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Effectiveness of Neural Mobilization on Functional Activity in Patients with Cervical Radiculopathy: Review Article

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ABSTRACT

Background: One of the most prevalent conditions affecting the cervical nerve root is cervical spine radiculopathy (CSR). Pain that radiates down one or both upper extremities in a pattern is the hallmark of CR. This discomfort is related to one or more cervical nerve roots being constricted or inflamed.

Objective: This review article aimed to determine the effectiveness of neural mobilization on neck disabilities in patients with CR.

Methods: We conducted a date-unrestricted search of the Cochrane Controlled Trials Register on Cervical radiculopathy, Neural mobilization (NM), Neurodynamics, Neural tension and Neural sliding. We used Science direct, PubMed, and Google database between September 2023 and the date of launch. The search for literature was limited to English language works. Dissertations, oral presentations, conference papers, unpublished articles, and abstracts from smaller scientific investigations were excluded.

Conclusions: This review supported neural mobilization, which decreases pain, improves neck impairments, and promotes cervical ROM in individuals with CR. Additional clinical studies are required to support the therapeutic impact of this strategy.

Keywords Cervical radiculopathy, Neural mobilization, Neurodynamics, Neural Tension, Neural sliding.

INTRODUCTION

Pain that travels along a particular cervical nerve root distribution is known as cervical radiculopathy (CR). Cervical spondylosis, disc herniation, or a combination of the two are frequently the causes. "Radiculopathy" denotes a discomfort caused by inflammation or compression of the nerve roots [(1)].

The C6 (66%) and C7 (62%) levels are most usually affected by primary instances of CR, with C2 (1.5%) and T1 (4.9%) being the least frequently affected levels. According to Kim *et al.* (2016), the distribution of impacted levels is similar in males and females. CSR prevalence estimates range from 1.2 to 5.8 per 1000 people [(2)].

The most typical signs of cervical degenerative radiculopathy include paresthesia or numbness along the dermatomal distributions of the afflicted nerve root, as well as neck discomfort and muscular spasms. These feelings might radiate to the upper arm from the shoulder or upper back [(3)].

The precise nerve root level afflicted determines the location and symptom pattern of CR. It appears as sensory complaints in the upper limb, including tingling, discomfort, and numbness. There may also be motor signs, such as weakness in the muscles. Reflex activity might also be decreased. Significant functional restrictions and impairment are frequently the result of these symptoms [(4)].

CR is managed using both conservative and surgical techniques. Physical therapy or immobilization with a rigid collar may provide longer-lasting, more effective pain relief than surgery, according to low-quality research. On the other hand, the long-term results seem to be modest to nonexistent [(5)].

In CR, the key concern is to take pressure off the nerve root and improve its blood flow and oxygenation" [(6)]. Physical therapy rehabilitation regimens for CR frequently include manual and mechanical traction, posture guidance and education, exercises, and manual therapy that targets the cervical spine. Combining these methods has shown to be effective in lowering functional impairment, enhancing joint mobility, and reducing discomfort. Mobilizations, manipulations, and NM are examples of manual therapy procedures that may be used to treat CR as well as an assessment tool. These methods improve blood flow and flexibility, which may reduce discomfort [(7)].

Pathophysiology of injured nerves

When the pain system is damaged, aberrant neuronal discharge from locations other than the sensory ends causes neuropathic pain. Compressive and tensile, or shear forces that obstruct axoplasmic flow and intraneural circulation appear to first cause ischemia and reduced function [(8)]. Changes in the neurophysiology and motility of peripheral nerves usually result in neural dysfunction [(9)]. These alterations may result in mechanosensitivity, or the nerve's increased sensitivity to touch and movement, which can cause discomfort when moving or holding a protracted position [(10)].

Neural mobilization (NM)

A sequence of active and passive therapeutic motions is used in NM, a treatment for nerve entrapment disorders, with the goal of restoring the normal mechanical

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function of nerves. For CR, neuromobilization is a therapeutic intervention and assessment technique [11].

NM techniques comprise a certain set of joint motions that the therapist does. The purpose of these motions is to lengthen the nerve at one joint and shorten it at another. The objective is to cause brain structures, also known as sliders or gliding techniques, to glide in relation to neighboring tissues. A further tactic that is a little more forceful is an oscillating tensioning method that lengthens the space between the nerve tract's ends. Other techniques, such as dynamic and static motions that open the bone and fascial interface (e.g., lateral glides), also produce an opening action around the nerve root [6, 12].

