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Application of transcutaneous nervous electric stimulation in individuals with temporomandibular dysfunction: randomized clinical trial

Aplicação da estimulação elétrica nervosa transcutânea em indivíduos com disfunção temporomandibular: ensaio clínico randomizado

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RESUMO | INTRODUÇÃO: A fisioterapia dispõe de vários recursos para o tratamento da disfunção temporomandibular, como a estimulação elétrica nervosa transcutânea (TENS), mas com muitas variações nos protocolos e parâmetros dosimétricos. **OBJETIVO:** Analisar a eficácia da estimulação elétrica nervosa transcutânea (TENS), com duração de fase e frequência fixas, na analgesia e funcionalidade de disfunções temporomandibulares. **MÉTODOS:** A amostra foi composta por 20 indivíduos, separados em grupo tratado e placebo, ao longo de 2 semanas de tratamento, avaliados pelo Questionário de Sintomas Mandibulares e Hábitos Orais, analisando dor e função articular. **RESULTADOS:** Ambos os grupos apresentaram redução na dor e escore geral, comparados ao momento pré-intervenção, para a função, apenas o TENS apresentou redução dos valores, mas, não houve diferenças entre os grupos. **CONCLUSÃO:** TENS não foi diferente do placebo no controle da dor porém, promoveu a melhora funcional nos voluntários.

PALAVRAS-CHAVE: Articulação temporomandibular. Medição da dor. Estimulação elétrica.

ABSTRACT | INTRODUCTION: Physiotherapy has several resources for the treatment of temporomandibular dysfunction, such as transcutaneous electrical nerve stimulation (TENS), but with many variations in protocols and dosimetric parameters. **OBJECTIVE:** To analyze the efficacy of transcutaneous electrical nerve stimulation (TENS), with fixed phase duration and frequency, in the analgesia and functionality of temporomandibular disorders. **METHODS:** The sample consisted of 20 individuals, separated in a treated group and placebo, during 2 weeks of treatment, evaluated by Questionnaire on Mandibular Symptoms and Oral Habits, analyzing pain and joint function. **RESULTS:** Both groups presented reduction in pain and general score, compared to the pre-intervention moment, for the function, only the TENS showed a reduction of the values, but there were no differences between the groups. **CONCLUSION:** TENS was not different from placebo in pain control, however, it promoted functional improvement in volunteers.

KEYWORDS: Temporomandibular joint. Pain measurement. Electric stimulation.

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Introduction

Temporomandibular Dysfunction (TMD) indicates a group of orofacial problems that present as signs and symptoms pain or discomfort in the temporomandibular joint (TMJ), in the ears, masticatory and cervical muscles, cracking, restriction of range of motion, deviations and difficulty of mastication[1]. It is a multifactorial condition that affects TMJ and chewing muscles, resulting in pain and disability between 5-12% of the population. Its pathogenesis involves genetic, anatomical and hormonal factors, and degenerative changes disorganize the relationship between the capsule, articular disc and mastication muscles[2].

The treatment of this disorder in cases of severe acute pain or in the severe chronic cases of degeneration is the pharmacotherapy, and even in refractory cases the surgical procedures can be considered; however, usually the conservative with occlusion orthoses, massage, manual therapy, taping, thermotherapy and laser should be the first choice because of the low risk of side effects[3]. Since another physical modality, which is transcutaneous electrical nerve stimulation (TENS), seems to be effective even in cases refractory to drug therapy[4].

TENS therapy consists basically in the use of a device that manages low-voltage, pulsed electric current in a biphasic, symmetrical or balanced asymmetric waveform. It is intented to relax hyperactive muscles and promote pain relief. It is seen as a relatively economical, safe and non-invasive modality that can be used to treat a variety of painful conditions[5–7]. In individuals with sciatic nerve irritation TENS has shown a reduction of pain in about 20%, with a larger effect size8. In addition, this equipment has been shown to be an effective therapy in reducing the pain and tonus of the muscles around the TMJ, but there is great variation in the protocols both in duration of therapy, duration of phase and frequency, and still have manuscripts that do not present data important dosimetry[4,9–14]. Thus, the present study analyzed a protocol with fixed frequency and phase duration of TENS in the analgesia of the masticatory muscles, and in the improvement of the function of individuals with TMD.

Materials and methods

The present study is an experiment, randomized, convenience and quantitative study. Performed at the Centro de Reabilitação Física of the State Universidade Estadual do Oeste do Paraná – UNIOESTE. Previously approved by the Research Ethics Committee of UNIOESTE, under protocol No. 2,324,273 (CAAE 76323317.6.1001.0107). All volunteers read and signed the free and informed consent form prior to the start of the research. Data were gathered in October and November 2017. Twenty individuals, 19 females and 1 male, randomly divided into 2 groups, were randomized into an opaque envelope. The treated group (TG) with 10 subjects, to whom TENS was applied and the placebo group (PG) with 10 participants to whom the same procedure was performed, however, with the device switched off.

Included in the study were men and women, aged between 18 and 55 years, who presented signs and symptoms of temporomandibular myogenic dysfunction. Those who did not present masticatory muscle pain, history of systemic rheumatic disease, or were taking analgesic and / or anti-inflammatory drugs were excluded.

Initially, anamnesis and application of the Questionnaire on Mandibular Symptoms and Oral Habits, proposed by Gerstner, Clark and Goulet[15], translated unofficially by Chaves, Oliveira and Grossi[16] were performed. The instrument is characterized by two domains: na assessment of mandibular pain and assessment of mandibular function. For each question, there are five possibilities of response, with scores varying between 0 and 4. It has the benefit of evaluating at the same time the severity of clinical signs and symptoms, as well as the functional limitation related to TMD.

