DOI: 10.7860/JCDR/2023/64196.18734

Review Article

Physical Medicine and Rehabilitation Section

Managing Carpal Tunnel Syndrome using Neurodynamics: A Narrative Review

BHOOMIKA BHAT[1], SAUMYA SRIVASTAVA[2]

ABSTRACT

Carpal Tunnel Syndrome (CTS) is one of the preeminent types of peripheral neuropathies of the upper limb, where the median nerve is injured in the carpal tunnel, leading to a cascade of symptoms. CTS can cause pain, substantial motor function and sensory impairment, and a weakened ability to perform skilled work. Utilising the Neurodynamic Technique (NDT), a hands-on manual therapy approach can effectively address CTS. This technique focuses on manipulating neural tissues and the adjacent non-neural structures related to the nervous system, to alter pain physiology. The current narrative review aimed to ascertain the effectiveness of NDT in the management of CTS so that it can guide the practitioners in effectively managing and understanding CTS and also help in adding the literature to the existing evidence. The review evaluated outcome measures such as pain intensity, motor issues, physical function, and nerve conduction investigations. The review was done to demonstrate that NDT can offer significant therapeutic advantages and can serve as a practical approach to managing CTS.

Keywords: Flexor tendon gliding, Manual therapy, Sensation, Sliding, Tensioning

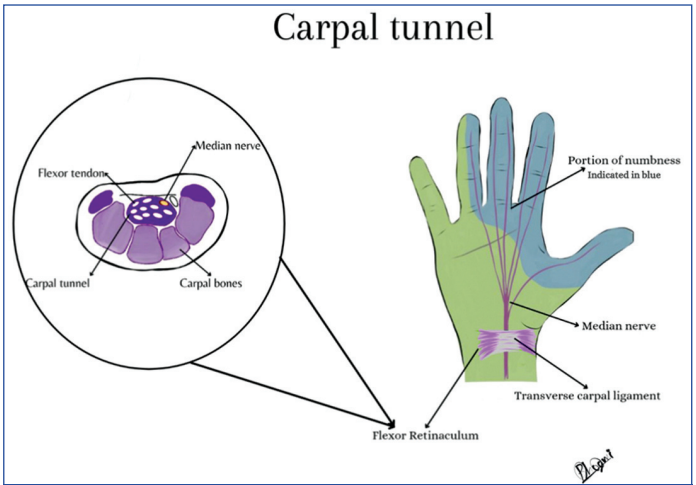
INTRODUCTION

Carpal Tunnel Syndrome (CTS) is the most prevalent form of entrapment neuropathy, affecting approximately 99 out of every 100,000 individuals in the general population [1]. Its frequency varies between 7% and 19% globally, with those over 40 years being more susceptible than younger people, particularly women, who account for 65-75% of cases [1]. About one in five individuals reporting symptoms like hand pain, numbness, and tingling could potentially be suffering from CTS, as indicated by examinations and nerve conduction studies [2]. The increasing incidence of CTS has resulted in a surge of workers' compensation claims due to work absence, limitations in daily activities, and disability, all of which can significantly deteriorate the quality of life [3,4]. It has been demonstrated that CTS negatively affects one's Overall Health Status (OHS) [5].

Early diagnosis and treatment are crucial, as untreated CTS can lead to irreversible nerve damage and a worsened quality of life. Thus, finding optimal treatment approaches is essential to improve the lives of those affected by CTS [6]. Research indicates that initial treatment often involves non operative interventions, with various treatment techniques available for mild to moderate CTS [7]. Incorporating methods such as splinting and manual therapy approaches including NDT, wrist distraction, and transverse carpal ligament stretching [8,9], along with electrotherapy modalities like ultrasound and laser therapy are common in addressing CTS [4]. Neurodynamic Technique (NDT) is a manual therapy technique that helps to reinstate balance within the nervous system and its adjacent structures by mobilising either the nervous system itself or the surrounding anatomical components [10]. The main objective of conducting this review is to thoroughly examine existing literature, collecting evidence regarding the effectiveness of NDT in the conservative management of CTS, encompassing various outcome measures such as improved function, pain relief, enhanced flexibility, nerve conduction, functional status, and symptom severity.

