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THE EFFECTIVENESS OF THE USE OF OCCLUSAL PLAQUES IN THE TREATMENT OF TEMPOROMANDIBULAR DISORDER: A REVIEW

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ABSTRACT

Temporomandibular disorder (TMD) is a pathology of the temporomandibular joint and / or of the muscles responsible for chewing. Its etiology is multifactorial, being the occlusal splint therapy a favorable application in the treatment of TMD. The stabilizing oclusal appliance, also called conventional or michigan miorrelaxing oclusal splint is the most used one, a removable device, usually made out of acrylic, which covers the surfaces of the teeth of an arch, creating a homogenous contact with the teeth of the opposite arch. This treatment causes smaller risk of irreversible occlusal changes to the patient, such as an anterior open bite, dental extrusions and pathological migrations. The objective of this paper is to present a literary review on the effectiveness of occlusal splints in the improvement of painful symptoms resulting from TMDs, notwithstanding the fact that auxiliary therapies are needed/necessary, such as medication and herbal therapies, as well as regular monitoring by dentists.

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INTRODUCTION

The term temporomandibular dysfunction (TMD) has been defined as a collective term that encompasses some clinical problems related to masticatory musculature, temporomandibular joint (TMJ) or both. TMDs are characterized as a complex picture involving masticatory muscles, TMJ and associated structures; and may present: facial pain, joint pain and noise, head and neck pain, hypertrophy of the masticatory muscles and limitation of mandibular movements. In addition, they can be divided into two major subgroups, depending on their muscular or articular origin (Bertolz *et al*., 2002; RAMOS, 2002, Yavelow *et al*., 1973). According to Okeson (2000), the most common complaint of patients with functional disorders of the masticatory apparatus is muscle pain, associated with functional activities and that is aggravated by manual palpation or functional manipulation of muscles. The etiology of TMDs has been discussed in the literature with several factors involved such as: occlusal disharmonies, psychological factors (anxiety, stress and depression), traumatic, inappropriate postural activities, parafunctional habits such as bruxism of sleep and bruxism in wakefulness and more recently, sleep disorders and nutritional. There is a consensus in the current literature that this etiology would be multifactorial, with contributing etiological factors that could be predisposing, initiating or perpetuating TMDs. The diagnosis of TMDs includes the patient's history, clinical examination and complementary tests, and most of the information for a correct diagnosis is obtained in the patient's anamnesis. There are currently several treatment modalities for TMDs, which may be patient education and self-care, behavior modification (including relaxation techniques), medications; physical therapy, stabilizing occlusal plates, occlusal therapy (orthodontics, oral rehabilitation) and surgery. Thus, multidisciplinary therapy would often be indicated, favoring the prognosis when several therapeutic modalities are used

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together (Portero *et al*, 2009). Studies also show that invasive and irreversible therapies were not superior to conservative and reversible therapies in the long term, so the initial treatment plan should always be started by the use of lower cost and more conservative therapies. Among the conservative and reversible modalities we have counseling, change in behavioral habits, diaphragmatic breathing, physiotherapy, medications and the use of occlusal plaques. The occlusal plaque is the most popular therapeutic modality for the control of pain in patients with TMD. Its ease of manufacturing and low operating costs, combined with success in about 70.0 % to 90.0 % of cases, when associated with other therapeutic modalities, may explain its popularity in the dental community. The stabilizing occlusal plaque, also called the conventional or Michigan MRI, is the most used because it causes a lower risk of irreversible occlusal alterations to the patient: anterior open bite, dental extrusions, pathological migrations. The objective of the present study was to conduct an exploratory bibliographic research with the objective of demonstrating the efficacy of occlusal plaque therapy in the TMD adjuvant treatment.

MATERIALS AND METHODS

Experimental and clinical studies were included (case reports, retrospective, prospective and randomized trials) with qualitative and / or quantitative analysis. Initially, the key words were determined by searching the DeCS tool (Descriptors in Health Sciences, BIREME base) and later verified and validated by MeSh system (Medical Subject Headings, the US National Library of Medicine) in order to achieve consistent search.

Mesh Terms

The words were included "Stabilizing Plates" "Temporomandibular Dysfunction", "Temporomandibular Articulation". For further specification, the "anterior maxilla" description for refinement was added during searches. The literature search was conducted through online databases: Pubmed, Periodicos.com and Google Scholar. It was stipulated deadline, and the related search covering all available literature on virtual libraries.

