Research Paper

Hong Kong Physiotherapy Journal
Vol. 43, No. 1 (2023) 73–80
DOI: 10.1142/S1013702523500117

Hong Kong Physiotherapy Journal
https://www.worldscientific.com/worldscinet/hkpj

Effect of myofascial cupping vs integrated neuromuscular inhibition techniques on pain and neck movement in individuals with latent trigger point in trapezius

Preeti Gazbare[1,*], Manisha Rathi[1] and Dhanashree Channe[1]

[1]*Dr. D.Y. Patil College of Physiotherapy, Dr. D.Y. Patil Vidyapeeth, Pune, India*

preeti.gazbare@dpu.edu.in; preeti.gazbare@gmail.com

Received 22 September 2021; Accepted 12 March 2023; Published 4 May 2023

Background: Pain is the most common symptom for seeking therapeutic alternative to conventional medicine. Trigger points (TrP) being the most debilitating cause of nonspecific neck pain, are found to be more prevalent in trapezius muscle. Various instrument-based and other manual therapy techniques are effective in the treatment of TrP.
Objective: To compare the effect of Myofascial Cupping (MFC) and Integrated Neuromuscular Inhibition Technique (INIT) on the upper trapezius latent TrP on pain intensity, pressure pain threshold (PPT) & cervical range.
Method: A randomized trial controlled on 40 individuals aged 20–40 years, both gender with latent TrPs in upper trapezius excluding ones who have taken treatment for upper trapezius TrPs within 6 months. Participants were randomly allocated into 2 groups by chit method, one group received MFC and other INIT. Pre- and post-intervention assessment was done using NPRS, pressure algometer and goniometer.
Result: Within group, pain has significantly reduced after MFC and INIT with mean difference of 6.05 ± 0.8 and 4.95 ± 0.7, respectively ($p < 0.001$). PPT increased in both groups ($p < 0.001$) with mean difference of 0.63 ± 0.3 and 0.28 ± 0.11, respectively. Comparison between the groups showed significant difference in pain intensity ($p = 0.003$) suggesting MFC was more effective in reducing pain. However, a PPT (p=0.606) and neck lateral flexion to the contralateral side of TrP ($p = 0.74$) were not significant.
Conclusion: MFC was more effective than INITs in improving pain, however both interventions showed similar effect on PPT and neck lateral flexion on latent TrP in trapezius.

Keywords: Integrated neuromuscular inhibition; latent trigger point; myofascial cupping therapy; pressure pain threshold.

*Corresponding author.

Introduction

Pain is the most common symptom for seeking therapeutic alternative to conventional medicine.[1] Pain is defined as an unpleasant sensory sensation caused by injury or illness.[2] Nonspecific neck pain is typically caused by mechanical or myofascial disorders.[3,4] Trigger point (TrP) is one of the most widespread long-lasting muscle disorders affecting all ages and social groups, regardless of occupation, physical build, or physical activity levels. A TrP is associated with a tender spot situated in a taut band of muscle. When this spot is manipulated, impulsive or exertion pain may be experienced.[3,5] TrP is classified as latent or active. However, both types have the potential to create pain, limit ROM and restrict functional activities[3,6] therefore clinically it is important to identify it and should be addressed as part of a comprehensive physical therapy program.[7]

Several studies have attempted to examine TrP complications, which have resulted in the development of various treatments.[7] Currently, instrument-based, and non-instrument-based manual therapy interventions exist for the deactivation of TrPs. Dry needling,[8] cupping,[9] ischemic compression,[10] muscle energy techniques, Myofascial release, strain–counterstrain are the most common conventional treatment approaches for treating TrP.[11,12]

Cupping therapy (CT), a traditional Chinese medicine therapy, has been used for $>$ 2000 years and uses a negative pressure mechanism on stimulating the acupuncture points. CT is an effective way to manipulate soft tissues.[3] The rationale for use of cupping is not yet fully understood; it is said that it works on various theories like reflex zone theory, pain gate theory, increased blood circulation theory, Nitric oxide theory and Genetic theory. It is described as a detoxification process by which waste matter and toxins are removed, and as a harmonization process for the imbalanced vital energy.[13] Today, cupping is widely used as a holistic treatment in foreign for inpatient care and the prevention and treatment of various disorders, as well as for promotion of general health.

