

Evaluation of stabilizing plate therapeutic effects on different types of temporomandibular disorders - painful evolution of patients treated in a reference center

Avaliação dos efeitos terapêuticos da placa estabilizadora nos diferentes tipos de desordens temporomandibulares – evolução sintomatológica de pacientes atendidos em um centro de referência

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ABSTRACT

Objective: Evaluation of the symptomatic outcome of patients of various types of TMD treated exclusively with stabilizing plate for a period of three months patients comparing painful muscle and joint symptoms, and clinical aspects, both before and after treatment periods. **Material and methods:** A retrospective study of medical records of 628 rescue the last ten years (2004 – 2013) of subjects treated at the Serviço de Diagnóstico e Orientação a pacientes com Desordem Temporomandibular (Serviço ATM), Faculty of Dentistry/UFJF. The sample was divided into subgroups distinct diagnoses, in which the evaluation of symptomatic progression of patients through the analysis of pain scores, measuring the amplitude of mouth opening and the presence of joint sounds was performed. Data were obtained in early stages and after treatment with stabilizing plate. **Results:** The group of individuals diagnosed with muscular disorder (47.45 %) and those with multiple diagnoses (3.34 %) had a higher prevalence of chronic orofacial pain (90.26 % and 95.23 %). The remission of painful symptoms was visible in groups accompanied by increased amplitude of mouth opening. Additional way, we obtained reduction joint sounds in patients with intracapsular and degenerative disorders, respectively. **Conclusion:** The stabilizing plate has shown efficacy in various types of temporomandibular disorders evaluated. However, in an attempt to encompass all etiological factors in therapy, emphasizes the importance of multidisciplinary therapies for the treatment of temporomandibular disorders.

KEYWORDS

Occlusal splint; Temporomandibular disorders.

RESUMO

Objetivo: Avaliação da evolução sintomatológica de pacientes com diagnósticos de DTM, tratados exclusivamente com a placa estabilizadora durante um período de 3 meses, comparando a sintomatologia dolorosa muscular e articular, assim como aspectos clínicos, nos períodos anterior e posterior ao tratamento. **Material e métodos:** Foi realizado um estudo retrospectivo com avaliação de 628 prontuários dos últimos dez anos (2004 – 2013) de pacientes atendidos no Serviço de Diagnóstico e Orientação a pacientes com Desordem Temporomandibular (Serviço ATM) da Faculdade de Odontologia/UFJF. A amostra foi dividida em subgrupos diagnósticos distintos, nos quais foi realizada a avaliação da evolução sintomatológica dos pacientes por meio da análise de escores de dor, mensuração de amplitude da abertura bucal e presença de ruídos articulares. Os dados foram obtidos em momentos iniciais e após o tratamento com placa estabilizadora. **Resultados:** O grupo dos indivíduos diagnosticados com desordem muscular (47,45 %) e aqueles com diagnósticos múltiplos (3,34 %) apresentaram maior prevalência de dor crônica orofacial (90,26 % e 95,23 %). A remissão da sintomatologia dolorosa foi visível nos grupos estudados acompanhada de aumento de amplitude de abertura bucal. De modo adicional, obteve-se redução ruídos articulares em pacientes com DTM intracapsulares e degenerativas, respectivamente. **Conclusão:** A placa estabilizadora mostrou eficácia nos variados tipos de desordens temporomandibulares avaliadas. Contudo, na tentativa de englobar todos os fatores etiológicos na terapêutica, ressalta-se a importância de terapias multidisciplinares para tratamento das desordens temporomandibulares.

PALAVRAS-CHAVE

Placa estabilizadora; Desordens temporomandibulares.

INTRODUCTION

The stomatognathic system formed by muscles, bones, temporomandibular joints (TMJ), and teeth is a complex unit designed to play many functional roles. Notwithstanding, in some situations, the tolerance, adaptability and remodeling capacity of the components of this system is surpassed, characterizing the Temporomandibular Disorder (TMD) [1,2]. Currently, TMD incidence has considerably increased, so that 50 % to 75 % of the population exhibits at least one TMD sign and 25 % shows associated symptoms. However, the lack of understanding of TMD etiology and pathogenesis together with either a definitive diagnosis or therapeutic approaches lead to constant longer impairing pain and poor patient's quality of life [3].

