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Effects of muscle inhibition technique on relief of masticatory pain in patients with temporomandibular disorders: an experimental study

Efeitos da técnica de inibição muscular sobre o alívio da dor mastigatória em pacientes com disfunção temporomandibular: estudo experimental

Lívia Moura Dias[1]; Itana Lisane Spinato[2]; Thiago Brasileiro de Vasconcelos[3]; Danielle Varela Rodrigues[4]; Raimunda Hermelinda Maia Macena[5]; Clarissa Bentes de Araujo Magalhães[3]; Maria do Socorro Quintino Farias[2]; Teresa Maria da Silva Câmara[6]; Danielle Silveira Macêdo[5]; Vasco Pinheiro Diógenes Bastos[7]

[1] Physiotherapist, Graduated by Estácio of Ceará University Center. Fortaleza, CE – Brazil.
[2] Master, Teacher of Estácio of Ceará University Center. Fortaleza, CE – Brazil.
[3] Physiotherapist, Masters Student – Federal University of Ceará – UFC. Fortaleza, CE – Brazil.
[4] Specialist, Physiotherapist – Mefi Clinic. Fortaleza, CE – Brazil.
[5] Doctor, Teacher of Federal University of Ceará – UFC. Fortaleza, CE – Brazil.
[6] Specialist, Teacher of Estácio of Ceará University Center. Fortaleza, CE – Brazil.
[7] Doctor, Teacher of Estácio of Ceará University Center. Fortaleza, CE – Brazil.

Postal address
Vasco Pinheiro Diógenes Bastos
R. Monsenhor Catão, 1.200 – Apto. 502, Bairro Meireles
60175-000 – Fortaleza – CE [Brasil]
vascodiogenes@yahoo.com.br

Abstract

Objectives: To verify the effects of the technique of muscle inhibition in individuals with Temporomandibular Disorder (TMD). **Methods**: A longitudinal, interventional, exploratory, comparative study was conducted of seven female subjects with a mean age of 42.8 (± 19.12) years. Participants were submitted to an active muscle inhibition technique until muscle relaxation occurred. We analyzed pain intensity, range of motion and bite force. **Results**: The pain decreased after use of the technique ($p < 0.01$) from 6.3 to 2.3; the range of motion showed gains in the opening ($p=0.04$) and an increase by 2 mm of right laterality ($p=0.01$) and left laterality ($p=0.01$), while protrusion was not affected ($p=0.35$). The bite force increased by 13 mmHg after the use of the technique ($p<0.01$). **Conclusion**: The technique of muscle inhibition was responsible for significant reductions in the frequency and intensity of kinesiological episodes and in changes of the functional conditions of patients with TMD.

Key words: Pain; Physical therapy modalities; Temporomandibular joint disorders.

Resumo

Objetivo: Verificar os efeitos da técnica de inibição muscular em indivíduos portadores de Disfunção Temporomandibular (DTM). **Método**: Realizou-se um estudo intervencional, longitudinal, exploratório e comparativo. Participaram deste estudo sete mulheres, com média de idade de 42,8 (± 19,12) anos. As participantes foram submetidas à técnica de inibição muscular ativa até que ocorresse o relaxamento muscular. Foram analisadas intensidade da dor, amplitude de movimento e força da mordida. **Resultados**: A dor diminuiu após o uso da técnica ($p<0,01$) de 6,3 para 2,3; a amplitude do movimento revelou ganhos na abertura ($p=0,04$) com aumento de 2 mm na lateralidade direita ($p=0,01$) e esquerda ($p=0,01$) enquanto que a protusão não foi afetada ($p=0,35$). A força da mordida foi aumentada em 13 mmHg, após o uso da terapia ($p<0,01$). **Conclusão**: A técnica de inibição muscular foi responsável por reduções importantes na frequência e intensidade dos episódios de alterações cinesiológicas e funcionais de portadores de DTM.

Descritores: Dor; Modalidades de fisioterapia; Transtornos da articulação temporomandibular.

Introduction

Temporomandibular Disorder (TMD) is a designation for a subgroup of orofacial pain disorders, involving complaints of pain over the region of the temporomandibular joint (TMJ) with clinical features of deep pain, of musculoskeletal origin. Thus it is related to functional demands, and may be accompanied by inflammation. Etiologically multifactorial, it is associated with emotional tension, occlusal interference, tooth loss, malposition of the teeth, dysfunction of the masticatory muscles, or a combination of these factors. Many times associated with muscle fatigue from cranial, facial and cervical structures, especially chewing muscles, it can produce limitation of mandibular movements and be accompanied by the presence of joint sounds[1-4].