Chaitow suggested combination of Muscle energy technique (MET), ischemic compression and Strain Counter-strain (SCS) producing a most effective, targeted approach to TrP release. This method is termed as integrated neuromuscular inhibition technique (INIT). The benefit of the technique lies in its multifaceted approach allowing delivery of the techniques in a single coordinated manner.[14]

With day-to-day activities and lifestyle, people are prone for TrPs which are frequently seen in trapezius muscle, as it is an anti-gravity muscle holding the head in upright position, leads to inefficient posture and emotional stress adding on to activate TrP.[3] The psychological side effects of living with chronic pain can be debilitating as pain itself. Thus, by reducing the pain, a person can focus on his work more clearly. Literature suggests the need to explore myofascial cupping (MFC) on autonomous nervous system affecting the pain sensitivity. However, these methods have not been critically evaluated or compared. Therefore, we hypothesised that MFC therapy will show better effect than INIT on pain, pressure pain threshold (PPT), and neck movement in individuals with latent TrP in trapezius. Thus, the study aimed to evaluate the effect of MFC therapy and INIT on these parameters.

Method

An experimental study was carried in a tertiary private hospital in Pune, India after an Institutional Ethical Committee approval, on 40 participants. The sample size was determined using Primer (version 7) statistical software, nineteen participants in each group was calculated based on a previous study[3] with alpha = 0.05, power 80%, attrition was 10%, mean difference of 1.15 and expected SD at 1.2. Therefore, total sample size taken was 40.

Participants aged 20–40 years, males and females, with neck pain more than 3 months, having latent TrPs in upper trapezius were included. And participants excluded were one with:

(a) Any other musculoskeletal problem at or around cervical region like fracture, sprain.
(b) Systemic disorder, infection, progressive disorder.
(c) Neurological condition like Parkinson's disease.
(d) Any psychological disorder where person might not cooperate for the treatment.
(e) One who has taken treatment for TrPs within 6 months.

Written informed consent was obtained from each participant at the time of enrolment in the study. Participants were examined for TrP in upper

trapezius muscle with following diagnostic criteria[15,16]:

(1) Taut band within the muscle.
(2) Exquisite tenderness at a point on the taut band.
(3) Reproduction of the patient's pain.
(4) Local twitch response.
(5) Referred pain.

Baseline assessment was taken for pain intensity using Numerical pain rating scale (NPRS), Pain Pressure Threshold (PPT) by Pressure Algometer and cervical lateral flexion range of motion (Cx-LROM) to contralateral side of TrP by Universal goniometer. Then participants were randomly allocated into two groups at 1:1 ratio. The responsible person for generating the randomization assignment was independent. Group A ($n = 20$) was treated with MFC and group B ($n = 20$) with INITs. Both the groups received isometric exercises for trapezius and retractors. Consort Flow Diagram is explained in Fig. 1.

Materials Required: Three plastic cups with size of anchoring cup of 2.5 cm in diameter i.e. size 2, Treatment cup of 6 cm in diameter i.e. size 5 & counterbalance cup of 6 cm in diameter, One piston gun and a Pressure Algometer (Biotech).

Myofascial cupping techniques[13,17]

TrP in upper trapezius was identified and marked. Then the participants were taken in prone position, lubrication was applied over the marked points and three cups were applied. Anchoring cup on C7 spinous process area followed by treatment cup on marked area and the counterbalance cup was secured on opposite side of treatment cup. Cups were fixed on the given area with the help of piston gun by creating a negative pressure (vacuum) inside the cups. 1 pump of air was removed from the cup initially to fix it on the area and after that according to the participant's feedback, more air was vacuumed with pump (Fig. 2). Participant was asked for any discomfort during the session.

