



Multimodal physiotherapeutic approach: effects on the temporomandibular disorder diagnosis and severity

Abordagem fisioterapêutica multimodal: efeitos sobre o diagnóstico e a gravidade da disfunção temporomandibular

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Abstract

Introduction: The temporomandibular disorder (TMD) consists of a set of signs and symptoms that affect the masticatory structures, which may cause joint and/or muscular pain. The physiotherapy approach aims at the pain relief and the functional recovery by means of several modalities. **Objective:** To investigate the effects, short and medium-term, of a multimodal physiotherapeutic approach on TMD diagnosis and severity. **Methodology:** Individuals with diagnosis of TMD, confirmed by the Axis I of the RDC/TMD, took part in the study. From this evaluation, the Temporomandibular Index (TMI) and its sub-indices were calculated. The participants were treated during ten sessions of physiotherapy, which included therapeutic ultrasound, thermotherapy, manual therapy, stretching and neuromuscular exercises, as well as self-care and home exercises instructions. Assessments were carried out before treatment (AV1), immediately after treatment

(AV2) and two months after the end of the treatment (AV3). The values of indices and the diagnosis prevalence were compared between the different periods by the t paired test ($p < 0.05$). **Results:** The number of diagnoses reduced in all the subgroups and 41.7% of the 24 participants presented no diagnosis after the treatment. A significant decrease in the TMI was observed between AV1 and AV2 ($p = 0.000$). There was no difference between AV2 and AV3 ($p = 0.204$) in 13 participants assessed two months after the end of the treatment. **Conclusion:** The multimodal physiotherapeutic approach resulted in positive effects, short and medium-term, on the symptoms and clinical signs, with deletion of the dysfunction or reduction of its severity in treated patients.

Keywords: Temporomandibular disorder. Temporomandibular index. Manual therapy. Orofacial pain. Physiotherapy.

Resumo

Introdução: A disfunção temporomandibular (DTM) envolve um conjunto de sinais e sintomas que afetam as estruturas mastigatórias, podendo causar dor articular e/ou muscular. A abordagem da fisioterapia visa o alívio da dor e a recuperação funcional por meio de diversas modalidades. **Objetivo:** Verificar os efeitos, em curto e médio prazo, de uma abordagem fisioterapêutica multimodal sobre o diagnóstico e a gravidade da DTM. **Metodologia:** Participaram do estudo, indivíduos com diagnóstico DTM, obtido pelo eixo I do instrumento RDC/TMD. A partir desta avaliação foram calculados o Índice Temporomandibular e seus sub-índices. Os participantes foram tratados durante dez sessões de fisioterapia que incluiu ultrassom terapêutico, termoterapia, terapia manual, exercícios de alongamento e neuromusculares, além de orientações de autocuidado e de exercícios domiciliares. Foram realizadas avaliações antes do tratamento (AV1), imediatamente após o tratamento (AV2) e 2 meses após o seu término (AV3). Os valores dos índices e prevalência de diagnósticos de DTM foram comparados entre os diferentes momentos pelo teste t pareado ($p < 0,05$). **Resultados:** Houve redução do número de diagnósticos em todos os subgrupos e ausência de diagnóstico em 41,7% dos 24 participantes após o tratamento. Obteve-se, ainda, significativa redução do ITM na comparação entre AV1 e AV2 ($p = 0,000$). Não houve diferença entre AV2 e AV3 ($p = 0,204$) em 13 participantes avaliados dois meses após o término do tratamento. **Conclusão:** A abordagem fisioterapêutica multimodal produziu efeitos positivos, em curto e médio prazo, sobre os sintomas e sinais clínicos, com supressão da disfunção ou redução da sua gravidade nos pacientes tratados.

Palavras-chave: Transtornos da articulação temporomandibular. Índice temporomandibular. Terapia manual. Dor orofacial. Fisioterapia.