Series of Articles and Eligibility

A total of 60 articles were found involving temporomandibular dysfunction. Initially, it was held the exclusion existing title and duplications in accordance with the interest described this work. After this process, the summaries were evaluated and a new exclusion was held. A total of 52 articles were evaluated in full, and 38 were included and discussed in this study.

LITERATURE REVIEW

Temporomandibular Disorder

The TMJ (temporomandibular junction) is the joint formed by the temporal bone of the skull with mandible, constituted by the articular disc, retrodiscal tissue (bilaminar zone), synovial membrane, articular cartilage, articular capsule and articular surface, which is formed by the condyle of the mandible and the fossa of the temporal bone. Any problem that interferes with the functioning of this complex system of muscles, ligaments, disks and bones can result in a TMD. ATM can be affected by infectious and inflammatory, vitamin or hormonal deficiencies and changes in shape caused by trauma or parafunction. In addition to TMJ, chewing teeth and muscles may also be involved by common pathological manifestations that together constitute the symptoms of temporomandibular disorders (TMD). Temporomandibular Disorders (TMDs) are defined as functional disorders of the masticatory system (in the functional relations of the teeth), including the signs and symptoms, involving the masticatory muscles and their supporting structures and the temporomandibular joint itself. (Conti, 1996; OKENSON, 1998; PEGORARO, 1998). The etiology of TMD is multifactorial, being associated with muscular hyperactivity, trauma, emotional stress, malocclusion, and innumerable other predisposing, precipitating or perpetuating factors of this condition. Several factors can cause a TMD. There is no cause common to all TMDs, but trauma can be the main cause of this functional change. TMDs may be present in all people, but they are more common in white women, usually in the third decade of life (OKESON, 2000). Generally TMDs can be divided into muscle; when they only affect the masticatory muscles and the neck; articular, which are characterized by internal disorders of the joint and joint muscles, covering both the musculature and the joint; the displacement of the disc, caused by a borderless movement or trauma (MADEIRA, 2010). The patient with TMD is usually a chronic patient who treatment. As the symptoms are very subjective and may be linked to other medical problems (depression, otological or rheumatologic problems), the dentist is often the last health professional to be sought. (BIASOTTO-GONZALEZ, 2005). Due to the morphological and functional complexity of the ATM Some non-masticatory painful orofacial manifestations of multifactorial etiology are also observable under different aspects, such as neuromuscular, psychological and anatomical factors (RUIZ, 2004 apud MILAM, 2014). According to Neil S. Norton (Netter, 3rd ed) arthritis and ankylosis are the pathological alterations in the TMJ, affecting the bilateral bone articular structures of women and men older than 60 years. And with the increase in the elderly population the TMD has been growing considerably. MILAM *et al*. (2014) advised that a thorough examination be clinical, since the orofacial pains are often confused with other painful conditions, such as those of dental origin, of oral infections, those caused by otitis and sinusitis, muscular pains in the back, neck and muscles of chewing and nerves.

Signals and Symptons

There are many signs and symptoms that may be related to TMD. Among the most common are pain in the chewing muscles and / or the TMJ (ALVES, 2002). In the studies by Bianchini (2000) and Pereira *et al*. (2005) the main symptoms presented were TMJ pain, headache, cracking, otalgia, joint pain, facial pain, functional limitation, pain during chewing, tinnitus in the ear and pain in the mandible. The clicks on the ATMs occur due to incorrect positioning of the cartilage, which moves up the condyle abruptly, when the mouth is opened and may or may not be accompanied by pain (KOSMINSKY, 1997). The headache also comprises a symptom associated with TMD (OKESON, 1992). It is estimated that 80% of all reported headaches are associated with muscle sources. It is thus understood that head and neck muscle activities probably play an important role in the etiology of many headaches. Thus, treatment aimed at

decreasing muscle hyperactivity may have a significant effect on headache reduction. The causes of the headache can be: constant excitation of the sympathetic nervous system and the mechanism of hormonal response to stress, macrotrauma, unilateral mastication, dental tightening, bruxism, muscular alterations resulting from occlusal interference and disorders in the circulatory system of the muscle (GARCIA E SOUSA, 1998). For Santos (2010), headache is the most common symptom in patients with TMJ disorders, which is the reason for seeking help from a specialized professional. The pain comes from the TMJ, usually located in the preauricular area, also found in the retroauricular region, which may radiate to the temporal, frontal or occipital areas, and present as a headache. When there is pain, we must obtain information about its location, behavior, type, duration and intensity. The pain can be localized when the patient points to the specific area, or it may appear as a large, ill-defined area. The location may always be the same or the pain may be radiated. The behavior of pain is assessed through the patient's report of the episodes in which it occurs: whether the pain is constant or intermittent, if there are bouts or periods of pain and if there are factors that intensify or relieve the pain. The type of pain can be defined as diffuse or acute. Duration refers to both the extent of the episode (days, weeks, or months) and the permanence of pain during an episode (if it is not constant). The intensity is defined by the patient through a scale; as the degree of perception varies from person to person, there should be no single index for pain assessment (OKESON, 1992).