Carpal Tunnel Structure

The median nerve and hand flexor tendons are present in the carpal tunnel, which is located between the trapezium, trapezoid, capitate, and hamate carpal bones of the wrist, which constitute the floor, and the transverse carpal ligament, which forms the ceiling [11]. It is essential for the motor and sensory processes in the thumb and finger [11]. Compression or enlargement of tendons within the tunnel can lead to CTS, manifesting as disrupted sensations in the digits due to median nerve pressure [12,13]. A diagram of carpal tunnel is shown below [Table/Fig-1].



[Table/Fig-1]: Illustration showing the anatomy of the carpal tunnel and the signs and symptoms.

Cascade of Events Following Median Nerve Compression

Compression of the median nerve in the wrist hinders blood flow, triggering a cascade of events including inflammation, oedema, intra-neural fibrosis, and ultimately demyelination [7]. This process culminates in the thickening of connective tissue both around and within the nerve, reducing its flexibility and impairing its mobility. Consequently, this can lead to dynamic compression during movements of the wrist or fingers [7]. In cases of median nerve compression within the wrist, the initial consequence is impaired nerve perfusion, primarily resulting in nerve oedema. If the condition advances, this oedema has the potential to progress to fibrosis [8]. Notably, this oedema primarily manifests in the form of nerve swelling, particularly at the carpal tunnel inlet and in the vicinity of the proximal carpal tunnel [14].

Risk Factors and Causes of CTS

The most frequent occupational risk factors for CTS are repetitive wrist and finger movements or holding uncomfortable wrist positions for extended periods [8]. In the fingers, a thickened transverse carpal ligament, a distal radial fracture or dislocation, lipoma, diabetes, hyperthyroidism, rheumatoid arthritis, and pregnancy can be considered as some more risk factors for CTS [15,16]. CTS typically has an idiopathic cause, however, trauma, metabolic disorders, infections, neuropathies, and others are considered as secondary causes for CTS [17-20]. Flexor tenosynovitis is another non occupational cause of patients with CTS [8].

Signs and Symptoms of CTS

Pain, abnormalities of multiple senses, and reduction in hand functions are some of the well-known symptoms in CTS patients [21]. Additionally, relevant manifestations include burning, numbness, and tingling in the ventral aspect of the hands, particularly after work or at night [20]. A 50% to 70% of patients report having noticeable nocturnal symptoms [21].Individuals often wake up during the night or in the early hours of the morning and resort to shaking their hands as a means to alleviate these symptoms [21]. These symptoms may only affect the thumb and the first two or three fingers, or they may be reported to affect the entire hand in extreme cases [21]. Paired with a reduction in blood supply to the median nerve, increasing nerve stress may worsen symptoms and further reduce circulation [10]. Further, the OHS is affected in patients diagnosed with CTS [5].

Treatment Techniques for the Management of CTS

A myriad of treatment options are available for the conservative management of CTS, which include bracing or splinting, electrotherapy modalities, and manual therapy [4]. Among manual therapy, NDT is a widely studied and utilised technique for managing patients with CTS [22]. Various treatment techniques for CTS are shown below [Table/Fig-2] [4,7,8,23-25].

Various physiotherapy treatments	Role in managing CTS
Splinting	Wrist splinting is justified in CTS patients due to its ability to alleviate pressure on the median nerve within the carpal tunnel by maintaining a neutral wrist position, ultimately reshaping the carpal tunnel and shifting the lumbricals distally to reduce median nerve pressure [7]
Extracorporeal shock wave therapy	This method employs acoustic waves to stimulate cells through mechanotransduction, resulting in enhanced metabolism and promoting tissue remodelling, along with anti-inflammatory, analgesic, and proliferative effects [23]
Therapeutic ultrasound	Therapeutic ultrasound utilises mechanical waves to interact with carpal tunnel structures, potentially reducing inflammation and promoting improved blood flow, tissue metabolism, nerve function, and membrane permeability [24]
Laser therapy	Low-level laser therapy utilising red and near-infrared light at reduced energy densities, results in improved short-term function, symptoms, and electrophysiological measures [4]
Manual therapy	Manual therapy techniques, such as NDT, wrist distraction, and joint movements, aim to relieve nerve compression, enhance blood flow, promote nerve healing, and alleviate CTS symptoms [8,25]

[Table/Fig-2]: Different types of physiotherapy treatment in CTS [4,7,8,23-25].
CTS: Carpal tunnel syndrome

NEURODYNAMIC TECHNIQUE (NDT)

What is NDT?