Introduction

Temporomandibular disorders (TMDs) consist of musculoskeletal conditions that affect joint, myofascial and sensorial structures of the face and the stomatognathic system, causing pain, functional limitations and disability (1, 2). Their components include traumas, occlusal discrepancies, stress, articular hypermobility, skeletal problems, parafunctional habits and psychological factors (3), once they are considered dysfunctions of multifactorial origin.

There are several signs and symptoms that characterize this disorder such as spontaneous or palpated

joint and muscular pain or discomfort, limitation and/or deviations of mandibular movements, joint noises and headache. These factors compromise the oral functions and may interfere significantly in the quality of life of individuals (1, 3).

Approximately 40-75% of the active adult population shows at least one sign of TMD, being joint noises the most frequent (33%), with prevalence of up to 50% in university college students (4) and more frequently occurring in women between 20 and 40 years of age (5).

Among the methods of assessing TMD, the Research Diagnostic Criteria for Temporomandibular

Disorders (RDC/TMD) distinguish. It enables the standardized assessment of the dysfunction, the detection of multiple diagnoses for each TMJ as well as the diagnostic subtypes classification (6, 7, 8).

In 2002, Pehling et al. (7) developed and validated the Temporomandibular Index (TMI), whose algorithm is appropriate to determine the severity of the TMD. The TMI provides scores that refer to the clinical aspects of the assessment such as joint amplitude, muscle and joint pain and the presence of joint noises, determining the severity of the TMD. The TMI consists of three sub-indices: functional index (FI), muscle index (MI), and articular index (AI). This index quantifies the severity of the dysfunction (0 = absence to 1 = higher severity) without classifying it in levels. Few studies analyze the alteration in the severity of the dysfunction with therapeutic interventions. Cuccia et al. (9) have compared the effect of osteopathy and the conservative treatment in patients with TMD through the score of the TMI.

The goals of physiotherapeutic intervention are to relieve musculoskeletal pain, reposition the jaw in the cranium, increase or maintain the amplitude of movement, reduce inflammation and muscle spasms, restore the function of the masticatory system and the musculoskeletal balance, as well as to promote the reeducation of the patient in controlling the adverse conditions which perpetrate the problem (1, 10, 11, 12, 13, 14).

Among the physiotherapeutic resources employed in the treatment of this disorder, there are electrotherapy, articular mobilization, massage therapy, techniques of myofascial liberation, muscle stretching, kinesiotherapy and relaxation techniques (11, 14, 15). In addition, instructions for self-care, patients education, clarification of risk factors and home exercises afford gains of psychological and behavioral order in the clinical picture of TMD patients, once they may decrease anxiety (16, 17).

Thus, we emphasize the importance in developing multimodal therapeutic programs that work on the different etiologic factors engaged in the TMD development and perpetration. Additionally, the monitoring of therapeutic results, with the indices of gravity of the disorder, allows to show the relief of symptoms and the functional recovery. Therefore, this study aimed at investigating the effects, short and medium-term, of a multimodal physiotherapeutic approach regarding the diagnosis and the severity of the disorder.

Methods

The study was carried out from February 2011 to October 2012, and approved by the Research Ethics Committee at the institution under the number 0281.0.243.000-08. All volunteers were informed about the objectives and procedures to be carried out and signed a Consent Term.

The participants were patients at the Occlusion Clinic of the Dentistry School at Universidade Federal de Santa Maria and/or knew about the study through its informing in electronic media.

The individuals included in the research were of both genders, between 18 and 70 years old, and with a diagnosis of temporomandibular disorder, obtained by the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) instrument (18). Individuals with signs of neuropsychomotor impairment, history of traumas and/or surgical procedures in facial and cervical areas and those who had not completed the minimum number of ten appointments in the physiotherapeutic program were excluded.