Among the disorders that present painful manifestations, TMD and orofacial pain appear with high prevalence in the population[5]. Although they can occur at any age, they are most common among the young and in productive life. Individuals with TMD reported chronic pain which causes decreased productivity, stress and anxiety[6,7].

The treatments of TMD are aggressive and irreversible. Nonsurgical treatment of TMDs generally consists of medication, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and antidepressants, splint therapy and/or physiotherapy (electrotherapy, ultrasound, acupuncture, muscle inhibition technique and laser treatments). Physical therapy is used in the treatment of TMD because of its analgesic, myorelaxing, anti-inflammatory, and stimulating effects[1,8].

It is known that active muscle inhibition is an effective technique for muscle relaxation due to its therapeutic effects that appear to be related to increased release of beta-endorphins, a decrease in muscle spasms by influence on motoneuron of excitability, improved motor control, and effects on the autonomic nervous system, which may contribute to an improvement in symptoms of TMD[9,10].

Thus, in this study, we evaluated the kinesiological and functional conditions before and after using the technique of muscle inhibition in patients with TMD.

Method

A longitudinal interventional study of an exploratory and comparative nature was carried out from September to October of 2007 after approval by the Research Ethics Committee of the Estácio of Ceará University Center. The sample consisted of seven female subjects, with a mean age of 42.8 (± 19.12) years (aged 19 to 69 years), selected by the triage service for TMD and orofacial pain of Estácio of Ceará University Center.

The individuals were included in the sample as they arrived at the above-cited clinic, complaining of orofacial pain or pain in the region of the TMJ, ranging in intensity from mild to severe, being acute or chronic in form, and exhibiting presence of trigger points. They were chosen independently of sex, nationality, economic class, race, religion, but were required to not have undergone any other therapy three month prior to the study and to not do so for its duration.

The study excluded individuals with syndromes or systemic disorders; neurological diseases; acute dental problems, as well as those who didn't present trigger points and/or who could not open their mouth and had a congenital abnormality, concomitant inflammatory condition; and those with a recent history of acute trauma.

The individuals were in agreement regarding the assessment and its methods, having received detailed information about the research, and provided written informed consent to participate, as mandated by Resolution 196/96 of the National Health Council[11].

A single examiner performed the evaluation using an anamnesis protocol for data collection in patients with TMD standardized by center's triage service. This was followed by muscle palpation where data components of

muscle and joint pain were harvested using a Visual Analogue Scale (VAS) which uses a line 100 mm in length with a scale from 0 to 10 to measure the sensation of pain.

The classification used was 0 (zero) for no pain, ½ for sensitivity or discomfort, 3/4 for pain, 5/6 for pain with facial retraction, and greater than 7 up to 10 for radiating pain (trigger point). Participants with a score of 0-2 were considered as not having muscle pain and those who had a score of 3 or more as having muscle pain.

Range of motion was measured with a caliper, and bite force with the use of a modified sphygmomanometer.

In order to evaluate the measurement of mouth opening, the value range of 40 to 60 mm was taken as normal, and in assessing the extent of lateralization of the jaw the normal value used was 0.9 mm. The centerline of the anterior incisors was used as guide.

In order to determine muscle strength, the patient underwent adaptation for the technique using the modified sphygmomanometer[12]. To perform the technique with the modified sphygmomanometer, the Velcro part of this device was removed, leaving only the inflatable bag. The pressure registered on the gauge was taken as the patient's muscle strength.

The technique used was active muscle inhibition[13], consisting of digital pressure for 90 seconds in the trigger point, until muscle relaxation occurs. After 15 minutes of rest, the subject was submitted to an evaluation a second time.

The data was analyzed using Epi Info, version 3.2 developed by the CDC for Microsoft Windows® 7, which was conducted through descriptive analysis of the mean (± standard deviation), 95% CI, and application of Student's t-test with significance of $p < 0.05$.

Results

When evaluating the level of pain (Figure 1) in Masticatory Musculature in Individuals with Temporomandibular Dysfunction after using the muscle inhibition technique, it was observed that the pain on palpation decreased after use of the technique [$p < 0.01$; Student's t-test, 6.3 (95% CI 5.1 to 7.4) vs. 2.3 (95% CI 1.0 to 3.6)].

