



Analgesic Effects of Dry Needling and Active Release on Upper Trapezius Muscles in Neck Pain Patients.

Dr. Anita Singh

Mpt (Sports), Integral University, Lucknow, India

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ABSTRACT

Objectives: To establish the best possible effective choice of treatment program for MTrPs by using the combination of DN with ART.

Intervention: The experimental group A received Dry needling alone, experimental group B received Active Release Technique alone, The experimental group C received DN in combination with ART and whereas control group (D) received conventional treatment only. Main outcome measures: Pain or pain intensity was assessed by using VAS scale, Range of motion was assessed with goniometer and the functional status of patients by Neck Disability Index score.

Results: Within group analysis revealed significant improvement in Pain, ROM and NDI in all groups. Between group analysis revealed significant difference between Group A, B, C and D for all variables even after alternative days of 1 week.

Conclusion: The combination of DN with ART has been shown to produce greater improvement in ROM, functional status on neck disability index scores and reduction in pain intensity on visual analogue scores even after alternative days of 1 week. This shows the long term effectiveness of combination of two techniques. This study may provide a rationale for the clinical use of these two techniques in deactivating the myofascial trigger point's pain.

INTRODUCTION

Neck Pain is a most common musculoskeletal disorder affecting individuals of any age group due to poor head posture and can occur when a person works for a long time or at high intensity. The prevalence of developing neck pain is 70%, posing future challenges to society. (1) A common cause of neck pain is development of Myofascial trigger points (MTrp) and unbalanced soft tissue around the head and neck structures that can limit the Range of Motion (ROM). (2-7)

MTrp is a condition, which is associated regional pain and muscle tenderness characterized by the presence of hypersensitive nodules within taut bands of skeletal muscles(8). Simons et al. defined MTrp as the presence of exquisite tenderness at a nodule in a palpable taut band of muscles. They are able to produce referred pain, either spontaneously or on digital compression and it is also reducing the joint ROM(9). Although MTrps are found in all muscle groups, they are more prevalent in the upper quarter postural muscles, especially the upper trapezius muscles and can cause local pain and may distribute the neck and shoulder girdle function in patients with neck pain(10,11,12). Therefore, the diagnosis and treatment of MTrps in muscles around neck especially upper parts of trapezius muscles is important with the aim of restoring soft tissue function or mobility to the joints in the patients with neck pain.

Physiotherapy is often considered the first treatment option for people with neck pain. Different therapeutic strategies, like Cervical spine mobilization and manipulation(13), Education(14), Thoracic manipulation(15) or Therapeutic exercises(16)

have shown to be effective for the treatment of neck pain. However, the evidence supporting the use of other therapies proposed for the management of neck pain such as Dry needling and Active release technique and their combined effect is still limited.

Dry needling is invasive methods to treat MTrps. During Dry needling, a needle is inserted directly into the trigger points in the muscles without injecting a substance. Cummings TM et al stated that Dry needling consists of the insertion of needle in the active trigger points, by means of which an analgesics effect is obtained through the mechanical stimulus and the neurophysiological effect associated with the introduction of needle. Dommerholt J reported that Dry needling may mechanically cause the local sarcomere to stretch and the cytoskeleton structures inside the MTrps to contracts. It stimulates A-delta fibers and activates enkephalin-producing neurons in the dorsal horn, which leads to the reduction and suppression of pain. This is an effective way to reduce the somatic pain and disabilities that are associated with the MTrps in neck muscles(17). Active release technique (ART) is a manual therapy for the recovery of soft tissue function that involves the removal of scar tissue, which can cause pain, stiffness, muscle weakness and abnormal sensations including mechanical dysfunction in the muscle, myofascia and soft tissue(18). The effectiveness of ART has been reported for carpal tunnel syndrome, Achilles tendinitis, tennis elbow, all of which involve soft tissue near joints in the distal part of body(19). Dvord J et al stated that soft tissue injuries is the cause of pain in 87.5% of neck pain cases and ART is performed directly on the injured soft tissue to relieve pain. It is also effective in reducing pain and increasing pain in patients with a partial tear of the supraspinatus tendon(20).

Most patients with neck pain experience pain and movement limitations as a result of soft tissue impairment in neck.

