

Comparison of the Immediate Effects of Various Durations of Trigger Point Compression Technique on Latent Trigger Points of the Upper Trapezius Muscle

Elham Sedgh^a, Farshad Okhovatian^{b*}, Sedigheh Sadat Naimi^b, Alireza Akbarzadeh Baghban^b

^a Department of Physiotherapy, School of Rehabilitation, Shahid Beheshti University of Medical Sciences, Tehran, Iran; ^b Physiotherapy Research Centre, School of Rehabilitation, Shahid Beheshti University of Medical Sciences, Tehran, Iran

*Corresponding Author: Farshad Okhovatian, Physiotherapy Research Centre, School of Rehabilitation, Shahid Beheshti University of Medical Sciences, Damavand Street, Opposite of Buali Hospital, Tehran, Iran. **Tel.:** +98-21 77561407; **E-mail:** farshadokhovatian1965@gmail.com

Submitted: 2019-02-14; **Accepted:** 2019-03-20; **DOI:** 10.22037/jcpr.v1i2.10868

Introduction: The aim of the present study was to investigate the immediate effect of time (30 and 90 seconds) trigger point compression techniques in the latent trigger points of upper trapezius muscle. **Methods and Materials:** A total of 39 women, aged between 20-30 who were diagnosed with latent MTrPs in the upper trapezius muscle, participated in the present study. Participants were randomly assigned to 3 groups, 13 each, using block randomization method: trigger point compression (30 sec), trigger point compression (90 sec), and control group. In all groups, the measurements were carried out before and after the intervention. **Results:** The duration of 30 and 90 sec trigger point compression techniques were observed to decrease the pain and increase the pain pressure threshold ($P < 0.001$). Significant differences were found between the duration of 30 sec trigger point compression technique and control group in terms of pain magnitudes ($P < 0.001$) and pain pressure threshold ($P < 0.01$). Also, there were significant differences between the duration of 90 sec trigger point compression technique and control group regarding pain magnitudes and pain pressure threshold ($P < 0.001$). Moreover, significant differences were observed between these 2 treatment groups in terms of pain magnitudes ($P < 0.05$) and pain pressure threshold ($P < 0.001$). The duration of 90 sec trigger point compression technique was observed to have more effects compared with that for duration of 30 sec. **Conclusions:** The results of the present study indicated that each of the 2 treatments decreased pain and increased pain pressure threshold. The results introduce the duration of 90 sec trigger point compression technique as a more effective treatment compared with that of the duration of 30 sec for latent MTrPs.

Key words: Compression Technique; Myofascial Trigger Points; Upper Trapezius

Please cite this paper as: Sedgh E, Okhovatian F, Naimi SS, Akbarzadeh Baghban A. Comparison of the Immediate Effects of Various Durations of Trigger Point Compression Technique on Latent Trigger Points of the Upper Trapezius Muscle. J Clin Physio Res. 2019;4(2): e8. Doi: 10.22037/jcpr.v1i2.10868

Introduction

Myofascial pain syndrome is one of the most common musculoskeletal pains and is characterized by Myofascial Trigger Points (MTrPs) (1, 2). MTrPs may be classified as active or latent. Active MTrPs reproduce spontaneous pain and higher levels of pain compared with the latent one that produces pain only in response to compression (3). Several measurement methods exist for the diagnosis and evaluation of treatments for MTrPs (such as Pressure Algometer), but there is no reliable list of physical diagnostic criteria for them (4, 5). Taut band, spot tenderness, local

twitch response, referred pain pattern, jump sign, and restricted range of motion are the most physical diagnostic features of MTrP (6). Electromyography, pressure algometer, and thermography are 3 measurement devices, which are used for MTrPs evaluation. Pressure algometer provides a simple and objective evaluation of MTrPs, and previous studies have reported good reliability and validity for this instrument (7-10).

There are a number of treatments aimed at eliminating MTrPs: massage, stretching, ultrasound, muscle energy technique, dry needling (11, 12), and Trigger Point Compression (TPC) (13, 14). The effectiveness of these treatment methods has previously been

examined (13). TPC tends to lengthen sarcomeres, increase the range of motion (ROM), change the circulatory perfusion of the skin and reduce the muscle tension (6, 11). Trigger point compression was applied in various time periods in the previous studies, including 30-sec (15), 60-sec (16-18), and 90-sec (19-22). Hou *et al.* compared the immediate effects of 3 times of TPC and reported that a 30-sec and 90-sec treatment, provide immediate pain relief and MTrP sensitivity decrease (23).