For TENS application, Ibramed® branded equipment was used, with frequency parameters of 100 Hz, phase duration of 200 µs, three times a week, over two weeks, for 20 minutes each therapy[17]. The electrodes were arranged bilaterally, with one channel for each hemiface, on each side an electrode was placed on the branch of the mandible and another on the temporomandibular joint, were 2 x 4cm rubber-silicone electrodes.

Data were provided in the median, 1st and 3rd quartiles. Data analysis was done by non-parametric tests. The Wilcoxon test was used only for comparison within the same group, and the Mann-Whitney test was used for comparison between groups. The accepted level of significance was 5%.

Results

There were no sample losses, so the results for the 20 volunteers obtained by the Questionnaire on Mandibular Symptoms and Oral Habits are presented in relation to pain, function and total score. Aiming that for pain and total score there was reduction of values in the two groups, only for the function the group that used the TENS presented reduction of the values, fact that did not occur in the placebo group. In the comparison between the groups, there were no significant differences (Table 1).

Table 1. Placebo groups and treatment, in relation to pain, function and final score of the Questionnaire of Mandibular Symptoms and Oral Habits, in the initial evaluation (EVi) and final evaluation (EVf)

			PG	TG	p-value
Pain	EVi	Median	10	11	0.5000
		1st Q – 3rd Q	8.25-13	8.25-13	
	EVf	Mediana	7	7	0.2727
		1st Q – 3rd Q	5.25-9	5.25-9.75	
		p-value	0.0142*	0.0290*	
Function	EVi	Median	3	4.5	0.1357
		1st Q – 3rd Q	3-4	3.25-7	
	EVf	Mediana	2.5	2.5	0.4549
		1st Q – 3rd Q	2-3.75	2-4	
		p-value	0.1359	0.0090*	
Final score	EVi	Median	14	16	0.2854
		1st Q – 3rd Q	11.25-17.5	11-19.5	
	EVf	Mediana	10.5	9	0.4103
		1st Q – 3rd Q	7.25-11.75	9-14.25	
		p-value	0.0207*	0.0063*	

* significant difference, p<0.05. EVi - initial evaluation; EVf - final evaluation; PG – placebo group; TG – treated group.

Discussion

The present study evaluated the effect of a specific TENS protocol for pain and function in individuals with TMD, with improved outcomes for both the treated and placebo groups, only with better function for the TENS group. In the protocol used, the frequency was fixed at 100 Hz, different from that performed by Ferreira et al.[10], who did a single application of 50 minutes, with frequency variation in the first 25 minutes, 4 Hz, and in time remaining 100 Hz, observed reduction of electromyographic signal (EMG) and pain for the treated group.

Monaco et al.[9] also in a single session, but with extremely low frequency (0.66 Hz) and high phase duration (500 μs), they observed reduction in EMG signal and improvement in interocclusal distance for the treated group when comparing with placebo. It should be noted that in the questionnaire on Mandibular Symptoms and Oral Habits[15], regarding the functional evaluation, in which noise and movement of TMJ are questioned, only the treated group had significant differences.

Carvalho et al.[18] associated the use of TENS (150 Hz, 20 μs, 30 minutes) to a kinesiotherapeutic protocol during 15 therapies and found among participants with symptoms of headache, myofascial pain, auricular pain, noise and otalgia between the beginning and the end of the intervention. With regard to pain the palpation of the masticatory muscles, evidenced that pain on palpation presented a reduction for the masseter, digastric, pterygoid, upper trapezius, temporal and sternocleidomastoid muscles. In relation to the opening of the mouth, in the same study, a gain in joint range of motion was observed. Seifi et al.[12] observed after four interventions that for the maximum mouth opening, muscle pain and sensitivity there was a significant difference favorable to the TENS group (50 Hz, 15 mA, 30 minutes), even compared to a group using low power laser. Another study comparing these methods was that of Rezazadeh et al.[4], and TENS (75 Hz, 750 μs, 20 minutes) decreased pain faster than the laser.

Tosato, Biasotto-Gonzalez and Caria[19] compared the use of massage therapy with TENS (30 minutes) in 20 women with TMD, citing EMG improvements and pain intensity for both groups. However, this study does not present important dosimetric data for the use of TENS, such as frequency and phase duration, similar to that found in studies by Shanavas et al.[13] and Rai et al.[14], thus making it difficult to reproduce them.

In the present study, TENS therapy was superior to placebo only for the function, not being superior in the evaluation of pain nor in overall score of the questionnaire used, being one of the limitations of this study the absence of a control group, aiming to individualize more the placebo action; also the absence of analysis of sample size is another limitation, suggesting that future studies may work with larger samples. Also, it should be borne in mind that TENS is part of the therapeutic arsenal, but should not be understood as a single therapy, because in order to more significantly impact this dysfunction, the ideal is to return complete functionality to the anatomical structures related to etiology of TMD[20].

Conclusion

Under the experimental conditions performed, it was observed that transcutaneous electrical nerve stimulation (TENS) was not different from placebo in the pain control of TMD, but it was shown to be beneficial in the functional improvement of the temporomandibular joint.

Author contributions

Canossa LA, Schons NC and Nadal P participated in the design of the research project, data collection and drafting of the manuscript. Azevedo MRB participated in the design of the research project, interpretation of the data and critical review of the manuscript. Bertolini GRFB participated in the design of the research project, statistical analysis, interpretation of data and critical review of the manuscript.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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