Meira (2002) reports that the signs and symptoms associated with TMD are: intra-articular pain, muscle spasm, intra-articular pain combined with muscle spasms, reflex pain, pain in the opening and closing of the mandible, pain radiated in the temporal, masseterian or infraorbital area; cracking, pain or ringing in the ear; radiating pain in the neck; chronic headache; feeling of ear blockage; xerostomia, among others. Patients report sounds or noises perceived by them in the articulation. The articular click is a single, dry, short-lasting sound that may occur during opening and mandibular closure. It is often related to joint disc problems. The crackle is a multiple sound and accompanies almost the entire condylar path, probably indicates disc damage and the noise is characteristic of bone contact of the condyle with the articular eminence. Cracking is common in degenerative diseases (RAMFJORD AND ASH, 1984). The vertigo has also been produced by an area of myofascial triggering in the sternocleidomastoid muscle, so that there may be some relationship between vertigo and dysfunctional muscle spasms in the chewing system (RAMFJORD AND ASH, 1984). It is common for patients with TMJ pain to also complain of pain in the heard. The ear is contained in the temporal bone and is related to the mandibular condyle, separated only by the tympanic wall. The proximity of the ear to TMJ and chewing muscles as well as its common innervation in the trigeminal joint, create a frequent condition of reflex pain (MACIEL, 1998). Otalgia without organic causes is a common symptom in patients with temporomandibular dysfunction (TMD), although the etiology is controversial. Investigations of the influence of TMD treatment due to otalgia are scarce (KEERSMAEKERS *et al*, 1996).

Diagnosis

The diagnosis of TMD is made by a specialized Dentist or trained in the area of orofacial pain and TMD, through anamnesis and specific clinical exams, which may support the diagnosis. Anamnesis should make it possible to survey the individual's previous history, as well as the possible predisposing, triggering and perpetuating factors. The complaint of mandibular function limitation is a subjective symptom pathognomon of functional alterations that, like TMD, are musculoskeletal manifestations, and palpation on the masticatory muscles and / or on TMJs trigger or exacerbate the pain symptoms described by the individual. Pain or discomfort should also be present during the mandibular movements of the mouth opening (OKESON, 1996). The most important characteristic of TMD is related to the chronicity of pain. Individuals with TMD, despite presenting a wide variety of signs and symptoms, have the main reason for seeking treatment the suffering caused by chronic pain due to TMD. The multidimensional aspect of this pain implies that a complete evaluation of TMDs should be analyzed by biopsychosocial factors (LIST and DOWORKIN, 1996).

Clinical Examination

Anamnesis

In the clinical dental examination the following items can be evaluated: · Main complaint; · Presence of systemic disease; · Maximum oral opening, being considered the normal standard of 40 to 45mm; · Snap of TMJ when opening and closing the mouth, through bilateral digital palpation; · Presence of dental wear, indicative of a possible parafunction such as teeth grinding; · Report directed to the presence of a patient's stress situation; · History of macrotrauma in the orofacial region; Anterior orthodontic treatment; · Palpation of the masticatory musculature and retrocondilar region. The evaluation of the muscular pain condition by palpation and indicated to be performed by only one evaluator during the first consultation, and the classification of the intensity of the pain can be defined through some pre-established scale during the evaluation of the patient as: 0 no pain; 1 weak pain; 2 medium pain; 3 strong pain. Evaluating these patients requires careful multidisciplary analysis. Realize in the anamnesis the possibility of TMD directs the rest of the procedure. The correct use of the patient's clinical approach with facial pain allows adequate therapeutic referral (MANFREDI *et al*, 2001).

Palpation

The muscles for a correct evaluation are: medial pterygoid, masseter, temporal (jaw lifts), mylohyoid and sternocleidomastoid, as well as the retrocondylar region with the open mouth patient. Dental trauma, dental occlusion, previous orthodontic treatment, and local and cervical trauma can also be evaluated. The presence of cysts or neoplasias may occur in the presence of cysts or neoplasms (MANFREDI *et al*., 2001).

