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MYOFASCIAL PAIN AND TREATMENT: SINGLE BLIND RANDOMIZED CONTROLLED

Effects of Integrated Neuromuscular Inhibition Technique on pain threshold and pain intensity in patients with upper trapezius trigger points

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A B S T R A C T

Introduction: Upper trapezius trigger points are among the most common causes of neck pain. This study aimed to investigate the effects of integrated Neuromuscular Inhibition Technique (INIT) on pain intensity and threshold.
Materials & methods: Thirty two female participants with upper trapezius trigger points were recruited in this study. The participants were assigned to control (n = 16) or intervention (n = 16). The intervention group received INIT in one session, consisted of muscle energy technique, ischemic compression and strain-counter strain. Pain threshold and intensity were measured using Pressure Pain Threshold (PPT) and Numerical Pain Scale (NPS). These measurements were performed at baseline, immediately after treatment and 24 h after treatment.
Findings: The results showed that pain intensity significantly decreased in the intervention group immediately after treatment (P = .01) and 24 h after treatment (P = .009) in comparison with the control group. There were no significant differences in pressure pain threshold between both groups.
Conclusion: It seems that Integrated Neuromuscular Inhibition Technique can reduce pain intensity in patients with upper trapezius trigger points.

1. Introduction

Chronic neck pain is a common musculoskeletal problem and its pain duration last longer than 3 months (Binder, 2006). Previous studies reported that about two thirds of the population experience some sort of neck pain during their lifetime (Mäkela et al., 1991; Côté et al., 1998). The prevalence of neck pain is 30–50% among the adult population with more women being involved (Castelein et al., 2015; Castelein et al., 2016).

Trigger points (TrPs) are the main sources of musculoskeletal pain in about 30–85% of patients, and these knots have detrimental effects on patient's social activities and quality of life (Tough et al., 2009; Ziaeifar et al., 2014; Morihisa et al., 2016).

Trigger points are painful spots formed taut band in muscles that become hyper-irritable, causing pain (Ge and Lars, 2011). These trigger points are developed as a result of trauma, overuse, mechanical pressure overload, psychological distress, and poor posture (Hanten et al., 2000). The upper trapezius muscle was found to be often affected by TrPs (Gemmell and Allen, 2008; Sarrafzadeh et al., 2012). Patients with TrPs in the upper trapezius muscle, may have symptoms such as tension headaches, neck pain and dizziness. Deactivation of these trigger points can effectively relieve pain and disability (Kim et al., 2013).

Several manual and non-manual interventions are used to deactivate TrPs. Manual interventions include Muscle Energy Techniques (METs) (Nagrale et al., 2010), Strain–Counterstrain (SCS) (D'Ambrogio and Roth, 1997; Dardzinski et al., 2000), Myofascial Release Therapy (MRT) (Selkow et al., 2009), friction massage (Mohamadi et al., 2017), and ischemic compression (Fernández-de-las-Peñas et al., 2006; Montañez-Aguilera et al.,

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2010). Chaitow (1994, 1996) suggested that Integrated Neuromuscular Inhibition Technique (INIT), which is a combination of METs, ischemic compression and SCS techniques, may be an effective method to treat TrPs. Previous studies investigated the efficiency of INIT in comparison with other interventions (Singh et al., 2014; Nagrale et al., 2010; Sibby and Kavitha Vishal, 2009). They stated that INIT decreased pain intensity compared to conventional treatments (Singh et al., 2014) and MET (Nagrale et al., 2010) in patients with upper trapezius TrPs. Also, (Sibby and Kavitha Vishal, 2009) reported that both INIT and Laser, combined with stretching, are equally effective in reducing neck pain. In spite of INIT's beneficial effects, lack of control group *made* it *difficult* to determine the *true* treatment effects of INIT technique. Hence, the purpose of this study was to compare the effects of INIT technique on pain threshold and pain intensity in comparison with a control group with upper trapezius TrPs.

