

Flexion-Relaxation Phenomenon in Patients with Low Back Pain and Radiculopathy: A Cross-Sectional Investigation

Marijan Dean*

Department of Physiotherapy, Faculty of Health Studies, University of Rijeka, 51000 Rijeka, Croatia

Introduction

Low back pain is a prevalent condition affecting millions of individuals worldwide, often leading to significant disability and reduced quality of life. Among those affected, a subset of patients also experience radiculopathy, characterized by radiating pain, numbness, and weakness in the lower extremities due to nerve root compression. The flexion-relaxation phenomenon (FRP) is a notable biomechanical event observed in the lumbar muscles during forward bending, wherein muscle activity ceases at full flexion. This article presents a cross-sectional investigation into the FRP in patients with LBP and radiculopathy, examining its implications for diagnosis, treatment, and understanding of these conditions. The FRP is a well-documented phenomenon in healthy individuals, characterized by the cessation of electromyographic activity in the lumbar erector spinae muscles during full trunk flexion. This relaxation allows passive structures such as ligaments and intervertebral discs to bear the load. In contrast, deviations from the typical FRP pattern have been observed in patients with LBP, suggesting alterations in neuromuscular control and spinal mechanics. This investigation aims to explore the characteristics of the FRP in patients with LBP and radiculopathy, contributing to a better understanding of the underlying pathophysiology and potential clinical applications [1-3].

Description

A cross-sectional study design was employed, involving patients diagnosed with LBP and radiculopathy. Ethical approval was obtained from the institutional review board, and all participants provided informed consent. The study included 100 patients with LBP and radiculopathy (age range: 25-65 years; 50 males and 50 females) and a control group of 50 healthy individuals matched for age and sex. Inclusion criteria for the patient group included a clinical diagnosis of LBP with radiographic evidence of radiculopathy and persistent symptoms for at least three months. Exclusion criteria were previous spinal surgery, neurological disorders, or any other condition affecting muscle function. Surface electromyography (sEMG) was used to record the activity of the lumbar erector spinae muscles. Participants performed a standardized forward bending task, consisting of three phases: upright standing, forward flexion to full trunk flexion, and return to the upright position. sEMG data were collected at a sampling rate of 1000 Hz and processed using bandpass filtering (20-450 Hz) to remove artifacts. The primary outcome measure was the presence or absence of the FRP, defined by a marked reduction in EMG activity (>50%) during full trunk flexion compared to upright standing. Secondary outcomes included the amplitude and duration of muscle activity during each phase of the movement. Statistical analyses were conducted using SPSS software, with comparisons

between groups made using t-tests and chi-square tests as appropriate. The patient group and control group were comparable in terms of age, sex, and body mass index (BMI). The mean duration of symptoms in the patient group was 12.4 ± 5.6 months. The FRP was present in 90% of the control group but only in 40% of the patient group ($p < 0.001$). Among patients with LBP and radiculopathy, those with severe pain and greater functional disability were less likely to exhibit the FRP. Patients with LBP and radiculopathy showed significantly higher EMG amplitudes during forward flexion and full trunk flexion compared to controls ($p < 0.01$). The duration of muscle activity was also prolonged in the patient group, indicating sustained muscle contraction and reduced relaxation during full flexion [4-6].

Conclusion

The reduced prevalence of the FRP in patients with LBP and radiculopathy suggests alterations in neuromuscular control, potentially due to pain-related changes in muscle activation patterns and spinal biomechanics. Persistent muscle activity during full flexion may reflect a protective mechanism to stabilize the spine and prevent further injury, but it also indicates impaired relaxation and increased muscle fatigue. The findings of this study have important implications for the diagnosis and treatment of LBP and radiculopathy. The presence or absence of the FRP can serve as a diagnostic marker to identify patients with altered neuromuscular control and guide treatment decisions. Interventions aimed at restoring normal muscle activation patterns, such as targeted physical therapy and neuromuscular training, may improve clinical outcomes by reducing pain and enhancing functional recovery. This cross-sectional investigation highlights significant disparities in the flexion-relaxation phenomenon between patients with low back pain and radiculopathy and healthy controls. The absence or alteration of the FRP in these patients underscores the complex interplay between pain, neuromuscular control, and spinal biomechanics. Understanding these relationships is crucial for developing effective diagnostic and therapeutic strategies to manage LBP and radiculopathy. Future research should focus on longitudinal studies to explore the causal relationships and evaluate the efficacy of targeted interventions aimed at restoring normal neuromuscular function.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Memtsoudis, Stavros G., Crispiana Cozowicz, Janis Bekeris and Dace Bekere, et al. "Peripheral nerve block anesthesia/analgesia for patients undergoing primary hip and knee arthroplasty: Recommendations from the International Consensus on Anesthesia-Related Outcomes after Surgery (ICAROS) group based on a systematic review and meta-analysis of current literature." *Reg Anesth Pain Med* 46 (2021): 971-985.

*Address for Correspondence: Marijan Dean, Department of Physiotherapy, Faculty of Health Studies, University of Rijeka, 51000 Rijeka, Croatia, E-mail: deanm@gmail.com

Copyright: © 2024 Dean M. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Received: 27 March 2024, Manuscript No. jsp-24-135930; Editor assigned: 30 March 2024, PreQC No. P-135930; Reviewed: 15 April 2024, QC No. Q-135930; Revised: 20 April 2024, Manuscript No. R-135930; Published: 29 April 2024, DOI: 10.37421/2795-7939.2024.13.658

2. Panzenbeck, Paul, Arvind von Keudell, Girish P. Joshi and Claire X. Xu, et al. "Procedure-specific acute pain trajectory after elective total hip arthroplasty: Systematic review and data synthesis." *Br J Anaesth* 127 (2021): 110-132.
3. Bober, Kamil, Allen Kadado, Michael Charters and Ayooluwa Ayoola, et al. "Pain control after total hip arthroplasty: A randomized controlled trial determining efficacy of fascia iliaca compartment blocks in the immediate postoperative period." *J Arthroplast* 35 (2020): S241-S245.
4. Karlsen, Anders Peder Højer, Anja Geisler, Pernille Lykke Petersen and Ole Mathiesen, et al. Dahl. "Postoperative pain treatment after total hip arthroplasty: A systematic review." *Pain* 156 (2015): 8-30.
5. Wainwright, Thomas W., Mike Gill, David A. McDonald and Robert G. Middleton, et al. "Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: Enhanced Recovery After Surgery (ERAS®) society recommendations." *Acta Orthop* 91 (2020): 3-19.

How to cite this article: Dean, Marijan. "Flexion-Relaxation Phenomenon in Patients with Low Back Pain and Radiculopathy: A Cross-Sectional Investigation." *J Spine* 13 (2024): 658.