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Effect of global spinal postural correction on pain and functional outcome in patients with lumbar radiculopathy: A Narrative Review

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Abstract:

Background: Normalization of global body alignment has gained attention as an effective therapeutic intervention for spinal disorders. Recently, there has been growing interest in its mechanical impact in lumbar spine disorders.

Purpose: This review aims to investigate the current evidence on the effect of global postural correction on pain and function in patients with lumbar radiculopathy.

Methods: A comprehensive search of Science Direct, PubMed, and Google Scholar was conducted using keywords such as lumbar radiculopathy, forward head posture, excessive thoracic kyphosis, abnormal lumbar lordosis and total body alignment. Articles published from January 2015 to January 2025 were included, search for literature was limited to English language works. while oral presentations, conference papers, unpublished articles, and abstracts from smaller scientific investigations were excluded.

Results: The review supported that normalizing the total body posture combined with conventional rehabilitation and core stability exercises has the potential to reduce pain and enhance function in patients with lumbar radiculopathy. However more studies are needed confirm these findings.

Conclusion: Normalizing total body posture holds promise as an active therapeutic intervention for reducing pain and enhance function in cases of lumbar radiculopathy.

Key words: Lumbar radiculopathy, Spinal Postural correction, Functional outcome.

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Introduction:

Lumbosacral radiculopathy linked to disc herniation or herniation of the nucleus pulposus (HNP) represents a prevalent clinical issue, significantly correlated with prolonged recovery, ongoing disability, and heightened healthcare utilization and expenses. The prevalence of radiating leg pain ranges from 1% to about 40%, significantly contributing to the financial burden associated with general low back pain, which increases healthcare and economic costs by approximately two-thirds. [4]

Integrating a knowledge of a patient's localized pathology such as disc herniation as a contributing factor to lower back pain (LBP) whereas considering the impact of changed regional and full-spine alignment and biomechanics on the patient's condition present a challenge for clinicians. This leads to emerge a complete framework for comprehending this complicated link, thereby clearly illustrating the interaction between tissue disease and spinal dysfunction. [7]

According to the findings of several studies, a change in trunk posture and hypolordotic alignment of the lumbar spine are significant etiological variables that contribute to the development of low back pain (LBP) and are related with its existence.[8,9]

Over the last ten years, Scheer, et al, (2016) and Elsayed & Alowa, (2024) have shown that whole-body pain and impairment, including lower back discomfort and associated disorders, is much influenced by cervical and thoracic posture. However, It is still unclear whether this interaction is essentially mechanical in character. Studies reveal that numerous neurophysiological reactions connected to upright posture are confined in cervical and thoracic areas. Correcting cervical spine misalignment seems to be necessary for obtaining ideal full-spine postural correction, in which case the rest of the spine lines top-down.[10,17]

Overview of lumbosacral radiculopathy:

Most symptoms of lumbosacral radiculopathy occur due to mechanical or inflammatory issues. Patients usually complaint of back pain associated with leg pain in the form of numbness, tingling and motor weakness in specific dermatome according to the nerve root affected.[12]

Degenerative disorders are primary cause of lumbosacral radiculopathy, in which the intervertebral disc suspected to fissuring or tearing. This may cause bulging of disc material beyond the boundaries of disc space. Because posterolateral annulus fibrosis is weaker than the posterior longitudinal ligament, the posterolateral aspect is the common direction of herniation.[13] There are many other causes of lumbosacral radiculopathy such as inflammatory, viral, or neoplastic conditions.[13]

Effect of dorsal spine abnormality on lumbar spine:

Changes in thoracic spine curvature may have major effects on lumbar spine biomechanics, which is why lumbar radiculopathy develops mostly in this direction. Whether increased kyphosis or decreased curvature, deviations from normal thoracic curvature cause compensatory adjustments in lumbar lordosis. For example, a higher thoracic kyphosis usually causes an extended lumbar lordotic curve that distorts mechanical stresses over the lumbar vertebrae and intervertebral discs. These biomechanical changes might cause focused stress on posterior structures like the facet joints and ligamentum flavum, therefore perhaps restricting neural foramina and subjecting nerve roots to compression. On the other hand, a decrease in thoracic curvature might cause lumbar lordosis to drop, thereby moving the load anteriorly and raising disc pressure and so aggravating the risk of radiculopathy.[5] Besides these biomechanical elements, changed thoracic posture influences neuromuscular control and proprioception across the spine. Changes in thoracic curvature set off compensatory processes that affect not just the force distribution but also the coordinated action of paraspinal muscles, therefore leading to muscular imbalances and changed movement patterns. Such disturbances hasten degenerative processes and compromise spinal stability even further, therefore aggravating the burden on spinal components. Therefore, a thorough knowledge of the interaction between thoracic alignment and lumbar biomechanics is crucial as it may direct the creation of more complete and successful treatment approaches restoring normal spinal function and avoiding lower back disorders.[1,2]