Shacklock M was the initial proponent to elucidate the concept of NDT. Neurodynamics is the study of the physiological and mechanical interactions between the musculoskeletal system, neural system, and one another [26]. This approach is designed to reinstate balance within and adjacent to the nervous system, achieved by mobilising either the nervous system itself or the encompassing structures [10]. The neural mobilisation enables movement between neural components and their neighbouring interface [10].

The three-part system is chosen for its precision and its role in establishing a systematic framework for the application of neurodynamics [27]. The three-part system (mechanical interface, neural structures, and innervated tissues) classifies body tissues based on their relationship to the nervous system [27]. Furthermore, this perspective enables the categorisation of neural dynamics according to pertinent components, aiding in the derivation of diagnosis and treatment from causal mechanisms [27].

Role of NDT in Rectifying Altered Neurodynamics in Patients with CTS

Utilising neural mobilisation and tendon gliding exercises in the treatment of unfavourable neurodynamics in a patient with CTS, aims primarily to re-establish a dynamic equilibrium between the movement of neural tissues and their adjacent mechanical interfaces [28]. This restoration, in turn, enables decreased inherent pressures on neural tissue, thereby enhancing optimal physiological functioning [28]. The anticipated advantages of employing such techniques encompass aiding nerve gliding, improving neural vascularity, dispersing harmful fluids, diminishing nerve adhesions, and optimising axoplasmic flow in patients with CTS [28].

Impact of NDT on CTS

Reverse heightened immune responses after nerve injury NDT has a significant impact, as it can reduce intraneural oedema, enhance the dispersion of intraneural fluid, alleviate thermal and mechanical hyperalgesia, and reverse heightened immune responses following nerve injuries [10]. It stimulates inherent pain-relieving neural pathways and makes it less sensitive to mechanical pressure through adjustment and gradual acclimatisation [7].

Treatment Techniques in NDT- Neural Gliding and Neural Tensioning

The execution of neural mobilisation can involve either employing a stretching technique (tensioning) to promote movement or optimising the sliding of peripheral nerves in relation to neighbouring structures (gliding) [29]. The treatment techniques falling within the scope of NDT are illustrated below [Table/Fig-3] [27,30].

Neurodynamic sliders	Neurodynamic tensioners
The slider technique is a neurodynamic manoeuvre designed to generate the sliding motion of neural structures about their surrounding tissues [27]	The tensioner serves as a neurodynamic assessment causing heightened tension in neural structures, utilising the inherent viscoelastic properties of the nervous system without exceeding its elastic threshold [27]
The sliding technique involves alternating movements of elbow extension (which loads the median nerve) and wrist flexion (which unloads the median nerve), followed by elbow flexion (unloading) and wrist extension (loading). The range of motion for this technique was identical to the amplitudes used in the tensioning technique, with wrist movement between 0° and 60° extension and elbow movement between 90° and 165° extension [30]	The tensioning technique consists of a simultaneous extension of the wrist (from 0° to 60°) and the elbow (from 90° to 165°). This movement was followed by returning to the starting position, which meant the wrist returned from 60° extension to neutral (0°), and the elbow returned from 165° extension to 90°. A full elbow extension was defined as 180° [30]

[Table/Fig-3]: Treatment techniques encompassed within the framework of NDT [27,30].
NDT: Neurodynamic technique

REVIEW OF LITERATURE

The present review encompasses a comprehensive analysis of various studies as presented in [Table/Fig-4] and investigates the efficacy of NDT in the management of CTS [5,8,9,22,31-37]. The reviewed studies collectively shed light on the potential benefits of manual therapy, specifically NDT, as a conservative management