No previous studies have assessed how ART in combination with Dry needling can improve ROM and decrease pain in patients with neck pain. Also there are no literature available that shows which intervention should be given first during treatment of neck pain, i.e, either ART should incorporate prior to Dry needling or Dry needling should incorporate prior to ART to assess their combined effects.

Literatures are available which shows the effectiveness of both Dry needling and ART either Individually/isolate or with some other techniques but there's no literature/research comparing the effectiveness between technique ART and Dry needling in patients with upper trapezius MTrps.

Therefore, the purpose of this study is to compare the combined effects of both techniques and assess which intervention should be given first on pain and ROM in upper trapezius MTrps with the aim of elucidating additional information on their effects and identifying more efficient treatments that can be used in clinical Settings.

NEED FOR STUDY/RESEARCH GAP

Neck pain is one of the most common health-related problems affecting economic productivity in modern society and researches into optimal treatment for neck pain is lacking. Previous studies have reported the application of Dry needling and ART with other therapeutic interventions for the treatment of neck pain but there are no studies available as per our knowledge to analyse the combining effect of Dry needling and ART in the treatment of neck pain or which technique is better in showing the best analgesic effect and in improving ROM in patients with neck pain.

So, the need for this study is to compare the influence of both techniques (DN & ART) on upper trapezius MTrps as a useful intervention in the management to reduce neck pain and increase ROM.

HYPOTHESIS

Null Hypothesis

1. There will be no significant difference in pain and neck ROM following combined treatment of Active Release Technique and Dry needling in patients with neck pain.

2. There will be no significant difference in pain and neck ROM following individual treatment of Active Release Technique and Dry needling in patients with neck pain.

Experimental Hypothesis

1. There will be a significant difference in pain and neck ROM following combined treatment of Active Release Technique and Dry needling in patients with neck pain.

2. There will be a significant difference in pain and neck ROM following individual treatment of Active Release Technique and Dry needling in patients with neck pain.

AIMS & OBJECTIVES

To know the combining effect of Dry needling and ART in the treatment of neck pain or which technique is better in showing the best analgesic effect and in improving ROM in patients with neck pain.

1. To assess the effects of both techniques on Upper Trapezius muscles in neck pain patients to reduce pain, improve neck function and increase ROM.

2. To assess the combine effect of both techniques on Upper Trapezius muscles in the neck pain patients to reduce pain and increase ROM.

SIGNIFICANCE OF STUDY

This study will be undertaken to compare the analgesics effects of Dry needling and Active Release Technique and to determine if Active Release Technique should incorporate before or after Dry needling in the treatment of neck pain associated with MTrps of upper trapezius muscle and identify which intervention is more efficient treatment that can be used in clinical settings.

OPERATIONAL DEFINITION

Myofascial Trigger Points: -

MTrPs are highly sensitive spots that lie in the skeletal muscle, and are diagnosed with mechanical pressure. Patients with MTrps are generally characterized by the presence of one or more of the following symptoms: local pain, referred pain according to a typical pattern, pain when exerting compression or stretch on the muscle, local twitch response (LTR) provoked by the snapping palpation of the taut band, reduced force, and decreased range of motion (ROM). A combination of these symptoms can result in less functionality and quality-of-life.

ACTIVE RELEASE TECHNIQUE

According to Austin Sports Therapy, ART was developed by chiropractor Dr. P. Michael Leahy to work on a variety of muscle, tendon, ligament, fascia and nerve issues. In this technique deep digital pressure is applied over the tender point (trigger point) in a shortened position of the muscle and then patient is asked to actively take it in an opposite lengthened position. This will break the adhesions.

DRY NEEDLING

Dry needling consists of the insertion of a needle in the active trigger point, by means of which an analgesic effect is obtained through the mechanical stimulus and the neurophysiological effect associated with the introduction of the needle.

VISUAL ANALOGUE SCALE

We used the VAS to evaluate the degree of neck pain. The VAS is a subjective scoring method for recording the degree of present pain from 0 (no pain) to 10 (the most severe pain ever experienced) on a 10-cm scale.

