Short-Term Effects, on Pressure Pain Threshold, After Applying Techniques Of Isquemic Compression and Traction-Compression-Stretching: A Randomized Clinical Trial

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ABSTRACT

Objectives: The objective of the study was to measure and compare the immediate effect on the pressure pain threshold (PPT), after a single treatment of the latent myofascial trigger point 1 (MTP1) of the upper trapezius muscle, comparing localized ischemic compression (CI) and the integrated neuromuscular traction-compression-stretch technique (TTCE).

Methods: Pre- and post-intervention measurements (at five minutes) of the PPT were made on 30 subjects, 12 men and 18 women, with ages ranging from 24 to 48 years old, asymptomatic, who presented latent MTP1 in upper trapezius, randomly distributed in three groups: G1 (10 subjects) treated with TTCE, G2 (10 subjects) treated with IC and G3 or Control (10 subjects) treated with a simulated myofascial release procedure. The outcome variable, pressure pain threshold (PPT), was measured by a blinded external evaluator regarding the intervention performed. The treatment was performed by an expert operator, blinded to the pre-intervention measurements.

Results: The results showed a significant improvement in the PPT (Control: = 0.00 Vs G1 = +0.42 and G2 = +0.32) after the treatment of MTP1 with TTCE and CI, the improvement being greater in the group treated with TTCE.

Conclusions: The integrated traction-compression-stretch neuromuscular technique (TTCE) could be included in the treatment protocols of the latent MTP1 of the upper trapezius to reduce the pain sensitivity of that trigger point in asymptomatic subjects.

Key Words: Traction-Compression-Stretching, Ischemic Compression, Myofascial Trigger Point, Algometry, Pressure Pain Threshold.

HIGHLIGHTS

• TTCE can be included as a useful tool in the treatment protocol of patients with muscular disorders caused by MTP in the trapezius muscle.
• TTCE can reduce the painful sensitivity of the trapezius muscle and improve cervical mobility
• Patients with cervical pain and reduced cervical mobility may improve their quality of life.
Background

Myofascial pain syndrome (MPS) is a regional muscular process that, in many occasions, is not correctly diagnosed or adequately treated, causing a high rate of recurrence of symptoms and may lead the individual to a significant functional disability [1, 2, 3].

The MPS is characterized, mainly, by the presence of myofascial trigger points (MTP) and a limited range of motion of the affected tissues.

Attending only to its clinical activity, it is possible to distinguish between active and latent MTPs. Active MTPs cause spontaneous pain in the patient; On the other hand, latent MTrPs do not hurt spontaneously, they only hurt when palpated [4, 5]. The problem with latent MTP is its ability to produce alterations in muscle activity and movement and its capacity as active precursors of MTP [5]. Latent MTPs are frequent, both in symptomatic and asymptomatic subjects, and may occur in 45 to 55% of asymptomatic young adults in the shoulder girdle [6], which makes it necessary to correctly identify and treat them [7].

Current evidence suggests that the upper trapezius is probably the muscle most affected by MTP [8] and Gerwin [9] has shown a high prevalence of latent MTP in the trapezius muscle, signaling the MTP1 as having the highest frequency of activation causing problems such as headaches and pain or stiff neck. According to several studies [5, 10, 11], the prevalence of this latent MTP, in asymptomatic subjects, is between 50 and 78%.

There are numerous treatment techniques for MTP. However, the existing variations in the affectation of the different muscular groups, the persistence in the time and the multitude of points, makes it difficult to systematize the treatments. However, our clinical experience in the treatment of patients with sequelae due to whiplash-associated disorders (WAD), and in the context of a global treatment protocol, showed an evident improvement in pain sensitivity and mobility, after the intervention, with the integrated neuromuscular traction-compression-stretch technique (TTCE). However, we have not found any previous controlled studies that evaluate the effects of TTCE on the PPT of trapezius muscle MTP.

The TTCE is part of what is known as the "integrated approach of myofascial and joint treatment" [12, 13] and consists of a simultaneous combination of stretching and pressure release procedures that can contribute to improve joint function and provide, simultaneously, a stretching of the muscle fibers, an activation of the afferent pathways of the articular mechanoreceptors and a smooth activation on the Golgi tendon organ [12, 14, 15].

The objective of the present study was to evaluate the immediate effects, on the PPT of the latent MTP1 of the upper trapezius, of the TTCE and compare these results with those obtained by applying, on the same MTP, the localized IQ, whose effects have been sufficiently studied and contrasted [16, 17, 18].