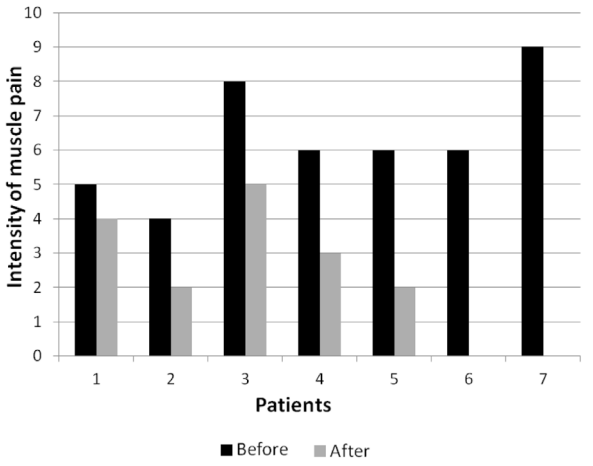

Figure 1: Distribution of data according to the intensity of muscle pain before and after using the muscle inhibition technique ($p = 0,008$; paired Student's t-test).

At the beginning, the patient underwent an evaluation by the therapist, who identified the muscle trigger point. The palpation was performed more precisely on muscle bundles connected to the TMJ and to those used in chewing. Each muscle fibre bundle was rated numerically according to the level of pain, whenever the subject mentioned absence or presence of pain, and its intensity upon palpation. After identifying where the stimulation of the sensitive points occurred and subsequently assessing the intensity of pain felt by the patient, the amplitude of motion and strength of the bite were measured. VAS was used for measuring the pain. This instrument consisted of a 100-mm horizontal line with possible scores ranging, in this study, from 0 (no pain) to 7-10 (trigger point). Subjects were asked to mark the score along the line that best corresponded to their pain.

Following this, the opening of the mouth was measured using as a guide the lower edge of the inferior front teeth. The caliper's small rod was placed between the upper and lower incisors, and then the patient was asked to per-

form the maximum aperture of the mouth while a professional recorded the caliper aperture value. This procedure was performed three times and the largest value retained.

For analysis of mouth laterality, we verified whether the incisor mid-lines of the upper and lower teeth were coincident. If they weren´t, a vertical marking coincident with the upper and lower teeth was made to serve as a new guide. The mark on the maxillary incisor served as a fixed point, and the one on the lower incisor as a moving point. The outside jaw of the caliper was used to measure the value of the lateral displacement of the jaw based on the distance between the markings. In measuring the protrusion, we prompted the patient to maintain the occlusion to allow making a mark on the coincident upper and lower canines. The patient was then requested to move the protrusion, and the physiotherapist measured the distance between the two marks using the caliper.

The range of motion (Table 1) showed gains in the opening (p = 0.04; Student's t- test), with an increase of 2 mm, from 38.4 [95% CI 33.8 to 43] to 40.5 [95% CI 36.5 to 44.6]; the right lateral (p = 0.01; Student's t-test) had an increase of 4 mm, from 5.0 [95% CI 2.4 to 7.5] to 9.2 [95% CI 8.0 to 10.5] and the left (p = 0.01; Student's t-test) went from 6 [95% CI 3.6 to 8.3] to 10.2 [95% CI 7.9 to 12.6]; protrusion wasn´t affected (p = 0.35; Student's t-test) being 7.5 [95% CI 5.2 to 9.8] before, and 8.8 [95% CI 8.6 to 9.1] after.

Table 1: Kinesiological conditions and functional of temporomandibular joint. We used mean values of 95% CI and application of Student's t-test with significance p < 0.05

	Before	After	P
Opening (mm)	38.4 [33.8 – 43]	40.5 [36.5 – 44.6]	p = 0.04*
Right laterality (mm)	5 [2.4 – 7.5]	9.2 [8.0 – 10.5]	p = 0.01*
Left laterality (mm)	6 [3.6 – 8.3]	10.2 [7.9 – 12.6]	p = 0.01*
Protrusion (mm)	7.5 [5.2 – 9.8]	8.8 [8.6 – 9.1]	p = 0.35

* p < 0.05; paired Student's t-test.

The force of the bite was measured with a modified sphygmomanometer, which had its Velcro straps removed, leaving only the inflatable bag. This bag was folded twice and covered by a transparent PVC film, and the place that the patient bit was reinforced using tongue depressors, which were tied together in the shape of a clothespin. The tongue depressors were changed for each patient.

