DOI: 10.7860/JCDR/2021/47436.15030

Review Article

Physiotherapy Section

Physiotherapeutic Intervention for Cervicobrachial Pain Syndrome: A Scoping Review

SHUBHRENDU SHEKHAR PANDEY[1], ASHISH ASHISH[2], ROYANA SINGH[3]

ABSTRACT

Introduction: Cervicobrachial Pain Syndrome (CBPS) is a disorder of enhanced mechanosensitivity to the neural structure, also known as lower cervical pain syndrome. Cervicobrachial pain is managed by manual and traditional therapy, besides medical management.

Aim: The aim of this scoping analysis was to determine the efficacy of the protocols for cervicobrachial syndrome treatment.

Materials and Methods: Until March 2020, initial literature searches were performed through robust online electronic databases such as "Scopus" "MEDLINE via PubMed, EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Web of Sciences and Cochrane Controlled Trials Register in Cochrane Library, Physiotherapy Evidence Database (PEDro), ProQuest 5000 International, ProQuest Health and Medical Complete, and following keywords were used "Neck Disability Index, "Upper Limb Tension test, "Goniometry "Neck pain," "Cervicobrachial Pain Syndrome," Thirty six studies were included in this scoping study using PRISMA guidelines.

Results: There is little evidence of manual and conventional physiotherapy treatment of cervicobrachial pain and its efficacy. Key advantages have been reported in manual therapy and exercises methods for pain relief and rehabilitation. Electrotherapeutic modalities, neck strengthening exercises, traction and methods for handling soft tissue are considered to be less effective in managing cervicobrachial pain syndrome relative to manual therapy. Lateral cervical glide and median nerve slider technique (neurodynamic) have useful effects as a treatment intervention in multiple cases of cervicobrachial pain syndrome, such as the median nerve slider technique and contra-lateral cervical glide technique. Recommendations for the management of cervicobrachial syndrome in practice should be encouraged in additional trials of innovative treatment methods.

Conclusion: Studies should identify which cervicobrachial pain respond to specific interventions for immediate and effective response so as to increase the quality of life of the patients. Further research with innovative techniques of therapeutic approach would facilitate practice guidelines for the management of cervicobrachial syndrome.

Keywords: Cervical radiculopathy, Lateral cervical glide technique, Neck isometric, Neural tissue, Neural tissue mobilisation, Neurodynamics, Provocative testing

INTRODUCTION

It is normal for patients to seek physiotherapy for neck and arm pain. Relatively younger patients are stated to be more affected and are found to be more debilitating than any symptom in neck or arm presenting alone and the cause of symptoms may be multiple in cervicobrachial pain syndrome. It is known as neurogenic cervicobrachial pain syndrome when inflamed neural tissues are reported as the primary source of symptoms [1,2]. Via a proper history, physical examination and medical investigations, the presence of various causes of cervical pain may be identified. The most likely diagnoses include visceral disorders, neuromusculoskeletal, psychosocial and occupation oriented disorder [3]. It is essential to rule out other possible causes like cardiovascular diseases, gastrointestinal and pulmonary diseases prior to initiation of therapeutic interventions [4]. Specific joint dysfunctions, myofascial imbalances, trigger points, neural tissues and disc derangements are also other possible sources which contribute to cervicobrachial pain [2]. Perpetuating factors such as cervical core muscle dysfunction, dynamic instabilities, altered movement patterns, oculomotor, proprioceptive dysfunctions, central pain hypersensitivity and psychosocial aspects need to be explored [5]. More than a single symptom may present itself at a time or there may also be a substantial overlap in the presentation of patterns. However, rigorous physical examination and clinical reasoning for the primary cause of the symptom can be assessed [6].

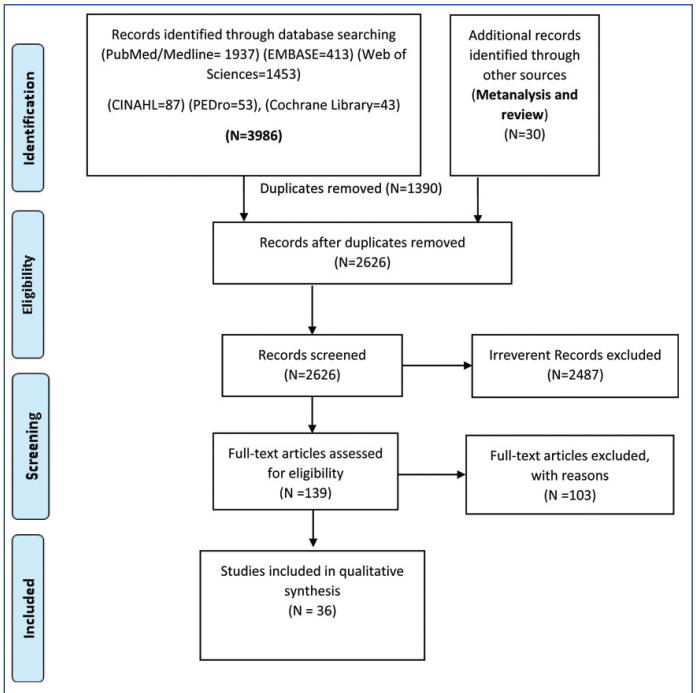
It is often mistaken as cervical radiculopathy. Cervical radiculopathy involves objective symptoms presenting in a segmental distribution with a combination of sensory and motor dysfunction [7]. Moreover, a complete evaluation of the neuro musculoskeletal system usually points to the absence of frank deficits in peripheral nervous system among patients with cervicobrachial pain presentations thus ruling out radiculopathy [8]. Possible sources for cervicobrachial pain are referred or radiating pain from dysfunctional tissue structures (non-somatic or somatic) such as visceral organs, facet joints, cervical discs, tender points and inflamed neural tissues or upper quarter muscular imbalances with the associated trigger factors [9]. Conservative management may lead to a recurrence when neural tissues are involved. On the other hand, therapies can improve the outcomes [10]. The neurodynamics approach refers to an attempt being made to restore the dynamic balance between the relative movement of neural tissues and the mechanical interfaces that surround, effectively minimising intrinsic pressures on neural tissues and thereby encouraging optimal physiological function [11]. Improved neurophysiological and neuromechanical functions of the peripheral nervous system are the presumed advantages of this technique. Addressing the interface dysfunctions may provide a better environment around the nerves and allow them to slide without undergoing undue strain [8]. Commonly implemented interface mobilisation techniques include Cervical Lateral Glide (CLG) and surrounding soft tissue mobilisation. Specific interface mobilisation was also advocated depending on identified dysfunction [12].

