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The Effectiveness of Median Nerve Mobilization in Patients with Cervical Radiculopathy: A Systematic Review

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Abstract

As cervical radiculopathy incidence is on the increase, largely due to aging populations and lifestyle-related issues, its conservative management relies heavily on physiotherapy. Median nerve mobilization has emerged as a potential modality for pain reduction, improved functional outcomes, and enhancement of nerve mobility in patients with CR. The systematic review considered the literature published between 2014 and 2025, including 10 high-quality studies, which comprised randomized controlled trials, systematic reviews, and one case report, that evaluated MNM alone or in combination with either conventional physiotherapy or cervical traction. Commonly, findings revealed that MNM provided a valuable addition to the standard modalities of treatment, providing significant improvements in pain reduction, cervical range of motion, muscle endurance, disability scores, and overall functional outcome, while demonstrating better tolerance and fewer side effects than pharmacological intervention. In general, MNM appears to be safe, non-invasive, and effective in the conservative management of cervical radiculopathy, adding to functional independence and quality of life, although large-scale, well-standardized trials are needed to determine long-term effectiveness and the optimization of treatment packages.

Keywords

Cervical radiculopathy, median nerve mobilization, nerve mobility, pain management

Introduction

Cervical Radiculopathy (CR) is a musculoskeletal and neurological ailment caused by the compression or inflammation of cervical nerve roots, characterized by neck pain radiating to the arm along with sensory disturbances, motor deficits, and altered reflexes depending on the involved root (Yıldırım et al., 2024; Rafiq et al., 2022). The C6 and C7 nerve roots are most commonly involved, often creating dermatomal tingling, numbness, and weakness (Rafiq et al., 2022; Corey et al., 2014). Most of the time, CR is a result of cervical disc herniation and osteophyte

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formation; however, trauma, poor posture, degenerative disc disease, and other space-occupying lesions could also be a cause (Yıldırım et al., 2024; Rafiq et al., 2022; Shenai et al., 2018). Diagnosis is mainly clinical; MRI is considered the gold standard (Shenai et al., 2018; Rodríguez Sanz et al., 2018). Spurling's test, ULNT1, distraction test, and cervical rotation tests are physical tests that may help further in identifying neural involvement, especially in settings where imaging is not easily available (Rafiq et al., 2022; Shenai et al., 2018). In such assessments, the median nerve is often tested to determine the severity and location of neural irritation.

The growing prevalence of CR runs parallel to the increasing burden of neck pain worldwide, which can be attributed to several factors, including aging population and lifestyle-related elements (López-Pardo et al., 2024). Surgical treatments are usually indicated for severe or resistant diseases since generally similar results can be achieved with conservative management but with fewer complications (Yıldırım et al., 2024). Non-surgical treatments being widely used include physiotherapy, manual therapy, cervical traction, and pharmacological interventions, along with supplementary modalities like TENS, cryotherapy, ultrasound, and infrared therapy (Yıldırım et al., 2024). Neural mobilization has been increasingly regarded as one of the possible methods to re-establish normal neurodynamics in CR patients (Calvo-Lobo et al., 2018). Of particular interest, median nerve mobilization appears to be important due to the mediastinal connections between the median nerve and the C5–T1 roots of the cervicobrachial pathway.

The MNM techniques, which commonly include sliding or tensioning maneuvers, try to enhance neural mobility, decrease intraneural pressure, facilitate blood flow, and disperse inflammatory mediators to improve conduction and alleviate symptoms (Rafiq et al., 2022). Rodríguez Sanz et al., (2018) and Rafiq et al., (2022) have reported limitations to clinical standardization due to inconsistencies in dosage, frequency, and treatment duration. The existing evidence is tentative because many studies have small sample sizes or heterogeneous patients and are not isolated effects of MNM but combined with other therapeutic modalities. As reported by Rafiq et al. (2022) and Calvo-Lobo et al. (2018), several studies suggest that incorporating MNM into a multimodal physiotherapy program results in improvement in pain, cervical mobility, and upper-limb function. However, the independent effectiveness of MNM remains unclear. This review, therefore, tries to critically synthesize the current evidence, outlines the existing gaps, and establishes the clinical importance of median nerve mobilization in the conservative management of cervical radiculopathy.