RANGE OF MOTION

Passive ROM can be measured by fixing the subjects's shoulder so that it will not be affected by the other parts of the trunk. Then, neck flexion, extension, right side bending, left side bending, right rotation, and left rotation can be measured.

The range of the angle can be measured with a therapist passively assessing the patients's pain-free neck-joint ROM.

NECK DISABILITY INDEX

The Neck Disability Index (NDI) is a commonly used health outcome measure to capture perceived disability in patients with neck pain.

The NDI contains 10 items—7 related to activities of daily living, 2 related to pain, and 1 related to concentration.

MATERIALS AND METHODS

1. Study Design: - Randomised Control Trial.
2. Study Setting: - Study will be execute in the Parihar physiotherapy centre , Kanpur U.P., under the supervision of Dr. S. D. Singh Parihar and under the guidance of Dr. Ashfaque Khan.
3. Sample Size: - n=40. The subjects were recruited from the Parihar physiotherapy centre, Kanpur.
4. Study Duration:- Total study duration will be 1 weeks. Individual will receive treatment for the duration of 1 weeks of alternate days and one week of follow-up after the termination of intervention.
5. Subjects:- The participants with clinical diagnosis of neck pain associated MTrps of upper trapezius muscles, who will fulfil the predetermined inclusive and exclusive criteria are selected and divided into 4 groups by simple random sampling. Groups are named as group A, B, C and D.
6. Selection Criteria
Inclusion Criteria :-
 - a) Not participated in any other intervention.
 - b) Gender – Males and Females.
 - c) Age group between 18 or above.
 - d) Clinical diagnosis of unilateral or bilateral (the more painful side will be selected for the treatment) Mtrps of upper trapezius muscles.
 - e) The participants who had a 3 months or longer history of neck pain and had mild disability based on neck disability index.
 - f) ART and Dry needling must be used as a intervention.

Exclusion Criteria :-

- a) History of upper quadrant surgery.
- b) Radiculopathy.
- c) Neck and back deformities like torticollis or scolios
- d) History of trauma, fracture or surgery of neck or upper back or shoulder.

- e) Non-myofascial diseases.
- f) Neck pain associated with whiplash injury.
- g) Neck pain associated with cervical disc herniation.
- h) Neck pain accompanied by vertigo.

7. Outcome Measures :-

a) Primary Outcomes –

- i) Pain and Degree of pain can be assessed by using VAS.
 - ii) Status of MTrPs as determined by digital palpation.
 - iii) Trigger points are rated as – 1. Active (Spontaneously painful).
2. Latent (Requiring palpation to reproduce the pain).
 3. Resolved (no palpable nodule).

b) Secondary Outcomes –

- i) Range of Motion can be assessed by using Universal Goniometer.
- ii) Neck Disability can be assessed by using Neck Disability Index.

8. Variables:-

DEPENDENT VARIABLES INDEPENDENT VARIABLES

1. Pain
 2. Range of Motion
 3. Neck Disability
1. Active Release Techniques
 2. Dry Needling.

9. Measurement Tools:-

- a) Visual Analogue Scale.
- b) Universal Goniometer
- c) Neck Disability Index

PROTOCOL

Prior to participation each subjects were required to read and sign an informed consent forms. The entire subjects who had met the inclusion and exclusion criteria was assigned randomly via chit method to any of the four groups. Visual Analogue Scale (VAS), Range of Motion (ROM) and Neck Disability Index (NDI) scores were taken pre-intervention and after 2 min. of post-intervention at day 1, day3 and day 5 and one week of follow up after the termination of intervention. All the four groups received the treatment on three alternate days for one week. Neck

Disability Index (NDI) score were taken but limited to pre-intervention at day 1, post-intervention at day 5 and one week of follow-up after the termination of intervention.

- Group A received Dry Needling with simple ROM exercises, B received active release technique with simple ROM exercises, Group C received combined intervention of ART and Dry needling with simple ROM exercises and Group D (Control group) received simple ROM exercises.

- All the participants of study received 3 successive ART and Dry needling session weekly and post treatment evaluation will be done at Day 1, Day 3 and Day 5 of intervention and follow-up. Total 3 session of treatment will be given to participants.

