

The effect of biofeedback on pain and sleep in a patient with temporomandibular disorder. Case report

Efeito do biofeedback na dor e no sono de paciente com disfunção temporomandibular. Relato de caso

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ABSTRACT

BACKGROUND AND OBJECTIVES: Literature has shown that behavioral and educational modalities are effective options in the treatment of chronic pain, including temporomandibular disorder, and techniques such as biofeedback have been used for single therapy or in combination for effective pain control in these individuals. Furthermore, the severity of symptoms is related to relevant prognostic factors, such as quality of life, emotional states and sleep quality. The aim of the present study was to evaluate the effect of the biofeedback audiovisual technique on pain control and sleep quality in a patient with temporomandibular disorder.

CASE REPORT: Female patient, 34 years old, with Temporomandibular Disorder. The DC/TMD (Diagnostic Criteria for Temporomandibular Disorders) Axis I, diagnostic was applied, and the patient was classified with more than one subtype of temporomandibular disorders: local myalgia and myofascial pain with reference, in addition to neck pain as a comorbidity.

CONCLUSION: In this case, the biofeedback treatment was effective both in reducing pain intensity and improving sleep quality.

Keywords: Biofeedback, Pain control, Seep, Temporomandibular disorder.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A literatura tem demonstrado que as modalidades comportamentais e educacionais são opções efetivas no tratamento da dor crônica, inclusive da disfunção temporomandibular, e técnicas como o *biofeedback* vêm sendo utilizadas como terapia isolada ou em combinação para um controle efetivo da dor nesses indivíduos. Além disso, a gravidade dos sintomas tem correlação com fatores de relevância para o prognóstico, como a qualidade de vida, estados emocionais e qualidade do sono. O objetivo deste estudo foi avaliar o efeito da técnica do *biofeedback* audiovisual no controle da dor e na qualidade do sono em paciente com disfunção temporomandibular muscular.

RELATO DO CASO: Paciente do sexo feminino, 34 anos, com disfunção temporomandibular. O critério diagnóstico DC/TMD (Diagnostic Criteria for Temporomandibular Disorders) Eixo I foi aplicado, sendo a paciente classificada com mais de um subtipo de disfunção temporomandibular: mialgia local e dor miofascial com referência, além de cervicalgia como comorbidade.

CONCLUSÃO: No caso clínico apresentado a terapia com *biofeedback* foi efetiva na redução da intensidade da dor e melhoria da qualidade do sono.

Descritores: *Biofeedback*, Controle da dor, Disfunção temporomandibular, Sono.

INTRODUCTION

The American Academy of Orofacial Pain defines Temporomandibular Disorder (TMD) as group of disorders that involve the chewing muscles, the temporomandibular joint (TMJ) and associated structures. The symptoms most often reported by patients include pain in the face, TMJ, masticatory muscles. Other symptoms reported by patients are ear manifestations such as tinnitus, ear fullness and vertigo¹.

The multifactorial origin of the TMD determines the greater importance of a complete anamnesis for the possible identification of the predisposing, initiating and perpetuating factors. One among the most relevant factors associated with TMD is micro-trauma, provoked by continuous overloads of the “chewing system” due to postural imbalances or parafunctional habits such as teeth squeezing, lip biting and abnormal jaw postures¹⁻³. The severity of symptoms are correlated with quality of life, emotional states and bad quality of sleep, and this alterations influence the clinical and therapeutic handling⁴⁻⁷. Sleep, in particular, has been pointed out as an element whose complex and multidimensional

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interaction with pain is relevant, either from the physiopathological point of view, or from the clinical point of view⁸. Moreover, sleep disturbances, like insomnia, are prevalent in populations with orofacial pain (OFP) and temporomandibular disorder⁹. Literature has shown that the behavioral and educational modalities are effective options for the control of chronic pain conditions, including TMD, and that techniques such as biofeedback are being used in single or combined therapies¹⁰⁻¹².

