

## Effectiveness of neuro mobilisation on pain, range of motion, muscle endurance and disability in cervical radiculopathy: A systematic review

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### Abstract

**Objective:** To assess the effects of the neural mobilisation technique on mobility, pain and disability in cervical radiculopathy patients, and to assess the functional activity level

**Method:** The systematic review was conducted from January 5 to July 5, 2022, and comprised search on Medline, PEDro, Cochrane Library and Embase databases for randomised controlled trials involving patients diagnosed with cervical radiculopathy that were published in the preceding 10 years in the English language. The search terms were divided into four classes by using the guideline for systematic reviews of trials of interventions in the Cochrane neck and back groups and related spinal disorders. Data was retrieved after the studies were subjected to quality assessment and risk of biasness.

**Result:** Of the 1563 studies initially found, 8 (0.51%) were reviewed. No matter the approach or dosage used, manual therapy was successful in treating cervical radiculopathy symptoms in all investigations.

**Conclusion:** A multimodal strategy incorporating neural mobilisation appears to be the most successful short-term technique.

**Keywords:** Cervical radiculopathy, Neural mobilisation, Muscle endurance. (JPMA 73: 1857; 2023)

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### Introduction

Cervical radiculopathy (CR) is a clinical condition that is usually caused by inflammation or damage to the cervical nerves.<sup>1</sup> It is usually caused by any trauma to the cervical spine, space-occupying lesions, disc herniation or disc compression, bone spurs, osteophytes, degenerative cervical spine leading to compression of the spinal nerves, and inflammation or impingement of nerve roots.<sup>2</sup> These changes can cause both sensory and motor changes, leading to tingling sensations, numbness, weakness of muscles, fragility in upper endpoints, and motor weakness in the neck and scapular region. Nociceptors can be triggered, causing pain along the pathway of the affected nerve roots, neck, shoulder, arm and hand.<sup>3</sup> Pain can radiate unilaterally or bilaterally, but bilateral pain radiation is reported to occur in only 5-36% of CR patients.<sup>4</sup>

The CR incidence is reported to be higher in males (107.3/100,000) compared to females (63.5/100,000).<sup>5</sup> The incidence is reported to increase with age; in the 5th decade of life, the incidence is observed to be as high as 203/100,000.<sup>6</sup>

Numerous diagnostic tests are used for the accurate CR diagnosis. Among all the diagnostic tests, magnetic resonance imaging (MRI) and electromyography (EMG) are

considered the gold standard, but these tests are not available in all clinical settings, and require referral to other centres, and, as such, several manual tests are conducted for an immediate CR diagnosis.<sup>7</sup>

Several techniques are used for CR treatment, including surgery, physiotherapy, rehabilitation strategies, cervical traction in combination with other conservative treatments, and multimodal treatment approaches, like traction, manual therapy and strengthening exercises.<sup>4</sup> Conservative management is effective in the initial stages of the disorder. These include physical therapy techniques, rehabilitation, multimodal treatments, cervical traction, and strengthening exercises.<sup>8</sup> However, evidence supporting non-operative conservative management for reducing pain and discomfort is weak.<sup>9</sup>

Mobilisation of the nerve is a technique used in several CR patients to treat neural impingements and compression caused by surrounding structures causing cervical pain, lumbar pain, carpal tunnel syndrome (CTS), lateral epicondylalgia and cervicobrachial pain.<sup>10</sup> Most commonly used neural mobilisation techniques include lateral translatory glides on the cervical spine to ensure the decompression of nerve roots caused by surrounding structures, degenerative changes, or spasms.<sup>11</sup> To mobilise the median nerve in CTS, fingers are positioned in several sequences to ensure the decompression of nerve in the flexor retinaculum and mobilisation. Yet additional investigations are required for endorsement of this neural mobilisation perception.<sup>12</sup>

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To date, several methods have been advised for CR treatments in literature, but the studies have generally lacked accurate efficiency due to unspecified inclusion and exclusion criteria, number of participants, the total number of sessions conducted, use of improper measurement techniques, and comparison of multiple studies.<sup>13</sup>

The current systematic review was planned to assess the effects of neural mobilisation technique on mobility, pain and disability in CR patients, and to assess the functional activity level of such patients.

## Materials and Methods

The systematic review was conducted from January 5 to July 5, 2022 in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement and the standards of the Cochrane Handbook for Systematic Reviews of Interventions.<sup>14</sup> Medline, PEDro, Cochrane Library and Embase databases were searched using a defined strategy (Table 1). The search terms were divided into four classes in line with the guideline for systematic reviews of trials of interventions in the Cochrane neck and back groups and related spinal disorders.<sup>15</sup> The first category included the study design (randomised controlled trial [RCT]), while the second and third categories include the pathology (CR) and neural mobilisation. In the fourth classification, it was further filtered into CR with any of the outcomes that included pain, range of motion (ROM), disability or endurance. To obtain the results, the search terms for all four classes were combined.