It is claimed that the majority of myofascial pain syndromes are located in head, neck, and shoulder regions (23, 24). Some symptoms are neck stiffness, pain, and insomnia (11). It may refer pain along the posterolateral aspect of the neck, from behind the ear to the temple (11).

Current evidence includes a variety of times for TPC but there is little information about the efficacy of specified times. Based on these concerns, the aim of the present study was to investigate the immediate effects of various times of TPC on latent MTrPs.

Methods and materials

The present study was a single-blind randomized control trial, approved by Physiotherapy Research Centre of Shahid Beheshti University of Medical Sciences (SBMU.REC.1391). Informed consent was obtained from all the participants at the onset of the study. A convenience sample of 39 women aged 20-30 and observed with latent MTrPs in the upper Trapezius muscle were recruited for the study. After screening, the participants were randomly assigned to 3 groups of 13 using block randomization method.

The sample size was calculated to achieve 90% power at an alpha of 0.05. All participants were students at Jahrom University of Medical Sciences.

To be included, the participants had to have a palpable taut band or nodule hypersensitive in response to 25 N of pressure (21). The individuals with history of whiplash injury, cervical spine surgery, undergoing myofascial therapy within the previous month and the presence of active MTrP or diagnosis of fibromyalgia syndrome were excluded.

As described by Simons *et al.* (6), the minimum criteria for the diagnosis of latent TrPs are the following (11):

- a. A palpable taut band in a skeletal muscle
- b. Hypersensitive tender spot in the taut band

Instrumentation

a) Pressure Threshold meter (Algometer)

Pain Pressure Threshold (PPT) was measured by an algometer using a 1 cm² disk surface area pressed vertically on MTrP. To

provoke pain, pressure was increased with a speed of 1 kg·cm²·s⁻¹ (22, 25).

The reliability was evaluated in 10 healthy participants prior to the study and an Interclass correlation coefficient (ICC) of 0.84 was obtained. The pressure sensor was calibrated before data collection.

b) Inclinator

Active bilateral cervical lateral flexion range of motion was measured using a dual Inclinator, for which ICC of 0.97 was reported in the previous studies (21). The ranges of active ipsilateral flexion (ILF) and contralateral lateral flexion (CLF) of the cervical spine were measured using a dual inclinometer. This instrument consists of master and slave parts that record the greatest range of motion for each movement. The master part was placed parallel to the shoulders horizontally, and the slave part was placed on the lateral border of the head.

c) Visual Analogue Pain Scale (VAS)

A 10 cm line, with 0 indicating "no pain at all" and 10 indicating "the most intense pain imaginable", was used as a measure of pain intensity. To evaluate the pain intensity, a pressure of 25 N was exerted on the MTrP using the algometer, and patients were asked to show their pain on VAS.

Furthermore, to evaluate the magnitude of pain, the VAS was used simultaneously with the algometer, but to determine PPT, the algometer was used alone (22, 25).

d) Ultrasound

A sham ultrasound was applied to MTrPs via a Novin ultrasound (512X model) for 2 minutes with a gentle pressure on MTrPs.

Outcome measures:

The outcome measures included VAS, PPT, and active cervical lateral flexion range of motion.

An experienced physician who was blind to the group allocation of participants performed the measurements before and after the intervention.

Procedure

All the participants were positioned supine with the cervical spine in neutral position. The clinician applied low pressure to MTrP until the pain value of 7 out of 10 was reached. It was found that if the pain value reduced to 3-4, the pressure would increase until pain value of 7 was elicited. This process was maintained for 30 seconds in group 1 and 90 seconds in group 2. In group 3, we applied sham ultrasound for 2 minutes. In all the 3 groups, the outcome measures were obtained 2 minutes after the intervention by an examiner blinded to the process.