- Evaluation of primary and secondary outcomes will perform at baseline, Day1, Day3, and Day5 of intervention to analyse the analgesics effects of combined intervention of Dry needling and ART and to assess the analgesics effects of Dry needling and Active Release Technique.

PROCEDURE

MEASUREMENT OF PAIN INTENSITY

- Method: To determine the area of the possible trigger point, the subjects were asked to point to the painful area in the upper trapezius muscles. Then I palpated the upper trapezius region on one side with thumbs.

Subjects were told to rate their pain on VAS, assessing local pain evoked by the application of that amount of pressure.

MEASUREMENT OF RANGE OF MOTION

- Methods: Accurate measurement of cervical motions was done by using Goniometer

1. For Flexion and Extension

- Subjects were instructed to sit erect in a straight-back chair with the sacrum against the chair, thoracic spine away from the back of the chair, arms hanging at the sides and feet flat on the floor. To measure cervical flexion, first instruct the subjects to “nod your head to make a double chin” (suboccipital flexion). Then encourage the subjects to flex further until full cervical flexion is obtained. Then I recorded measurements of ROM by using Goniometer. To measure cervical extension, first instruct the subjects to “nod your head back” (suboccipital extension). Then have the subject extend further until full extension is achieved. Record this measurement also.

2. For Lateral Flexion

- Subjects were instructed to sit erect in a straight-back chair with the sacrum against the back of the chair, the thoracic spine away from the back of the chair, arms hanging at the sides and feet flat on the floor.

Note: to eliminate rotation during lateral flexion the subjects should focus on a point on a wall straight ahead. Next subjects were instructed to flex the head laterally to the left or right, keeping the shoulders level and without rotating the head. Monitor for shoulder elevation by lightly placing hand on the right or left shoulder, correct manually any head motion outside the coronal plane. Note and record the measurement by using goniometer.

3. For Left or Right Rotation

- Subjects were instructed to sit erect in a straight-back chair with sacrum against the back of the chair, the thoracic spine away from the back of the chair, arms hanging at sides and feet flat on the floor. Then subjects were instructed to focus on a horizontal line on the wall so the head is not tipped during rotation. Have the subjects turn the head as far to the left or right as possible, and to ensure that no shoulder rotation occurs, lightly stabilize the right or left shoulder with the hand by the therapists. Record the measurement in the appropriate place on the recording sheet.

MEASUREMENT OF NECK DISABILITY INDEX

- A functional questionnaire “Neck Disability Index (NDI)” was provided to the subjects to assess their functional limitations due to myofascial trigger points pain. The subjects were instructed to take the closest choice to the one which indicated the true subjective assessment of the subject disability for that particular item. The scores of each item were added and final score was calculated for analysis.

DESCRIPTION OF THE APPLIED MANUAL TECHNIQUES

- The physiotherapies interventions applied in this study were, Dry needling and Active Release Technique.

For Active Release Technique

a) Kage V, Ratnam R et al, (2014), stated the protocol for the application of ART as follow - Firstly instruct the patient to sit comfortable on a stool or chair with hands supported on the thigh. The therapist stands behind the patient to stabilize his shoulder with one hand. Asked the patient to take his neck into extension and then therapist places his other hand onto patients MTrPs of upper trapezius muscles and applied a deep tension stretch with the thumb and lastly asked patient to flex and turn his neck. Repeat this maneuver for 3-5 times.

For Dry Needling

b) Cumming TM et al (2009) and Azzaretta E, et al (2013), stated that Dry needling is a non-pharmacological treatment for myofascial pain syndrome commonly used for reducing pain associated with MTrPs. And the protocol for the application of Dry needling as follows – Dry needling is frequently performed by a clinicians using a 32 gauge acupuncture needle inserted into a palpably painful nodule using a superficial (10-20mm) or deep (25-40mm) needle technique.

DATA ANALYSIS

- The statistical analysis will be performed using the Excel 2017 software. Descriptive statistics will be calculated for total study sample for both male and females using mean and standard deviation. The variable will be expressed as the mean and standard deviation and p value will set as 0.05, the result is taken to be statistically significant if $p < 0.05$.
- Before starting the test, demographic data will be collected and with the collection of demographic data, test administrator measures the primary and secondary outcome measures of participants at baseline, day 1, day 3 and day 5 and one week of follow up after the termination of intervention.