Methodology

This review followed a systematic process to identify, appraise, and synthesize evidence regarding the effectiveness of median nerve mobilization in patients with cervical radiculopathy. A structured search strategy was developed to ensure comprehensive retrieval of relevant literature. The electronic search was conducted through the PubMed and Google Scholar databases; therefore, the search focus was limited to literature between 2014 and 2025. Key terms included "neural mobilization," "median nerve," and "cervical radiculopathy," coupled with their respective Medical Subject Headings (MeSH) terms. Boolean operators ("AND," "OR," "NOT") were utilized during the search to narrow or broaden the results for maximum identification of eligible studies. Filters were used to limit results to peer-reviewed articles.

All retrieved titles and abstracts were screened for relevance, followed by full-text review for eligibility. The inclusion criteria involved randomized controlled trials, systematic reviews, meta-analyses, and comparative studies that assessed the effects of neural or median nerve mobilization in patients with cervical radiculopathy. Studies conducted between 2014 and 2025, and whose full text was published in English, were included. Exclusion criteria included unavailability of full text, studies that did not address specifically neural mobilization in cervical radiculopathy, or studies that did not meet the threshold for methodological quality. Articles with less than 50% of the total score on their respective critical appraisal tools were excluded.

Quality appraisal was carried out using validated instruments. Randomized controlled trials were assessed using the Physiotherapy Evidence Database scale, which evaluates internal validity and statistical reporting. The CASP checklists were used to appraise systematic reviews, meta-analyses, and comparative studies. Only those studies that presented acceptable methodological standards were included in the study. Secondary searching was also done by reviewing including article reference lists for other relevant studies. Study selection was done according to the PRISMA guidelines. After duplicates were removed from records obtained from database searches, the titles and abstracts were reviewed for relevance. The obtained full-text articles were then screened against the eligibility criteria established for this review, with their reasons for exclusion noted. The final pool comprised those that met the inclusion criteria and were deemed to have appropriate methodological rigor, as evidenced by their critical appraisal scores. The citations of eligible studies were managed in a reference management system to assist in structured analysis and synthesis.