The biofeedback technique allows, by the means of electronic or electromechanics tools, digitally or analogically, with sounds or visuals, capturing the vital or biological signals that, when processed, promote a phenomenon of auto regulatory response, whereby the patients learn to intercept and correct physiological processes previously taken for involuntary.

This technique must be performed by a professional with experience and training in biofeedback, providing relevant information to the patients about their bodily functions, with the intention of promoting changes in behavior, resulting in prevention or decrease of symptoms¹³⁻¹⁵.

Studies have demonstrated the efficacy of this method, alone or in combination with other conservative techniques, for controlling patients' oral parafunctional habits and pain^{11,14,16-19}. The purpose of this study was to evaluate the impact of the audiovisual biofeedback technique on pain intensity and sleep quality in patients with OFP associated with TMD.

CASE REPORT

Female patient, 34 years old, nurse technician, sought the masters degree clinic of TMD and OFP with complaints of pain in the right side masseteric parotid region for at least 5 years. The patient initiated some treatments, but could not reverse the parafunctional habits (teeth squeezing and lip biting). The patient was classified with more than one subtype of muscular TMD when the TMD Axis I diagnostic criteria was applied: local myalgia and myofascial pain with reference, in addition to neck pain as comorbidity. During the muscle palpation test on the chewing muscles, the intensity 5 familiar pain was reproduced, according to the visual analog scale (VAS).

The biofeedback work on the chewing muscles activity uses the positioning of electrodes in the temporal muscles and in the masseter^{17,20,21}. This study's equipment was designed for use in the anterior portion of the temporal muscle, unilaterally. For the application of the equipment training protocol, the clinical researcher performed a biofeedback certification. The chosen therapy was audiovisual biofeedback. The equipment was connected around the head of the patient using a velcro strip, where the surface electrodes and sensors were positioned in contact with the more anterior portion of the temporal muscle.

With the action of these muscular fibers on the jaw movements, the signals generated there are transmitted to a notebook by means of graphic signals, allowing the patient to understand how to position her jaw to stabilize the graphic element (nave) below the threshold interposed on the computer screen during sessions (Figure 1).

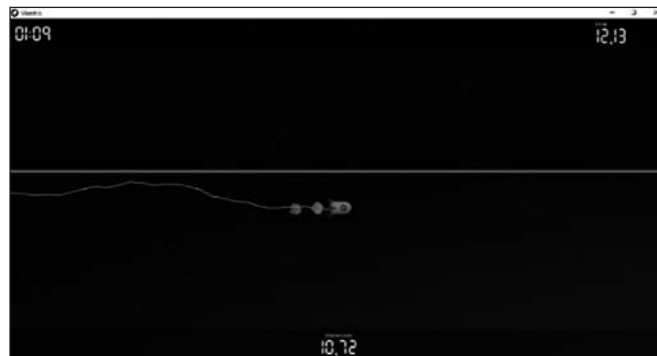


Figure 1. The software's graphic elements

The training's objective was to create consciousness, through auto regulation, of which actions the participant should execute in order to maintain the most adequate position of the jaw and, with that, avoid parafunctional habits that are considered risk factors for pain in TMD. The electrical activity signals generated in this model are interpreted via bluetooth by a specific software composed of the following graphic elements: Spaceship, controlled by the signals received by the sensors; Intensity of the contraction signal, which corresponds to the number presented in the lower and central area of the screen; Limiar, horizontal line inserted by the professional/researcher, whose value is in the superior right corner of the screen. The objective is to keep the spaceship below this limiar (Figure 1), resulting in the maintenance of the low electrical activity in the anterior temporal muscle. The patient was asked to keep the spaceship below the limiar, being instructed to keep teeth out of contact, with correct position of lips and tongue, in addition to correct head and neck postures (Figure 2).