2. Method and material

This research was a single blind randomized controlled trial registered at the Iranian Registry of Clinical Trials (IRCT201412129440N8). The participants who referred to the physiotherapy clinic at the School of Rehabilitation Sciences of Shiraz University of Medical Sciences were recruited. Total of 32 women, age 20–30 years old with active TrPs in their upper trapezius muscles were included in this study. Exclusion criteria were any history of neck or shoulder surgery, moderate to severe cervical, thoracic and shoulder degenerative pathology, history of neck or shoulder trauma, systemic disorder, spinal deformities, cervical radiculopathy, and fibromyalgia syndrome. All participants signed a written informed consent form approved by the local Ethics Committee of Shiraz University of Medical Science. The study was performed in the physiotherapy clinic at the School of Rehabilitation Sciences of Shiraz University of Medical Sciences (Shiraz, Iran).

The subjects were randomly assigned to intervention (INIT technique) or the control group (no treatment) using a computer-generated randomized table of numbers. One of the expert physical therapists with at least 5 years of clinical experience in the field of manual therapy diagnosed and treated the subjects with “active TrPs”, defined as a tender spot within the taut band. The other physical therapist who was blind to the patients' group allocation assessed them.

Pain threshold and intensity were measured using Pressure Pain Threshold (PPT) and Numerical Pain Scale (NPS). The Numerical Pain Scale (NPS) consists of numbers between (0–10). The point 0 represents no pain and 10 indicate severe pain (Wong and Baker, 1988). The NPS reliability and validity was confirmed by (Jensen et al., 1999). In order to record pressure pain threshold, algometer was held on the trigger points vertically, while pressure was applied at a rate of 1 $\frac{kg}{cm^2}$. The, the pressure was stopped as soon as the patient started to feel discomfort. Previous study reported that intra-examiner reliability (ICC: 0.6–0.97) and inter-examiner reliability (ICC: 0.4–0.98) of PPT as a valid measurement tool (Takala, 1990; Levoska, 1993).

In INIT method, the patient was asked to lie-down in a supine position. In order to reduce activity in the upper trapezius, a towel was placed under the neck. Multiple techniques were performed in the following sequence:

1) Ischemic compression: the pressure was applied over a specific trigger point using pincher grip between the thumb and index finger. The applied pressure was maintained until the pain was reduced. Then, pressure was applied again until the patient reported discomfort. This procedure was performed for 90 s and repeated between three to five times.
2) Strain-counterstrain (SCS): slight pressure was then applied on a trigger point until pain was felt; this pressure was then maintained until the position of ease was identified. In order to position the upper trapezius in a shortened/relaxed position, the patient was placed into a supine position, and the therapist side-bent the patients' head toward the involved side, while positioning the ipsilateral arm in abduction or flexion to reduce tender point pain. Once the position of ease was achieved, it was maintained for 20–30 s and then repeated three times.
3) Muscle energy technique (MET): the patient was asked to simultaneously shrug the involved shoulder toward her ear, as well as bringing the ear closer to the shoulder, against resistance. The isometric contraction was held for 7–10 s. Following the contraction, the therapist applied contralateral side bending and ipsilateral rotation to initiate a local tissue stretch, in the tissues in which the trigger point was located. The stretch was held for 30 s and the procedure was repeated three to five times (Nagrale et al., 2010; Sibby and Kavitha Vishal, 2009)

Pain intensity and PPT were measured immediately following INIT and 24 h after the procedure. All treatments were performed in one session and each session lasted about 15–20 min.

3. Statistics

The sample size was determined at 16 participants in each group based on a previous study ($\alpha = 0.05$, $1\text{-}\beta = 0.80$) (Nagrale et al., 2010). Data were analyzed using SPSS 16 for Windows XP (SPSS Inc., Chicago, USA). The data normality was checked by Shapiro-Wilk test ($P > .05$). A 2 way mixed design Analysis of Variance (ANOVA) with one between-subject factor (Group: intervention, control) and one within-subject factor (Time: baseline, immediately after treatment and 24 h after treatment) was used.

