INTI JOURNAL | Vol.2026, Issue 1, No.15
eISSN:2600-7320

Understanding the Gastro-Musculoskeletal Loop: A Case of GERD-Induced Postural Adaptations Leading to Cervical Spondylosis

Alagappan Thiyagarajan[1*], Vijayakumar Palaniswamy[2], Hanzala J Shaikh[3], Thangamani Ramalingam Alagappan[4]

[1]School of Physiotherapy, Faculty of Health Sciences, Nursing and Education, MAHSA University, Malaysia.
[2]Institute of Physiotherapy, Srinivas University, City Campus, Pandeshwar, Magaluru, 575001, Karnataka India.
[3]Shri B.G. Patel College of Physiotherapy, Anand, Gujarat, India.
[4]Sarvajinik College of Physiotherapy, Rampura Surat, Gujarat, India

[*]**Email:** alagappanphd@gmail.com

Abstract

Gastroesophageal reflux disease (GERD) is a gastrointestinal disorder that can induce compensatory postural adaptations, potentially contributing to cervical spondylosis. Understanding this gastro-musculoskeletal relationship is crucial for holistic patient management. A 40-year-old male with chronic GERD and cervical spondylosis underwent an 8-week physiotherapy program focusing on postural correction, strengthening of deep cervical flexors and scapular stabilizers, stretching of tight anterior chest muscles, and diaphragmatic breathing exercises. Concurrent GERD management included lifestyle modifications and prescribed medications. Outcome measures included cervical range of motion, pain intensity, and postural assessment scores. Over 8 weeks, the patient demonstrated progressive improvement in cervical mobility, reduction in neck pain, and correction of forward head posture and scapular protraction. Integration of physiotherapy and GERD management contributed to symptom relief and functional recovery. This case highlights the bidirectional gastro-musculoskeletal loop, where GERD-induced postural adaptations can predispose to cervical spondylosis. Combined physiotherapy and GERD management can effectively improve musculoskeletal function and patient quality of life. Early recognition and interdisciplinary intervention are recommended for optimal outcomes.

Keywords

Cervical spondylosis, GERD, Postural adaptation, Physiotherapy

Introduction

The interplay between gastrointestinal dysfunction and musculoskeletal health is an emerging area of clinical interest. Gastroesophageal reflux disease (GERD), characterized by retrograde flow of gastric contents into the oesophagus, is traditionally associated with symptoms such as heartburn, regurgitation, and dysphagia. However, chronic GERD can also lead to

Submission: 27 March 2026; **Acceptance:** 21 April 2026; **Available online:** March 2026

compensatory postural adaptations, as patients instinctively modify their head, neck, and thoracic alignment to minimize discomfort. Over time, these maladaptive postures may contribute to biomechanical stress in the cervical spine, predisposing individuals to degenerative changes and conditions such as cervical spondylosis (Chu & Butler, 2021).

It is more important to understand this gastro-musculoskeletal loop is critical, as it highlights the potential for systemic conditions to manifest as localized musculoskeletal pathology. Integrating knowledge of gastrointestinal triggers with postural assessment allows physiotherapists and rehabilitation specialists to implement more targeted, holistic interventions. This case report explores the clinical presentation, assessment, and physiotherapy management of a 40-year-old patient with GERD-induced postural adaptations leading to cervical spondylosis, emphasizing the importance of addressing both gastrointestinal and musculoskeletal contributors in rehabilitation planning.

Methodology

A 40-year-old male office worker presented with a 6-month history of gradually worsening neck pain and stiffness, primarily localized to the lower cervical region. The pain was described as dull and aching, occasionally sharp with neck movements, and was associated with intermittent numbness and tingling radiating along the right upper limb, predominantly affecting the thumb and index finger. The patient denied any history of trauma, prior cervical spine issues, or systemic illness.
In addition to musculoskeletal complaints, the patient reported frequent episodes of heartburn, acid regurgitation, and occasional dysphagia persisting for over a year, consistent with GERD symptoms. These episodes were exacerbated by certain foods and postural positions, particularly after meals and during nighttime.
Clinical Examination-On physical examination, the patient exhibited a noticeable forward head posture with rounded shoulders. Cervical spine range of motion was restricted, particularly in extension and right rotation. Palpation revealed tenderness and increased muscle tone over the lower cervical paraspinal muscles and upper trapezius bilaterally. Spurling's test was positive on the right side, reproducing radicular symptoms.
Neurological examination identified decreased sensation in the C6 dermatome on the right and mild weakness (grade 4/5) in the right biceps brachii muscle. Deep tendon reflexes were intact. Postural assessment noted scapular protraction and tightness of the pectoralis major and minor muscles, likely secondary to habitual postural adaptations (Imagama et al., 2012; Ohba et al., 2018). Radiographic imaging of the cervical spine revealed degenerative changes including osteophyte formation at the C5-C6 and C6-C7 levels, reduced intervertebral disc height, and mild foraminal narrowing consistent with cervical spondylosis. No evidence of acute fracture or instability was noted. Upper gastrointestinal endoscopy confirmed the diagnosis of GERD, showing oesophageal mucosal erythema and mild esophagitis. The patient was under medical management with proton pump inhibitors prescribed by a gastroenterologist (Salles et al., 2020).