The aim of this scoping review and current literature was to explore different physiotherapeutic approaches and their relevance in recent developments for the treatment of CBPS.

MATERIALS AND METHODS

Search Strategy

This research was conducted using "Scopus" "MEDLINE via PubMed, EMBASE, CINAHL, Web of Sciences and Cochrane Controlled Trials Register in Cochrane Library, PEDro, ProQuest 5000 International, ProQuest Health and Medical Complete, and following keywords and text:" Neck Disability Index, "Upper Limb Tension test, "Goniometry "Neck pain," "Cervicobrachial Pain Syndrome," "Cervical radiculopathy," "Non specific neck and arm pain," "Cervical Radicular pain," "Cervical Radiculitis," "Epidemiology," "Prevalence," "Incidence," "Neurogenic," "CLG," "Neural Tissue Mobilisation," "Interferential Therapy," "Cervical traction," "Thermal agents," "Heat therapy," "Exercise," "Neurodynamics," "Numeric Pain Rating Score," "Neural tissue provocative," "testing," "Spurling's test," "Clinical Prediction Rule," "Neural Mechanosensitivity". Boolean operators: AND, OR and NOT with Truncation symbols: #, *,? Or! were used. Expanding these database search words, appropriate articles were chosen for a scoping examination, and literature analysis was further supplemented by search and reference articles provided by original researchers up to March 2020. A total of 36 studies were included in this scoping review (PRISMA 2020 guidelines) [13] outlined in [Table/Fig-1].



[Table/Fig-1]: Flow diagram, expanding and relevant search terms related articles were selected for a comprehensive scoping review.

Inclusion criteria: All cervicobrachial pain syndrome literature published in English without restrictions until March 2020, including guidelines/evaluations, clinical trials; basic science, epidemiological studies, and comments of constitutions and guidelines from various foreign organisations and government agencies were included in the study.

Exclusion criteria: The data that was untrusted and presented on third-party websites were excluded from the review.

STATISTICAL ANALYSIS

All the data was tabulated systematically. It was analysed for descriptive statistics for frequency and percentages.

RESULTS

Epidemiology

Cervicobrachial syndrome has been more common than neck pain in isolation. This disorder is prevalent in patients seeking care with physiotherapy for neck and arm pain [14]. Due to differences in meanings, methods, classification, population samples, and geographical locations, prevalence estimates have major variations [15]. In 32% of patients with cervicobrachial pain and discomfort over a 4.9 year period, Radhakrishnan K et al., observed recurrences [16]. Provocative factors were occupational works that involve rigid neck holding positions for a long period of time [17]. Appraisal of reviewed studies of moderate to good methodological quality is presented in [Table/Fig-2] [18-26].

Symptoms and Clinical Presentation

Symptoms may present with spontaneous onset as a deep aching or sharpshooting or bizarre or dysesthesia (abnormal sensation) or as gripping, toothache like irritating, burning, tingling sensation etc., [27]. These physical symptoms are antalgic posture, symptom reproduction on active and passive movements of the cervical spine, tender response to palpation of neural and associated cutaneous tissues, and evidence of related pathology [28].

Clinical Examination

Neural tissue provocative testing: Provocative neural tissue tests or neurodynamic test are a set of motions designed to determine the mechanics and physiological components of the nervous system. The arrangement of the nerve enables it to conduct movement and stretch in relation to the tissues that surround it. The test causes similar symptoms but differs from the unaffected side and can also distinguish central or peripheral neural structures and interconnecting structures that contact the nervous system

Author(s) year of study	Country	Subjects-Number	Outcome measurement	Prevalence
Cagnie B et al., [18] 2006	Belgium	Office workers n=512	Online questionnaire	12-month prevalence of neck pain was 45.5%.
Hush JM et al., [19] 2006	UK	Office workers	Questionnaire	Lifetime prevalence of neck pain 67%
Eltayeb SM et al., [20] 2007	Netherland	Office workers	Postal questionnaire MUEQ	1-year prevalence of arm, neck and shoulder pain 54%. Neck and shoulder 33% and 31% respectively.
Tsauo JY [21] 2007	China	Sedentary workers	Questionnaire	Life time prevalence of neck pain 80%.
Alipour A [22] 2008	Scotland	Industrial employee	Cross-sectional survey with NMQ	20.5% neck pain
Cote P et al., [23] 2008	Canada	Office workers	Questionnaire	1 year prevalence 17.7-63%
Smith L et al., [24] 2009	Australia	School children n=1073	CUQ	20% reported neck pain.
Kanchanomai S [25] 2011	Thailand	Undergraduate students	Self-administered questionnaire and standard physical examination	46% neck pain
Hogg-Johnson S [26] 2008	Canada	All age groups	Systematic search and critical review of electronic Database	1 months prevalence of adults-15.4 to 45.5% children-4.5 to 8.5% 12 months prevalence of adults-12.1% to 71.5% children-34.5 to 71.5%