Effect of change of cervical alignment on lumbar spine:

Recent research has demonstrated that pain and impairments throughout the body, including lower back pain (LBP), can be influenced by head and neck alignment. Nevertheless, it is still uncertain whether this is due to mechanical effect or not.[18] Changes in cervical alignment such as a forward head position or lack of normal cervical lordosis are increasingly recognized for their influence on general spinal biomechanics, which may indirectly lead to lumbar radiculopathy. Variations in cervical posture might upset global sagittal balance and call for compensatory changes down the spine. To maintain horizontal sight, a forward head position can, for example, require the thoracic and lumbar areas to adjust by increasing lumbar lordosis or changing pelvic tilt. Such compensatory processes might cause unequal load distribution throughout the lumbar vertebrae and intervertebral discs, therefore increasing mechanical stress on these structures and subjecting nerve roots to compression.[3]

New biomechanical and observational research confirm the idea that lumbar spine strain might be influenced by cervical misalignment. Research on full-spine alignment indicates that the compensatory shifts resulting from cervical misalignment play a major role in general spinal function, although direct clinical evidence linking cervical alignment changes solely to lumbar radiculopathy is limited compared to studies on thoracic curvature. Studies looking at global sagittal balance, for instance, have shown links between cervical malalignment and elevated lumbar hyperlordosis, therefore increasing the likelihood of nerve impingement. These results highlight the importance of a thorough, whole-spine assessment in patients with radiculopathic symptoms as correcting cervical alignment issues might be a necessary component of complete treatment plans concerning lower lumbar nerve compression.[6]

Clinical evidence of importance of total spinal correction in lumbar radiculopathy:

Teo, et al., (2020) and Moustafa & Diab, (2015) have conducted studies providing understanding of how spinal correction affects lumbar spine mechanics, and showed that normalizing cervical curvature results in a more equal distribution of stress across thoracic vertebrae and intervertebral discs which may impact overall spinal balance, this uniform distribution of mechanical stresses lowers localized overload, a recognized factor causing nerve root compression. Cervical alignment correction into complete treatment plans for lumbosacral radiculopathy.[11,6]

Moustafa, et al., (2022) also found that the participants receiving Denneroll traction experienced significant improvements in cervical lordosis and forward head posture, which positively impacted 3D posture parameters, leg and back pain scores, and neurophysiological measures. While both groups showed similar improvements in pain and disability at 10 weeks, only the study group maintained these benefits at the 6-month follow-up, indicating the importance of cervical alignment in treatment outcomes.[7]

Global body alignment plays a crucial role in the management of lumbar radiculopathy as it directly influences spinal health and nerve root compression. Proper alignment, characterized by a neutral pelvic tilt and optimal lumbar lordosis can alleviate symptoms by reducing stress on spinal nerve root.[14] Deviation in alignment, such as

in excessive lordosis or scoliosis can exacerbate pain[15]. Additonally, muscle imbalance can lead to poor posture and disturb spinal alignment so activating core muscles for postural awareness and the normal muscle balance if fundamental in lumbar radiculopathy intervention.[16] While the focus is often in lumbar lordosis and sagittal alignment, it is essential to consider the entire spinal alignment, including cervical and thoracic region, as they can compensate for changes in lumbar alignment. This comprehensive approach ensures better management of lumbar radiculopathy and improved patient outcomes.[3]

Conclusion:

Global postural correction of the spine shows promise in reducing impairments in patients with lumbar radiculopathy, however more studies are required to confirm these findings.

Disclosure statement:

No author has any financial interest or receive any financial benefits from this research.

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