Table 1: Week wise scores of Outcome Measures

Outcome Measures/ Week	NDI (%)	VAS (0-10)	CROM (°)
Week 0	48	7	40
Week 2	40	6	45

Week 4	32	5	50
Week 6	28	4	55
Week 8	22	3	60

[The Neck Disability Index (NDI), Visual Analog Scale (VAS), and Cervical Range of Motion (CROM)]

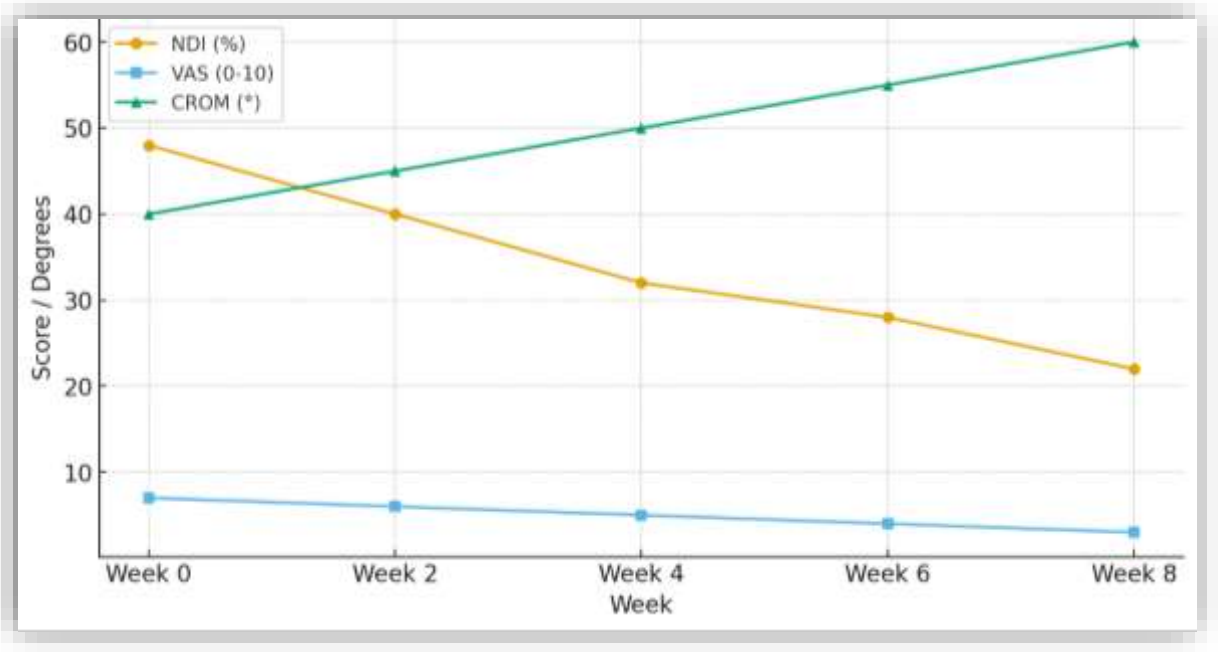

Figure 1. Scores of Outcome measures over 8 weeks of Physiotherapy treatment

The Neck Disability Index (NDI), Visual Analog Scale (VAS), and Cervical Range of Motion (CROM) are commonly used outcome measures to assess the severity and functional impact of cervical spine conditions such as cervical spondylosis (Table 1 and Figure 1). The NDI evaluates the patient's perceived disability related to neck pain through a self-reported questionnaire, providing insight into the impact of symptoms on daily activities. The VAS quantifies pain intensity by allowing patients to rate their pain on a continuous scale, facilitating the monitoring of changes in pain severity over time. The CROM device objectively measures cervical spine mobility in multiple planes, including flexion, extension, lateral bending, and rotation, which is critical for assessing functional limitations and treatment effectiveness in patients presenting with restricted neck movements and associated neurological symptoms. Together, these measures offer a comprehensive evaluation of pain, disability, and physical function in patients with cervical spine disorders (Shaheen et al., 2023; Takahashi et al., 2021).