The studies included were RCTs published in the preceding 10 years in the English language. CR Diagnosis had to be based on clinical criteria, like having pain, numbness, tingling sensation, weakness, or through the Spurling's test.<sup>16</sup> The outcome measures included at least one of the

following: assessment of neural mobilisation, pain, ROM, muscle endurance and disability.<sup>17</sup>

Studies comprising any other than diagnosis than CR, and those using any treatment technique not related to physiotherapy were excluded.

The search was conducted independently by two researchers, and in case of disagreement, a third, more experienced, researcher was consulted.

Data was retrieved regarding sample size, CR diagnosis criteria, kind of intervention, treatment regimen, follow-up, variables investigated, and key findings. Primary outcomes, secondary results, and adverse effects were documented for all variables.

The methodological quality of the studies was rated by two researchers independently using the PEDro scale, and in case of doubts or disagreements, the third researcher was consulted.<sup>18</sup> The PEDro scale assesses 11 elements, assigning a score of 1 or 0 to each item based on whether it met or did not meet the requirement. Item 1 was used to evaluate external validity, while items 2-9 were used to evaluate internal validity, and items 10-11 were used to evaluate the results' interpretability.<sup>9</sup> Each article was categorised based on its score as 6 = "high quality", 4-5 = "moderate quality", and <4 = "poor quality". The Cochrane risk of bias-2 (RoB2) tool was also used,<sup>20</sup> which makes assessments across 5 domains: the randomisation procedure, the influence of intervention assignment, missing outcome data, outcome assessment, and reported outcomes. One or more questions must be answered for each domain. Based on the responses, RoB2 assigns "low", "moderate" or "high" risk of bias.<sup>21</sup>

## Results

Of the 1563 studies initially found, 8(0.51%) were reviewed (Figure 1). Of the total, 4(50%) studies had good overall quality score(22), 3(37.5%) had moderate score<sup>23</sup> and 1(12.5%) study received a low score<sup>24</sup> (Table 2). In 3(37.5%) studies, concealment of data and intention of treatments analysis were inadequate, 2(25%) studies did not have comparison with baseline values, adequate follow-up and variability, and 1(12.5%) study had no blinded assessor, while blinding was not done properly in the rest of the studies reviewed.

Methodological quality of the trials were assessed in detail (Figure 2A-B).

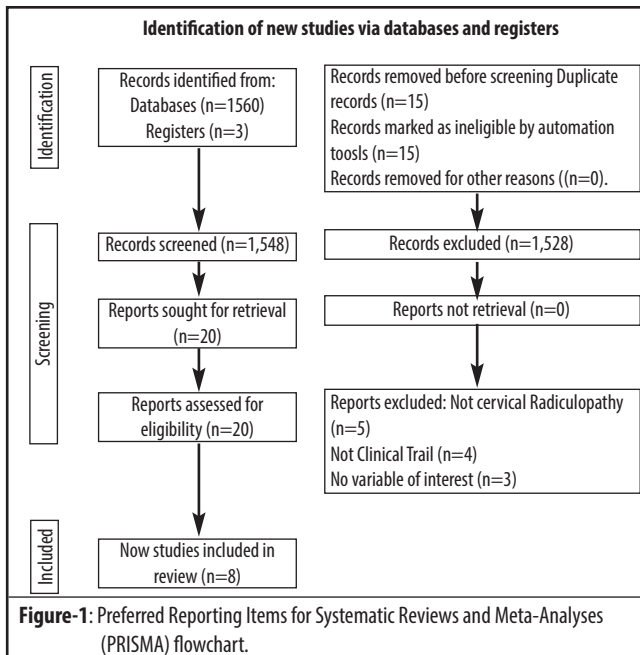
While 2(25%) studies did not mention the age of the subjects, the remaining 6(75%) studies comprised adults aged >18 years (Table 3).

**Table-1:** Search strategy.

### MeSH terms

- |     |   |
|-----|---|
| #14 | Search (cervical radiculopathy) AND neural mobilisation |
| #13 | Search (cervical radiculopathy) OR neural mobilisation  |
| #12 | Search (radiculopathy) AND neural mobilisation          |
| #11 | Search upper limb tension test                          |
| #10 | Search nerve mobility                                   |
| #9  | Search nerve mobilisation                               |
| #8  | Search neural mobilisation                              |
| #7  | Search cervical radiculopathy                           |
| #6  | Search (radiculopathy) AND randomised clinical trial    |
| #5  | Search (randomised clinical trial) AND radiculopathy    |
| #4  | Search radiculopathy                                    |
| #3  | Search control trial                                    |
| #2  | Search clinical trial                                   |
| #1  | Search randomised clinical trial                        |

MeSH: Medical subject headings.