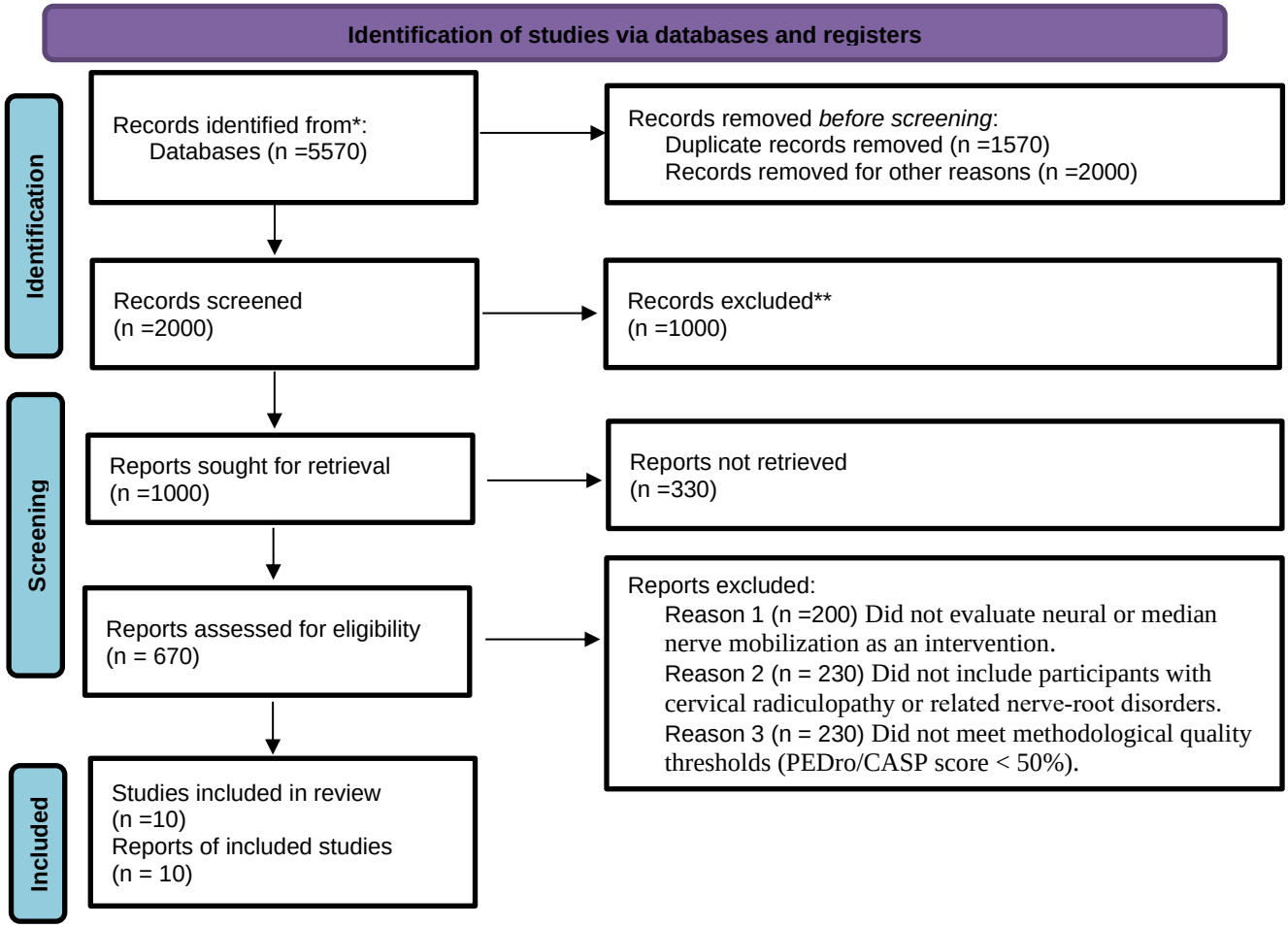

Figure 1. PRISMA Flowchart for Synthesize Evidence

Table 1. Review of Literature

Study	Objective	Methods	Key Findings	Critical Appraisal
Yıldırım et al. (2024)	To examine the immediate effects of neural mobilization in cervical radiculopathy.	RCT with 44 participants divided into control and experimental groups.	Neural mobilization improved pain descriptors and pinch grip strength more than physiotherapy alone.	Strong short-term benefits; long-term effects unknown.
López-Pardo et al. (2024)	To compare physiotherapy with and without neural mobilization in chronic neck disorders.	Systematic review and meta-analysis.	Improved ROM; inconsistent effects on pain.	Moderate evidence; heterogeneity and small samples reduce interpretability.
Rafiq et al. (2022a)	To evaluate neural mobilization + cervical strengthening.	RCT comparing strengthening alone vs. strengthening + NM.	Greater improvements in pain and disability.	Supports multimodal therapy; small sample size.
Rafiq et al. (2022b)	To compare multimodal conservative therapy with conventional therapy.	RCT comparing NM + isometrics vs. conventional PT.	Improved pain, endurance, and quality of life.	Cannot isolate NM effect; methodological limitations.
Thoomes et al. (2021)	To investigate median nerve excursion in CR patients.	Case-control ultrasound study.	Nerve excursion improved after treatment; correlated with symptom improvement.	Mechanistic support; small sample size.
Shenai et al. (2018)	To report combined CR and median nerve schwannoma case.	Case report of a 73-year-old.	Staged surgery resolved symptoms.	Not generalizable; highlights diagnostic value.
Calvo-Lobo et al. (2018)	To compare ibuprofen vs. median nerve mobilization.	RCT comparing NM and medication.	Ibuprofen relieved pain faster; NM had fewer side effects.	Short-term advantage for medication; NM safer.

Kim et al. (2017)	To assess NM added to manual cervical traction.	8-week RCT comparing MCT vs. MCT + NM.	Better pain, ROM, and endurance improvements in NM group.	Supports integrated approach; needs larger trials.
Rodriguez-Sanz et al. (2017)	To compare NM with oral ibuprofen for cervicobrachial pain.	RCT measuring pain and ROM outcomes.	NM improved ROM; ibuprofen reduced pain more but with side effects.	NM a viable non-drug option; limited follow-up.
Corey et al. (2014)	To summarize mechanisms and presentation of CR.	Narrative review.	Identified common root levels and mechanisms.	Background only; not treatment-focused.

Results

A total of ten studies were included in the review, including seven randomized controlled trials, two systematic reviews with meta-analysis, and one case report. Results generally showed that MNM, alone or combined with conventional physiotherapy, yielded favorable short-term effects in patients with cervical radiculopathy. Various trials demonstrated improvements in pain intensity, cervical range of motion, upper-limb function, and muscular endurance, particularly by incorporating MNM in a multimodal treatment approach. Systematic reviews supplemented these findings but mentioned that methodology and treatment varied between studies. Studies comparing MNM with pharmacological treatment demonstrated that medication provided pain reduction more quickly but that MNM enabled functional improvements and resulted in fewer adverse effects than medication. Mechanistic evidence from ultrasound-based assessments supported improved neural excursion after MNM. Overall, results point toward MNM as effective in improving neurodynamic mobility and functional outcomes, although its effectiveness for long-term use remains uncertain.