Author, year (study design)	Place of the study	Number of the studies, number of participants (n)	Mean age/Average age	Intervention duration	Intervention	Conclusion
Zaheer SA and Ahmed Z, 2023 (A systematic review and meta-analysis) [31]	Edgbaston, Birmingham	12 RCTs, n=1003	18-85 years	4-10 weeks	Neurodynamic modulation technique for the median nerve	The results indicated significant improvement in Boston CTS questionnaire, symptom severity scale (mean difference=-1.20, 95% CI, p <0.05), and Boston CTS questionnaire-functional severity scale (mean difference=-1.06, 95% CI, p<0.05)
de Arenas-Arroyo SN et al., 2021 (A systematic review with meta-analysis [32]	Cuenca, Spain	22 trials, n=1203	26.0-57.9 years	1-10 weeks	NDT, electrotherapy modalities, exercise, carpal bone, and surgery	The utilisation of NDT exhibited low certainty evidence of effectiveness in enhancing both pain relief (SMD=-0.54; 95% CI) and functional improvement (SMD=-0.35, 95% CI) among individuals with CTS
Hamzeh H et al., 2021 (RCT) [33]	Amman, Jordan	n=41	50.85±9.14 years	60 min weekly for 4 weeks	Group-1: Received NDT that included neurodynamics manual therapy and neurodynamic home-based exercises Group-2: The control group received no treatment	NDT was better at enhancing function, and strength, and lessening pain (p<0.05)
Talebi GA et al., 2020 (RCT) [8]	Babol, Iran	n=30	30-50 years	4 weeks	Group-1: Mechanical interface mobilisation (throughout the median nerve at the wrist and forearm) Group-2: Nerve mobilisation group (median nerve gliding and tension)	Both the groups demonstrated significant improvement in the outcome measures (p<0.05). However, no group was superior to each other with respect to pain, symptom severity scale, and functional status scale (p>0.05) in patients with CTS
Wolny T and Linek P, 2019 (RCT) [34]	Silesia, Poland	n=103	Experimental group=54.6±9.1 years Control group=53.1±10.1 years	Conducted twice weekly (20 sessions)	Group-1: Experimental group received NDT Group-2: Control group received no treatment	The numerical pain rating scale, Boston CTS questionnaire, and nerve conduction study demonstrated significant improvement (p<0.01) in the NDT group or experimental group when compared to no treatment
Wolny T and Linek P, 2018 (RCT) [5]	Silesia, Poland	n=189	Manual therapy group: 52.6±9.3 years Control group: 53.1±8.9 years	Weekly twice (20 therapy sessions)	Group-1: Manual therapy group received NDT and functional massage, and mobilisation of the carpal bones Group-2: In the control group, no treatments were administered	After examining the patients using RAND 36-Item Short Form (SF-36) Health Survey, OHS improved (p<0.001) in the manual therapy group compared to the control group
Lim YH et al., 2017 (Systematic review) [35]	Bentley, Australia	9 studies	18-85 years	-	3 different median nerve mobilisation techniques (distal nerve tensioning, upper quarter nerve tensioning, and nerve sliding) in CTS	Across the studies, the individual techniques demonstrated improvement in pain, functional status, sensation, and strength. However, there were no significant differences between the three techniques. The treatment outcomes' standardised mean differences ranged from being very small to being very large (0.05-1.71)
Wolny T et al., 2017 (RCT) [22]	Silesia, Poland	n=140	Manual therapy group: 53.1±8.7 years Electrophysiological modalities group: 51.5±10.3 years	10 weeks	Group-1: Manual therapy group received NDT and functional massage, and carpal bone mobilisation technique Group-2: Electrophysiological modalities group, including laser and ultrasound therapy	Upon analysing nerve conduction, it was observed that the median nerve sensory conduction velocity increased by 34% in the manual therapy group, while the motor conduction velocity saw a 6% increase (p<0.01). The study concluded that there is a significant improvement in sensory conduction of the median nerve, functional status, subjective complaints, and pain reduction improved within the manual therapy team
Wolny T et al., 2016 (RCT) [9].	Silesia, Poland	n=140	Neurodynamic mobilisation group: 53.128±8.7 years Electrophysiological modalities group: 51.514±10.348 years	20 therapy sessions delivered at twice-weekly intervals	Group-1: The neurodynamic mobilisation group received NDT Group-2: Electrophysiological modalities group received red, infrared laser, and ultrasound therapy	The study found significant improvement (p<0.001) in the 2-point discrimination of the symptomatic limbs within the neurodynamic mobilisation group and electrophysiological modalities group
Vikranth G et al., 2015 (An experimental comparative study) [36]	Bengaluru, India	n=30	25-55 years	2 weeks	Group-A: Received carpal bone mobilisation Group-B: Received median nerve mobilisation	The median nerve mobilisation and carpal bone mobilisation showed improvement (p<0.05) in pain relief, functional status, and symptom severity for individuals with CTS
De-la-Llave-Ricon AI et al., 2012 (Case series) [37]	Alcorcon, Spain	n=18	31-59 years	1 week	Nerve slider NDT and soft tissue mobilisation	Utilising soft tissue NDT s and mobilisation resulted in a reduction in pain intensity (p<0.01) among this cohort of women dealing with chronic CTS