Study	Risk of bias domains					Overall
	D1	D2	D3	D4	D5	
Basson 2020	+	+	+	+	+	+
Ayub 2019	+	+	-	-	+	-
Calvo 2018	-	+	+	+	+	+
Rodriguez-Sanz 2018	-	+	-	+	-	-
Sarfaraj 2018	+	+	+	+	+	+
Kim 2017	-	+	+	-	+	-
Savva2016	-	+	+	+	+	+
Anwar2015	+	X	X	X	X	X

Domains:  
 D1: Bias arising from the randomization process.  
 D2: Bias due to deviations from intended intervention.  
 D3: Bias due to missing outcome data.  
 D4: Bias in measurement of the outcome.  
 D5: Bias in selection of the reported result.

Judgement  
 X High  
 - Some concerns  
 + Low

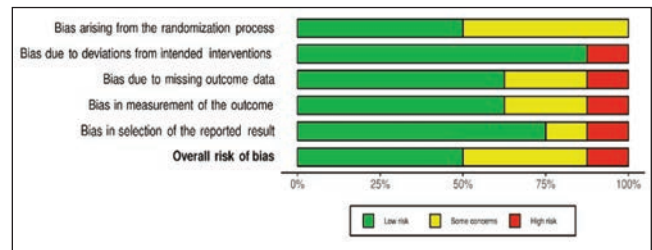
**Figure-2A:** Methodological quality of the studies as assessed using the Cochrane risk of bias-2 (RoB2) tool.

**Table-2:** Methodological quality of the studies using PEDro scale.

Study	1	2	3	4	5	6	7	8	9	10	Total	Quality
Basson 2020 <sup>22</sup>	↑	↑	↑	×	×	↑	↑	↑	↑	↑	8	High
Ayub 2019 <sup>23</sup>	↑	×	↑	×	×	↑	↑	×	↑	×	5	Moderate
Calvo 2018 <sup>25</sup>	↑	↑	↑	×	×	↑	×	↑	↑	↑	7	High
Rodriguez-Sanz 2018 <sup>27</sup>	↑	↑	×	×	×	↑	×	×	↑	↑	5	Moderate
Sarfaraj 2018 <sup>28</sup>	↑	↑	↑	×	×	↑	↑	↑	↑	↑	8	High
Kim 2017 <sup>29</sup>	↑	×	↑	×	×	×	×	↑	↑	↑	5	Moderate
Savva2016 <sup>26</sup>	↑	↑	↑	×	×	↑	↑	↑	↑	↑	8	High
Anwar2015 <sup>24</sup>	↑	×	×	×	×	×	×	×	↑	×	2	Low

**Discussion**

The current review was planned to see how efficient neural mobilisation is in treating CR patients for pain, ROM, endurance and disability. Previous research has shown a paucity of evidence to regarding the effect of neuronal



**Figure-2B:** Methodological quality of the studies as assessed using the Cochrane risk of bias-2 (RoB2) tool.

mobilisation on pain, ROM, endurance and disability in CR patients.<sup>24</sup> The efficiency of non-invasive treatment for cervicobrachial discomfort has previously been questioned, with ambiguous results.<sup>25</sup>

Only 2 studies used MRI to show probable structural nerve root damage, and none of the research used EMG or electroneurography (ENG) to evaluate nerve conduction changes.<sup>26</sup>

Because of the diagnostic criteria utilised, the studies reviewed contained individuals with symptoms that are comparable to radicular disorders, but were not actually instances of CR. Similar symptoms might be simulated by myofascial trigger points, faceted radiated pain, and distant neural compressions.

As primary factors, the three CR indicators specified by clinical recommendations were examined. Future research should cover the new functionalities as well. As a measurement variable, the current review used an impact scale designed particularly for CR. After witnessing the outcome of the methodical process, it is clear that a new definition is required. This review highlighted the necessity for reference criteria for diagnosing CR instances in order to avoid a blanket approach.