Attempting to TMD control and avoid TMD progression, frequently occlusal splint therapy is the immediate treatment proposed to patients because it has a low cost, easy construction and high success rate [4,5]^{4,5}. Many types of occlusal splints have been described by the literature with different indications and functions. Among them, the stabilizing plate (also known as Tanner's appliance, Fox's appliance, Michigan plate, neuromuscular relaxant plate) is the device with the greatest number of studies in the literature, demonstrating considerable efficacy in TMD therapeutics [7]. This plate is constructed in thermopolymerized acrylic aiming to obtain a temporary and reversible ideal occlusal, through bilateral and homogeneous occlusal contacts between opposing teeth [8].

Many theories try to explain the mechanisms of action of this plate. However, its therapeutic effects, accurate indications, and mechanism of action are not completely understood. It is believed that there exists the combination of many peripheral, central, and behavioral modifications, playing an important role in this scenario [9].

In myofascial pain, the most common TMD type [6], it is believed that the occlusal plate

acts through obtaining an occlusion considered as "ideal", together with the reestablishment of a stable physiologic mandibular posture [9], considerably reducing the electromyographic activity [10]. Considering the articular disc displacements, articular disc repositioning is not established, but the occlusal plate enables an increasing of the articular space, which makes the articulation free of overloads, and consequently promoting the remission of pain and characteristic sounds [11]. Among the degenerative disorders (osteoarthritis and osteoarthrosis), the plate acts as a "crutch", therefore avoiding the overload of the articular area previously unprotected and aiding in the pain remission and TMD staging [12]. Additionally, the stabilizing plate is also indicated in cases of tension type headaches, and protection against excessive dental weariness in individuals with parafunctional habits, as bruxism [13].

Both the cognitive alterations and placebo effect should also be considered as possible mechanisms of actions of the stabilizing plate [14], mainly when the disorder accompanied by pain, is present at least for six months, period from which the pain is considered as chronic [15]. Chronic pain coming from TMD is directly related to the patients' psychological state, with great influence on social behavior and generating a great impact on the quality of life of these individuals [16]. Such characteristics greatly account for the individual symptomatology variation of these patients facing different therapies [17,18].

Notwithstanding, it is worth emphasizing that in many DTM cases, other therapeutic approaches have been considered as most indicated and effective (associated or not with stabilizing plate), and may include guidance [19] (possible by the strict relationship between the dentist and patient), physiotherapy [20], psychotherapy, pharmacotherapy [21], or even more invasive procedures, such as occlusal adjustment and surgeries [5]. Thus, considering the doubts still existing on the real effects of the stabilizing plate and the fact that this therapy

is the most used by dentists, this present study aimed to evaluate the pain evolution of patients exhibiting different TMD types, exclusively treated with stabilizing plate for 3-month period, through the comparison of muscle and articular pain and clinical aspects, before and after treatment.

MATERIAL & METHODS

This study was submitted and approved by the Institutional Review Board under protocol no. 359.922 to meet the Resolution no. 466/12.

A retrospective study was conducted through the analyses of dental records of the last ten years (2004 – 2013) of the individuals treated in the Service of Diagnostic and Instruction for Temporomandibular Disorder Patients (Serviço ATM), School of Dentistry/UFJF. Inclusion criteria comprised: 1) the patient must be treated in the institution of the study; 2) the patient could not be submitted to any other TMD treatment; 3) the only treatment at all evaluation period must be the stabilizing plate, by adopting the following protocol for all patients: 24 h per day during the first three weeks; 16 h per day from 4th to 6th week; 12 hours per day from 7th to 9th week; and 8 h per day from 10th to 12th week. The used stabilizing plate was constructed in colorless chemically-activated acrylic resin with approximately 3 mm of thickness, covering all incisal and/or occlusal surfaces of the maxillary teeth, attempting to reestablish an “ideal” occlusal (through proper occlusal contacts with the opposing teeth and presence of incisal and canine guided occlusion). The plate adjustments were carried out at centric relationship, at every 15 days, by the same dentist.

