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The Effects of Neural Mobilization in Carpal Tunnel Syndrome (CTS), a Review Article

Nafeesa Zamurd*

Department of Physiotherapy, Al jalal Institute for Down Syndrome, Jhelum, Punjab, Pakistan

***Corresponding author:** Nafeesa Zamurd, Department of Physiotherapy, Al jalal Institute for Down Syndrome, Jhelum, Punjab, Pakistan; Email: raquibul@mail.usf.edu

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Abstract

Objective: The main aim of this review is to integrate the studies that investigated the effects of neural mobilization in carpal tunnel syndrome.

Method and strategy: The following databases were explored including; ResearchGate, MIDLINE, Google Scholar, Pedro and PubMed. Keywords were used for the searches; neural mobilization, nerve gliding exercises, neurodynamics, median nerve mobilization and neural gliding exercises, carpal tunnel syndrome. The studies are selected by reviewing their abstracts, methodology, results and conclusion.

Selection criteria: The studies, determined the effects of neural mobilization in carpal tunnel syndrome were included in this review.

Results: There were 18 studies selected for the review including, 1 clinical trial, 3 systemic reviews and 14 Randomized Control Trails (RCTs). There was a difference noted in application of the neural mobilization techniques in almost all reviewed studies.

Conclusion: This review showed the beneficial effects obtained by the application of neural mobilization in carpal tunnel syndrome to reduce temporal summation, pain intensity and symptoms severity, to improve two-point discrimination, median nerve function, grip strength, range of motion, nerve conduction velocity and overall hand function. This Systemic review of the studies concluded that there is limited evidence to support the effects of neural mobilization in carpal tunnel syndrome and further research is acquired in future.

Keywords: Neural mobilization; Carpal tunnel syndrome

Introduction

The most common peripheral neuropathy in upper extremity is carpal tunnel syndrome [1]. In CTS, compression of median nerve occurs at the level of wrist. Symptoms of carpal tunnel syndrome include; pain, numbness, tingling and muscle weakness involving 1st three digits and half of the 4th digit with symptoms increasing at night. Physical examination findings of carpal tunnel syndrome may involve neurological deficit, thenar weakness, impaired sensations and two-point discrimination in median nerve distribution. Most common cause of CTS includes repetitive hand activities [2]. Incidence of CTS ranges from 0.125 to 1%. The overall prevalence of CTS in workers is 6.7%.

Non-surgical treatment of CTS includes; medications, occupational therapy and physical therapy (ultrasound, laser, infrared, TENS, night splints, nerve and tendon gliding exercises and median nerve mobilization) [3]. Neural mobilization is a technique which helps to restore the longitudinal motion of the affected nerve by improving nerve conduction velocity and reducing pain and symptoms severity. Limited studies have supported the effectiveness of neural mobilization as a treatment option for carpal tunnel syndrome, thus further research is required in future. Thus systemic analysis of review studies is done to determine the contribution of neural mobilization as treatment option for the carpal tunnel syndrome [4].

Objective: The main aim of this review is to integrate the studies that investigated the effects of neural mobilization in carpal tunnel syndrome.

Selection criteria

Study selection: There were 18 studies selected for the review including, clinical trial, systemic reviews and Randomized Control Trails (RCTs).

Participant selection: Both gender either with acute or chronic cases of carpal tunnel syndrome were included in this review [5].

Intervention: Various interventions were reviewed in the articles e.g., neural mobilization, nerve gliding exercises, neurodynamics, median nerve mobilization and neural gliding exercises, carpal tunnel syndrome.

Outcome measures: Outcome measures used are pain intensity, symptoms severity, range of motion, median nerve function, nerve conduction velocity, overall hand function and two-point discrimination and grip strength [6].

Literature review

This is a systemic review. Studies conducted from 2002 to 2020 are included in this review. The following databases were explored including; ResearchGate, MIDLINE, Google Scholar, Pedro and PubMed. Keywords were used for the searches; e.g. neural mobilization, nerve gliding exercises, neurodynamics, median nerve mobilization and neural gliding exercises, carpal tunnel syndrome. The studies are selected by reviewing their abstracts, methodology, results and conclusion. Randomized control trail, clinical trials and systemic reviews done in the past were studied to determine the effects of neural mobilization on following outcome measure; pain intensity, symptoms severity, range of motion, two-point discrimination, median nerve function, nerve conduction velocity, overall hand function and grip strength [7].