The current review has limitations as systematic evaluation was hampered owing to the variability of the inclusion

criteria and the neural mobilisation procedures utilised in the studies reviewed. As a result, it was difficult to examine the outcomes of each approach individually. Another constraint was that, in addition to the references in Spanish and French, there may be more references accessible that

**Table-3:** Characteristics of studies reviewed.

Author	n (Age)	Inclusion criteria	Intervention	Protocol	Outcomes	Results
Basson 2020 <sup>22</sup>	102 (>18 years)	Nerve related pain, contrary reactions to neurodynamic tests	<ul style="list-style-type: none"> <li>G1:- cervical + Thoracic mobilisation and exercise.</li> <li>G2:- Cervical + thoracic Mobilisation, Neural mobilisation, exercises.</li> </ul>	3th week, 6th week, 6th month and 12th month.	Pain, Function, Quality of Life.	Pain reduce, function ad quality of life improve
Ayub 2019 <sup>23</sup>	44 (30-50 years)	CR/neck ache for 6 months at least, with positive compression/ distraction/ Spurling/ upper limb tension test (ULTT)	<ul style="list-style-type: none"> <li>Group 1:- active upper limb (UL) neural mobilisation+ Cervical spine traction+ uni.pos.ant.glide</li> <li>Group B:- passive upper limb (UL) neural mobilisation+ Cervical spine traction+ uni.pos.ant.glide</li> </ul>	12 treatment session	Pain, range of motion, disability	Both group shows similar results.
Calvo 2018 <sup>25</sup>	105 (18-45 years)	Patient consent, with positive compression/ distraction/ Spurling/ upper limb tension test (ULTT), MRI reports, cervicobracial	<ul style="list-style-type: none"> <li>Group 1:- median nerve neural mobilisation.</li> <li>Group 2:- cervical lateral glide</li> <li>Group 3:- ibuprofen oral</li> </ul>	6th week treatment	Pain, physical function, range of motion.	Group 3 result better results as compared to other 2 groups.
Rodriguez-Sanz 2018 <sup>27</sup>	60 (18-65years)	Cervicobrachial MRI diagnosed, both gender, PT 2 year experience of median nerve neural mobilization (MNNM), with positive compression/ distraction/ Spurling/ upper limb tension test (ULTT), pain or numbness symptoms.	<ul style="list-style-type: none"> <li>Group 1:- Receive median nerve neural mobilisation.</li> <li>Group 2:- didn't receive any treatment.</li> </ul>	30 days follow up	Pain, range of motion and functionality	Group 1 participant show significant result for reducing pain and increasing ranges and functionality.
Sarfaraj 2018 <sup>28</sup>	30 (30-55years)	Radiating symptom(radiculopathy), age(mention already), both gender, non-surgically, symptoms more than 2months	<ul style="list-style-type: none"> <li>Group 1:- manual traction + median nerve neural mobilization (MNNM)</li> <li>Group 2:- mechanical traction+ median nerve neural mobilization (MNNM)</li> </ul>	15 days	Pain, range of motion	Both are equally effective
Kim 2017 <sup>29</sup>	30 (25-60years)	Diagnosed with CR, symptoms longer than 3 months, radiation pain, with positive compression/ distraction/ Spurling/ULTT	<ul style="list-style-type: none"> <li>Group 1:- neural mobilisation + manual cervical traction.</li> <li>Group B :- Manual cervical mobilisation</li> </ul>	8 weeks	Pain, range of motion, functionality, flexor endurance	Neural mobilisation show more effective result as compared to other group.
Savva2016 <sup>26</sup>	42 (age not mentioned)	Sensory/motor deficits, sharp pain, weakness of muscle and numbness, diagnosed cases of Cervical radiculopathy with MRI/ CT scan, with positive compression/ distraction/ Spurling/ upper limb tension (ULTT)	<ul style="list-style-type: none"> <li>Group 1:- neural mobilisation + cervical traction.</li> <li>Group 2:- prescribed medication/anti inflammatory</li> </ul>	12 treatment session	Pain, functionality, range of motion and grip strength	Neural mobilisation was effective in obtaining outcome measures.
Anwar2015 <sup>24</sup>	30 (age not mentioned)	Symptoms of radiculopathy	<ul style="list-style-type: none"> <li>Group 1:- cervical mobilisation + hot pack+ c. isometrics.</li> <li>Group 2 :- neural mobilisation + c.ismoetrics and hot pack</li> </ul>	6 months	Pain and functionality	Neural mobilisation was more effective as compared to cervical mobilisation.



were not examined owing to the language limitations set out in the inclusion criterion. Finally, in the absence of a Cochrane Information Expert, the reviewers had to make do with a specialist having 2-year experience who might not have been as effective as an expert would have been.

## Conclusion

A multimodal strategy that incorporates neural mobilisation treatment appeared to be the most successful short-term technique without EMG and ENG confirmation. The methodological flaws and lack of follow-up in research must be taken with caution. Studies with larger sample sizes and longer follow-ups are required to present high-quality scientific data.

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**Conflict of Interest:** None.

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