied by stiffness, muscle guarding, and movement-related discomfort. Such symptoms may impair essential functional activities, including reading, driving, lifting objects, maintaining prolonged sitting positions, and performing occupational tasks. Persistent pain and disability may subsequently reduce participation in social, recreational, and work-related activities, particularly among older adults. Previous studies have demonstrated that pain-related disability in cervical disorders is strongly associated with diminished physical function, reduced activity participation, and lower health-related quality of life.⁵ Therefore, conservative interventions capable of reducing symptoms while restoring functional performance remain clinically important.

Physiotherapy plays a central role in the conservative management of cervical spine disorders through interventions designed to reduce pain, improve mobility, restore neuromuscular control, and enhance functional capacity. Among the available modalities, Transcutaneous Electrical Nerve Stimulation (TENS) is widely used as a non-invasive intervention for pain management.⁶ TENS is believed to produce analgesic effects through activation of large-diameter afferent fibers, modulation of nociceptive transmission at the spinal cord level according to the gate control theory, and stimulation of endogenous inhibitory mechanisms. Previous evidence has demonstrated that TENS may contribute to short-term pain reduction and improved patient comfort in individuals with cervical pain disorders.⁷

Exercise therapy represents another important component of cervical rehabilitation. Chin Tuck Exercise is specifically designed to facilitate activation of the deep cervical flexor muscles, particularly the longus capitis and longus colli, which are essential

for cervical stabilization and postural control. Dysfunction of these muscles has been associated with forward head posture, impaired cervical biomechanics, reduced neuromuscular control, and persistent neck pain.^{8,9} Through improved activation of the deep cervical flexors, Chin Tuck Exercise may enhance segmental stability, optimize postural alignment, reduce excessive loading on passive cervical structures, and improve functional movement patterns. Previous studies have reported that deep cervical flexor training can reduce pain intensity, improve muscle endurance, decrease disability, and enhance overall functional outcomes in individuals with cervical disorders.⁸

Although the individual benefits of TENS and cervical stabilization exercises have been extensively reported, evidence describing their combined application in older adults with cervical disc herniation remains limited.⁶ Most published studies have focused on chronic nonspecific neck pain populations rather than patients with radiographic evidence of degenerative cervical disc pathology. Furthermore, clinical presentations in older adults are frequently influenced by multiple interacting factors, including age-related degeneration, occupational exposure, postural adaptations, and functional decline, all of which may affect prognosis and treatment response. Consequently, detailed case reports remain valuable for illustrating clinical reasoning, individualized patient management, and real-world treatment outcomes in specific patient populations.

The present case is clinically relevant because it involves an older adult farmer with recurrent cervical symptoms, forward head posture, radiographic evidence of degenerative cervical changes, and occupational risk factors associated with prolonged cervical loading. These characteristics provide an opportunity to describe the physiotherapy assessment process, justify intervention selection based on clinical findings, and document patient outcomes following a structured conservative rehabilitation program. Therefore, the objective of this case report was to describe the clinical management and outcomes of a physiotherapy program consisting of TENS and Chin Tuck Exercise in an older adult with cervical disc herniation, with particular emphasis on changes in pain intensity and functional disability following treatment.

Methods

This study was conducted using a case report design in accordance with the CARE (CAse REport) Guideline to describe the clinical presentation, physiotherapy management, and outcomes of an older adult with cervical disc herniation. The report focused on documenting the patient's clinical characteristics, physiotherapy assessment, intervention procedures, and changes in pain intensity and functional disability throughout the treatment period.

The subject was a 64-year-old male farmer (Tn. S) referred to the Physiotherapy Department of PKU Muhammadiyah Sukoharjo Hospital following an orthopedic consultation for recurrent neck pain. The patient reported a history of neck pain radiating to the left shoulder and upper arm approximately one year before presentation. The symptoms had previously improved but recurred two weeks before the current consultation. The recurrence was associated with prolonged agricultural activities involving repetitive neck flexion, carrying heavy loads on the shoulders, prolonged static postures, and a history of falling with direct impact to the head approximately three years earlier.