There were 18 studies selected for the review including, clinical trial, systemic reviews and Randomized Control Trails (RCTs). The analysis of the reviewed articles indicated that the amount and quality of literature to support the effect of neural mobilization in carpal tunnel syndrome is very limited. There was a difference noted in application of neural mobilization in almost all reviewed studies like neurodynamic sliders, neurodynamic tensioners, median nerve mobilization, ipsilateral neural mobilization, contra-lateral mobilization and neural gliding [8]. In few studies neurodynamic were combined with other different techniques like ultrasound, TENS, infrared, mid carpal distraction, tendon gliding, sham neurodynamic technique, soft tissue mobilization, laser and wrist splints and standard medical care.

Effects of neural mobilization in CTS

Akalin, et al. in 2002 carried out a randomized controlled trial on 28 patients with carpel tunnel syndrome. To group 1 wrist splint was applied and to group 2 wrist splint with nerve and tendon gliding exercises were applied. Intervention was applied for 4 weeks. Assessment was done with clinical parameters, a functional status scale and a symptom severity scale. This study concluded that group 1 showed better improvement than group 2 [9].

Michelle L. Heebner, et al. in 2007 carried out a randomized controlled trail RCT, 60 patients were included. To group 1 standard care and to group 2 neurodynamic mobilization exercise with standard care was given. Treatment was applied for 6 months. Assessment was done at baseline and at 1 and 6 months with disabilities of the arm, shoulder and hand questionnaire, (CTSQ) and elbow extension range of motion during an upper limb median nerve tension test. This study concluded that there was no significant difference between 2 groups but group 1 show significant improvement in CTSQ after 6 months than group 2 [10].

Jennifer M. Medina McKeon, et al. in 2008 carried out a systematic review and determined that the efficacy of neural gliding is not clear, future studies are required.

Joel E. Bialosky, et al. in 2009 carried out a randomized controlled trail RCT, 40 Subjects having signs and symptoms of CTS were randomly assigned to receive either neurodynamics or sham treatment. Duration of treatment was 3 weeks and assessment was done at baseline and 3 weeks with visual analog scale, DASH, sensations Semmes Weinstein monofilament, grip strength and electro diagnostic test. This study concluded that improvement in clinical pain intensity and upper extremity disability was equivalent in both groups but reduction in temporal summation was only observed in subjects who received NDT [11].

Horng, Yi-Shiung, et al. in 2011 carried out a randomized controlled trail RCT, 60 patients were divided into 3 groups. Group 1 received conventional treatment (splint and paraffin therapy) with tendon gliding, group 2 received nerve gliding with conventional treatment and group 3 received conventional treatment. Intervention was applied for 2 months. Assessment was done with the disabilities of the arm, shoulder and hand questionnaire and the physical domain of the world health organization quality of life questionnaire brief version. This study concluded that conventional treatment with tendon gliding was more effective than nerve gliding to improve functional status.

Azza Atya, Waleed Talat Mansour in 2011 did RCT, 30 female patients of age 30-45 years were included. Group 1 received low level laser and group 2 received nerve and tendon gliding exercises. Intervention was applied for 10 min, 3 times/week for two months in both groups. Assessment was done at baseline and at the end of 2nd month with visual analogue scale, grip strength measurement and nerve conduction studies. This study concluded that low level laser was more effective to reduce pain, improve grip strength and nerve conduction than nerve and tendon gliding [12].

Mistook HA, et al. in 2012 carried out a Randomized Controlled Trail RCT, 20 female patients were included. One group received median nerve mobilization and other group received self-median nerve mobilization. MNM was applied for 15 sec with 10 sec break, 3 times. Assessment was done with nerve conduction study and electromyography. This study concluded that MNM was more effective than self MNM for improving NCV.

Ana l. De-la-Llave-Rincon, et al. in 2012 carried out a clinical trial, soft tissue mobilization with neurodynamic mobilization was applied to 18 female patients with mild, moderate and worse pain on NPRS. Intervention was applied for 1 week. Assessment was done at baseline and after 1 week with NPRS. This study concluded that after 1-week reduction in pain intensity was observed, pressure of pain sensitivity was not changed.

Ali E. Oskoui et al, in 2014 carried out a randomized controlled trail RCT, double blind study. 20 patients with CTS were included and divided into two groups. Control group received routine physiotherapy and treatment group received neuromobilizations with routine physiotherapy. Intervention was applied 3 times per session, 3 days per week for 4 weeks. Assessment was done with Boston questionnaire, Phalen's test, Visual Analogue Scale (VAS) and Median Nerve Tension Test (MNTT), This study concluded that improvements in symptoms severity, visual analogue scale and median nerve tension test and Phalen's sign

was equivalent in both groups and functional status scale and median nerve distal motor latency were improved only in the treatment group (neural mobilization with routine physiotherapy) [13].

Discussion

Faten I. Mohamed, et al. in 2015 carried out a randomized controlled trail RCT, 28 patients were included. Group I received median nerve mobilization and group II received conventional medical treatment. Treatment was applied for 3 times per week for 6 weeks. Assessment was done at baseline and after 6 weeks. This study concluded that median nerve mobilization was more effective than conventional medical treatment.

