

Effects Of Soft Tissue Mobilisation Versus Therapeutic Ultrasound For Patients With Neck Pain- A Randomised Clinical Trial

Mohini Sunil Gadge¹, Dr. Swapna Kamble²

¹Final Year Student, Department of Musculoskeletal, Physiotherapy, Ravi Nair Physiotherapy College, Sawangi (Meghe), Wardha

²Associate professor, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Sawangi (Meghe), Wardha

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Abstract

Neck and arm pain is common in the general population.^{1,2} Individuals with neck and upper extremity symptoms demonstrate greater levels of disability than do individuals with neck pain alone.³ While individuals with cervical radiculopathy often report neck pain, they most frequently seek treatment due to arm pain.^{3–5} Individuals with whiplash associated disorders who demonstrate signs of irritation of the brachial plexus and subsequent neck and arm pain reported more severe symptoms and achieved worse outcomes than those without brachial plexus irritation.⁶ Some authors have suggested that patients with neck and arm pain should be treated more expeditiously in order to avoid the further negative impact on mental health status associated with chronic symptoms.³

INTRODUCTION

Neck and arm pain is common in the general population.^{1,2} Individuals with neck and upper extremity symptoms demonstrate greater levels of disability than do individuals with neck pain alone.³ While individuals with cervical radiculopathy often report neck pain, they most frequently seek treatment due to arm pain.^{3–5} Individuals with whiplash associated disorders who demonstrate signs of irritation of the brachial plexus and subsequent neck and arm pain reported more severe symptoms and achieved worse outcomes than those without brachial plexus irritation.⁶ Some authors have suggested that patients with neck and arm pain should be treated more expeditiously in order to avoid the further negative impact on mental health status associated with chronic symptoms.³

Neck and arm pain may be associated with several factors including cervical disc disease,⁷ osteophyte formation,⁸ neural tissue mechanical sensitivity,^{9–11} and soft tissue dysfunction. Neural tissue mechanosensitivity is a condition where there is an elevated painful response (hyperalgesia) to mechanical stimuli, i.e. changes in tension and/or compression of the neural tissues.^{9–11} Mechanical sensitivity of the neural structures of the upper limb may be

related to impaired movement of the nerves as they glide past adjacent structures such as joints, discs, ligaments, muscles, and other soft tissue structures such as the intermuscular septum.⁹ For example, patients with non-specific arm pain and carpal tunnel syndrome demonstrate decreased movement of the median nerve at the wrist where it travels past the carpal bones and flexor retinaculum.

It has been suggested that neural mobilization, a treatment approach focusing on facilitating movement of the nerve and surrounding structures, may be beneficial for those who present with cervicobrachial syndrome.^{9,10} The goal of interventions is either to encourage gliding of the nerve by controlled angular movements or to allow more space for the nerve to move by improving mobility of the structures that surround the nerve (the neural container).^{9,11} An example of such an intervention includes the cervical lateral glide mobilization with the involved upper extremity placed in a position designed to take up the slack in the brachial plexus. However, several authors have advised against applying cervical spine mobilization techniques to patients who demonstrate either normal or excessive mobility of the cervical spine, which may include some patients with cervicobrachial syndrome.¹⁷ Hypermobility is a frequent finding in patients with whiplash-associated disorder, a group who

commonly reports neck and arm pain.⁶ Furthermore, joint mobilization techniques may be contra-indicated in those who have recently undergone cervical surgery. For these patients, interventions other than cervical joint mobilization may be indicated.

Rationale

Just as the bony structures may restrict movement of the neural tissues, restriction of the surrounding soft tissue may also impair movement of the nerve and compress the nerves as they course through the neural container.⁹ Patients with decreased upper limb neural extensibility, as indicated by decreased range in the upper limb neurodynamic test (ULNT), demonstrated a reduced amount of length of the upper trapezii compared to those with greater extensibility. Greening et al. hypothesized that reduced sliding of the median nerve observed in patients with whiplash injury or non-specific arm pain (NSAP) may be related to shortening of the scalene muscle which may elevate the first rib and restrict sliding of the medial cord of the brachial plexus. Dysfunction of the soft tissue structures of the upper quarter (muscle and connective tissue) may also provide nociceptive input to the nervous system, contributing to the pain perceived by the patient. Tenderness on palpation, shortened length, and hyperirritable tender points within a palpable taut band of the upper quarter soft tissues are common findings

in patients with neck pain. Letchuman et al. reported that cervical radiculopathy was associated with increased tender points in the muscles innervated by the involved nerve root.

There is preliminary evidence that soft tissue techniques may be beneficial for patients with carpal tunnel syndrome and with cervical radiculopathy.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4984818/>

- C20 Burke et al. investigated the effects of two different soft tissue mobilization (STM) techniques designed to address soft tissue restrictions in the forearm and hand of patients with carpal tunnel syndrome. Although clinical improvements were not different between them, both manually applied and instrument assisted STM techniques improved pain, range of motion (ROM), nerve conduction latencies, and function. De-la-Llave Rincon et al. recently reported clinically important reduction in hand pain in a case series of patients with carpal tunnel syndrome after a single application of STM followed by manual nerve sliders directed at the median nerve.