The Neck Disability Index (NDI), Visual Analog Scale (VAS), and Cervical Range of Motion (CROM) were employed as outcome measures over an 8-week period to assess changes in pain, disability, and functional mobility in patients with cervical spine conditions. The NDI provided a self-reported measure of the impact of neck pain on daily activities, while the VAS captured fluctuations in pain intensity throughout the treatment duration. The CROM device objectively tracked improvements or limitations in cervical spine movement across multiple planes, offering a quantifiable assessment of physical function. Using these measures consistently over 8 weeks allowed for a comprehensive evaluation of treatment efficacy and patient progress (Takahashi et al., 2021).

Physiotherapy treatment for the patient's cervical spondylosis focuses on alleviating neck pain, improving cervical mobility, and correcting postural dysfunctions such as forward head posture and scapular protraction (Table 2). This includes manual therapy techniques, therapeutic exercises to strengthen deep cervical flexors and scapular stabilizers, stretching of tight muscles like the pectoralis major and minor, and modalities to reduce muscle tone and tenderness in the cervical paraspinal and trapezius muscles. Postural education and ergonomic advice are integral to prevent symptom recurrence. Concurrently, management of GERD involves medical treatment with proton pump inhibitors as prescribed, alongside lifestyle modifications such as dietary adjustments, avoiding trigger foods, elevating the head during sleep, and weight management. Physiotherapy may also incorporate diaphragmatic breathing exercises to reduce intra-abdominal pressure and improve oesophageal sphincter function, supporting symptom control in GERD (Kahrilas et al., 2021).

Table 2. Treatment Chart for 8-week Program

Week	Physiotherapy Intervention	GERD Management Support	Goals / Expected Outcomes
0	- Initial assessment: cervical ROM, posture, muscle tenderness - Pain management with modalities (TENS, heat) - Education on posture and ergonomics	- Initiate PPI medication as prescribed - Advise dietary modifications (avoid spicy/fatty foods)	- Baseline assessment - Reduce acute pain - Patient understanding of posture and GERD triggers
2	- Begin deep cervical flexor strengthening - Scapular stabilization exercises - Gentle stretching of pectoralis major/minor - Soft tissue mobilization of trapezius	- Reinforce dietary advice - Encourage head elevation during sleep - Introduce diaphragmatic breathing exercises	- Improve cervical stability - Reduce muscle tightness - Begin GERD symptom control
4	- Progress strengthening exercises (resistance bands) - Cervical ROM exercises - Postural correction drills - Continue soft tissue therapy	- Monitor symptom response - Encourage weight management if required - Continue diaphragmatic breathing	- Improved cervical mobility - Reduced forward head posture - Further GERD symptom reduction
6	- Functional training: dynamic scapular and neck exercises - Postural retraining in sitting and standing - Manual therapy for residual stiffness	- Maintain lifestyle modifications - Reinforce adherence to medical therapy	- Near-normal cervical ROM - Improved postural control - Sustained GERD symptom control
8	- Advanced strengthening and endurance exercises - Integration into daily activities - Education for self-	- Review GERD management success - Patient able to self-monitor triggers	- Optimal cervical function and posture - Pain-free neck - Long-term GERD symptom management

	management and recurrence prevention		

Discussion

Gastroesophageal reflux disease (GERD) is primarily recognized as a gastrointestinal disorder, yet emerging evidence suggests that its effects extend beyond the digestive system, influencing musculoskeletal function and postural alignment. In this case, the patient's chronic GERD symptoms appear to have contributed to maladaptive postural changes, particularly forward head posture and scapular protraction, ultimately predisposing him to cervical spondylosis. This interplay underscores the concept of a gastro-musculoskeletal loop, where visceral dysfunctions influence musculoskeletal health, and vice versa (Kahrilas et al., 2021).

The postural adaptations observed in this patient can be explained through biomechanical and neurophysiological mechanisms. Chronic GERD may lead to increased thoracic kyphosis due to protective posturing during reflux episodes, causing the cervical spine to adopt a forward head posture to maintain visual orientation. Forward head posture increases compressive loads on the cervical vertebrae and intervertebral discs, accelerates degenerative changes, and contributes to muscle imbalance, particularly in the deep cervical flexors, trapezius, and levator scapulae. Additionally, sustained protraction of the scapula disrupts scapulothoracic rhythm, limiting shoulder function and further exacerbating cervical strain. These findings are consistent with prior literature linking visceral discomfort and chronic pain with compensatory musculoskeletal patterns, emphasizing the need for a holistic evaluation in patients with seemingly unrelated systemic conditions (Vuillerme & Pinsault, 2009).