Material & Methods

The sample of this pilot study consists of 30 subjects (12 males and 18 females), with an age range between 24 and 48 years, asymptomatic and who presented pressure sensitivity in the latent MTP1 of the upper trapezius muscle.

The subjects were informed of the purpose of the study and the need to undergo a previous selection process to establish the presence of
tender points in the trapezius muscle. Likewise, they were asked to complete a survey that, together with the positivity / negativity of the diagnostic test, would serve to determine who was included or excluded in the study.

During the selection process, the subjects who presented any of the MTPs of said muscle were excluded; finally, subjects with traumatic or cervical surgery antecedents were excluded, those who presented degenerative or inflammatory pathology in the cervical spine or shoulder girdle, those diagnosed with fibromyalgia or neuromuscular diseases, those with symptoms aggravated by movement and / or positioning of the neck and those who were in pharmacological treatment.

The criteria for establishing the presence of latent MTP1 in the upper trapezius muscle were those established by Travell and Simons [5]:

1. Presence of a palpable taut band in the affected muscle.
2. Presence of a hypersensitive focus within said taut band.
3. Response of local spasm induced by brusque palpation of the taut band.
4. Reproduction of a sensation of referred pain with the stimulation of said point.

As a result variable, the PPT was evaluated as defined by Fischer [19], as the minimum pressure that induces only pain, without considering discomfort, expressed in kg / cm2. For the measurement of the PPT an analog pressure algometer was used (Wagner Instruments, model Force Dial FDK 40).

With the patient in supine position, the assessor, seated at the head of the patient and by flat palpation of the trapezius muscle, with the thumb, established the presence of a taut band. Next, he palpated the clamp, along the taut band, to locate the sensitive nodule. Finally, he proceeded to measure the PPT following the rules proposed by Fischer [20, 21]; Once the MTP1 was located, the pressure algometer (PA) was applied perpendicularly to the muscular plane, centering it on the point of maximum sensitivity, placing the tip of the index finger or the middle under the nodule and the tip of the PA on the nodule, perpendicular to this. The pressure on it was gradually increased, at a rate of 0.5 kg / cm2 / s, until the individual reported a change in the sensation of pressure to painful sensation. The subjects were not informed of the result of the measurement.

After the measurement, the evaluator left the room and the therapist entered. At that time, the subjects were randomly assigned to one of three groups (two intervention groups and one control group). The therapist, who was blinded to the measurement of the PPT, was in charge of applying the intervention techniques:

- **G1**: received the application of TTCE, on the latent MTP1 of the upper trapezius. With the subject in the prone position, the therapist placed himself on the side of the muscle to be treated. With the caudal hand he fixed the subject’s arm and with the index finger and the middle of the cephalic hand executed a compression of the MTP using the rest of the fingers of that hand to fix the muscle to be treated. Once the desired compression was achieved, the therapist performed a gentle traction of the arm, to perform a muscular elongation and activate the afferent pathways of the articular mechanoreceptors and, simultaneously, holding the MTP1 fixed, performed a stretch of the upper trapezius muscle, using a sliding of the muscle mass over
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the underlying tissues. The application was maintained for 20-30 s, depending on the subject’s tolerance and muscular complexion, then the traction and sliding parameters were reduced and the compression was relieved for 5 s, maintaining the MTP1 fixation, and they were re-established again all the parameters This process was repeated 3 consecutive times (Figure 1).

• G2: received the application of localized IC, directly on the latent MTP1 of the upper trapezius. It was applied According to the recommendations of Chaitow [22]; the process was repeated 5 consecutive times.

• G3 (control): received a simulated myofascial release procedure as a treatment, accompanied by listening to relaxing music for 5 minutes.

After the therapist left the room and re-entered the evaluator, who measured the PPT at 5 minutes post-intervention, following the same protocol as in the first measurement. At all times, the evaluator was blinded to the intervention performed on the subject.

To assess the results obtained in the PPT measurements pre- and post-intervention, in the different study groups, the ANOVA test was used.

To analyze the clinical effects in each group, the Cohen d test was used.

The statistical analysis was performed using the statistical software SPSS 19.0 with a confidence level of 95% (p <0.05).

Results

The study sample consisted of 18 women, with an average age of 35.22 ± 12.78 years and 12 men, with 38.08 ± 9.92 years. Table 1 shows the distribution and initial characteristics of the subjects. No significant differences were found between the different study groups (p> 0.05). From this we can deduce the homogeneous distribution of the groups.