Table 1. Groups' characteristics [Mean (SD)]

Groups	N	Age	BMI
90	13	21.08 (1.038)	21.39 (2.79)
30	13	22.38 (2.959)	21.21 (3.35)
Us	13	24.77 (3.94)	22.74 (4.10)
Total	39	22.74 (3.226)	21.78 (3.43)

Table 2. Means and standard deviations for PI, PT, ILF and CLF

Groups		Pain intensity	P-value	Pain treshold	P-value	ROM IL	P-value	ROM CL	P-value
90	Before	6.7 (1.2)	$P<0.001$	14.6 (4.3)	$P<0.001$	17.1 (2.0)	$P<0.001$	16.7 (1.8)	$P<0.001$
	After	4.5 (1.1)		20.0(4.0)		21.3 (1.3)		21.6 (1.5)	
30	Before	7.6 (1.3)	$P<0.001$	14.6 (5.3)	$P<0.001$	16.7 (3.6)	$P<0.001$	14.6 (3.2)	$P<0.001$
	After	5.9 (1.1)		16.1 (5.3)		19.2 (3.2)		17.7 (2.4)	
US	Before	7.0 (0.7)	$P<0.137$	11.9 (2.5)	$P<0.145$	14.4 (2.7)	$P<0.636$	14.9 (2.8)	$P<0.190$
	After	6.6 (1.1)		12.3 (3.1)		14.6 (3.4)		14.4 (2.6)	

PI=pain intensity; PT=pain threshold; ILF=ipsilateral lateral flexion; CLF=contralateral lateral flexion

Statistical analysis:

A Shapiro-Wilk test was run to determine the normal distribution of each variable. Also, Analysis of variance (ANOVA) was carried out to find whether there was a difference among the 3 groups. After adjusting the effect of background and dependent variables prior to the intervention, ANCOVA was used to assess the between-group differences for all the 3 outcome measures (pain intensity, VAS, and lateral cervical flexion after intervention). Within-group differences were assessed using the paired t-test. The statistical analysis was conducted at a 95% confidence level. The P-values less than 0.05 were considered as statistically significant.

Results

A total of 39 female students were randomly categorized into 3 groups: 90 sec TPC (13 females), 30 seconds TPC (13 females), and the control group (13 females).

Group characteristics are given in Table 1. No significant difference was found for BMI ($P=0.477$), but there were significant differences observed for age ($P<0.01$).

Table 2 shows that application of the 30 and 90 seconds TPC decreased the pain and increased the pain pressure threshold, contralateral lateral flexion (CLF), and ipsilateral lateral flexion (ILF) ($P<0.001$), respectively. There were significant differences between the 30-sec duration of TPC and the control group in terms of pain intensity, CLF, ILF ($P<0.001$), and pain pressure threshold ($P<0.01$). Also, there

were significant differences between the 90-sec duration of TPC technique and the control group in terms of pain intensity, pain pressure threshold, CLF, and ILF ($P<0.001$).

In addition, the 90-sec duration of TPC implementation was observed to be more effective ($P<0.05$) for decreasing pain intensity, increasing pain pressure threshold of upper trapezius MTrPs, and increasing cervical AROM compared with those in the 30-sec TPC.

Discussion

Treatment of latent trapezius MTrPs with 30-sec and 90-sec of TPC produced a significant immediate decrease in pain intensity and significantly increased pain threshold and neck lateral flexion ROM (both ipsi- and contra-lateral). The mean changes in both groups were significantly different from that of the each other. The use of ultrasound without output, as the control group, produced no significant changes.

Many studies have evaluated the effect of TPC manual therapy on trigger points, but to the best of our knowledge, the present study is the first study, which compares the usual time lengths of TPC application for treatment of latent MTrPs.

Latent trigger points are quite common in the upper trapezius muscle, due to carrying bags and overhead activities. So, finding an appropriate treatment is a necessity. The accurate pathophysiology of MTrPs is yet unknown, but researchers have suggested some theories for this phenomenon. One of the most famous theories is suggested by Simons who

proposed that acute or chronic muscle overload will damage the motor end plate and subsequently acetylcholine would release. Excessive acetylcholine results in formation of contraction knots and therefore local hypoxia and ischemia. This ischemia consequently leads to pain in MTrPs areas (13).

Different treatments have been proposed for MTrPs treatment, such as manual therapy, electro therapy, kinesio taping, etc. Manual therapy techniques consist of strain/counterstrain, MRT, PRT, etc. Trigger point compression is a very common, easy, and inexpensive method for treating MTrPs. Different mechanisms have been proposed for TPC technique. Simons believed that to treat a MTrP, we should stop the release of acetylcholine by lengthening the sarcomeres (5).