Information regarding previous pharmacological management, analgesic use, anti-inflammatory medication, injection therapy, or other conservative treatments before physiotherapy referral was not available in the medical record. Similarly, information regarding the patient's functional status before the most recent recurrence could not be obtained retrospectively and therefore could not be reported in this case.

The patient initially attended the Orthopedic Outpatient Clinic on 15 May 2025 because of increasing neck pain and functional limitations. Cervical radiography was subsequently performed and demonstrated straightening of the normal cervical lordosis, narrowing of the lower cervical intervertebral disc spaces predominantly at C5–C7, and osteophytic changes consistent with degenerative cervical pathology. No evidence of fracture, dislocation, or destructive bone lesions was observed. Based on the orthopedic assessment and radiographic findings, the patient was referred to physiotherapy on 17 May 2025.

Although cervical disc herniation was the primary working diagnosis, other cervical conditions such as cervical spondylosis, cervical radiculopathy, and myofascial pain syndrome may present with overlapping symptoms.¹⁰ However, detailed differential diagnostic procedures and advanced imaging examinations, including magnetic resonance imaging (MRI), were not available in the patient's medical record. Therefore, diagnostic interpretation was based on the available clinical and radiographic information.

At the initial physiotherapy examination, the patient's blood pressure was 161/86 mmHg, indicating a history of hypertension requiring monitoring during treatment. Safety monitoring was conducted before and after each intervention session by assessing symptoms such as dizziness, headache, excessive fatigue, or exercise intolerance. If such symptoms occurred, exercise intensity would be reduced or temporarily discontinued.

Physical examination included observation, palpation, pain assessment, and functional evaluation. Static observation revealed forward head posture accompanied by reduced cervical lordosis and mild shoulder protraction. Dynamic observation demonstrated guarded cervical movement patterns with visible limitations during extension, rotation, and lateral flexion. Palpation identified tenderness over the cervical paraspinal region, particularly at the C5–C7 segments, accompanied by increased muscle tone and spasm of the bilateral upper trapezius and levator scapulae muscles. Objective measurements of cervical range of motion, neurological examination findings (dermatomal, myotomal, and tendon reflex assessments), postural measurements, muscle endurance testing, and specific cervical provocation tests such as the Spurling Test, Cervical Distraction Test, and Upper Limb Tension Test were not available in the medical record and therefore could not be reported.

Pain intensity was evaluated using the Numeric Rating Scale (NRS), a validated self-reported outcome measure ranging from 0 (no pain) to 10 (worst imaginable pain).¹¹ Baseline assessment demonstrated resting pain of 3/10, movement-related pain of 6/10, and pressure pain of 5/10. Functional disability was assessed using the Neck Disability Index (NDI), a validated instrument consisting of ten items with a total score ranging from 0 to 50, where higher scores indicate greater disability.¹² The patient's baseline NDI score was 28/50, indicating moderate-to-severe disability associated with cervical symptoms.

The clinical timeline illustrates the patient's management pathway from the initial orthopedic consultation and cervical radiographic examination to referral for physiotherapy. The patient underwent baseline assessment (T1), followed by a combined physiotherapy intervention over four treatment sessions, with a final post-intervention evaluation at T4. The sequence of clinical events and assessment points is presented in Figure 1.

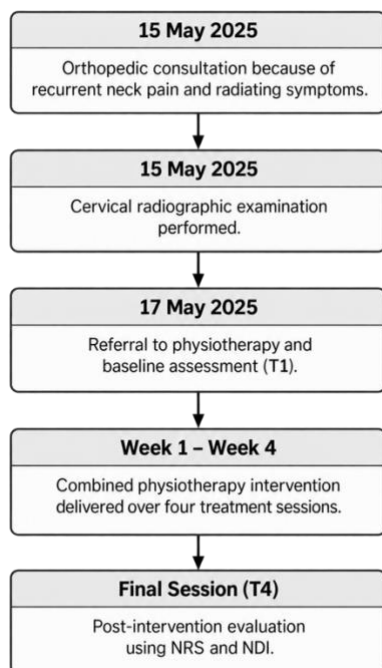


Figure 1. Clinical Timeline of Physiotherapy Management

The physiotherapy program consisted of conventional TENS and Chin Tuck Exercise administered over four treatment sessions within one month. TENS was delivered at a frequency of 80–100 Hz for 15 minutes at sensory-level intensity according to patient tolerance. Electrodes were positioned over the symptomatic cervical paraspinal region corresponding to the area of pain and muscle spasm. The intervention aimed to reduce pain through modulation of nociceptive transmission and activation of endogenous analgesic mechanisms.¹³