[Table/Fig-2]: Appraisal of reviewed studies of moderate to good methodological quality [18-26].
UK: United Kingdom; MUEQ: Maastricht upper extremity questionnaire; NMQ: Nordic musculoskeletal questionnaire; CUQ: Cigarette use questionnaire

[29]. Upper Limb Neural Tissue Provocation Testing (ULNTPT-1), straight leg raise, passive neck flexion, prone knee bending, and slump testing are widely used tests which moves neural structure. These provocative tests, including median nerve, radial and radial sensory nerves, ulnar nerve, general peroneal, sural, and posterior tibial nerve, lead strain to specific peripheral nerves [30]. One of the measures suggested are assessing the status of upper quadrant neural tissues and their associated structure is the upper limb neural tissue provocation test [31]. It has also been claimed previously about the possible role of fascia connections and pain symptoms strain with this examination [32]. Researchers found high reliability for ULNTPT1 in patients with CBPS using an elbow extension angle in a study [33]. A study showed that NTPT1 is more sensitive and precise than other types of Neural Tissue Provocation Test (NTPT) procedures and thus recommended it for evaluation of median nerve pathology [34]. In another validation study, 77 per cent sensitivity and 94 percent specificity for NTPT1 were recorded among patients with neck pain [35].

Spurling's test: Spurling test is the manoeuvre which is used for clinical diagnosis, to rule out cervical nerve root pathology and is utilised in differentiating from other neural disorders affecting the upper limbs. Various modifications have come up to this test ever since its initial design attempting to increase its sensitivity and specificity. The Spurling test has a 52.9% sensitivity and 93.8% specificity and also found a 73 percent sensitivity and 92.3% specificity in a systematic review of the combined results of the Magnetic Resonance Imaging (MRI) findings and operative findings [36]. The spurling test had a sensitivity of 92 percent and a specificity of 95 percent in a diagnosis of soft lateral cervical disc prolapse, and this test was compared with surgical or MRI findings, which are considered as gold standard techniques for diagnosis [37].

Physiotherapeutic Intervention for CBPS

Neurodynamics (Neural mobilisation of Median Nerve): Neurodynamics is a movement based intervention that seeks to rebuild and homeostasise the nervous systems in and around them. Being a continuous structure, any limb movement will have its mechanical effects on neural tissues resulting in events such as sliding, cross-sectional changes, elongation, angulation, and compression [38,39]. Neural sliding dysfunction occurs when neural structures do not undergo adequate excursion compared with normal situations [12]. Interfacing structures have a significant role on neurodynamics [40]. These interface dysfunctions can be classified as closing and opening dysfunctions. These pathodynamic presentations can be identified in performing a neural tissue provocation test with differentiating makeovers [41]. A study shows the therapeutic efficacy of Peripheral Nerve Sliders technique in cervicobrachial Pain Syndrome [42]. Chandan S et al., compared CLG mobilisation versus median nerve tensioner mobilisation on 20 CBPS patients who were given hot packs in addition to these treatments and found significant improvement in both groups indicating both treatments were effective in CBPS in the short-term [43]. In order to compare and measure the efficacy of cervical mobilisation techniques versus peripheral nerve slider techniques, a study was performed, where the effectiveness of cervical mobilisation in neck pain was greater than that of peripheral nerve slider techniques [44].

Cervical Lateral Glide (CLG): It is a commonly applied passive accessory mobilisation technique in CBPS. According to initial descriptions of this technique, it aims at the lateral translation of the cervical spine to the opposite side at a specific spinal segment without inducing any rotation or side bending. It increases intervertebral neural foramen size to facilitate nerve root mobility and thereby, symptom reduction in neurogenic presentations [13,45]. This technique has been described in many ways subsequently in literature with variations in therapist's holds, patient position, sites of technique delivery (at symptomatic or asymptomatic levels). Direction to which vertebra needs to be glided, either away or towards the side of symptoms, etc. Various mechanisms have been proposed for and apparent improvements in symptoms with the CLG technique. These include sympathetic nervous system effects and mechanoreceptor stimulation changing spinal cord hyperexcitability and resulting in excess periaqueductal grey activation in the midbrain, leading to cortical control on descending pain inhibition pathways. Clinical evidence that CLG improves neurodynamics and alleviates pain [13]. The CLG Neural Mobilisation was found effective in treating subjects who suffer from CBPS in comparison to the subjects with complete absence of treatment [46]. Efficacy of Median Nerve Neural Mobilisation (MNNM) and CLG versus Oral Ibuprofen (OI) intervention in subjects suffering from cervicobrachial pain have been undertaken [47].

Soft tissue mobilisation: Degenerated soft tissues around nerves create excess mechanical stimulation leading to nociceptive inputs. This suggests mobilisation strategies targeting soft tissue could be helpful to enhance neurodynamics [48]. An interventional study was carried out to assess the immediate effects of patients with neck and arm pain between soft tissue mobilisation and therapeutic ultrasound. The CBPS patients reported greater pain changes while performing soft tissue mobilisation after therapeutic ultrasound [49].