Five sessions were done, two times a week, in alternate days, lasting 20 minutes each. Pain was assessed with the VAS, being zero – no pain, and 10 – worst possible pain. The VAS was also used for the assessment of sleep quality, being zero – bad sleep, and 10 – best sleep possible. These tools were used in all sessions. The application of the VAS sleep scale consi-



Figure 2. Training with equipment

dered a previously published protocol adaptation²² with the objective of formally assessing the subjective quality of sleep. Additionally, before the first and after the last session, the Pittsburgh Sleep Quality Index (PSQI) was applied, with the intention of consolidating the subjective evaluation of sleep quality measured by the VAS. A score greater than the cut-off point of 5 represents an impaired quality of sleep²³. After the gathering and analysis of data, the VAS pain score decreased from 5 (moderate) to 2 (mild) and the sleep score increased from 4 (bad) to 8 (good). Regarding the PSQI, initially a bad quality of sleep was assessed (score 7) and after therapy a good quality of sleep was assessed (score 3).

DISCUSSION

Several studies defend that non-invasive therapies constitute possible interventions for patients with TMD, being counseling^{24,25} and the biofeedback technique^{17,26} relevant examples. As for biofeedback interventions in the dental context, most publications are based on the evaluation of this tool in the management of bruxism^{21,27,28}. Some studies have analyzed pain symptoms by observing their reduction in response to the biofeedback therapy, either alone or in association^{17,29,30}. In the present case, the patient had an improvement on pain which is in line with what was established in a study in which the technique was applied with a similar protocol^{17,29}.

The association between sleep and pain has been the subject of several researches and, despite the complex interaction between these two vital functions, the results suggest that, in patients with chronic pain, an improvement in the quality of sleep significantly influences the results of the interventions on pain⁷. On the other hand, due to the contribution that the circadian temporal system, frequently known as biological clock, assumes in the regulation of both these functions, the feedback mechanisms involving sleep, the circadian temporal system and pain probably constitute models with clinical relevance and deserve more in-depth studies⁸.

Some publications have systematically sought to evaluate the quality of sleep of patients with TMD/OFP^{5,6,9,25}. Standardized and validated self-reported tools designed for screening of sleep disorders or the evaluation of treatment outcomes in this population have increased the evidence with significant impact on treatment options³¹, also reinforcing credit on the importance of addressing pain and sleep together.

In the present case, according to the assessment tools (VAS and PSQI), there was an improvement in sleep and pain after the therapy. This is relevant, specially due to the observance of the mutual interaction between the two phenomenon^{7,8}. Although several studies addressed the relation between OFP and sleep, few have focused in the response of quality of sleep after therapeutic intervention on TMD. A recent comparative study²⁵ used VAS for pain assessment and PSQI for sleep assessment, showing that patients who participated in counseling obtained better scores in both, which can be translated into lower pain rates and better quality of sleep.

As for the use of the biofeedback technique specifically on sleep, the results are known to be not sufficient. More random-

ized clinical trials with better methodology are necessary, aiming at establishing the effectiveness of biofeedback for the treatment of insomnia¹².

Nevertheless, one of the interesting aspects of the present case was that, in contrast to what was described in other studies³², it was not influenced by changes in sleep hygiene routines, which remained unchanged, suggesting that the technique's effect was independent of this potential bias.

Despite the inherent limitations of a case study, in regard to the inference over the assumed therapeutic potential, it was interesting to notice the impact of the biofeedback technique in a patient in which sleep and pain interacted with each other, one impacting the other in a negative manner, undermining health and quality of life.

The treatment's effectiveness covered, in this particular case, two dimensions with unmistakable value for a clinic that is frequently overwhelmed with complaints related to pain and sleep, diminishing hope of success. It's indisputable, however, the benefit of further populational and clinical quality studies that may take into account genetic and environmental coexisting factors and are capable of modifying the effects of the technique on short, medium and long term over pain, sleep and the interaction between both functions.

CONCLUSION

Despite the controversial literature on the biofeedback technique for patients with pain and disorder, in the present study it showed effectiveness in the treatment of orofacial origin pain associated with TMD. The concurrent improvement on quality of sleep allows for a favorable prognosis and reinforces credit in the clinical relevance of the multidimensional approach to pain, addressing its interaction with inadequate sleep.

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