Exercise therapy consisted of Chin Tuck Exercise intended to activate the deep cervical flexor muscles and improve cervical postural control. The patient performed 8–10 repetitions for three sets while maintaining each contraction for 5–10 seconds within a pain-free range. Because the intervention period was relatively short and the patient's symptoms remained responsive to the initial dosage, no formal exercise progression was implemented during the four treatment sessions. Verbal instruction and therapist supervision were provided throughout the intervention period to ensure correct performance and minimize compensatory movement patterns.

In addition to supervised treatment, the patient received education regarding postural awareness, avoidance of prolonged static neck positions, modification of work-related activities, and symptom management strategies. Formal documentation of adherence to a home exercise program was not available; however, the patient attended all scheduled treatment sessions and reported compliance with the instructions provided during physiotherapy visits.

Outcome evaluation was conducted at baseline (T1) and at the final treatment session (T4). Descriptive analysis was used to compare changes in NRS and NDI scores across the intervention period. Clinical improvement was interpreted based on reductions in pain intensity, improvements in self-reported disability, decreased muscle spasm, and enhanced comfort during daily activities. Because this report involved a single patient, no inferential statistical analysis was performed.

Written informed consent was obtained from the patient for clinical management, publication of anonymized clinical information, and use of radiographic findings for scientific and educational purposes. Patient confidentiality was maintained throughout manuscript preparation in accordance with ethical principles governing case report publication.

Results

The primary objective of this case report was to describe changes in pain intensity and functional disability following a four-session physiotherapy program consisting of Transcutaneous Electrical Nerve Stimulation (TENS) and Chin Tuck Exercise in an older adult with cervical disc herniation. Outcome evaluation was performed using the Numeric Rating Scale (NRS) and Neck Disability Index (NDI). In addition to these outcome measures, clinical observations related to muscle spasm, movement comfort, treatment tolerance, and patient-reported functional changes were documented throughout the intervention period.

To provide a structured overview of clinical progression, Table 1 summarizes the changes in pain intensity and functional disability observed between baseline assessment (T1) and the final evaluation (T4).

Table 1. Changes in Clinical Outcomes Following Physiotherapy Intervention

Outcome Measure	T1 (Baseline)	T4 (Final Evaluation)	Change
Resting pain (NRS)	3/10	1/10	–2
Pressure pain (NRS)	5/10	2/10	–3
Movement pain (NRS)	6/10	3/10	–3
Neck Disability Index (NDI)	28/50	14/50	–14

NRS: Numeric Rating Scale; NDI: Neck Disability Index.

As shown in Table 1, improvements were observed across all reported outcome measures following completion of the intervention program. The greatest reduction in pain intensity occurred in pressure pain and movement-related pain, both of which decreased by three points on the NRS. Functional disability also improved substantially, with the NDI score decreasing by 14 points, representing a 50% reduction from baseline.

Pain intensity was evaluated using three dimensions of clinical pain experience: resting pain, pressure pain, and movement-related pain. At baseline, movement-related pain demonstrated the highest intensity (6/10), followed by pressure pain (5/10) and resting pain (3/10). Following four treatment sessions, resting pain decreased to 1/10, pressure pain decreased to 2/10, and

movement-related pain decreased to 3/10. These findings indicate a consistent reduction in symptom severity throughout the intervention period.