Therapeutic exercise: As a consequence of not getting enough rest, patients develop chronic neck pain, which affects their work capacity, and then their pain persists. Therapeutic exercises focused on strengthening, motor control and muscle re-education provide recovery from cervicobrachial pain syndrome. Exercise is found to be effective with other therapies, but it's not as effective without therapy. Results have also indicated that intense muscular strength training improves muscle function through enhanced neuromuscular coordination and reduces pain through stretch receptor activation and endorphin release [45]. It has also been claimed that strength training in people with work-related neck pain reduces pain and improves functional ability [46]. In another study, it was found that precise strength training in the sore muscle increased movement leading to improved function and relief of pain [47]. When comparing the effectiveness of isometric neck and stretching exercises, both were found to be equally effective [50].

Cervical traction: Cervical traction is often used to treat cervical radiculopathy, herniated disc and other related pathological conditions that include cervical spine elongation and can be provided intermittently or continuously. Traction can separate the cervical vertebrae up to 1 to 2 mm, increasing intervertebral space, producing relaxation of spinal muscles, allowing nerve root decompression. In a randomised, controlled trial, the effectiveness of traction in neck and low back pain has not been conclusively proved, although it is widely used and thought to be effective in relieving radicular cervical pain. No evidence has been found to show that traction is an inadequate treatment for pain in the neck and back [48].

Interferential Therapy (IFT): This electrical modality utilises medium frequency currents, which interfere to generate low-frequency currents (beat frequency) in deeper target tissues. This is to avoid skin irritation leading to discomfort while overcoming resistance offered by skin to low-frequency currents (example: Transcutaneous Electrical Nerve Stimulation (TENS)). This modality attempts to induce analgesia through pain gate and opioid mechanism [51].

Thermal agents: Thermal agents are common modalities of choice in physiotherapy practice [52]. They are observed to raise temperature of tissues within 1 cm depth up to 3.8-degree centigrade [53]. Moist heat is considered to be beneficial in conditions presenting with muscle spasm. It is hypothesised to relieve spasm, reduce pain and facilitates healing mechanism [54]. There is mild evidence that moist heat therapy is neither superior nor inferior in contrast to other approaches. However, it is generally used in combination with other treatments and is intended to augment rehabilitation [55]. Appraisal of reviewed studies of moderate to good methodological quality is presented in [Table/Fig-3] [11,44,55-64].

Authors and year of publication	Study design	Level of evidence	Appraisal
Allison GT et al., (2002) [55]	A randomised clinical trial	1B	Chronicity of presenting symptoms with a median of 36 months indicating chances for multiple confounders on results Emphasised for specific intervention based on diagnostic categories and ongoing evaluation while implementing therapies
Cowell IM and Phillips DR (2002) [56]	A single case study	3B	A well-executed single case report with ABC experimental design. However, limits generalisation of results.
Coppieters MW et al., (2003) [57]	A randomised clinical trial	1B	Only immediate effects of interface mobilisation were studied
Ellis RF and Hing WA (2008) [11]	A systematic review	1A	Suggested for dichotomising results as successful (achieving MCID) or failure (failing to achieve MCID) as it's an important parameter to gauze improvements Observed that NTM has limited evidence for therapeutic efficacy Indicated paucity of trails and suggested for exploring the effects of NTM on neuromechanical and neurophysiological effects
Chhabra D et al., (2008) [58]	A randomised clinical trial	1B	Interface mobilisation was not included in NTM
Ragonese J (2009) [59]	A randomised clinical trial	1B	Results indicated an additive effect of NTM on symptoms when combined with exercise therapy.
Salt E et al., (2011) [60]	A systematic review	1A	Recommended for high quality of trails with appropriate sample size and relevant outcome measures.
Marks M et al., (2011) [44]	A randomised clinical trial	1B	In spite of wide demographic characteristics of participants, lack of specific categorisation prior to inclusion and a too short follow-up duration (one week), the authors suggested to incorporate techniques directed towards interface mobilisation prior to NTM.
Nee RJ et al., (2012) [61]	A randomised controlled trial	1B	First study to report number of sessions required to bring in reduction of symptoms and adverse effects with NTM.
Savva C and Giakas G (2013) [62]	A case report	3B	Demonstrated beneficial effects on simultaneous delivery of cervical traction and NTM.
Efstathiou MA et al., (2015) [63]	A critical review	5	Recommended for homogeneity in sample based on prognostic screening for clinical decision making.
Basson A et al., (2015) (Abstract) [64]	A systematic review and meta-analysis	1A	Supports the use of NTM in CBPS

[Table/Fig-3]: Appraisal of reviewed studies of moderate to good methodological quality [11,44,55-64].
NTM: Neural tissue mobilisation; MCID: Minimal clinically important difference; CBPS: Cervicobrachial pain

Outcome Measurements of Therapeutic Interventions

The outcomes of various therapeutic modalities were reviewed through various methodologies like door to door interviews and surveys through forms and questionnaires etc. [65-79]. The evaluation and comparative analysis of previous studies reviews is given in [Table/Fig-4] [65-75].