Firstly, the participants took part in an interview for the identification of inclusion and exclusion criteria. The TMD diagnosis was established through the axis I of RDC/TMD, which assesses the amplitude of mandibular movements, the presence of joint noises, joint and muscle palpation, and allows the classification of TMD into three subgroups: myofascial pain; displacement of articular disc and articular disorders (arthralgia, arthritis and arthrosis of the TMJ).

The scores for the calculation of Temporomandibular Index (TMI) and its sub-indices (8) were obtained from the RDC results. The TMI consists of three sub-indices: functional index (FI), muscle index (MI) and articular index (AI). The value of each sub-index is calculated through the addition of scores of assessed items divided by the total number of items. TMI is obtained through the mean value of the three sub-indices, varying from zero to 1, being 1 the highest score possible, indicating a greater severity of the dysfunction. The FI includes 12 items referring to amplitude of jaw movement, characterizing pain or limitation and deviations in the opening movement. The MI measures pain associated to intra and extra-oral bilateral digital palpation of masticatory muscles in 20 points. The AI assesses pain caused by the digital palpation of two points (lateral pole and posterior ligament) and the occurrence of noises in each TMJ (7, 9).

The physiotherapeutic treatment consisted of ten appointments, one per week, 50 minutes each. The participants were assessed prior to treatment (AV1), immediately after treatment (AV2) and two months after the end of treatment (AV3). The last assessment was made with 13 participants.

The treatment included multimodal physiotherapeutic intervention and self-care and home exercises instructions:

- Modalities:
 - 1) Ultrasound (Ibramed, model Sonopulse III 1 and 3 MHz) of 3 MHz in continuous mode with intensity of 1,3 W/cm², for three minutes in the TMJ area and masseter muscles, bilaterally, in patients who showed chronic pain (19);
 - 2) US of 3 MHz pulsed with intensity of 0.5 W/cm², for three minutes in patients with acute clinical pictures (19);
 - 3) Superficial thermotherapy with infrared radiation for the cervical muscles relaxation, during 20 minutes (19);
 - 4) Myofascial release and stretching of masticatory (jaw elevators) and cervical muscles (trapezius, sternocleidomastoid, scalene), bilaterally for the mouth opening amplitude recovery and pain reduction (15, 20) (Figure 1A and 1B);
 - 5) Manual therapy techniques which included traction, distraction and therapeutic massage employed in the cervical spine and TMJ (19, 21) (Figure 1C);
 - 6) Jaw exercises with the help of a silicone rubber tube to improve amplitude of movement and neuromuscular coordination (2, 19, 22) (Figure 1D).
- Self-care instructions: diaphragmatic breathing, relaxation of cervical muscles, postural advice and adequate sleeping position (13, 15, 19);
- Home exercises: articular mobility and directed opening of the mouth in front of the mirror, exercises for joint stabilization, stretching of masticatory and cervical muscles, opening and closing movements of the mouth with tongue in palate, performed daily (2, 15, 23).

The score values of the assessed items were compared between the different periods (AV1 versus AV2

and AV2 versus AV3) through the paired t-test, assuming a significance level of 5% ($p < 0.05$).

Results

Twenty-four volunteers with mean age of 34.5 ± 16.3 years old participated in the study, 3 males and 21 females.

The most frequent diagnostic classifications of TMD prior to treatment were the muscular and mixed subgroups. After 10 sessions of physiotherapy, there was a reduced number of diagnoses in all subgroups and the absence of diagnosis in 47.1% of the volunteers (Figure 2).

A significant decrease in the temporomandibular index and its subgroups was observed in the comparison between initial and post-treatment assessments (AV1 versus AV2) when comparing the results of the 24 participants. This decrease was of 28.3% in the temporomandibular index, 46.9% in the articular index, 23.7% and 19.2% in the muscular and functional indices, respectively (Table 1).

Thirteen participants were assessed two months after the end of treatment (AV3). No difference was found between the mean values of temporomandibular ($p = 0.204$), muscular ($p = 0.388$), articular ($p = 0.134$) and functional ($p = 0.782$) indices in this assessment, when compared to the post-treatment assessment (AV2).