RESULTS

VARIABLES	GROUP-A	GROUP-B	GROUP-C	GROUP-D
Pre VAS	9.10 \pm 0.74	8.80 \pm 0.92	9.20 \pm 0.79	9.10 \pm 0.74
Post VAS Day-5	3.40 \pm 0.52	5.42 \pm 0.52	3 \pm 0	6.40 \pm 0.70
Pre ROM	74 \pm 4.59	75.5 \pm 3.69	75 \pm 3.33	74.50 \pm 2.84
Post ROM Day-5	90 \pm 0	87 \pm 2.58	90 \pm 0	84 \pm 3.94
Pre NDI	88.6 \pm 12.03	83.3 \pm 13.15	86 \pm 13.03	86.8 \pm 11.003
Post NDI Day-5	6.2 \pm 8.7	40.52 \pm 21.18	10 \pm 8.89	42.96 \pm 21.200
P- value	p < 0.0001	p < 0.0001	p < 0.0001	p < 0.0001

Group-A: Dry needling; Group-B: Active Release Technique; Group-C: Combined intervention on both (D.R. + A.R.T.) and Group-D: Control Group.

DISCUSSION

This was a Comparative study to evaluate the efficacy of ART, DN or Combined intervention of both on trapezius muscles pain due to spasm or development of MTrPs, the most commonly found musculoskeletal disorders. The trapezius is particularly susceptible to damage by repetitive movements of the hand and arm while performing work such as using a computer for prolonged periods and poor posture. More of the study participants were right-handed and thus performed more movement of the right upper extremity than the left. ART by the literature is designed to accomplish three unique objectives: These are restoring free and unimpeded motion of soft tissues, release of entrapped nerve, vasculature and lymphatics thereby, re-establishing optimum texture, resilience and function of soft tissues. ART is a method for treating the soft tissues such as the tendon, nerve, and myofascial, and is performed for repetitive strain injury, acute injury, and functional fixation damage due to abnormal posture maintained over the long term. Furthermore, ART is an effective at resolving adhesion of scar tissues and the soft tissues that causes pain, spasm, muscle weakness, tingling, and other symptoms.

The use of ART, as echoed by many authors, is found to be a successful treatment option in soft tissue injuries and muscle pain like hamstring tightness and flexibility, Achilles tendinopathy, upper extremity overuse syndrome, lateral epicondylitis,

adductor strain etc. The possible mechanism for this effectiveness may be that ART by virtue of mechanical stimulation causes a reactive hyperaemia and produces analgesic effect. Mechanical stimulation through digital pressure invokes the physiological response to cutaneous as well as muscular mechanoreceptors. This may alter the nociception and pain. With manual contact, mechanoreceptors may induce inhibitory effect on central nervous system which may result in decrease in H reflex. A patient also actively does the movement which increase the circulation and thus, reduction in pain and spasm may reduce the symptoms.

Robb et al. demonstrated immediate improvement of muscle PPT when ART was used to treat patients with adductor strain. Additionally, in a study by Tak et al. ART treatment for 3 weeks on the gluteus medius of a patient with low back pain for 3 weeks resulted in improvement of the patient's VAS score and PPT. Although our target area differed from the studies of Tak et al. and Robb et al., significant improvement was observed in the VAS score, ROM and NDI after using ART to treat the neck muscles in the present study. It is my opinion that these improvements in VAS, ROM and NDI after treatment is the result of decreases in muscle tone after removing scar tissue adherent to soft tissue.

In a study by James involving 20 young men with no injury of the lower extremity, hamstring flexibility increased immediately after ART was applied. Similarly, in the present study, ROM significantly increased and NDI score significantly decreased after ART was applied on the neck for alternate days of 1 week. This findings indicates that scar tissue, which can limit the mobility of soft tissue, can be removed by ART and thus relieve limitations of movements.

While in DN, There is a growing body of evidence supporting the use of Dry needling (DN) as an intervention to MTrPs.

Investigators have attributed the therapeutic effects of DN to various mechanisms, such as mechanical, neurophysiologic and chemical effects. It is thought that DN mechanically provides a localized stretch to the shortened sarcomeres and contracted cytoskeletal structures within the MTrPs. This would allow the sarcomeres to resume its resting length by reducing the degree of overlap between actin and myosin filaments.