Author (s) year	Country	Subjects-Number	Outcome measurement	Prevalence
Chopra A et al., [65] 2002	India	Bhigwan village more than 15 years n=4092	Door to door interviews	One week pain prevalence: 6%
Sharma AK et al., [66] 2006	India	IT professional	Questionnaire and interview	Prevalence of musculoskeletal problems-55% while neck pain was 44%.
Bhandari D et al., [67] 2007	India	Computer operators	Questionnaire	Prevalence of musculoskeletal problems 75%
Makela M et al., [68] 1991	Finland	General population	Questionnaire	43% neck pain
Cote P et al., [69] 2000	Saskatchewan	General population	Cross sectional survey	54% neck pain
Guez M et al., [70] 2002	Sweden	General population	Questionnaire	43% neck pain
Korhonen T et al., [71] 2003	Finland	Office employee working with VDU	Questionnaire	Incident neck pain-13.3%
Ferrari et al., [72] 2003	Canada	General population	Questionnaire	80% neck pain
Brandt LPA et al., [73] 2004	Demark	General population	Questionnaire	4.1% neck pain
Cote P et al., [74] 2004	Canada	16-19 school children	Questionnaire	6 months prevalence 54.2%
Hill J et al., [75] 2004	U.K.	General population	Cross-sectional survey	1 month prevalence 30.9% neck pain

[Table/Fig-4]: Comparative analysis of previous studies in terms of outcomes [65-75].

Limitation(s)

This was a retrospective study, based on previous data, while better and reliable results on interventions can be analysed only after well-conducted and well-reported trials.

CONCLUSION(S)

There is inconclusive evidence about the effectiveness of the treatment of cervicobrachial pain syndrome by manual and traditional physiotherapy. In the provision of manual therapy and exercise therapeutic methods for pain reduction, main benefits were noted. In contrast to manual therapy for pain relief, general physiotherapy, IFT, neck isometric exercise, traction, heating modalities, and soft tissue manipulation techniques were not efficient. Future research should classify which intervention responds immediately and appropriately in cervicobrachial pain syndrome. Further studies with high therapeutic approach techniques involving high-quality studies, sufficient sample sizes and clinically valid findings are required to inform practice guidance on cervicobrachial syndrome treatment and management.

We also request future trial investigators to consider to what extent interventions are valuable, in addition to possible confounders. Another issue to consider is the extent to which the control groups ought to be given care and attention as the intervention groups.

Authors contribution: SSP worked on the conception of the paper, helping find and collect study reports, and accepted the final paper. AA helped review the reports, evaluated the results, and updated and approved the final document. RS contributed to the conception, design, and writing of the study protocol and the design of search strategies; she located and obtained trial reports, helped to select and assess trials, conducted the data analysis, and drafted and approved the final paper. All authors have contributed to the conception, design, and writing of the document.

REFERENCES

[1] Moloney NA, Hall TM, Doody CM. Pathophysiology of non-specific arm pain. Phys Ther Rev. 2011;16(5):321-30.
[2] Gangavelli R, Nair NS, Bhat AK, Solomon JM. Cervicobrachial pain-How Often is it Neurogenic?. J Clin Diagn Res. 2016;10(3):YC14-16. Doi: 10.7860/JCDR/2016/16456.7492.