The individual without the aforementioned characteristics were excluded from the study, comprising 107 patients. Thus, the final sample comprised 628 dental records evaluated. After sample selection, the following steps were followed:

1) TMD diagnosis

All patients were evaluated by trained professionals with experience in TMD and Orofacial Pain. TMD was classified as follow: Myofascial Pain (Group I); Disorders by Disc Displacement (Group II); Arthralgia, osteoarthritis and/or osteoarthrosis (Group III); and Multiple diagnoses (Group IV). The diagnoses were obtained after analysis of data contained in the anamnesis and physical examination of conventional lateral planar graphs with incidences at maximum intercuspation and maximum mouth opening. Because the questionnaire “*Research Diagnostic Criteria for Temporomandibular Disorders*” (RDC/TMD), considered as gold standard for TMD diagnosis, was only translated to Portuguese in October 2004, and the dental records of this present study were evaluated since the beginning of that year, it was not possible to adopt it. Notwithstanding, this study diagnosis considered the criteria recommended by the *American Academy of Orofacial Pain* for Orofacial Pain and TMD.

2) Evaluation of pain chronicity

This study considered the mean time period that the patient presented pain in the orofacial region (in months), to characterize the pain as acute or chronic; the pain was considered as chronic when the patient complained for at least six months [15].

In order to evaluate the pain evolution for each diagnosis group, different aspects were evaluated, according to TMD type:

Myofascial Pain (Group I):

1) Measurement of mouth opening

The measurement of mouth opening was evaluated passively: the patient was instructed to perform maximum mouth opening without the dentist’s aid; and actively: pressure was applied by forcing the maximum mouth opening supported by the patient. The measurement was performed vertically by considering the distance between the maxillary and mandibular incisors through millimetric ruler.

2) Muscle pain to palpation

The palpation described the mean of bilateral pain levels in temporal, masseter, and sternocleidomastoid muscles by extraoral palpation; and lateral and medial pterygoid muscles by intraoral palpation. For this purpose, 1 kg pressure [22] was applied for extraoral palpation and 0.5 kg for intraoral palpation, measured through algometer according to the guidelines established by the *American Academy of Orofacial Pain for Orofacial Pain* and TMD.

The pain evaluation of patients was performed through comparative analysis of mean pain scores, obtained before and after the use of stabilizing plate, as follows 0=no pain; 1 = mild pain; 2 = moderate pain and 3 = severe pain [23].

Disc Displacement (Group II):

1) Measurement of mouth opening

Similarly to Group I, measurement of mouth opening was evaluated passively and actively.

2) Verification of the presence of sounds

This stage was executed through the report of the patient and the evaluation of the dentist. For this analysis, the forefinger was placed onto TMJ just ahead of the tragus. The patient was instructed to open the mouth slowly at the maximum, even with pain.

Arthralgia, Osteoarthritis and/or Osteoarthrosis (Group III):

1) Articular pain to palpation

Articular evaluation was carried out through articular palpation on lateral pole and inside the ear, through digital pressure of 0.5 kg [21] measured by algometer. The following scores were used to evaluate the pain 0 = no pain; 1 = mild pain; 2 = moderate pain and 3 = severe pain [22].

2) Evaluation of crackle presence

Crackle was considered as present when a multiple sound of trituration of continuous sand aspect for a long period during movement.

The methodological criterion and the crackle perception were similar to the sound evaluation.

Multiple Diagnoses (Group IV)

1) Pain evaluation

All patients presenting more than one TMD diagnosis based on the specific methodological criteria for each group (Group I, II or III) were referred to multiple diagnosis group (Group IV). In this group, the pain evaluation was executed by the comparative analysis of the mean pain scores at before and after stabilizing plate treatment group. The pain levels varied regarding to general pain, headache, earache, and pain during mastication. It is worth emphasizing that the pain patterns were directed towards TMD symptomatology, excluding the possibility of pain of other origin. The values ranged from 0 to 10, considering 0 as no pain and 10 as maximum pain.

Because of the longer evaluation time of this present study (10 years), it was not possible to verify through statistical tests the inter- and intra-examiner agreement scores aiming to calibration. Notwithstanding, all examiners were trained by the same professional and used the algometer (always properly calibrated).

RESULTS

Of the 628 dental records evaluated, 298 individuals (47.45 %) showed muscle disorders (Group I), 97 (15.44 %) articular alterations with disc displacement (Group II), 212 (33.75 %) arthralgia, arthritis and/or arthrosis (Group III), and 21 (3.34 %) multiple diagnoses (Group IV).