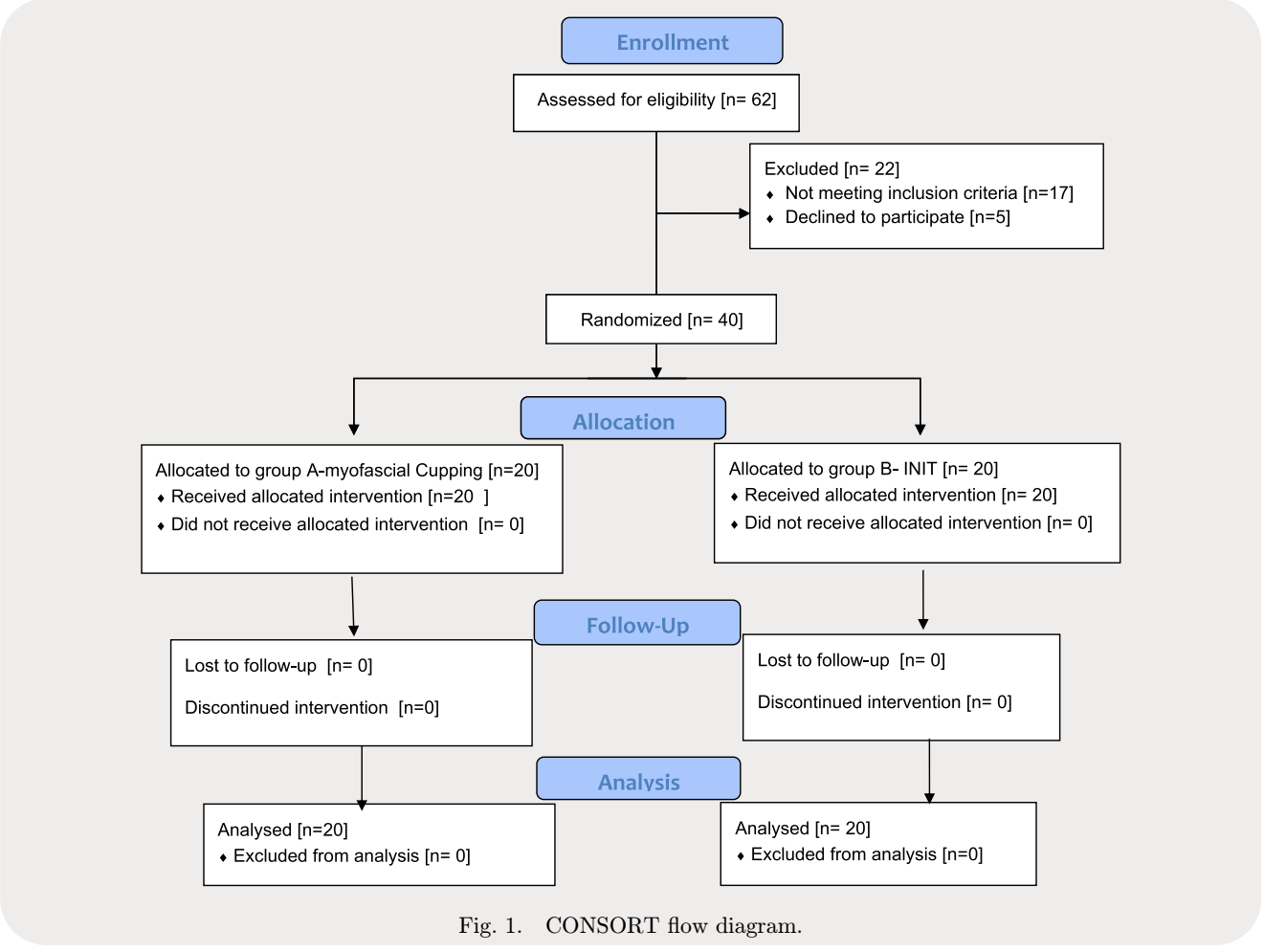

Fig. 1. CONSORT flow diagram.

Fig. 2. MFC therapy on trapezius.

After 10 min, the cups were removed. Next session was done after 3 days.

Integrated neuromuscular inhibition technique[7]

Participants were assessed for TrPs and then in supine position, the participant's arm was placed in shoulder abduction, external rotation and head side flexed to the involved side with elbow flexion. Using the pincher grip, the therapist moves through the fibres of trapezius on marked point. Ischemia compression was followed by the application of strain counter strain i.e. isometric contraction of muscle and then MET was given. Each isometric contraction was held for 8–10 s and was followed by contralateral side bending, flexion and ipsilateral rotation to maintain the soft tissue stretch for 30 s and was repeated for 5 times.