[3] Sizer PS, Brismée JM, Cook C. Medical screening for red flags in the diagnosis and management of musculoskeletal spine pain. Pain Pract. 2007;7(1):53-71.
[4] Ramanayake RJC, Basnayake BT. Evaluation of red flags minimises missing serious diseases in primary care. J Fam Med Prim Care. 2018;7(2):315-18.
[5] Petru M, Prášil L, Novák O. Abstracts: 5th International Whiplash Trauma Congress- August 24-28, 2011, Lund, Sweden. Article: Reduce of head Injuries during whiplash by the help of materials with independent strain rate. Journal of Rehabilitation Medicine. 2011;43(50):28-29.
[6] Sterling M, Childs JD. Proposal of a classification system for patients with neck pain: Invited commentary. Journal of Orthopaedic and Sports Physical Therapy. Movement Science Media. 2004;34(11):697-700.
[7] Iyer S, Kim HJ. Cervical radiculopathy. Curr Rev Musculoskelet Med. 2016;9(3):272-80.
[8] Dorsett M, Liang SY. Diagnosis and treatment of central nervous system infections in the emergency department. Emergency Medicine Clinics of North America. W.B. Saunders; 2016;34:917-42.
[9] Cervicobrachial Syndrome-Physiopedia [Internet]. [cited 2019 Sep 5]. Available from: https://www.physio-pedia.com/Cervicobrachial_Syndrome#cite_note-1.
[10] Colloca L, Ludman T, Bouhassira D, Baron R, Dickenson AH, Yarnitsky D, et al. Neuropathic pain. Nat Rev Dis Prim. 2017;3:17002. Doi: 10.1038/nrdp.2017.2.
[11] Ellis RF, Hing WA. Neural mobilisation: A systematic review of randomised controlled trials with an analysis of therapeutic efficacy. J Man Manip Ther. 2008;16(1):08-22.
[12] Rodríguez-Sanz D, Calvo-Lobo C, Unda-Solano F, Sanz-Corbalán I, Romero-Morales C, López-López D. Cervical lateral glide neural mobilisation is effective in treating cervicobrachial pain: A randomised waiting list controlled clinical trial. Pain Med. 2017;18(12):2492-503.
[13] Matthew P, Joanne M, Patrick B, Isabelle B, Tammy H, Cynthia M, et al. PRISMA 2020 statement: Updated guidelines for reporting systematic reviews and meta analyses. 26th Cochrane Colloquium, Santiago, Chile. 2019.
[14] Ris I, Juul-Kristensen B, Boyle E, Kongsted A, Manniche C, Søgaard K. Chronic neck pain patients with traumatic or non-traumatic onset: Differences in characteristics. A cross-sectional study. Scand J Pain. 2017;14:01-08. Doi: 10.1016/j.sjpain.2016.08.008.
[15] Sterling M, de Zoete RMJ, Coppieters I, Farrell SF. Best evidence rehabilitation for chronic pain part 4: Neck pain. J Clin Med. 2019;8(8):1219.
[16] Radhakrishnan K, Litchy WJ, O'fallon WM, Kurland LT. Epidemiology of cervical radiculopathy: A population-based study from rochester, minnesota, 1976 through 1990. Brain. 1994;117(2):325-35.
[17] Hurwitz EL, Randhawa K, Yu H, Côté P, Haldeman S. The Global Spine Care Initiative: A summary of the global burden of low back and neck pain studies. European Spine Journal. Springer Verlag. 2018;27 (suppl. 6):796-801.
[18] Cagnie B, Danneels L, Van Tiggelen D, De Loose V, Cambier D. Individual and work related risk factors for neck pain among office workers: A cross sectional study. Eur Spine J. 2007;16(5):679-86.
[19] Hush JM, Maher CG, Refshauge KM. Risk factors for neck pain in office workers: A prospective study. BMC Musculoskelet Disord. 2006;7:81. Doi: 10.1186/1471-2474-7-81.
[20] Eltayeb SM, Staal JB, Hassan AA, Awad SS, De Bie RA. Complaints of the arm, neck and shoulder among computer office workers in Sudan: A prevalence study with validation of an Arabic risk factors questionnaire. Environ Heal A Glob Access Sci Source. 2008;7:33. Doi: 10.1186/1476-069X-7-33.
[21] Tsauo JY, Jang Y, Du CL, Liang HW. Incidence and risk factors of neck discomfort: A 6-month sedentary-worker cohort study. J Occup Rehabil. 2007;17(2):171-79.
[22] Alipour A. Neck and shoulder pain: Prevalence, incidence and risk factors. The IKCo cohort study "2008:09-23.
[23] Côté P, Van Der Velde G, Cassidy JD, Carroll LJ, Hogg-Johnson S, Holm LW, et al. The burden and determinants of neck pain in workers: Results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine (Phila Pa 1976). 2008;33(4 SUPPL.).
[24] Smith L, Louw Q, Crous L, Grimmer-Somers K. Prevalence of neck pain and headaches: Impact of computer use and other associative factors. Cephalalgia. 2009;29(2):250-57.
[25] Kanchanomai S, Janwantanakul P, Pensri P, Jiamjarasrangsi W. Risk factors for the onset and persistence of neck pain in undergraduate students: 1-year prospective cohort study. BMC Public Health [Internet]. 2011;11(1):566.
[26] Hogg-Johnson S, van der Velde G, Carroll LJ, Holm LW, Cassidy JD, Guzman J, et al. The burden and determinants of neck pain in the general population: Results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine (Phila Pa 1976). 2008; 33(4 Suppl):S39-51. Doi: 10.1097/BRS.0b013e31816454c8. PMID: 18204398.
[27] Palmer B. DUNE: DigitalUNE Critically Appraised Topics (CAT) Physical Therapy Student Papers Treatment For Cervicobrachial Pain Syndrome; A Comparison Of Direct And Indirect Manual Therapies. 2013.
[28] Miller KJ. Physical assessment of lower extremity radiculopathy and sciatica. Journal of Chiropractic Medicine. 2007;6:75-82.
[29] Latremoliere A, Woolf CJ. Central Sensitization: A Generator of Pain Hypersensitivity by Central Neural Plasticity. Journal of Pain. 2009;10:895-926.
[30] Davis DS, Anderson IB, Carson MG, Elkins CL, Stuckey LB. Upper limb neural tension and seated slump tests: The false positive rate among healthy young adults without cervical or lumbar symptoms. J Man Manip Ther. 2008;16(3):136-41.
[31] Baselgia LT, Bennett DL, Silbiger RM, Schmid AB. Negative neurodynamic tests do not exclude neural dysfunction in patients with entrapment neuropathies. Arch Phys Med Rehabil. 2017;98(3):480-86.
[32] Rajguru SM, Ifediba MA, Rabbitt RD. Biomechanics of horizontal canal benign paroxysmal positional vertigo. J Vestib Res Equilib Orientat. 2005;15(4):203-14.