[Table/Fig-4]: Summary of articles reviewed to find out the effect of NDT in CTS [5,8,9,22,31-37].
CI: Confidence interval; RCT: Randomised controlled trial; SMD: Standardised mean difference; p: Statistically significant

for alleviating pain, improving functional status, enhancing nerve conduction, and addressing other symptoms associated with CTS.

CONCLUSION(S)

To conclude, the accumulated evidence from these studies provides strong support for incorporating NDT as a valuable therapeutic strategy in CTS management. As a manual therapy intervention, NDT exhibits promise in pain alleviation, improved nerve conduction, enhanced hand sensation, and overall functional enhancement. Nevertheless, further investigation is warranted to pinpoint practical NDT approaches for diverse CTS patient profiles and establish optimal treatment protocols. The findings contribute significantly to the growing evidence base endorsing NDT's effectiveness in CTS management, carrying meaningful implications for enhancing the quality of life for individuals grappling with this condition. The technique can thus be incorporated as a standalone method of management by the practitioners with confidence in patients with CTS.

Acknowledgement

The authors express their gratitude to Prof. Dr. Dhanesh Kumar KU and the University for granting the opportunity to conduct the study.

REFERENCES

[1] Kazantzidou V, Lytras D, Kottaras A, Iakovidis P, Kottaras I, Chatziprodromidou IP. The efficacy of manual techniques in the treatment of carpal tunnel syndrome symptoms: A narrative review. Int J Orthop Sci. 2021;7(2):423-27.
[2] Uchiyama S, Itsubo T, Nakamura K, Kato H, Yasutomi T, Momose T. Current concepts of carpal tunnel syndrome: Pathophysiology, treatment, and evaluation. J Orthop Sci. 2010;15(1):01-13.
[3] Atroshi I, Tadjerbashi K, McCabe SJ, Ranstam J. Treatment of carpal tunnel syndrome with wrist splinting: Study protocol for a randomized placebo-controlled trial. Trials. 2019;20(1):01-11.
[4] Padua L, Coraci D, Erra C, Pazzaglia C, Paolasso I, Loreti C, et al. Carpal tunnel syndrome: Clinical features, diagnosis, and management. Lancet Neurol. 2016;15(12):1273-84.
[5] Wolny T, Linek P. The effect of manual therapy including neurodynamic techniques on the overall health status of people with carpal tunnel syndrome: A randomized controlled trial. J Manipulative Physiol Ther. 2018;41(8):641-49.
[6] Yildirim P, Dilek B, Şahin E, Gülbahar S, Kizil R. Ultrasonographic and clinical evaluation of additional contribution of kinesiotaping to tendon and nerve gliding exercises in the treatment of carpal tunnel syndrome. Turkish J Med Sci. 2018;48(5):925-32.
[7] Karjalanen T, Raatikainen S, Jaatinen K, Lusa V. Update on efficacy of conservative treatments for carpal tunnel syndrome. J Clin Med. 2022;11(4):950.
[8] Talebi GA, Saadat P, Javadian Y, Taghipour M. Comparison of two manual therapy techniques in patients with carpal tunnel syndrome: A randomized clinical trial. Casp J Intern Med. 2020;11(2):163-70.
[9] Wolny T, Saulicz E, Linek P, Myśliwiec A, Saulicz M. Effect of manual therapy and neurodynamic techniques vs ultrasound and laser on 2PD in patients with CTS: A randomized controlled trial. J Hand Ther. 2016;29(3):235-45.