The presence of chronic pain was found in 269 patients (90.26 %) of Group I, 85 (87.62 %) of Group II, 192 (90.56 %) of Group 3 and 20 (95.23 %) of Group IV. The mean time of pain presence, found in each group was respectively: 50.49 ± 12 months (Group I), 47.2 ± 8.3 months (Group II), 55.49 ± 11.21 months (Group III) and 61.43 ± 10.1 months (Group IV).

Myofascial pain (Group I)

In Group I (myofascial pain), after 3 months of stabilizing plate use, the initial mean of passive opening altered from 32.6 ± 2.1 mm to 44.3 ± 3.2 mm. The measurement of active opening allowed observing a variation in the initial amplitude from 39.7 ± 2.7 mm to a final value of 47.2 ± 3.9 mm. The measurement of the passive opening showed a mean increasing of 35.8 % in mouth opening; the active opening increased 18.9 % (Graph 1).

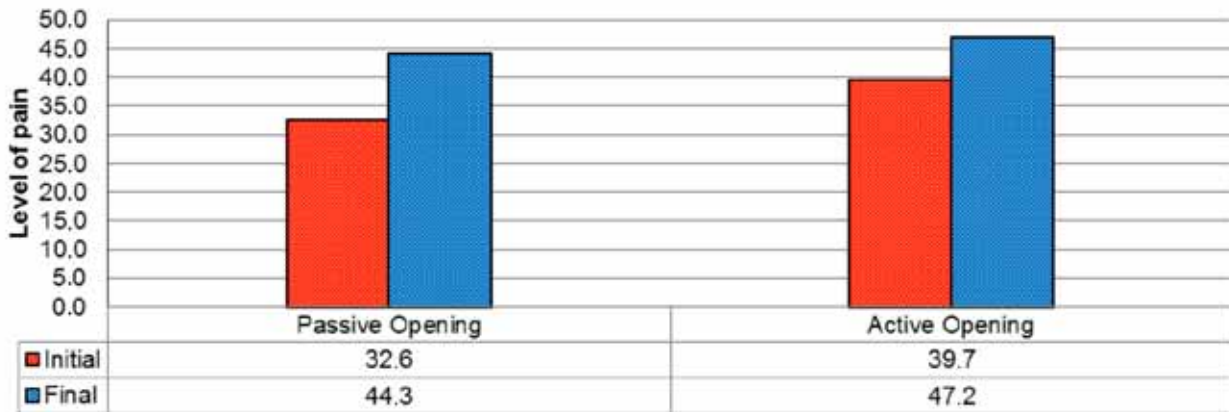
Also in Group I, we observed the reduction of 56.25 % ($1.12 - 0.49$) in the pain level of

masseter muscle, 54.74 % ($0.95 - 0.43$) of pain reduction in temporal muscle, 50 % ($1.26 - 0.63$) in medial pterygoid muscle, 49.32 % ($1.46 - 0.74$) in lateral pterygoid muscle, and 46.4 % ($0.97 - 0.52$) in sternocleidomastoid muscle (Graph 2).

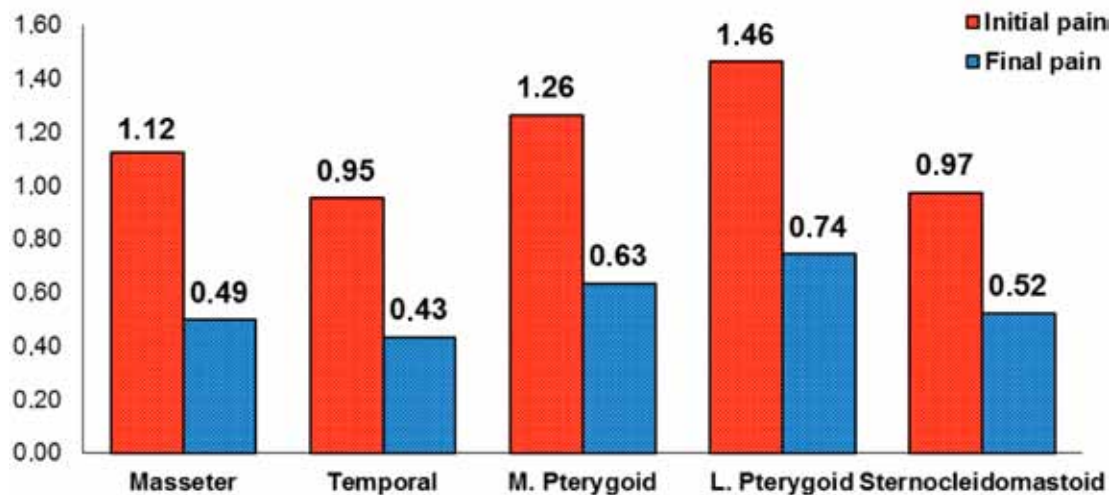
Disc Displacement (Group II)