The progression of pain intensity during the physiotherapy intervention is presented across four assessment points. At baseline (T1), resting, pressure, and movement-related pain were recorded at 3/10, 5/10, and 6/10, respectively. Subjective improvement was reported during T2 and T3, including reduced discomfort, decreased tenderness, and improved tolerance to cervical movement. At the final evaluation (T4), pain scores decreased to 1/10 at rest, 2/10 with pressure, and 3/10 with movement, as shown in Figure 2.

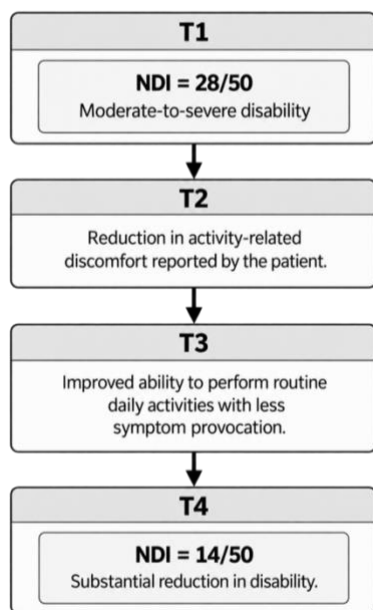


Figure 2. Changes in Pain Intensity Across Physiotherapy Treatment Sessions

In addition to reductions in pain intensity, clinical observation demonstrated decreased muscle spasm and reduced tenderness within the cervical paraspinal musculature. Guarded movement patterns observed during the initial assessment became less apparent at the final evaluation. The patient also reported greater comfort when performing daily activities that previously aggravated symptoms.

Functional disability was assessed using the NDI. Baseline evaluation demonstrated a score of 28/50, indicating moderate-to-severe disability associated with cervical symptoms. Following completion of the physiotherapy program, the NDI score decreased to 14/50. This reduction exceeded the minimum clinically important difference (MCID) reported for individuals with neck pain disorders, suggesting that the observed improvement was not only numerically evident but also clinically meaningful.¹⁴

The progression of functional disability assessed using the Neck Disability Index (NDI) is presented in Figure 3. At baseline (T1), the patient had an NDI score of 28/50, indicating moderate-to-severe disability. During T2 and T3, the patient reported reduced activity-related discomfort and improved ability to perform routine daily activities with less symptom provocation. At the final evaluation (T4), the NDI score decreased to 14/50, indicating a substantial reduction in disability.

Throughout the intervention period, the patient attended all scheduled treatment sessions and demonstrated good tolerance to both TENS and Chin Tuck Exercise. No adverse events, symptom exacerbation, dizziness, excessive fatigue, or other complications were reported. Ongoing blood pressure monitoring and symptom surveillance were performed because of the patient's history of hypertension, and no safety concerns requiring treatment modification were identified.

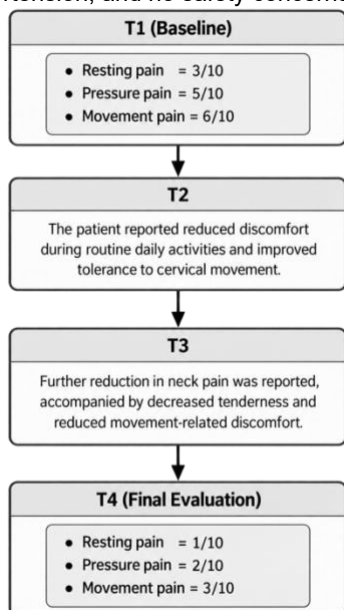


Figure 3. Changes in Neck Disability Index Across Physiotherapy Treatment Sessions

From the patient's perspective, symptom improvement was perceived primarily as reduced pain during daily activities and increased comfort during neck movement. Although a formal patient perspective questionnaire was not administered, the patient reported satisfaction with the physiotherapy program and expressed that daily functional activities could be performed more comfortably at the end of the intervention period.

Overall, the findings demonstrated improvements in pain intensity, functional disability, cervical comfort during movement, and daily activity performance following completion of the four-session physiotherapy program. These outcomes provide a descriptive account of the patient's clinical progression during conservative physiotherapy management.