Discussion

This review intended to synthesize evidence of various study designs on the effectiveness of median nerve mobilization in the management of cervical radiculopathy. The results indicate a consistent pattern that MNM contributes meaningfully to symptom reduction and functional restoration, particularly when incorporated as part of a comprehensive physiotherapy regimen. Many randomized controlled trials reported superior results from the addition of MNM to exercises for cervical strengthening, manual traction, or conventional physiotherapy over standard care alone. Improvements were reflected in reductions in pain and disability indices, enhanced cervical range of motion, and improved function of the upper limb. Such findings are supported by several theoretical frameworks suggesting that neurodynamic dysfunction contributes to symptoms of radiculopathy and that restoring neural mobility can reduce mechanosensitivity and promote normal physiological function.

Individual trial findings are reinforced by these systematic reviews included in this analysis but at the same time point to heterogeneity in existing research. The heterogeneity in pain outcomes, especially found in López-Pardo et al. (2024), might be explained by differences in the dosage of the intervention, chronicity of symptoms, and patient characteristics. Whereas some studies clearly showed pain improvements, others mainly presented functional improvements. This variability points to the importance of an individualized clinical approach and could suggest that MNM might be more effective in particular phenotypes, such as neurodynamic ones rather than patients where symptoms have a mainly nociceptive or inflammatory origin.

A key common theme among the individual studies involves the safety profile of MNM. Interventions were well tolerated, with no reported adverse events, which strengthens the case for integrating MNM as a conservative treatment option. This is furthered with comparisons to oral ibuprofen, highlighting that MNM can provide measurable improvements without medication-related side effects. For patients unable or unwilling to use pharmacological agents, MNM may be a useful alternative or adjunctive therapy. Supportive mechanistic findings, such as those by Thoomes et al. (2021), illustrate the physiological basis of MNM, by measuring improved median nerve excursion following treatments. Objective improvements that correlate with reductions in pain and enhancements in function provide credibility to the biological plausibility of neurodynamic interventions.

Despite the encouraging findings, several limitations need to be recognized in the literature. There was a high level of methodological variability between studies regarding MNM technique, frequency, duration, and progression criteria. Such inconsistency makes direct comparison difficult and limits the extent to which standardized clinical guidelines can be developed. Most trials were small in sample size, conducted in single clinical centers, and lacked long-term follow-up, thereby limiting the generalizability of findings. Furthermore, many studies included MNM as part of multimodal treatment programs, and clear isolation of its independent effects was not possible. Whereas multimodal care better reflects clinical reality, it introduces complicating variables and masks the single contribution that MNM may make to the improvement of the patient.

From a clinical perspective, evidence supports the inclusion of MNM in physiotherapy treatment plans for cervical radiculopathy, particularly when combined with strengthening or traction for the cervical spine. The intervention seems most beneficial for neurodynamic tension reduction and nerve mobility improvements, which might help improve pain and function. Considering MNM's low risk and non-invasive nature, it would be suitable for a wide range of patients, even those sensitive to pharmacological treatments. However, clinicians should consider symptoms' irritability when individualizing MNM techniques and avoid aggressive tensioning in sensitive patients. Future studies should focus on the establishment of standardized MNM protocols to improve reproducibility and facilitate clinical use. Long-term follow-up in large, multicenter randomized controlled trials is required to determine if short-term benefits are sustained. The isolated effects of MNM need to be compared in future studies to other single-modality interventions. The inclusion of objective outcome measures, such as nerve excursion imaging or electrophysiological assessments, may further elucidate the mechanism of action of MNM. Clinical guidelines based on best evidence will require methodological designs that address these shortcomings.

Conclusion

From the current evidence, median nerve mobilization appears to be a safe, effective, and non-invasive intervention for the conservative management of cervical radiculopathy. In the reviewed studies, it consistently reduces pain, enhances functional capacity, and improves neurodynamic mobility, all of which contribute to an overall improvement in quality of life among affected individuals. Its therapeutic value is further enhanced when incorporated into multimodal rehabilitation approaches that complement cervical strengthening, traction, and manual therapy techniques. Although short-term results are encouraging, the long-term effectiveness of the treatment and uniform treatment protocols remain poorly researched. Future research of high quality is needed to refine dosing parameters, establish clinical guidelines, and report on long-term effectiveness of treatments over time. Nonetheless, median nerve mobilization represents a clinically valuable component of physiotherapy practice for patients with cervical radiculopathy.

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