In Group II, the difference between initial and final passive opening increased 2.10 % ($42.8 \pm 3.1 - 43.7 \pm 2.7$). Considering the active opening, the difference was 0.69 % ($43.1 \pm 3.5 - 43.4 \pm 1.9$) (Graph 3).

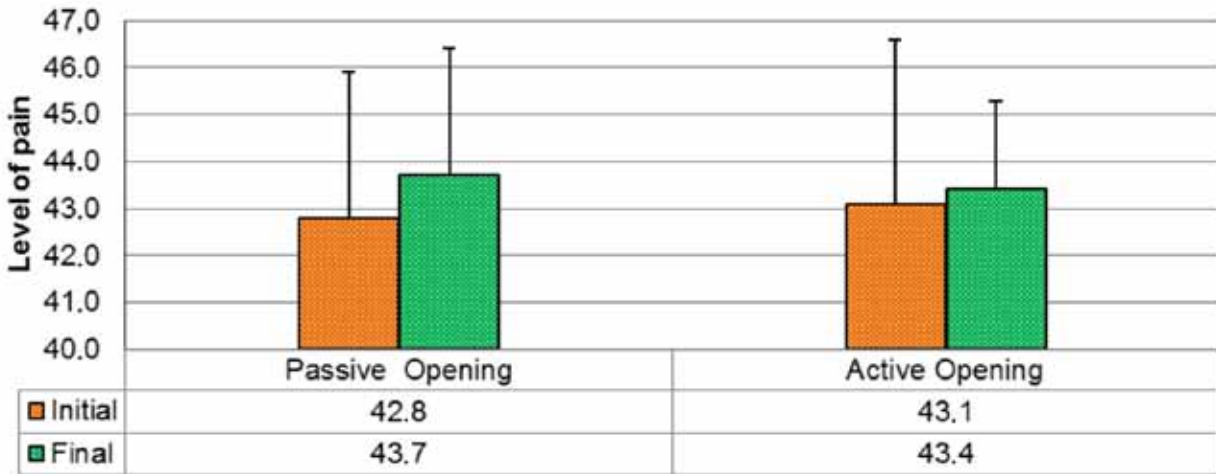
Graph 1 - Mean (in mm) of passive and active mouth opening at initial and final moments (Group I)



Graph 2 - Level of muscle pain - Individuals with myofascial pain (Group I)



Graph 3 - Mean (in mm) of passive and active mouth opening at initial and final moments (Group II)