Discussion

This case report described the clinical outcomes of a physiotherapy program consisting of Transcutaneous Electrical Nerve Stimulation (TENS) and Chin Tuck Exercise in a 64-year-old farmer with cervical disc herniation. Following four treatment sessions, improvements were observed in pain intensity, functional disability, cervical comfort during movement, and daily activity performance. The reductions in NRS scores and the substantial improvement in NDI suggest that the intervention period was accompanied by meaningful clinical changes. Although causality cannot be established within a single-case design, the findings provide insight into the potential role of multimodal physiotherapy management in older adults with degenerative cervical spine disorders.

One of the principal findings of this report was the reduction in pain intensity across all pain categories. Resting pain decreased by two points, while pressure pain and movement-related pain each decreased by three points on the NRS. Several mechanisms may explain these improvements. TENS is widely recognized as a non-invasive modality capable of modulating nociceptive input through activation of large-diameter afferent fibers, inhibition of pain transmission at the spinal cord level, and stimulation of endogenous analgesic pathways.¹³ Previous studies have demonstrated that TENS may contribute to short-term pain reduction and improved comfort in individuals with cervical pain disorders.⁷ Therefore, the observed reduction in pain intensity in this patient is consistent with current evidence supporting the use of TENS as part of conservative physiotherapy management.

The present findings also demonstrated a clinically meaningful improvement in functional disability. The NDI score decreased from 28/50 to 14/50, representing a 50% reduction from baseline. Importantly, this change exceeded the minimum clinically important difference reported for patients with neck pain disorders, suggesting that the improvement was clinically relevant rather than merely reflecting measurement variability.¹⁵ Functional recovery is particularly important because pain-related disability often affects occupational participation, social engagement, and independence in daily activities. Current clinical practice guidelines emphasize that successful management of cervical disorders should address both symptom reduction and restoration of functional performance.¹⁰ Consequently, the improvement in NDI observed in this case represents an important outcome beyond pain relief alone.

Another factor that may have contributed to the observed outcomes is the inclusion of Chin Tuck Exercise. Deep cervical flexor dysfunction has frequently been reported in individuals with neck pain, forward head posture, and impaired cervical control. These muscles are essential for maintaining cervical alignment and providing segmental stabilization during functional activities. Previous research has demonstrated that deep cervical flexor training can improve neuromuscular control, reduce pain, and decrease disability among individuals with cervical disorders.^{8,16} The patient in the present case demonstrated forward head posture and movement-related pain during the initial assessment. Therefore, activation of the deep cervical flexor musculature through Chin Tuck Exercise may have contributed to improved cervical control and reduced mechanical stress on symptomatic structures.

The patient's age and occupational background should also be considered when interpreting the findings. Radiographic examination demonstrated reduced cervical lordosis, narrowing of the lower cervical disc spaces, and osteophytic formation, findings that are frequently associated with age-related cervical degeneration.² Degenerative changes may predispose individuals to chronic pain, stiffness, reduced mobility, and recurrent symptom episodes.¹⁷ Furthermore, the patient's occupation as a farmer involved repetitive loading, prolonged neck flexion, carrying heavy loads, and sustained static postures over many years. Such occupational demands may increase cumulative mechanical stress on cervical structures and potentially contribute to both symptom development and recurrence.¹⁸ Consequently, the favorable outcomes observed in this case are noteworthy because they occurred despite the presence of several risk factors associated with persistent cervical dysfunction.

Although improvements were observed during treatment, several alternative explanations should be considered. The patient reported that the recurrence of symptoms had occurred approximately two weeks before physiotherapy assessment. Therefore, the possibility of natural recovery cannot be completely excluded. Some acute or subacute musculoskeletal conditions may demonstrate spontaneous improvement over time regardless of intervention.¹⁰ Nevertheless, the concurrent improvements in pain intensity, disability scores, muscle spasm, and functional performance observed throughout the intervention period suggest that physiotherapy may have contributed to the recovery process. Similar considerations have been reported in studies evaluating conservative management strategies for cervical pain disorders.⁷