Discussion

This study aimed to assess the effects of a physiotherapeutic intervention in individuals with TMD through the RDC/TMD protocol and the Temporomandibular Index, which consist of validated clinical instruments for diagnosis and determination of the TMD severity.

In this study, it was possible to find, through the RDC, the suppression of the diagnosis of TMD in 41.7% of the treated patients. Other studies (1, 2, 9, 11, 23, 24) with multimodal approach for TMD treatment, including exercises and manual therapy applied to craniofacial and cervical-scapular areas (articular mobilizations, mobilization of soft tissues), postural education and neuromuscular stabilization of TMJ, found positive results from these interventions on the patient's clinical history. Nevertheless,

in order to assess the therapeutic results, the authors used Analogic Visual Scale (AVS), algometry, measurements of amplitude of mandibular movement and degree of interference of the symptoms of TMD on daily activities, with no reports of change on the dysfunction diagnosis.

A study (25) with 144 patients with TMD diagnosed by RDC obtained the cessation of symptoms associated to muscle pain, such as headache, otalgia and cervical pain in 68% of patients treated with instructions of daily stretching of jaw elevator muscles exercises, control of oral habits and body positioning care. Another study found a percentage of 78% of asymptomatic patients soon after physiotherapeutic treatment and 59%

during follow-up 4 and 18 months after the end of treatment (13). Furto et al. (2) observed favorable results in 61.29% of patients attended during two weeks of a therapeutic treatment with multimodal physiotherapy.

The disparity observed among the therapeutic results of a number of studies may be attributed to the lack of a standardized prescription regarding the modalities used, frequency, intensity, and length of treatment. The heterogeneity of studies, especially in the diagnosis of TMD, and the lack of controlled studies with appropriate sampling sizes and detailed methodology also explains this diversity, according to a systematic review about the effectiveness of physiotherapy in TMD (12).



Figure 1 - (A) Myofascial release of the masseter muscle; (B) Stretching of jaw elevator muscles (C) Mobilization of TMJ; (D) Neuromuscular exercises

Source: Research data.