It helps relieve pain by improving nerve suppleness, lowering dynamic sensitivity of the nervous system, and boosting blood flow. Furthermore, increased joint mobility improves dynamic range of motion (ROM) and increases the neural system's capacity to adapt to resistance-free movement [7, 13].

By restoring a dynamic equilibrium between the movement of brain tissue and its mechanical surfaces, the use of NM methods reduces clinical symptoms through a variety of consequences. Blood flow and nerve transmission are restored as a major outcome of these procedures. NM aids in the reduction of intraneural edema by encouraging the dispersion of intraneural fluid, which leads to enhanced, maintained, or restored nerve functioning [14]. Impaired axoplasmic flow helps to reduce sensory and motor deficiencies in the afflicted limb, which reduces symptoms including tingling, numbness, weakness, and tense muscles [15]. Furthermore, NM has been promoted as a practical choice for pain management [14, 15, 16].

Mechanisms of NM

In patients with CR, neural mobilization techniques (NMTs) are frequently used to restore the normal shape and function of the cervical nerve roots by encouraging nerve gliding, lowering neural mechanosensitivity, and decreasing nerve adhesion [16].

Thermal quantitative sensory testing on asymptomatic participants revealed an instantaneous hypoalgesic effect on C-fiber-mediated pain when applying a particular tensioning method to the median nerve, as reported by **Beneciuk *et al.*** [17]. The authors hypothesised that inhibition at the dorsal horn may be the mechanism by which NM lessens heat discomfort.

By altering the movement type and sequence, several iterations of the Upper Limb Tension Test (ULTT) specifically target different upper limb nerves. ULTT2b examines the radial nerve, ULTT3 concentrates on the ulnar nerve, while ULTT1 and ULTT2a test the median nerve [16].

Application of NM in CR:

Langevin *et al.* [18] performed a randomized clinical study in which 36 patients with CR were randomized to one of two groups. The cervical mobilization techniques (lateral glide, F rotation away from discomfort, and other techniques that target the opening of the intervertebral foramina) were administered to the intervention group in addition to stability and mobility exercises. Over the course of four weeks, the control group received cervical and thoracic mobilizations, mobility exercises, and stabilization. The degree of discomfort in patients who got NMs was significantly reduced.

A slider NMT was administered to the median nerve in a patient with CR while cervical traction was being performed, as documented in a case report by **Savva and Giakas** [19]. The patient reported improvements in pain and functional activities, as well as all end measures, after 12 sessions over the course of a month.

In the research conducted by **Savva *et al.*** [20], 42 patients with unilateral CR were randomly assigned into two groups: The study group, which underwent simultaneous intermittent cervical traction (ICT) with NM (slider NMs with median nerve), and the control group, which received no therapy at all. Twelve therapy sessions (three sessions each week for four weeks, lasting fifteen minutes each). The findings showed that improvements in pain, function, disability, grip strength, and cervical range of motion were shown when NM and ICT were applied together.

In a randomized experiment, **Ragonese** [21] evaluated therapeutic exercise (deep neck flexor, trapezius, and serratus anterior strengthening) vs manual treatment (cervical lateral glides, nerve glides, and thoracic mobilizations) or a combination of both in 30 patients with CR. When NMs were used in addition to therapeutic activities, the results demonstrated an additive impact on pain.

Coppieters *et al.* [22] conducted a randomized clinical experiment in which twenty patients suffering from peripheral neurogenic cervicobrachial pain were split into two groups and assigned to receive either ultrasonography or NMs (more precisely, lateral glides). All outcome variables included as range of motion (ROM) for elbow extension, distribution of symptoms, and degree of pain, significantly changed in patients treated with NMs.

In the research by **Allison *et al.*** [23] thirty patients suffering from cervicobrachial pain syndrome were divided into three groups at random: One group received manual therapy targeting the articular tissues of the thoracic spine and shoulder, the second group received NMT specifically lateral glides, and the third group received no treatment at all. In contrast to the other two groups, the NM group's pain scores were noticeably lower.

A multimodal strategy to therapy was used on 27 patients with CR in the research by **Murphy *et al.*** [24], which included traction, NM, and cervical manipulation. During the three-month follow-up, pain and disability were reported to have significantly improved in 25 out of 27 individuals.

CONCLUSION

The usage of NM may give additional benefits for CR patients. It can help CR sufferers reduce their pain, functional impairment, and cervical ROM. However, further clinical trials are needed to demonstrate the effectiveness of this combination strategy, particularly in terms of neck pain relief, disability reduction, and cervical range of motion improvement.

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