Hou *et al.* believed that local reactive hyperemia is the main reason of pain reduction after TPC (6). He also proposed that a spinal reflex can produce reflex relaxation of the muscle and in this way contributes to pain reduction (23). Gate theory, endorphin and enkephalin release, and neurologic inhibition may be other mechanisms of pain reduction in MTrPs areas (21, 26-28).

Many researchers have already evaluated the effects of TPC on MTrPs. Fryer and Hodgson showed that TPC is better than placebo in reducing pain on latent MTrPs of the upper trapezius muscle. The results obtained by them are similar to those in the present study (18).

One of the most similar studies to ours is that of Hou *et al.*, who found that 90 seconds of higher pressure caused the most significant pain relief in active MTrPs; however, lower pressure was also observed to have a significant effect on pain reduction (23).

In a systematic review on the chiropractic management of MTrPs, Vernon *et al.* recommended that strong evidence is behind the manipulation and trigger point pressure for immediate pain reduction of MTrPs (28).

Another similar study was conducted by Gemmell and colleagues (25). They divided the participant with nonspecific neck pain into 3 groups: TPC, pressure release, and sham US, but unlike the procedure in the present study, they worked on active MTrPs of the trapezius muscle. TPC was found to be significantly effective for PPT and AROM parameters (25).

In another study, Fernandez-de-las Penas *et al.* evaluated sensitivity changes in MTrPs in the trapezius muscle (both active and latent) after 90 sec TPC. Their method of measurement (VAS) and the duration of TPC technique (90 sec) are identical to those used in our study. The results showed significant changes (22).

The findings of the present study must be considered

alongside its limitations. First, only the immediate effect of 2 different applications of trigger point compression technique was examined. Second, there was a short interval between the completion of VAS prior to and after the treatment. It is possible that participants remembered their pre-treatment score, which might have influenced the completion of the post-treatment VAS. Third, the participants were asymptomatic and may not have been the typical of the population referring to manual therapists for treatment. Finally, the small sample size may have negatively influenced generalization of the findings.

Conclusion

Our results suggest that 30 and 90 seconds of trigger point compression on latent trigger points of the upper trapezius effectively reduce pain intensity, increase pain threshold, and ipsilateral and contralateral side flexion ROMs of the neck; however, the 90-sec TPC was observed to be more effective compared with the 30-sec one. Future studies are required to examine the long-term effects of these techniques, and also to clearly define the amount of pressure that is necessary to apply to a MTrP to obtain clinical improvement.

Acknowledgments:

None

Conflict of interest:

None

Funding support:

None

Authors' contributions:

All authors made substantial contributions to conception, design, acquisition, analysis and interpretation of data.

References

1. Chaiamnuay P, Darmawan J, Muirden KD, Assawatanabodee P. Epidemiology of rheumatic disease in rural Thailand: a WHO-ILAR COPCORD study. Community Oriented Programme for the Control of Rheumatic Disease. *J Rheumatol.* 1998;25(7):1382-7.
2. Yeganeh Lari A, Okhovatian F, Naimi S, Baghban AA. The effect of the combination of dry needling and MET on latent trigger point upper trapezius in females. *Man Ther.* 2016;21:204-9.
3. Shah JP, Danoff JV, Desai MJ, Parikh S, Nakamura LY, Phillips TM, et al. Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points. *Arch Phys Med Rehabil.* 2008;89(1):16-23.