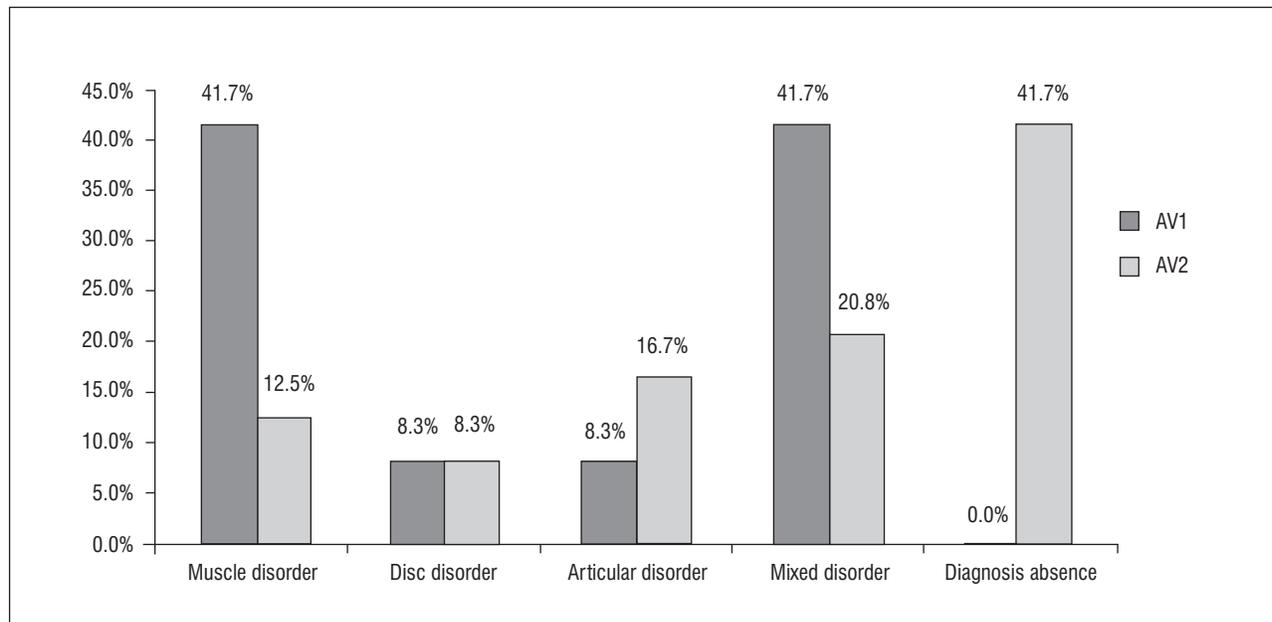


Figure 2 - Percentage distribution of diagnostic classifications of TMD according to RDC/TMD (n = 24)

Source: Research data.

Table 1 - Mean, standard deviation and decrease percentage of Temporomandibular Indices and muscular, articular and functional sub-indices in the initial (AV1) and immediately after treatment assessments (AV2)

Indices (n = 24)	Measurements	AV1	AV2	% Decrease
Temporomandibular Index	mean (SD)	0.53 (0.13)	0.38 (0.12)	28.3%
	P		0.000*	
Muscular Sub-Index	mean (SD)	0.38 (0.19)	0.29 (0.15)	23.68%
	P		0.035*	
Articular Sub-Index	mean (SD)	0.49 (0.29)	0.26 (0.22)	46.94%
	P		0.001*	
Functional Sub-Index	mean (SD)	0.73 (0.18)	0.59 (0.19)	19.18%
	P		0.002*	

Note: *Statistical significance in paired t-test.

Source: Research data.

The TMI allows to differentiate normal individuals from individuals with TMD, to assess changes in the degree of dysfunction along time, and the therapeutic intervention outcomes. The decrease in the scores of temporomandibular index and its sub-indices obtained in this study indicates a significant clinical improvement with symptoms relief and the TMD severity reduction. Few studies have considered the effects of therapeutic intervention on the severity of

TMD and by means of the TMI assessment. Despite the suppression of diagnosis of TMD in 41.7% of participants after treatment, the mean of scores of TMI has not reached values observed in asymptomatic individuals, from 0.08 to 0.12, according to the Pehling et al.'s study (7).

Cuccia et al. (9) compared the effects of osteopathy and conventional conservative treatment with the use of oral appliances, heat and/or cold, TENS and

muscle stretching, and relaxation exercises in patients with TMD. The author calculated the TMI, before and after treatment, and obtained a decrease of 15% in its score with both osteopathy and the conservative treatment. According to the authors, such modalities induce to an adequate neural plasticity with positive influence on the myofascial tonus. In this study, there was a decrease of 28.3% in the TMI after treatment. In the assessment of the validity of TMI, to compare results prior to and post-treatment, Pehling et al. (7) observed a decrease in its score from 0.41 to 0.29, that is, 29.3% after treatment with medication, intra-oral appliances, physiotherapy, behavioral cognitive therapy and/or arthrocentesis in the TMJ.

Articular signs and symptoms seem to have responded better to therapeutic intervention, what was showed by the higher decrease in the articular sub-index (46.9%) in comparison to the other indices (23.7% and 19.1%, muscular and functional indices, respectively). Protocols based on active and passive jaw exercises, postural correction and relaxation techniques have shown to be efficient in improving the amplitude on mouth opening and pain reduction in patients with disc displacement without reduction and the results were maintained short and long-term (six-month follow-up care) (24).