[33] Coppieters MW, Schmid AB, Kubler PA, Hodges PW. Description, reliability and validity of a novel method to measure carpal tunnel pressure in patients with carpal tunnel syndrome. Man Ther. 2012;17(6):589-92. Doi: 10.1016/j.math.2012.03.005. Epub 2012 Mar 29. PMID: 22464188.
[34] Kleinrensink GJ, Stoeckart R, Mulder PG, Hoek G, Broek T, Vleeming A, et al. Upper limb tension tests as tools in the diagnosis of nerve and plexus lesions. Anatomical and biomechanical aspects. Clin Biomech (Bristol, Avon). 2000;15(1):09-14. Doi: 10.1016/s0268-0033(99)00042-x. PMID: 10590339.
[35] Misailidou V, Malliou P, Beneka A, Karagiannidis A, Godolias G. Assessment of patients with neck pain: A review of definitions, selection criteria, and measurement tools. J Chiropr Med. 2010;9(2):49-59. Doi: 10.1016/j.jcm.2010.03.002.
[36] Rubinstein SM, Pool JJ, van Tulder MW, Riphagen II, de Vet HC. A systematic review of the diagnostic accuracy of provocative tests of the neck for diagnosing cervical radiculopathy. Eur Spine J. 2007;16(3):307-19. Doi: 10.1007/s00586-006-0225-6. Epub 2006 Sep 30. PMID: 17013656; PMCID: PMC2200707.
[37] Shah KC, Rajshekhar V. Reliability of diagnosis of soft cervical disc prolapse using Spurling's test. Br J Neurosurg. 2004;18(5):480-83. Doi: 10.1080/02688690400012350. PMID: 15799149.
[38] Bijur PE, Silver W, Gallagher EJ. Reliability of the visual analog scale for measurement of acute pain. Acad Emerg Med. 2001;8(12):1153-57.
[39] Shacklock M. Clinical Neurodynamics. Elsevier Ltd; 2005.
[40] Shacklock M. Neurodynamics. Physiotherapy. 1995;81:09-16. 10.1016/S0031-9406(05)67024-1.
[41] Gross A, TM K, JP P, Blanchette S, Lalonde P, Christie T, et al. Exercises for mechanical neck disorders. Cochrane Database Syst Rev. 2015;1:CD004250.
[42] Jamwal NR, Kumar SP. Therapeutic efficacy of peripheral nerve sliders in cervicobrachial pain syndrome: Sliding towards evidence versus evidence towards sliding. Indian J Med Heal Sci. 2015;2(2):61-64.
[43] Chandan S, Sen S, Arfath U. Effect of cervical lateral glide over neural tissue mobilisation for median nerve in case of patients with cervico-brachial pain syndrome. Int J Heal Rehabil Sci. 2015;4(1):37.
[44] Marks M, Schöttker-Königer T, Probst A. Efficacy of cervical spine mobilisation versus peripheral nerve slider techniques in cervicobrachial pain syndrome- A randomised clinical trial. J Phys Ther. 2011;4(1):09-17.
[45] Calvo-Lobo C, Unda-Solano F, López-López D, Sanz-Corbalán I, Romero-Morales C, Palomo-López P, et al. Is pharmacologic treatment better than neural mobilization for cervicobrachial pain? A randomized clinical trial. Int J Med Sci. 2018;15(5):456-65. Doi: 10.7150/ijms.23525. PMID: 29559834.
[46] Sanz DR, Solano FU, López DL, Corbalan IS, Morales CR, Lobo CC. Effectiveness of median nerve neural mobilization versus oral ibuprofen treatment in subjects who suffer from cervicobrachial pain: A randomized clinical trial. Arch Med Sci. 2018;14(4):871-79. Doi: 10.5114/aoms.2017.70328.
[47] Gehlsen GM, Ganion LR, Helfst R. Fibroblast responses to variation in soft tissue mobilisation pressure. Med Sci Sport Exerc. 1999;31(4):531-35.
[48] Costello M, Puentedura E 'Louie' J, Cleland J, Ciccone CD. The immediate effects of soft tissue mobilisation versus therapeutic ultrasound for patients with neck and arm pain with evidence of neural mechanosensitivity: A randomised clinical trial. J Man Manip Ther. 2016;24(3):128-40.
[49] Lee HS, Yoo JH. The effects of stretching and isometric exercise for chronic neck pain patient in strength and pain. J Korean Soc Phys Med. 2012;7(3):329-37.
[50] Clement I, Clement I. Cervical Traction. In: Textbook on Neurological and Neurosurgical Nursing. Jaypee Brothers Medical Publishers (P) Ltd.; 2015. Pp. 663-63.
[51] ELECTROPHYSICAL AGENTS- Contraindications and precautions: An evidence-based approach to clinical decision making in physical therapy. Physiotherapy Canada. 2010;62(5):01-80. Doi: 10.3138/ptc.62.5.
[52] Paillard T. Combined application of neuromuscular electrical stimulation and voluntary muscular contractions. Sports Medicine. 2008;38:161-77.
[53] Gorgey AS, Dudley GA. The role of pulse duration and stimulation duration in maximizing the normalized torque during neuromuscular electrical stimulation. J Orthop Sports Phys Ther. 2008;38(8):508-16.
[54] Dehail P, Duclos C, Barat M. Electrical stimulation and muscle strengthening. Annales de Readaptation et de Medecine Physique. 2008;51:441-51.
[55] Allison GT, Nagy BM, Hall T. A randomised clinical trial of manual therapy for cervico-brachial pain syndrome- A pilot study. Man Ther. 2002;7(2):95-102.
[56] Cowell IM, Phillips DR. Effectiveness of manipulative physiotherapy for the treatment of a neurogenic cervicobrachial pain syndrome: A single case study-Experimental design. Man Ther. 2002;7(1):31-38.
[57] Coppieters MW, Stappaerts KH, Wouters LL, Janssens K. The immediate effects of a cervical lateral glide treatment technique in patients with neurogenic cervicobrachial pain. J Orthop Sports Phys Ther. 2003;33(7):369-78.
[58] Chhabra D, Raja K, Ganesh B, Prabhu N. Effectiveness of neural tissue mobilisation over cervical lateral glide in cervico-brachial pain syndrome- A randomised clinical trial. Indian J Physiother Occup Ther- An Int J. 2008;2(4):47-52.
[59] Ragonese J. A Randomised Trial Comparing Manual Physical Therapy to Therapeutic Exercises, to a Combination of Therapies, for the Treatment of Cervical Radiculopathy. Orthopaedic Physical Therapy Practice. 2009;21:71-76.
[60] Salt E, Wright C, Kelly S, Dean A. A systematic literature review on the effectiveness of non-invasive therapy for cervicobrachial pain. Manual Therapy. 2011;16:53-65.
[61] Nee RJ, Vicenzino B, Jull GA, Cleland JA, Coppieters MW. Neural tissue management provides immediate clinically relevant benefits without harmful effects for patients with nerve-related neck and arm pain: A randomised trial. J Physiother. 2012;58(1):23-31.
[62] Savva C, Giakas G. The effect of cervical traction combined with neural mobilisation on pain and disability in cervical radiculopathy. A case report. Man Ther. 2013;18(5):443-46.