Simons et al stated that the main therapeutic factor for the effectiveness of DN is the mechanical disruption of the MTrPs by the needle and trigger points change in status from active trigger points to latent trigger point or probably normal tissues.

DN can stimulate the A-delta nerve fibers, which in turn, may activate the enkephalinergic inhibitory dorsal horn interneurons, resulting in opioid-mediated pain suppression (pain relief). Some studies have also demonstrated that the increased levels of bradykinine, CGRP, substance P and other chemicals at MTrPs are directly corrected by eliciting LTR following DN. It has been suggested that DN may influence the microcirculation in muscles. Several investigators have demonstrated that needle insertion in the muscle may influence the microcirculation and enhance blood flow in the stimulated region.

Previous studies have assessed the effects of DN on MTrPs in UT. However, samples and testing procedures, different results have been reported regarding the effects of DN on MTrPs in the UT.

Abbaszadeh et al. and Ziaieifar et al. showed that DN administered to patients with MTrPs in the upper trapezius muscle significantly decreases the pain intensity and NDI and increases ROM.

Gerber et al. demonstrated that the DN treatment of MTrPs in the trapezius muscles decreased the pain and increased ROM after each of three assessment sessions.

Research has reported that DN may mechanically causes the local sarcomeres to stretch and cytoskeleton structures inside the MTrPs to contract. DN stimulates A-delta fibers and activates enkephalin-producing neurons in the dorsal horn, which leads to the reduction and suppression of pain. It has been shown that DN may affect the microcirculation of the skin and muscles, as well as change the chemical properties of MTrPs.

Similarly, in the present study, ROM significantly increased and NDI score significantly decreased after DN was applied on the neck for alternate days of 1 week. This findings indicates that MTrPS over UT causes pain, which can limit the mobility

of soft tissue, can be removed by DN and thus relieve limitations of movements and disability (NDI) caused due to pain and painful ROM.

In this study if we compare the effectiveness of both the intervention (DN & ART), DN has greater effects than ART to relieve symptoms.

There is no literature till date that demonstrated the effectiveness of combined intervention of DN and ART on MTrPs in the upper trapezius muscles.

In this study I investigate the combined effects of DN and ART on MTrPs in the upper trapezius muscles which shows significant effect on VAS, ROM and NDI after alternate days of a week interventions of both the treatment protocols.

LIMITATIONS OF STUDY

In this study, there was small sample size (40 patients) and lack of long-term treatment and follow-up. There was also heterogeneity of the sample in the relation to gender (22 females and 18), although, according to the 2011-2012 National Health Survey, there is a high prevalence of chronic cervical myofascial syndrome that appears more frequently in women (21.9%) than men (9.6%), which could be reflected in the study sample. Similarly, limitations of the study could be the wide ranges of ages between 18-85 years. In this study only unilateral affected side is considered

Another limitations is that treatment for neck pain focused exclusively on MTrPs of the upper trapezius muscles, and other muscles responsible for neck pain were not evaluated, although of all the targeted muscles are responsible for neck pain, trapezius is the most frequent.

FUTURE STUDIES

Further research is needed to examine results of long-term treatments and follow to determine the effects and probable side-effects of DN and ART and to better test the outcomes.

CONCLUSION

- Analgesic Effects of Dry Needling and Active Release Technique on Upper Trapezius Muscles in Neck Pain Patients.
- The data collection of this study was conducted at Parihar Physiotherapy Centre under the supervision of Dr. S. D. Singh Parihar.

1. The result of this study suggested that, after 1st & 2nd weeks of Dry Needling, Active Release Techniques and combined intervention of both Dry Needling and Active Release Techniques on patients of neck pain resulting from upper trapezius trigger points shows a significant effects on pain, NDI and painful Range of Motion.

2. The result also showed that for the management of active trigger points of upper trapezius, Active Release Techniques can be effective and for the management of latent trigger points of upper trapezius, Dry Needling can be effective.

3. The result also suggested that combined intervention of Dry Needling and Active Release Technique is more effective than single intervention of either Dry Needling or Active Release Technique.

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