[10] Basson A, Olivier B, Ellis R, Coppieters M, Stewart A, Mudzi W. The effectiveness of neural mobilization for neuromusculoskeletal conditions: A systematic review and meta-analysis. J Orthop Sports Phys Ther. 2017;47(9):593-615.
[11] Kohlhardt J. Carpal tunnel syndrome. J Am Dent Assoc. 2001;132(4):140-47.
[12] Gillig JD, White SD, Rachel JN. Acute carpal tunnel syndrome: A review of current literature. Orthop Clin North Am. 2016;47(3):599-607.
[13] Newington L, Harris EC, Walker-Bone K. Carpal tunnel syndrome and work. Best Pract Res Clin Rheumatol. 2015;29(3):440-53.
[14] O'Donnell MJ, Elio R, Day D. Carpal tunnel syndrome. Nurs Womens Health. 2010;14(4):318-21.
[15] Shem K, Wong J, Dirlikov B. Effective self-stretching of carpal ligament for the treatment of carpal tunnel syndrome: A double-blinded randomized controlled study. J Hand Ther. 2020;33(3):272-80.
[16] Hernández-Secorún M, Montaña-Cortés R, Hidalgo-García C, Rodríguez-Sanz J, Corral-De-toro J, Monti-Ballano S, et al. Effectiveness of conservative treatment according to severity and systemic disease in carpal tunnel syndrome: A systematic review. Int J Environ Res Public Health. 2021;18(5):01-34.
[17] Middleton SD, Anakwe RE. Carpal tunnel syndrome. BMJ. 2014;349:g6437.
[18] Jiménez-del-Barrio S, Cadellans-Arróniz A, Ceballos-Laita L, Estébanez-de-Miguel E, López-de-Celis C, Bueno-Gracia E, et al. The effectiveness of manual therapy on pain, physical function, and nerve conduction studies in carpal tunnel syndrome patients: A systematic review and meta-analysis. Int Orthop. 2022;46(2):301-12.
[19] Boudier-Revéret M, Gilbert KK, Allégue DR, Moussadyk M, Brismée JM, Sizer PS, et al. Effect of neurodynamic mobilization on fluid dispersion in median nerve at the level of the carpal tunnel: A cadaveric study. Musculoskelet Sci Pract. 2017;31:45-51.
[20] Ballestero-Pérez R, Plaza-Manzano G, Urraca-Gesto A, Romo-Romo F, Atín-Arratibel M de los Á, Pecos-Martín D, et al. Effectiveness of nerve gliding exercises on carpal tunnel syndrome: A systematic review. J Manipulative Physiol Ther. 2017;40(1):50-59.
[21] Franklin GM, Friedman AS. Work-related carpal tunnel syndrome. Diagnosis and treatment guideline. Phys Med Rehabil Clin N Am. 2015;26(3):523-37.
[22] Wolny T, Saulicz E, Linek P, Shacklock M, Myśliwiec A. Efficacy of manual therapy including neurodynamic techniques for the treatment of carpal tunnel syndrome: A randomized controlled trial. J Manipulative Physiol Ther. 2017;40(4):263-72.
[23] Gesslbauer C, Mickel M, Schuhfried O, Huber D, Keilani M, Crevenna R. Effectiveness of focused extracorporeal shock wave therapy in the treatment of carpal tunnel syndrome: A randomized, placebo-controlled pilot study. Wien Klin Wochenschr. 2021;133(11-12):568-77.
[24] Wilson JK, Sevier TL. A review of treatment for carpal tunnel syndrome. Disabil Rehabil. 2003;25(3):113-19.
[25] Talebi GA, Saadat P, Javadian Y, Taghipour M. Manual therapy in the treatment of carpal tunnel syndrome in diabetic patients: A randomized clinical trial. Casp J Intern Med. 2018;9(3):283-89.
[26] Shacklock M. Neurodynamics. Kinésithérapie la Revue. 2012;12(121):49-57.
[27] Shacklock M. Clinical Neurodynamics. Clin Neurodynamics. 2005;4(1):88-100.