The significant decrease of the articular sub-index of TMI may be attributed to the effect of neuromuscular stabilization through the movements of lateral deviation and protrusion, associated to the maintenance of the functional space of the TMJ. The effectiveness is explained by compressive forces applied to the disc, which improve the congruence between condyle, disc and articular eminence (2, 26). Another study (27) with patients affected by anterior disc displacement with reduction found that specific exercises for disc repositioning (protrusive opening), when performed daily, could help in the effective reduction of the cracking noise, confirming the efficiency of the conservative treatment.

A study developed by Haketa et al. (28) compared the efficiency of the mobilization treatment associated to home exercises and the use of occlusal splints in individuals with anterior disc displacement without reduction. After 8 weeks of treatment, a significant improvement in mouth opening was observed in the group of exercises in comparison with the group that used occlusal splints. In addition, a reduction in the daily pain intensity and in daily activities limitations was observed in both groups.

The lowest difference observed in the muscular sub-index in re-assessments after treatment may be partly because the score disregards pain intensity with palpation and, it is included even when occurring in only one place. In contrast, when assessed with RDC, myofascial pain is diagnosed only when there is pain in at least three places palpated on the same side where the patient has complained.

This study has evidenced the effectiveness and maintenance of results obtained with physiotherapeutic intervention, once there was no difference between the TMI scores and its sub-indices in the assessments carried out immediately after and two months after the end of treatment. On the other hand, Cuccia et al. (9) observed a slight worsening in pain symptoms after two months of the end of treatment with osteopathy and physiotherapy, although with better levels than the ones observed before treatment. La Touche et al. (1) obtained an increase in pain threshold to pressure in masticatory muscles, reduction in facial pain and increase of the mouth opening movement without pain with manual therapy and exercises directed to the cervical spine after 10 sessions. These results remained after 12 weeks of the end of treatment.

It is important to emphasize the patients education regarding self-care and the performance of home exercises as preponderant factors in order to maintain short and long-term therapeutic results (13, 15, 25). Moreover, the importance of treatment including not only TMJ and masticatory muscles but also the cervical-scapular area must be taken into account, once the hypoalgesic effects in this area are reflected in other areas due to the activation of descending inhibitory pathways (1). Milanese et al. (8) showed greater severity of TMD through TMI in women with greater forward head posture and flexion of the lower cervical spine, what reinforces the need for a therapeutic approach directed also to craniocervical posture.

The decrease in the temporomandibular index after physiotherapeutic intervention based on techniques of manual therapy, kinesiotherapy and home instructions indicates a significant improvement in aspects such as the increase in movement amplitude, muscle and articular pain relief by palpation and movement, and the reduction of joint noises. This clinical improvement is reflected in the reduction of severity of signs and symptoms of the temporomandibular disorder in a relatively short

period, with the maintenance of benefits reached with treatment. Once the functional performance of the stomatognathic system is influenced by dental occlusion, contraction of masticatory muscles, lips and tongue, the absence of pain during functional movements accounts for a prerequisite for mastication and other functions (29).

Physiotherapy has some advantages in relation to other modalities of treatment, once it is non-invasive, non-uncomfortable and has a favorable cost-benefit relation. It promotes an improvement in jaw functions, having a low cost, being non-invasive, and causing the minimum discomfort possible to the patient (1). It is important that dentists and physiotherapists/osteopaths work cooperatively in the management of disorders of TMJ and musculoskeletal structures (9).

A multiprofessional approach is recommended for a complete intervention on the multiple factors included in TMD, with benefits to the life quality of patients. An interdisciplinary team integrates various health professionals in a relation of support in order to carry out long-term treatments and the change of factors that contribute to the disorder (22).

The present study still shows limitations due to the number of participants, mainly in the re-assessment after the end of treatment. Furthermore, the longer duration of treatment may contribute to obtaining scores of TMI corresponding to asymptomatic individuals. Subsequent studies should include a control group with patients in the waiting list for treatment, as well as the blinding of examiners in order to contemplate the requirements of controlled and randomized clinical studies.

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