[63] Efstathiou MA, Stefanakis M, Savva C, Giakas G. Effectiveness of neural mobilisation inpatients with spinal radiculopathy: Acritical review. J Bodyw Mov Ther. 2015;19(2):205-12.
[64] Basson A, Olivier B, Ellis R, Coppieters M, Stewart A, Mudzi W. The effectiveness of neural mobilisations in the treatment of musculoskeletal conditions: A systematic review protocol. JBI database of systematic reviews and implementation reports. 2015;13:65-75.
[65] Chopra A, Saluja M, Patil J, Tandale HS. Pain and disability, perceptions and beliefs of a rural Indian population: A WHO-ILAR COPCORD study. WHO-International League of Associations for Rheumatology. Community Oriented Program for Control of Rheumatic Diseases. J Rheumatol. 2002;29(3):614-21.
[66] Sharma AK, Khera S, Khandekar J. Computer Related Health Problems among Information Technology Professionals in Delhi. Indian Journal of Community Medicine. 2006;31:36-38.
[67] Bhandari D. Occurrence of musculoskeletal discomfort in computer operators. Indian Journal of Community Medicine. 2008;333(1):65-66.
[68] Makela M, Heliovaara M, Sievers K, Imprivaara O, Knekt P, Aromaa A. Prevalence, determinants, and consequences of chronic neck pain in Finland. Am J Epidemiol. 1991;134(11):1356-67. Doi: 10.1093/oxfordjournals.aje.?a116038.
[69] Cote P, Cassidy JD, Carroll L. The factors associated with neck pain and its related disability in the Saskatchewan population. Spine. 2000;25(9):1109-17.
[70] Guez M, Hildingsson C, Nilsson M, Toolanen G. The prevalence of neck pain: A population-based study from northern Sweden. Acta Orthop Scand. 2002;73(4):455-59.
[71] Korhonen T, Ketola R, Toivonen R, Luukkonen R, Häkkänen M, Viikari-Juntura E. Work related and individual predictors for incident neck pain among office employees working with video display units. Occup Environ Med. 2003;60(7):475-82.
[72] Ferrari R, Russell A. Neck pain. Best Practice & Research Clinical Rheumatology. 2003;17(1);57-70.
[73] Brandt LPA, Andersen JH, Lassen CF, Kryger A, Overgaard E, Vilstrup I, et al. Neck and shoulder symptoms and disorders among Danish computer workers. Scand J Work Environ Health. 2004;30:399-409.
[74] Cote P, JD Cassidy, Carroll LJ, Kristman V. The annual incidence and course of neck pain in the general population: A population-based cohort study. Pain. 2004;112(3): 267-73.
[75] Hill J, Lewis M, Papageorgiou AC, Dziedzic K, Croft P. Predicting persistent neck pain: A 1-year follow-up of a population cohort. Spine. 2004;29(15):1648-54.
[76] Ming Z, Narhi M, Siivola J. Neck and shoulder pain related to computer use. Pathophysiology. 2004;11(1):51-56.
[77] Adedoyin RA, Idowu Bimbo O, Adagunodo Rotimi E, Owoyomi Ayodeji A, Idowu Peter A. Musculoskeletal pain associated with the use of Computer System in Nigeria. Technol Healthcare. 2005;13(20);125-30.
[78] Hsin-Yi Lee, Wen-Yu Yen, Chun-Wan Chen, Jung-Der Wang. Prevalence and Psychosocial Risk factors of upper extremity Musculoskeletal Pain in Industries of Taiwan: A Nationwide study. J Occup Health. 2005;47:311-18.
[79] Shahla Eltyeb. Prevalence of complaints of arm, neck and shoulder among computer office workers. Journal of Environmental Health. 2008;8(1):33-35.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Orthopaedics, Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India.
2. Research Scholar, Department of Anatomy, Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India.
3. Professor, Department of Anatomy, Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Royana Singh,
Professor, Department of Anatomy, Institute of Medical Sciences, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India.
E-mail: royanasingh@bhu.ac.in

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Oct 29, 2020
- Manual Googling: Feb 04, 2021
- iThenticate Software: Apr 23, 2021 (13%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: Sponsored by MRUs, Department of Health Research via grant from ICMR.
- Was Ethics Committee Approval obtained for this study? NA
- Was informed consent obtained from the subjects involved in the study? NA
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Oct 24, 2020**
Date of Peer Review: **Dec 22, 2020**
Date of Acceptance: **Feb 15, 2021**
Date of Publishing: **Jun 01, 2021**