The results of the PPT, for the times studied in each group, showed a normal distribution (p> 0.05). Regarding the evolution of the same within each group, it is observed that the variation of the mean indicates an increase of the PPT (improvement) both in G 1 and in G 2, but not in G 3 (Table 2). Likewise, the results show a better response of the PPT to the intervention through the TTCE, compared to the IC. These results can be seen more clearly in Figure 2.
The results of our study show that both TTCE and IC, produce a significant immediate decrease in pain sensitivity (increase in PPT), however, in the control group no variations were observed in any case.

The intervention with TTCE has produced an average increase in the PPT of the latent MTP1 of the upper trapezius, of 0.42 kg/cm². Having not found previous studies on this technique, the only possible comparison of the results has been with studies that evaluate similar techniques of treatment, for the MTP of the upper trapezius, by means of pressure algometry.

Jaeger and Reeves [23], quantified an increase in the PPT of almost 0.67 kg/cm², in active MTP of the trapeziun, after the application of a passive stretch, compared to about 0.27 kg/cm² in the latent MTP. This circumstance shows a different behavior of the MTP, for the same technique, according to its active or latent state. We, with the application of the TTCE, we have obtained an average increase of the PPT of 0.42 kg/cm² in the latent MTP1, showing a better result, however we have not studied the results in active MTP.

Zuil et al [24], studied the modification of the PPT in the MTP1 of the trapeziun after applying a muscle energy technique (TEM) finding, in the immediate post-intervention measurement, an average increase in the PPT of 0.33 kg/cm², compared to the 0.42 kg/cm² that we have obtained with the TTCE, although it is true that, in his study, the pre-intervention measurement showed an average PPT value of 2.59 kg/cm², while in our , the value of the pre-test measurement was 3.29 kg/cm². We do not know if the fact of applying this technique in an MTP with a lower PPT, influences the final results obtained.
Regarding IC, Fryer and Hodgson [16] have demonstrated the effectiveness of IC in reducing the tender sensitivity of latent MTP1 of the upper trapezius. The results of this study are similar to those reported in ours for IC.

On the other hand, Dearing and Hamilton [18], compared the results of the IC with those of the TEM, concluding that, while both were effective, IC seemed to be more effective in reducing pain sensitivity in the MTP1 in asymptomatic individuals, obtaining values similar to ours for IC. He also found that the effect size was large for the CI group (d = 0.77) and medium for the TEM group (d = 0.64).

In our study, the size of the clinical effect was greater for TTCE (d = 0.84) than for ischemic compression (d = 0.67), which suggests that TTCE seems to be more effective than ischemic compression, obtaining a greater increase of the PPT of the MTP1.

An outstanding aspect of our study, although it has not been controlled or reported, are the improvements mentioned in the joint mobility of the cervical and scapulohumeral area, which were reported by the subjects treated with the TTCE.

The main limitations of this study have been the low statistical power due to the small number of subjects in the sample, which was not calculated to detect a certain difference, and that the sample was chosen through convenience sampling. However, as the phenomenon that is investigated is quite frequent, we estimate that the risk of bias caused by this type of sampling is reduced. We are aware that this circumstance limits the external validity of the study. However, an attempt has been made to gain internal validity with simple randomization in the allocation to groups and double blind.

We are aware of the limitations of the study, as has been shown in the corresponding section. Therefore, we believe it is necessary to carry out new studies with an adequate sample size and with a longer-term follow-up to check the evolution of the results.

Conclusions

Although the changes measured in the PPT are not enough to conclude that the integrated neuromuscular traction-compression-stretch technique (TTCE) can be recommended as a preferred conservative treatment for the treatment of latent trapezius MTP, the difference of +0.10 kg/cm² against localized ischemic compression, reveals a clear clinical interest and the possibility of including it in the treatment protocol of the latent MTP1 of the upper trapezius.

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Conflict of interests

The authors declare that there is no conflict of interests associated with the development of this study.

Ethical approval

In our study, all the ethical and legal requirements applicable to research with human beings were fulfilled, in accordance with the Declaration of Helsinki, and it was approved by the ethics committee of the University of Seville.
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All the costs of this study were assumed by the authors.

Clinical Implications for Practice

The integrated neuromuscular technique of traction-compression-stretch (TTCE) can be included in the treatment protocol of patients with muscle disorders caused by PGM in the trapezius muscle, helping patients with cervical pain and reduced cervical mobility to improve their quality of life.

References

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