Vikrant G. R., et al. in 2015 did RCT, 30 patients with CTS were included. Group A received carpal bone mobilization and subjects in group B received median nerve mobilization. Intervention was applied for 2 weeks and assessment was done at baseline and after 2 weeks. Assessment was done with VAS, the Functional Status Score (FSS) and Symptom Severity Score (SSS) using the Boston's questionnaire for CTS. This study concluded that there is no significant difference in group A (carpal bone mobilization) and group B (median nerve mobilization) for improving pain, functional status and symptoms severity.

Manu Goyal, Sudhir Kumar Mehta, et al. in 2016 carried out a randomized controlled trail RCT, 30 female patients were included. Group A received conventional physical therapy and group B received neural mobilization. Intervention was applied for two times per week for 3 weeks. This study concluded that neural mobilization was more effective to improve motor nerve conduction velocity and functional status than conventional treatment [14].

Janusz Kocjan in 2016 did RCT, 36 patients of age 35 -50 years were included. Group I received median nerve neuromobilizations and group II received median nerve neuromobilizations with mid carpal distraction. Intervention was applied for 21 days (3 sets of 10 reps per day). This study concluded that improvement in hand function, symptoms severity and pain intensity was more significant in group II (mid carpal mobilization and median nerve mobilization), although in some cases improvement in both groups was equivalent.

Tomasz Wolny, et al. in 2016 carried out a randomized controlled trail RCT, patients were divided into 2 groups. To group 1 manual therapy and neurodynamic technique was applied and to group 2 electro physical modalities infrared, ultrasonic therapy and laser was applied. Intervention was applied for 20 sessions 2 times per week. Assessment was done with 2-point discrimination. This study concluded that there was no significant difference between two groups. Both groups showed significant improvement in 2-point discrimination.

Ruth Ballestero-Perez, et al. in 2017 concluded that conventional treatment is most effective for pain relief although nerve gliding is a complementary treatment to improve function.

Yi Huey Lim, et al. in 2017 concluded that the finding is not clear regarding the effects of median nerve mobilization on CTS. Further research is required in future.

Mahmoud S. Asal, et al. in 2018 carried out a RCT, 45 patients were included and randomly assigned to 3 groups. Group 1 received contra-lateral median nerve mobilization with conventional treatment, group 2 received ipsilateral median merve mobilization with conventional treatment and group 3 received only conventional treatment. Intervention was applied for 3 times per for 2 weeks and assessment was done with VAS and upper extremity functional status at baseline and after 2 weeks. This study concluded that conventional treatment (ultrasound, tens, infrared) had beneficial effect in improving pain and functional status neural mobilization is only complementary treatment.

Ghadam Ali Talebi, et al. in 2020 carried out a randomized controlled trail RCT, 30 patients were included. To group 1 mechanical interface mobilization and to group 2 neural mobilization was applied. Intervention was applied for 3 times per week for 4 weeks. Assessment was done with Visual Analogue Scale (VAS), Symptom Severity Scale (SSS), hand Functional Status Scale (FSS) and motor and sensory distal latencies of median nerve. This study concluded that there was no significant difference between two groups [15].

There is 1 clinical trial which reported that soft tissue mobilization with neurodynamic mobilization was effective to reduce pain intensity in chronic carpal tunnel syndrome. There were 3 systemic reviews which concluded that there was lack of qualitative and quantitative evidence to support the effects of neural mobilization in carpal tunnel syndrome. Out of 14 Randomized Control Trials (RCTs), studies concluded the beneficial effects of neural mobilization to reduce pain intensity, temporal summation, grip strength, two-point discrimination, overall hand function and median nerve function and studies reported less beneficial effects of neural mobilization. Different terminologies were used synonymously with neural mobilization like nerve gliding exercises, neurodynamics, median nerve mobilization and neural gliding exercises. This analysis showed that only one study was double blinded. Groups were similar at the baseline in almost all the studies included in this review. Despite the methodological limitations of studies included in this review such as study design, subject blinding and sample size calculation, beneficial effects of neural mobilization in carpal tunnel syndrome were observed.

Recommendations

Future research should determine the effectiveness of mobilization in carpal tunnel syndrome in elaboration with large sample size with a homogenous population.

Conclusion

This review showed the beneficial effects obtained by the application of neural mobilization in carpal tunnel syndrome to reduce temporal summation, pain intensity and symptoms severity, to improve two-point discrimination, median nerve function, grip strength, nerve conduction velocity and overall hand function. This systemic review of the studies concluded that there is limited evidence to support the effects of neural

mobilization in carpal tunnel syndrome and further research is acquired in future.

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