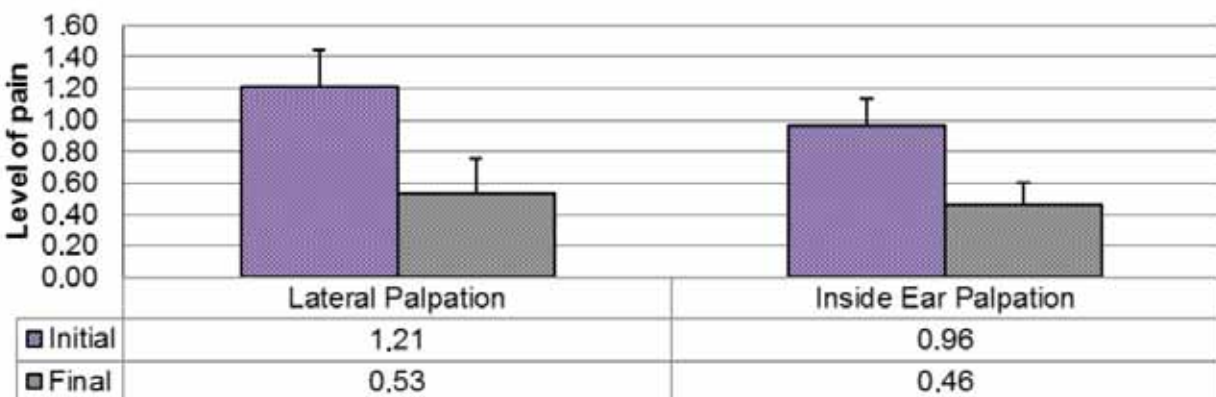


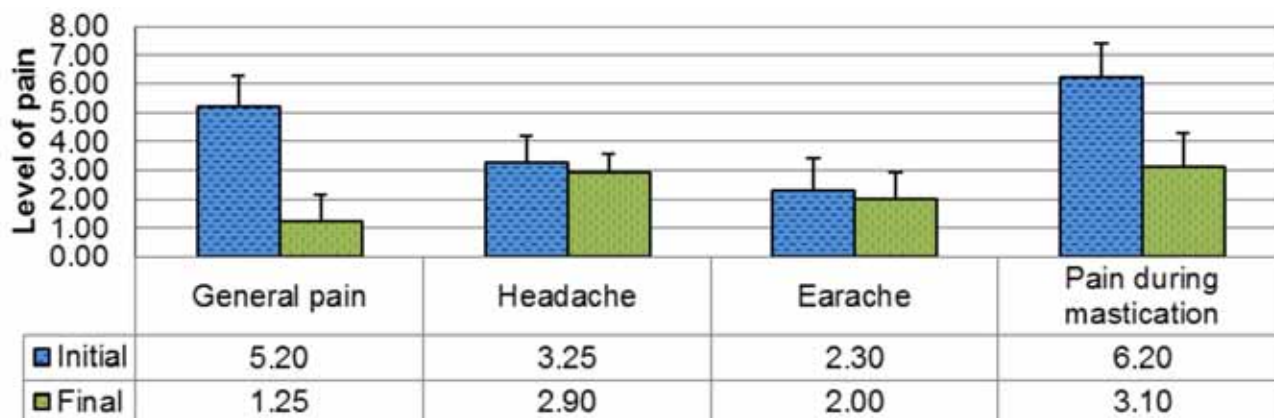
With regards to the sound presence, it was observed that prior to stabilizing plate therapy, 85 (87.62 %) of the individuals of group II (disorders because disc displacement) showed sounds. After three months using the device, sound presence was perceived by 72 (78.26 %) individuals of the group.

Arthralgia, osteoarthritis and/or osteoarthrosis (Group III)

In group III, the level of pain to lateral palpation reduced from an initial value of 1.21 ± 0.23 to 0.53 ± 0.22 . By comparing the ear scores, the initial mean was 0.96 ± 0.17 , and the final was 0.46 ± 0.14 (Graph 4).

Graph 4 - Evolution of pain levels to lateral palpation and inside the ear palpation of TMJs (Group III)



Graph 5 - Evaluation of the level of mean general pain in the group of individual presenting multiple diagnoses (Group IV)

When severe crackle presence was evaluated in group IV, it was observed that this was present in 110 individuals at the beginning of treatment and in 85 individuals after three months of stabilizing plate use.

Multiple diagnoses (Group IV)

By using the plate, it was possible to observe a decreasing of 75.97 % ($5.20 \pm 1.10 - 1.25 \pm 0.91$) in the level of general pain reported by the patient, 10.8 % ($3.25 \pm 0.96 - 2.90 \pm 0.67$) in the level of headache, 13.05 % ($2.30 \pm 1.12 - 2 \pm 0.93$) in the level of earache and 50 % ($6.20 \pm 1.18 - 3.10 \pm 1.19$) of improvement in the level of pain during mastication (Graph 5).

DISCUSSION

Pain is the main symptom of TMD patients and frequently is accompanied of behavioral factors that may contribute to its establishment and maintenance [24,25]. When the pain is chronic, there is the superposition of physical symptoms between the disorder and other comorbidities, leading to pain in many muscles and joints, cognitive problems, and change in sleep pattern and quality [16]. In this present study, in all evaluated groups, it was possible to observe the high prevalence of chronic pains, with values above 85% among groups. Moreover, with pain chronicity the possible development of central sensitization should be considered [15]. This process, more prevalent in patients

presenting more than one TMD type [23], involves the central nervous system, resulting in the persistent stimulation of nociceptors, spontaneous pain, reduction of pain threshold, and hyperalgesia [28]. Corroborating such affirmation, in the group of patients exhibiting more than one disorder type (Group IV), patients reported pain presence for a time period longer than those of other groups (mean of 61.43 ± 10.1 months).