The duration of treatment was 20 min per session, 3 times per week for 2 weeks.

Outcome measure

Pain intensity: It was assessed by Numerical Pain rating scale (NPRS), it's a segmented numeric version of the visual analogue scale in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of the pain. The 11-point numeric scale ranges from '0' representing no pain to '10' representing worst pain (Rodriguez *et al.*). NPRS is a valid and reliable scale to measure pain intensity. Strengths of this measure over the VAS are the ability to be administered both verbally and in writing, as well as its simplicity of scoring.[18]

PPT: It is the minimal amount of pressure that produces pain. PPT was quantitively measured by a Wagner Algometer which is considered as a reliable method in the assessment of TrPs sensitivity. It consisted of a 1 cm^2 rubber tip and a dial that could display the pressure of up to 10 kg with graduation with 100 g. Algometer was placed perpendicular on the marked TrP on the trapezius, and then the pressure was applied until the pressure caused a pain. The maximum pressure displayed by the Algometer was recorded.

Three measurements were obtained, and the mean value was calculated.[19,20]

Range of Motion (ROM): Cervical lateral flexion motion was measured using goniometer. Participants were asked to sit upright and laterally flex their head towards opposite side of the TrP. The motion was stopped once the available ROM was completed, and care was taken to disallow shoulder elevation. The cervical CROM device has demonstrated good to excellent inter-rater reliability (ICC 50.73–0.89).[21]

Single blinding was done for assessment & recording of all the outcome measures which was carried out by independent therapists.

Statistical Analysis

Data was recorded and analyzed using medical statistics software (version 5). Quantitative data were calculated by computing the mean and standard deviation (SD). The normal distribution of the continuous variables by Shapiro-Wilk tests was determined.

Using SPSS (Version 26), Repeated Measures analysis of variance-ANOVA was applied to compare the effect of two intervention groups, namely MFC and INIT (independent variable) on pain, PPT and neck lateral flexion (dependent variable). Statistical significance level was accepted at $p < 0.05$.

Result

Sixty-two participants were screened for the study of which 17 didn't fulfil the criteria and so were excluded, five participants were not ready to

participate. At the end of the study, all 40 participants completed the study and were included in the analysis. There was no deviation in intervention given from the originally allotted group so intention to treat analysis was done. There was no such missing data in the study.

The baseline characteristics showed no significant difference in two groups indicating randomisation was carried out effectively (Table 1).

Both groups individually demonstrated significant improvement in pain intensity on NPRS ($p < 0.001$), PPT score ($p < 0.001$), and cervical lateral flexion ROM ($p < 0.001$), after 2 weeks (Table 2). Between-group analysis indicated that there was significant difference ($p < 0.05$) in pain intensity, favouring MFC therapy (group A) than INIT (group B) whereas pain pressure threshold ($p < 0.606$) and neck lateral flexion range showed non-significant difference $p = 0.74$ (Table 3).

Details of statistical analysis by repeated measures ANOVA are as follows:

For Pain

Within-Subjects Effects (Pain) – $F(1, 38) = 1775.29$, Partial Eta Squared $= 0.979$, $p < 0.0001$

Pain_Group – $F(1, 38) = 17.753$, Partial Eta Squared $= 0.318$, $p < 0.0001$

Between Group – $F(1, 38) = 12.37$, Partial Eta Squared $= 0.246$, $p < 0.0001$

There was a statistically significant difference seen. 97.9% of the variation (effect size) was explained by the time and 31.8% by the pain_group. 24.6% by the groups.

Pain Pressure Threshold (PPT)

Within-Subjects Effects (PPT) – $F(1,38) = 165.917$, Partial Eta Squared $= 0.814$, $p < 0.0001$

PPT × Group – $F(1, 38) = 24.975$, Partial Eta Squared $= 0.397$, $p < 0.0001$

Between Group – $F(1, 38) = 0.271$, Partial Eta Squared $= 0.007$ $p < 0.606$

There was statistically no significant difference seen. 81.4% of effect size was explained by time and 39.7% by PPT × groups. 0.7% by groups.