The bite force (Figure 2) was increased by 13 mmHg after the use of the technique (p < 0.01; Student's t-test), from 50.0 (95% CI 42.6 to 57.3) to 63.0 (95% CI 53.2 - 72.8).

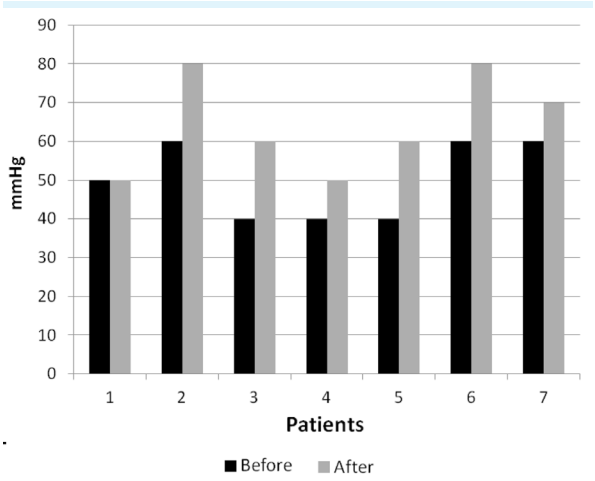

Figure 2: Distribution of data according to the bite force before and after using the muscle inhibition technique. *mmHg = Millimeters of mercury. (p = 0,031; paired Student´s t- test)

Discussion

In view of the results presented, we emphasize that patients with TMD present tense muscles with trigger points activated and orofacial pain and thus have restrictions in range of motion[10,14,15]. Just as in other studies, the intensity of reported pain in this group was a major factor in seeking treatment. Clinically, the pain was associated with the occurrence of these trigger points and signaled the existence of muscle damage that magnified the pain, varying in intensity and location[16-18].

Moreno et al.[19] emphasize that women with TMD had greater intensity of pain symptoms, teeth clenching, trouble sleeping, sensitivity to pain in the masticatory and neck muscles, and lower quality of life, compared with women without TMD.

The kinesiological impairment found in the sample reflects the significant functional changes found and, subsequently, minimized with the use of the technique of inhibition. For some authors[10,20-22], in general, these changes are related to spasms, capsulitis, and capsular fibrosis, which can often lead to altered movement of the mouth, either in bite force or even on the opening and/or the lateralization and protrusion. Inhibition of the trigger point allows the muscle to reach its normal resting length achieving. Their normal range of motion, with significant decrease in pain and improvement of mouth opening[23,24] was potentiated when combined with other therapies such as posture training, massage, electrotherapy, laser therapy, among others[25-27].

In a study by Silva et al.[28] conducted with 15 patients with TMD an improvement of bite force was found after treatment with occlusal splints.

Bjordal et al.[29] analysed the efficacy of low level laser therapy in pain reduction associated with chronic joint disorders. They also concluded that low level laser therapy, in correct doses, can reduce significantly the pain and improve health status in chronic joint disorders.

Another study confirmed our results. Oliveira-Campelo et al.[30] investigated the immediate effects of the atlanto-occipital joint manipulation and the suboccipital muscle inhibition technique on active mouth opening and pressure pain sensitivity over latent myofascial trigger points in the masticatory muscles and concluded that there was an immediate increase in pressure pain thresholds over latent trigger points in the masseter and temporalis muscles and an increase in maximum active mouth opening. Nevertheless, the effects of both interventions were small, and future studies are required to elucidate the clinical relevance of these changes.

Thus, although there is still uncertainty about how the technique of muscle inhibition acts on tissues, its utility is recognized in painful conditions because of the benefits it provides – which appear to be more involved with a hypoalgesic effect, through both peripheral and central mechanisms – thus producing analgesic and anti-inflammatory results[9]

The study was limited to patients with TMD before and after using the technique of muscle inhibition evaluated in the triage service of TMD and orofacial pain at Estácio of Ceará University Center. The sample was small, but the objective was reached; other studies with a larger number of participants should be done. Furthermore, controlled double-blind clinical trials and multi-centric studies are necessary to demonstrate the efficacy of the technique of inhibition in TMDs.

Conclusion

We conclude that the technique of inhibition was responsible for significant reductions in the frequency and intensity of kinesiological episodes and in changes of the functional conditions of patients with TMD, which can contribute to decreasing their suffering and the numerous procedures to which they are usually subjected.

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