[28] Shacklock M. Neural mobilization: A systematic review of randomized controlled trials with an analysis of therapeutic efficacy. J Man Manip Ther. 2008;16(1):23-24.
[29] Gamelas T, Fernandes A, Magalhães I, Ferreira M, Machado S, Silva AG. Neural gliding versus neural tensioning: Effects on heat and cold thresholds, pain thresholds and hand grip strength in asymptomatic individuals. J Bodyw Mov Ther. 2019;23(4):799-804.
[30] Coppieters MW, Butler DS. Do "sliders" slide and "tensioners" tension? An analysis of neurodynamic techniques and considerations regarding their application. Man Ther. 2008;13(3):213-21.
[31] Zaheer SA, Ahmed Z. Neurodynamic techniques in the treatment of mild-to-moderate carpal tunnel syndrome: A systematic review and meta-analysis. J Clin Med. 2023;12(15):4888.
[32] de Arenas-Arroyo SN, Cavero-Redondo I, Torres-Costoso A, Reina-Gutiérrez S, Álvarez-Bueno C, Martínez-Vizcaíno V. Short-term effects of neurodynamic techniques for treating carpal tunnel syndrome: A systematic review with meta-analysis. J Orthop Sports Phys Ther. 2021;51(12):566-80.
[33] Hamzeh H, Madi M, Alghwiri AA, Hawamdeh Z. The long-term effect of neurodynamics vs exercise therapy on pain and function in people with carpal tunnel syndrome: A randomized parallel-group clinical trial. J Hand Ther. 2021;34(4):521-30.
[34] Wolny T, Linek P. Is manual therapy based on neurodynamic techniques effective in the treatment of carpal tunnel syndrome? A randomized controlled trial. Clin Rehabil. 2019;33(3):408-17.
[35] Lim YH, Chee DY, Girdler S, Lee HC. Median nerve mobilization techniques in the treatment of carpal tunnel syndrome: A systematic review. J Hand Ther. 2017;30(4):397-406.
[36] Vikranth GR, Kumar VKC, Mathias L. Comparative effect of carpal bone mobilization versus neural mobilization in improving pain, functional status and symptoms severity in patients with carpal tunnel syndrome. Int J Physiother. 2015;2(3):524-30.
[37] De-la-Llave-Rincon AI, Ortega-Santiago R, Ambite-Quesada S, Gil-Crujera A, Puentedura EJ, Valenza MC, et al. Response of pain intensity to soft tissue mobilization and neurodynamic technique: A series of 18 patients with chronic carpal tunnel syndrome. J Manipulative Physiol Ther. 2012;35(6):420-27.

PARTICULARS OF CONTRIBUTORS:
1. Undergraduate Student, Department of Physiotherapy, Nitte Institute of Physiotherapy, NITTE (Deemed to be University), Mangaluru, Karnataka, India.
2. Associate Professor, Department of Physiotherapy, Nitte Institute of Physiotherapy, NITTE (Deemed to be University), Mangaluru, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Saumya Srivastava,
Associate Professor, Department of Physiotherapy, Nitte Institute of Physiotherapy, NITTE (Deemed to be University), Mangaluru-575018, Karnataka, India.
E-mail: saumyasri2000@nitte.edu.in

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Mar 27, 2023
- Manual Googling: Aug 16, 2023
- iThenticate Software: Sep 26, 2023 (8%)

ETYMOLOGY: Author Origin

EMENDATIONS: 8

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- 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: **Mar 22, 2023**
Date of Peer Review: **Jul 07, 2023**
Date of Acceptance: **Sep 28, 2023**
Date of Publishing: **Nov 01, 2023**