Aim

The immediate effects of soft tissue mobilization versus therapeutic ultrasound for patients with neck and arm pain with evidence of neural mechanosensitivity.

Objective To investigate the immediate effects of soft tissue mobilization (STM) versus therapeutic ultrasound (US) in patients with neck and arm pain who demonstrate neural mechanical sensitivity.

Hypothesis:

Null hypothesis: There is no significant difference between soft tissue mobilization (STM) and therapeutic ultrasound (US) in patients with neck and arm pain.

Alternate hypothesis: There is significant difference between soft tissue mobilization (STM) and therapeutic ultrasound (US) in patients with neck and arm pain.

Review of Literature

Naoki Ikeda et al.(2019)- Instrument-assisted soft tissue mobilization (IASTM) has been reported to improve joint range of motion (flexibility). However, it is not clear whether this change in the joint range of motion is accompanied by any alterations in the mechanical and/or neural properties. This study aimed to investigate the effects of IASTM in plantarflexors and Achilles tendon on the mechanical and neural properties of them.

Ozlem Ulger et al.(2017)- Determine the effects of spinal stabilization exercises (SSE) and manual therapy methods on pain, function and quality of life (QoL) levels in individuals with chronic low back pain (CLBP). This study showed that SSE and

manual therapy methods have the same effects on QoL, while the manual treatment is more effective on the pain and functional parameters in particular.

Mustafa Yilmaz et al (2019)- Compared the effect of high-intensity laser therapy (HILT) and a combination of transcutaneous nerve stimulation (TENS) and ultrasound (US) treatment on pain, range of motion (ROM) and functional activity on cervical pain associated with cervical disc herniation (CDH). They concluded that two treatment programs have similar effects in the treatment of cervical pain associated with CDH and can be used as an alternative to each other in clinical applications.

MATERIALS AND METHODS

Material and Methodology:

Study Type: Interventional Study

Study Design: Comparative Study

Study Setting: Department of Musculoskeletal OPD, Ravi Nair College of physiotherapy, Datta Meghe Institute of Medical Sciences, Sawangi, Wardha, India.

Study Population: Individuals with Neck and Arm Pain

Sample Size= 34

Sample size calculation

To determine sample size, an estimate of effect size was calculated from the data provided by Coppieters et al. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4984818/> - C21 This study examined the effects of a neuromobilization technique in a patient population similar to the current study. Using the values for each group provided by Coppieters et al., Cohen's d was estimated as $d=2.02$ for improvement in elbow ROM during the ULNT, and $d=1.1$ for the NPRS, both large effects. Since an ANOVA was used to analyze the effects of interventions, an estimate of effect size index f was made. The information needed to calculate f to determine sample size for an ANOVA was not provided by Coppieters et al. Cohen states that a value of $f=0.5$ may be used to estimate a large effect. Considering that the calculated d for elbow ROM is 2.02 and a 'large' d can be estimated at 0.80, using $f=0.5$ is reasonable. Using $f=0.5$ and power=80% produced a sample size of 17 patients per group.

Procedure: After permission from ethical committee, the permission to screen the participants was taken from the respective authority, an informed consent was taken from each participant and an explanation of the study was given

Participants those who were willing to participate in the study were screened according to inclusion and exclusion criteria

Group A (Soft tissue Mobilization): Soft tissue mobilisation will be given to the neck muscles as well as for deltoid. . It used for pain free mobilization. It is use to regain mobility, reduce tissue oedema, reduce muscle spasm, and stretch fibrous tissue

Group B (Therapeutic Ultrasound): Therapeutic ultrasound is given for 8 mins with 3 MHz frequency in neck region.

Outcome measures

Neck Disability Index (NDI)

The NDI is a self-report measure containing 10 items that assesses a patient's disability due to neck pain. Test-retest reliability for the NDI in patients with cervical radiculopathy has been reported to be fair

(ICC=0.55) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4984818/> - C39 to moderate (ICC=0.68), and the minimal clinically important change has been reported to be range from 7.0 points or 14% to 8.5 points or 17%.

Numeric Pain Rating Scale (24-hour NPRS)

The NPRS was used to measure pain intensity. The patient rated 'average pain', 'least pain', and 'worst pain' over the last 24 hours on a 0–10 scale, 0 representing no pain and 10 representing the worst pain imaginable. The average of these three scores was used for data analysis of 'daily pain'. The NPRS has demonstrated acceptable levels of test–retest reliability (ICC=0.59 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4984818/> - C47 to 0.63 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4984818/> - C46) and a 2.2 point change in the NPRS has been reported to be clinically meaningful (15-36).

DATA MANAGEMENT

Data collection and reporting will be performed under the guidance of the chief investigators. Documentation for the analysis will be carefully scrutinized for accuracy. The Excel spreadsheet will be issued to an allocation blinded statistician at the end of the study to perform the required analysis, after which the groups will be unblinded. The trial's data will be stored in a safe, locked storage area with restricted access for later analysis by a biostatistician and the lead researcher. Checklists are used to avoid data from being lost due to inadequate personnel procedures.

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