Physiotherapy interventions in this case were designed to address both the musculoskeletal consequences of postural adaptation and the secondary effects of GERD. Targeted strengthening of deep cervical flexors and scapular stabilizers, combined with stretching of the pectoralis major and minor, facilitated postural correction and reduced mechanical stress on cervical structures. Manual therapy and soft tissue techniques helped alleviate muscle hypertonicity and tenderness. Simultaneously, diaphragmatic breathing exercises served a dual role: reducing intra-abdominal pressure and supporting lower esophageal sphincter function, thereby improving GERD symptoms and minimizing their contribution to postural maladaptation. This integrative approach aligns with contemporary evidence advocating for interdisciplinary management of patients with overlapping gastrointestinal and musculoskeletal disorders (Vuillerme & Pinsault, 2009).

Outcome measures, including cervical range of motion, postural assessment scores, and patient-reported pain scales, demonstrated progressive improvement over the 8-week intervention period. These changes highlight the efficacy of combined musculoskeletal rehabilitation and GERD management in mitigating both pain and functional limitations. Moreover, postural education and ergonomic guidance played a critical role in sustaining improvements and preventing recurrence, illustrating the importance of patient-centred self-management strategies (Ohba et al., 2018).

Conclusion

In conclusion, this case illustrates the bidirectional relationship between gastrointestinal disorders and musculoskeletal health. Chronic GERD can induce compensatory postural adaptations that predispose individuals to cervical spondylosis, creating a gastro-musculoskeletal loop. Effective management requires a holistic approach that addresses not only cervical spine pathology but also underlying systemic contributors. Physiotherapy interventions focusing on postural correction, targeted strengthening, manual therapy, and breathing strategies, combined with medical and lifestyle management of GERD, can achieve meaningful improvements in pain, function, and quality of life. This case underscores the importance of interdisciplinary assessment and intervention in patients presenting with complex symptomatology spanning multiple body systems and highlights the potential for physiotherapists to play a key role in integrated care pathways for GERD-associated musculoskeletal dysfunction.

Acknowledgement

The authors would like to thank the clinical team and the patient for their cooperation and contribution to this case study. We also acknowledge the support of the physiotherapy department in facilitating the integrated treatment approach.

References

Chu, E. C. P., & Butler, W. (2021). Resolution of gastroesophageal reflux disease following correction for upper cross syndrome: A case study and brief review. *Clinical Practice, 11*(2), 45–50. https://doi.org/10.3390/clinpract11020045

Imagama, S., Hasegawa, Y., Wakao, N., Hirano, K., Hamajima, N., & Ishiguro, N. (2012). Influence of lumbar kyphosis and back muscle strength on the symptoms of gastroesophageal reflux disease in middle-aged and elderly people. *European Spine Journal, 21*(11), 2149–2157. https://doi.org/10.1007/s00586-012-2207-1

Kahrilas, P. J., Carlson, D. A., & Patankar, N. A. (2021). Esophageal virtual disease landscape using mechanics-informed machine learning. *Nature Communications, 12*, Article 7068. https://doi.org/10.1016/j.artmed.2022.102435

Ohba, T., Ebata, S., Koyama, K., & Haro, H. (2018). Prevalence and key radiographic spinal malalignment parameters that influence the risk for gastroesophageal reflux disease in patients treated surgically for adult spinal deformity. *BMC Gastroenterology*, *18*(1), Article 8. https://doi.org/10.1186/s12876-018-0738-6

Salles, F. L. P., Campos, Í. K., & Alho, L. de M. (2020). Assessment of gastroesophageal reflux disease and its relationship with spinal misalignment. *Digestive Diseases and Sciences, 65*(10), 2820–2830. https://doi.org/10.1016/j.ergon.2020.103038

Shaheen, A., Khan, R., & Khosro, A. (2023). IoT-based solution for detecting and monitoring upper-cross syndrome. *Sensors, 24*(1), 135. https://doi.org/10.3390/s24010135

Takahashi, S., Watanabe, Y., & Imagama, S. (2021). Relationship of back muscle and knee extensors with the sagittal spinal alignment in the elderly. *Scientific Reports, 11*, Article 82015. https://doi.org/10.1038/s41598-021-82015-8

Vuillerme, N., & Pinsault, N. (2009). Experimental neck muscle pain impairs standing balance in humans. *Experimental Brain Research, 194*(1), 115–123. https://doi.org/10.1007/s00221-008-1639-7