Table 1. Baseline characteristics of the participants.

Variables	Group A Pre-Mean (SD)	Group B Pre-Mean (SD)	Significance
Male: Female	9:11	8: 12	Chi square (χ^2) = 0.102 $p = 0.7491$
Age in years	27.3 (6.30)	28.4 (7.48)	$U = 187.00$, $Z = 0.353$ $p = 0.7242$
Pain	8.1 (0.96)	8.3 (0.73)	$U = 182$, $Z = 0.516$ $p = 0.60$
Pressure Pain tolerance	1.42 (0.34)	1.56 (0.25)	$T = 1.46$ $p = 0.675$
Neck Lateral flexion range	33.4 (3.05)	33.7 (2.73)	$T = 0.327$ $p = 0.1505$

Table 2. Pre and post values for group A-MFC and Group B-INIT.

		Group A-MFC				Group B- INIT			
Variables		Mean	SD	95% CI	*p*-value	Mean	SD	95% CI	*p*-value
Pain	Pre	8.1	0.96	7.0–9.0	$p < 0.001$*	8.3	0.73	8.0–9.0	$p < 0.001$*
	Post	2.05	0.68	2.0–2.5		3.3	0.74	3.0–4.0	
Pressure Pain tolerance	Pre	1.42	0.34	1.1–1.7	$p < 0.001$*	1.5	0.25	1.45–1.7	$p < 0.001$*
	Post	2.06	0.17	2.0–2.15		1.8	0.21	1.7–2.0	
Neck Lateral flexion range	Pre	33.4	3.05	31–36	$p < 0.001$*	33.7	2.73	31–35.5	$p < 0.001$*
	Post	43.8	2.41	42–45.0		43.0	1.94	41.5–45.0	

Note: *Highly significant.

Table 3. Comparison of MFC and INIT for Pain, PPT and Neck lateral flexion range.

Variables	Groups	Mean	SD	95% CI	P value
Pain	MFC	−6.05	0.88	−6.5 to −5.0	$p < 0.001$
	INIT	−4.95	0.75	−5.3 to −4.5	Significant
Pressure Pain tolerance	MFC	0.63	0.29	0.5 to 0.8	$p < 0.606$
	INIT	0.28	0.11	0.2 to 0.3	Non-significant
Neck Lateral flexion range	MFC	10.4	1.39	10.0 to 11.0	$p = 0.74$
	INIT	9.3	2.22	7.0 to 11.0	Non-significant

Note: Statistical analysis done by Repeated Measures analysis of variance.

Neck Range of Motion (ROM)

Within-Subjects Effects (ROM) – $F(1,38) = 1125.757$, Partial Eta Squared = 0.967, $p < 0.0001$

ROM × Group – $F(1, 38) = 3.510$, Partial Eta Squared = 0.085, $p < 0.069$

Between Group – $F(1, 38) = 0.109$, Partial Eta Squared = 0.003, $p < 0.74$

There was statistically no significant difference seen. 96.7% of variation can be explained by time and 8.5% by ROM × Groups. 0.3% by groups.

Discussion

The study was conducted to find the effect of MFC and INITs on pain intensity, pain sensitivity and lateral flexion ROM on latent TrP in upper trapezius muscle.

The study showed that the MFC has significant improvement in pain, increase in PPT and neck lateral flexion ROM. According to the physiology of cupping based on pain gate theory, it increases the stimulation of Aβ mechanoreceptor and deactivates the TrP. Release of endorphins, encephalin and increase in blood circulation results by applying negative pressure over the twisted bundle TrP, and adhesion broken painlessly without any force lead to hemodynamic changes and remove the inflammatory products and toxins. The therapeutic conception of dry cupping gives detail of reflex zone theory in which the perception of pain is blocked segmentally which stays for 6 h and if effect remains for more than 12 h, it is due to release of GABA affecting the end range of motion of a joint.[13]