4. Results

Table 1 shows the demographic characteristics of both groups. Independent t-tests showed no significant difference in age, weight and height between the two groups ($P > .05$).

Main effects of group and the interaction of time × group were

Table 1
Demographic characteristics of intervention and control Groups.

Variables	Intervention group Mean ± SD	Control group Mean ± SD
Age (year)	24.05 ± 3.06	23.45 ± 2.14
Weight (kg)	58.35 ± 4.23	58.17 ± 3.45
Height (cm)	163.7 ± 5.04	162.30 ± 4.00
NPS-baseline	5.68 ± 2.08	5.26 ± 1.27
PPT(kg/cm2)-baseline	0.95 ± 0.39	0.96 ± 0.26

NPS: Numerical Pain Scale, PPT: Pressure Pain Threshold.

Table 2
Summary of analysis of variance for NPS and PPT.

Independent variables	NPS		PPT	
	F Ratio	P	F Ratio	P
Time	0.63	0.53	0.02	0.97
group	4.20	0.04[a]	0.004	0.94
Time × group	11.99	<0.001[a]	0.04	0.95

[a] Indicates significant differences, NPS: Numerical Pain Scale, PPT: Pressure Pain Threshold.

significant for NPS variable (see Table 2). Analysis performed by independent t-tests to compare the effect of time between groups showed that INIT significantly decreased pain intensity immediately after treatment ($P = .01$), and 24 h after treatment ($P = .009$) in comparison with the control group.

Furthermore, the main effects of time, the main effect of group, and the interaction of time $\times$ group were not significant for PPT variable (see Table 2). In fact, there were no significant differences in each time between groups.

5. Discussion

Our findings showed reduced pain intensity following INIT technique. Our result was in line with the findings of Singh et al., 2014 and Nagrale et al., 2010. They showed that neck pain can be reduced following six sessions (Singh et al., 2014) and twelve sessions of INIT technique (Nagrale et al., 2010) in comparison with other treatments. However, our results showed that pain intensity was reduced after only one session of INIT technique compared to the control group.

5.1. Mechanisms

Pain relief can be attributed to combination of the three manual techniques.

- In ischemic compression, pain reduction by applying direct pressure can be attributed to improvement of local blood flow following release of the compression, and/or spinal reflex mechanism.
- In SCS technique, a nociceptive response is produced following pressure that can result in tension and stress reduction in the affected muscle. The reduced muscle tone can lead to increased local blood circulation subsequently (Singh et al., 2014). In addition, this technique normalizes the length of sarcomeres in the tissues housing the TrPs by resetting the muscle spindles and so potentially reducing pain.
- In MET technique, sequence activation of muscles and joint mechanoreceptors evokes the local somatic efferent. Sympathoexcitation and activation of periaqueductal gray matter following this process can affect descending pain modulation (Fryer and Fossum, 2008).

In addition, our findings showed that there was no change in the PPT. This finding was consistent with the findings of Singh et al. (2014) that might be due to the limited number of treatment sessions. It is likely that one INIT session is insufficient to change the PPT. The result of this clinical trial supports the use of a single INIT application, as an affordable and low-cost method in reducing pain in individuals with active TrPs.

6. Conclusion

This study suggested that one INIT session can reduce pain intensity in patients with TrPs, but did not change pain threshold.

Study limitations

The main limitation of this study was that our populations were limited to female participants 20–30 years old. Other limitations included small sample size, the subjectivity of pain, and absence of longer follow up session. These shortcomings should be considered in further studies.

Suggestions for further research

Further research is warranted with other objective outcomes such as functional status and cervical range of motion. Longer follow-up periods are recommended to investigate the INIT beneficial effects.

Conflicts of interest

None declared.

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