In the group of patients showing muscle disorders (Group I), there was muscle pain remission ranging according to the muscle analyzed with greater differences respectively in the muscles: masseter, temporal, medial pterygoid, lateral pterygoid, and sternocleidomastoid. The myalgia developed by TMD patients could be explained by a decrease in muscle's blood vascularization caused by the mechanic compression of the vessels and also because of accumulation of metabolites [29,30]. The stabilizing plate use is considered as a conservative and reversible therapy in these patients, reducing and/or eliminating the pain [31]. Its mechanism of action reestablishes the bilateral muscle balance [32], promoting the reduction of the electromyographic activity mainly of anterior temporal and masseter muscles [33], similar to which was observed in this present study.

On the other hand, the presence of muscle pain can play a determinant role in reducing

the mouth opening amplitude [34] and the closure velocity of the mandibular movements during the speech in this group [35], because an involuntary muscle contraction occurs in an attempt to avoid pain worsening or developing during movements. It is observed that with the remission of muscle pain levels, the individuals felt encouraged to execute wider mandibular movements, resulting in the increasing of mouth opening amplitude.

Unlikely, in Group II (disc displacements), it was observed an insignificant increasing of mouth amplitude, together with the reduced number of improvements in TMJ sounds. It is known, however, that in disc displacement cases, disc repositioning is not achieved by stabilizing plate approach; but this treatment has shown the reduction of articular overload, reestablishing the function and reducing the pain in this patients [36,37]. Thus, even without sound elimination, some individuals can tolerate more the presence of sounds [38]. Still, one should also consider this study limitation of not having magnetic resonance images of these individuals. As in some individuals the TMJ sounds disappeared, the situation of disc displacement with reduction may have evolved to disc displacement without reduction.

In group III (arthralgia, osteoarthritis and osteoarthrosis), by decreasing the articular overload it was possible to observe the remission of articular pain to palpation (lateral and inside the ear). Although the precise stabilizing plate mechanism of action is still unknown mainly in this group, it is known that the use of the devices seems to be beneficial to the patient by promoting an improvement mainly in the initial moments of the installation [39]. The presence of crackles (accompanied or not by pain) suggests the presence of degenerative processes [33]. Many therapeutic approaches are indicated in this group in addition to the use of occlusal splints, such as: joint injections [40], physiotherapeutic and educational measures [41], pharmacologic therapies [20], and more recently the use of chondroprotective

agents [42]. However, in most part of the cases, these therapeutic approaches only act by stabilizing the disorder, through the reduction of the articular inflammatory and pain process [41]. Thus, there is high prevalence of crackle maintenance, similar to which was found in this present study.

In group IV, composed by individuals having more than one TMD type, we evaluated the levels of general pain. Generally, it should be considered that stabilizing plate therapy showed significant remission of pain symptomatology at different patterns of TMDs. Thus, despite of the levels of pain remission, in none type, the mean pain level was reduced to zero, although eventually some individuals showed the total reduction of symptomatology. Therefore, it is worth emphasizing the pain chronicity in these patients, motive by which they required an interdisciplinary management to optimize the dental treatment, because of the physical and psychological nature of the pathology [16,17,43,44]. Additionally, many of the treated patients required a second phase of either dental or multidisciplinary interventions (oral rehabilitations, physiotherapy, speech and language therapy, etc.). The stabilizing plate may be an excellent therapeutic approach since a precise diagnosis is performed, by evaluating the individual necessities and indications [12].

It is worth highlighting that although this study included patients who initially wore only the occlusal splint as initial therapy, the indication of complementary treatments was not neglected. Notwithstanding, because the treatment was provided by a public institution, the execution of other therapies is many times difficult and/or delayed.

CONCLUSION

The stabilizing plate was effective in the different types of temporomandibular disorders evaluated. Therefore, despite of the remission of pain levels, in none type, the mean pain level was reduced to zero, although eventually some individuals showed the total reduction of

the symptomatology. Thus, it is suggested the importance of multidisciplinary therapies in these patients, associated or not with the use of the stabilizing plate, indicated after executing complete examinations, attempting that all etiological factors are included in the treatment.

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Date submitted: 2014 Jun 13

Accept submission: 2014 Sep 18