4. Huguenin LK. Myofascial trigger points: the current evidence. *Phys Ther Sport*. 2004;5(1):2-12.
5. Simons DG. Understanding effective treatments of myofascial trigger points. *J Bodyw Mov Ther*. 2002;6(2):81-8.
6. Simons DG, Travell JG, Simons LS. *Travell & Simons' myofascial pain and dysfunction: upper half of body*. Lippincott Williams & Wilkins; 1999.
7. Reeves JL, Jaeger B, Graff-Radford SB. Reliability of the pressure algometer as a measure of myofascial trigger point sensitivity. *Pain*. 1986;24(3):313-21.
8. Delaney G, McKee A. Inter-and intra-rater reliability of the pressure threshold meter in measurement of myofascial trigger point sensitivity. *Am J Phys Med Rehabil*. 1993;72(3):136-9.
9. Fischer AA. Pressure tolerance over muscles and bones in normal subjects. *Arch Phys Med Rehabil*. 1986;67(6):406-9.
10. Jaeger B, Reeves JL. Quantification of changes in myofascial trigger point sensitivity with the pressure algometer following passive stretch. *Pain*. 1986;27(2):203-10.
11. Simons DG, Travell JG, Simons LS. *Myofascial pain and dysfunction: the trigger point manual volume 1*. 1999.
12. Rickards LD. The effectiveness of non-invasive treatments for active myofascial trigger point pain: a systematic review of the literature. *Int J Osteopath Med*. 2006;9(4):120-36.
13. Simons DG. Clinical and etiological update of myofascial pain from trigger points. *J Musculoskelet Pain*. 1996;4(1-2):93-122.
14. Kostopoulos D, Nelson Jr AJ, Ingber RS, Larkin RW. Reduction of spontaneous electrical activity and pain perception of trigger points in the upper trapezius muscle through trigger point compression and passive stretching. *J J Musculoskelet Pain*. 2008;16(4):266-78.
15. Gulick DT, Palombaro K, Lattanzi JB. Effect of ischemic pressure using a Backnobber II device on discomfort associated with myofascial trigger points. *J Bodyw Mov Ther*. 2011;15(3):319-25.
16. Okhovatian F, Mehdikhani R, sadat Naimi S. Comparison between the immediate effect of manual pressure release and strain/counterstrain techniques on latent trigger point of upper trapezius muscle. *Clinical Chiropractic*. 2012;15(2):55-61.
17. Grieve R, Clark J, Pearson E, Bullock S, Boyer C, Jarrett A. The immediate effect of soleus trigger point pressure release on restricted ankle joint dorsiflexion: a pilot randomised controlled trial. *J Bodyw Mov Ther*. 2011;15(1):42-9.
18. Fryer G, Hodgson L. The effect of manual pressure release on myofascial trigger points in the upper trapezius muscle. *J Bodyw Mov Ther*. 2005;9(4):248-55.
19. Aguilera FJ, Martin DP, Masanet RA, Botella AC, Soler LB, Morell FB. Immediate effect of ultrasound and ischemic compression techniques for the treatment of trapezius latent myofascial trigger points in healthy subjects: a randomized controlled study. *Journal of manipulative and physiological therapeutics*. 2009;32(7):515-20.
20. Hidalgo-Lozano A, Fernández-de-las-Peñas C, Díaz-Rodríguez L, González-Iglesias J, Palacios-Ceña D, Arroyo-Morales M. Changes in pain and pressure pain sensitivity after manual treatment of active trigger points in patients with unilateral shoulder impingement: a case series. *Journal of Bodywork and Movement therapies*. 2011;15(4):399-404.
21. Sarrafzadeh J, Ahmadi A, Yassin M. The effects of pressure release, phonophoresis of hydrocortisone, and ultrasound on upper trapezius latent myofascial trigger point. *Arch Phys Med Rehabil*. 2012;93(1):72-7.
22. Fernández-de-las-Peñas C, Alonso-Blanco C, Fernández-Carnero J, Miangolarra-Page JC. The immediate effect of ischemic compression technique and transverse friction massage on tenderness of active and latent myofascial trigger points: a pilot study. *J Bodyw Mov Ther*. 2006;10(1):3-9.
23. Hou C-R, Tsai L-C, Cheng K-F, Chung K-C, Hong C-Z. Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. *Arch Phys Med Rehabil*. 2002;83(10):1406-14.
24. Han SC, Harrison P. Myofascial pain syndrome and trigger-point management. *Reg Anesth Pain Med*. 1997;22(1):89-101.
25. Gemmell H, Miller P, Nordstrom H. Immediate effect of ischaemic compression and trigger point pressure release on neck pain and upper trapezius trigger points: A randomised controlled trial. *Clinical Chiropractic*. 2008;11(1):30-6.
26. Baldry P. *Acupuncture. Trigger Points and Musculoskeletal Pain* 2nd ed Edinburgh: Churchill Livingstone. 1993.
27. Ward R. *Integrated neuromusculoskeletal release and myofascial release. Foundations for Osteopathic Medicine* 2nd edition Philadelphia, Pennsylvania: Lippincott Williams and Wilkins. 2002:931-65.
28. Vernon H, Schneider M. Chiropractic management of myofascial trigger points and myofascial pain syndrome: a systematic review of the literature. *J Manipulative Physiol Ther*. 2009;32(1):14-24.