Similar finding was researched stating that TrP showed symptomatic improvement after cupping when given for 2 weeks i.e., five sessions of cupping seen on pain at rest and maximal pain related to neck movement, VAS, NDI, SF-36, PPT, vibration-detection threshold.[22]

The author concluded that cupping also shows remarkable difference between the pre- and post-mobility, as it enhances other therapies by stretching muscle and connective tissue and thereby decreasing TGF-β1 and collagen synthesis, it may further enhance microcirculation, cellular metabolism, and regeneration. Evidence suggests removing LTrP normalises the Motor Action Potential.[23]

One study conducted a systematic review and meta-analysis by two independent researchers in national and international databases and concluded that cupping is a promising method for treatment of chronic back pain showing significant reduction in pain intensity score ($p = 0.001$).[24] Also adding dry cupping on calf muscle myofascial trigger points (MTrPs) in patients with plantar heel pain was found to be superior to only self-stretching and active ankle dorsiflexion exercises in pain, ankle dorsiflexion ROM, and plantar flexor strength.[25]

Blood flow to the skin increased (hyperaemia) immediately after the removal of the cup and some visible discoloured patch due to erythema, edema and ecchymosis in a variety of circular arrangements was seen with experienced warmth as result of vasodilation.[26] Cupping may relieve stress and pain perception not only by specific effect but also by unspecific effect on regulation of autonomic nervous system.[27] Also it mimics analgesic effect and has no side effect which was significant and effective on neck and shoulder pain.[28] The trigger response is linked to hemoxygenerase expression, which is associated with cytoprotective and anti-nociceptive effects.[29] The effect of LTrP on the muscle activation and muscle efficacy in scapular rotator muscles do alter the timing and decrease

the consistency of MAP of muscle group and more muscles in upper limb chain.[30]

In this study, INIT also showed significant improvement in pain, increase in PPT and neck LROM. Chaitow stated INIT technique to be effective in deactivating the TrPs.[16] Our results are consistent with the results of previous studies that showed the effect of INIT and MET on NDI, VAS, lateral flexion of cervical for 4 weeks and concluded statistically that INIT showed better effect in deactivating TrP and thus improving the variables.[7]

Simons proposed that in INIT the local direct ischemic compression decreases the sensitivity of painful nodules in muscle. Additionally, the subsequent tissue relaxation created by attaining a position of TrP ease (SCS) has been proposed as a mechanism of facilitating 'unopposed arterial filling' which allows decrease in tone, ultimately facilitating a resetting of the neural reporting structures, resulting in a more normal resting length, enhanced circulation, and decreased pain.[12,31]

A theory was hypothesised that the sequence of muscle and joint mechanoreceptor activation evokes firing of somatic efferent leading to sympatho-excitation and activation of the periaqueductal grey matter thus decreasing the modulation of pain.[32] One proposed mechanism for benefit of ischemic compression suggested that pain and muscle spasm relief from direct digital pressure may result from the reactive hyperaemia produced in the area, or from the spinal reflex mechanism.[33] Chaitow postulated that combination of MET, ischemic compression and SCS produce targeted effect on TrP.[11]

In this study both interventions showed effectiveness on deactivating TrP individually. On comparison, MFC therapy showed greater improvement by decreasing the pain significantly. Also, greater mean difference was observed in PPT and neck LROM than INIT.

Patient in the study reported the discolouration of skin caused due to cupping which lasted for few days post treatment, this can be one of the factors for aversion to cupping as the first line treatment for aesthetic reasons. Generalisation of results cannot be done due to sample size. Occupation, daily activities, stress, and other influencing factors for TrPs were not considered in the study. Further research is warranted with variable competing interventions used for treating TrP and addressing the long-term efficacy of this technique. Interventions can be explored in various age groups, in specific gender and also considering control group.

Conclusion

Thus, the study concludes that MFC therapy is an effective treatment for latent TrP in trapezius than INITs in improving pain, PPT and neck lateral flexion.

Acknowledgements

I am grateful to all my patients and thankful to Dr. Tushar J Palekar for providing the necessary infrastructure and research equipment. Also thankful to Dr. Sudhir Jadhav for statistical analysis.

Conflicts of Interest

The authors have no conflicts of interest relevant to this paper. No funding was provided.

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