It is also important to acknowledge that the relative contribution of each intervention cannot be determined from this case report. TENS and Chin Tuck Exercise were administered simultaneously throughout the treatment period, making it impossible to isolate the specific effects of either intervention. The observed outcomes may have resulted from a combination of pain modulation, neuromuscular adaptation, patient education, activity modification, and contextual therapeutic factors. Future controlled studies are therefore needed to determine the independent and combined effects of these interventions in patients with cervical disc herniation. Another consideration is the potential influence of placebo and contextual effects. Electrotherapy interventions may enhance patient expectations, therapeutic engagement, and confidence in movement. Contemporary pain science recognizes that treatment outcomes often reflect an interaction between specific physiological mechanisms and non-specific contextual influences. Consequently, some proportion of the improvement observed in this patient may have been related to positive treatment expectations in addition to the direct physiological effects of TENS and exercise therapy.¹⁹

Patient adherence may also have influenced the outcomes. The patient attended all scheduled treatment sessions and reported compliance with the recommendations provided during physiotherapy visits. Education regarding posture, activity modification, and symptom management was incorporated into the rehabilitation program. Previous studies have shown that adherence to exercise-based rehabilitation is associated with superior outcomes in individuals with neck pain and cervical dysfunction.¹⁶ Therefore, the patient's engagement with the treatment process may have contributed to the favorable clinical progression observed in this case.

Several limitations should be acknowledged when interpreting the findings of this report. First, this study involved a single patient, limiting external validity and preventing generalization of the results to broader populations. Second, objective measurements of cervical range of motion, postural alignment, neurological status, muscle endurance, and specific cervical provocation tests were

unavailable in the medical record. Third, diagnostic assessment relied primarily on cervical radiography, whereas magnetic resonance imaging would have provided a more comprehensive evaluation of disc pathology and neural involvement. Fourth, information regarding previous medication use and certain clinical variables before recurrence was unavailable. Finally, no long-term follow-up assessment was conducted; therefore, the durability of treatment effects beyond the intervention period remains uncertain.

Despite these limitations, this case report provides clinically relevant information for physiotherapy practice in musculoskeletal and geriatric populations. The findings support the consideration of personalised multimodal physiotherapy as part of conservative management for patients with cervical radiculopathy.⁶ The report also highlights the importance of considering occupational exposure, age-related degeneration, and functional limitations when developing individualized rehabilitation strategies. Future studies employing larger sample sizes, objective biomechanical measurements, and long-term follow-up are needed to strengthen the evidence base supporting multimodal physiotherapy interventions for cervical disc herniation.

Conclusion

This case report described the clinical outcomes of a physiotherapy program consisting of Transcutaneous Electrical Nerve Stimulation (TENS) and Chin Tuck Exercise in a 64-year-old patient with cervical disc herniation. Following four treatment sessions, improvements were observed in pain intensity, functional disability, cervical comfort during movement, and performance of daily activities. The reductions in NRS scores and improvement in NDI scores indicate favorable clinical changes during the intervention period.

From a clinical perspective, the findings suggest that a multimodal physiotherapy approach integrating pain modulation, cervical stabilization exercise, patient education, and activity modification may be considered as part of conservative management for older adults with cervical disc herniation, particularly when postural dysfunction and activity-related symptoms are present.^{6,10} However, because this report involved a single patient and lacked long-term follow-up, the findings should be interpreted cautiously and should not be generalized to broader populations.

Future studies employing larger sample sizes, controlled study designs, objective clinical outcome measures, and long-term follow-up are recommended to further clarify the effectiveness and clinical applicability of combined TENS and Chin Tuck Exercise in the management of cervical disc herniation.

Author Contributions

Siska Alfia Nita: Conceptualization, Investigation, Data Curation, Formal Analysis, Writing Original Draft, Visualization.

Dwi Rosella Komalasari: Supervision, Methodology, Validation, Writing Review and Editing, Project Administration.

Guntur Rusmana Putra: Supervision, Clinical Investigation, Validation, Resources, Writing Review and Editing.

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Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study.

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Ethics Statement

Written informed consent was obtained from the patient for participation and publication of anonymized clinical information and radiographic findings. All procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki and institutional regulations governing case report publication.

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