Physical Exam Intra and extra-oral

The signals produced when the masseter muscle is the largest involved are described as .dor in the mandible. When there is greater involvement of the temporal muscle there is the complaint of headache. Signs of oculargia and retrobulbar pain indicate greater sensitivity in the lateral pterygoid muscle. Swelling pain at the angle of the mandible, as well as odynophagia, comes from the medial pterygoid (MANFREDI *et al*, 2001). The most frequent sign of extra-capsular or myogenic disorders is diffuse facial pain. Historically,

excessive muscle work was considered to cause fatigue, which then led to pain. Studies have shown that in normal (non-patient) individuals, when they voluntarily tighten their teeth or force the mandibular protrusion, they present with acute pain. In addition, Christensen (1986) reported that teeth grinding, lateral movements of the mandible involved stretching of the masseter and medial pterygoid muscles as they were contracting. Pain described as facials, jaws, pre-auricular pains, earaches, headaches, are commonly exacerbated by the function of the mandible and are known as extra-capsular disorders. Deviations in the mandibular movements, limited or asymmetrical mandibular movements may be a result of hyperactivity of the muscles responsible for the closure of the mandible, but may also be the result of intracapsular disorders. In these cases, ATM sounds such as clicks and / or creping, more commonly described as clicking, are the most frequent signals. Internal or intra-capsular disorders are all abnormal processes that occur within the TMJ limits, including not only disc displacements, but also osteoarthrosis, inflammatory arthritis, congenital deformities, and traumatic, neoplastic, and developmental abnormalities.

Differential diagnosis

Mandibular interference: Through the opening of the mouth, the jaw is observed with respect to any deviation or deflection. Temporomandibular dysfunction (TMD) is a condition in which there is a disharmony in the stomatognathic system, and involvement and impairment may occur in the masticatory muscles, in the TMJ itself, or both, being classified, respectively, as muscular, articular and musculo-articular, or mixed The etiology of TMD is considered complex and multifactorial because it involves factors of anatomic, occlusal, muscular and psychological origin. Among the main etiological factors are dental malocclusion, myofunctional alterations, deleterious habits generating muscular hyperactivity and consequent overload in the joint, stress, emotional problems, among others. In some TMD subgroups, imaging techniques are included as an aid to diagnosis, especially when clinical examination suggests joint impairment (MCNEILL, 1997). The aim of the TMJ image is to assess the integrity of the structures when disorders are suspected, to confirm the stage and progression of the disease and to evaluate the effect of the treatment (BROOKS *et al*., 1997). However, the decision to prescribe a considering their clinical findings and diagnosis, as well as their contribution to the final diagnosis and treatment plan of the patient, their advantages and disadvantages as a selected technique, their cost and the exposure of the patient to radiation (BROOKS *et al*., 1997) . Among the various imaging methods, sectional techniques play a prominent role, and the most used as complementary examinations include computed tomography (CT) and magnetic resonance imaging (MRI). CT has been reported as one of the best methods to When clinical suspicion is related to bone tissues and MRI when the focus of the investigation are the soft parts (BROOKS, *et al*., 1997; RIBEIRO, 1996). Studies have been carried out in order to verify the relationship between the clinical findings and the imaging information. Studies point to the accuracy of cross-sectional imaging studies in the diagnosis of various TMDs (WARNKE, 1996; SUENAGA, 1996), but there is little evidence of their therapeutic efficacy. A limited view on the objectives of imaging diagnosis is one that considers these methods to be the providers of the best images and the most accurate diagnoses. Under a broader analysis, the imaging diagnosis is part of a large system whose goal is to treat the patient effectively and efficiently. For the expanded understanding of efficacy, it is necessary to consider standards that go beyond the quality and accuracy of imaging tests. Joint overload: Positioning the condyles in your muscle skeletal structures and applying load to the structures with manipulative force.

Diagnosis by anesthetic block

When none of the other previous procedures did help, the anesthetic block is indicated. It aims to assist in locating the patient's real source of pain. They are extremely useful in problems of musculoskeletal pain, in neuropathic pain as well as in those of odontogenic origin, clarifying primary or secondary pain. Diagnostic injections should be performed with a short anesthetic duration of preference without constricting vessel such as epinephrine, especially when S.N.A. mediated pain is suspected. Friendly. The term diagnostic anesthesia is not limited to somatic nerve blocks. Other forms of anesthesia, including topical anesthetics, sympathetic blockages may be used for this purpose.

Treatment

Temporomandibular dysfunction is a multifactorial disease requiring, therefore an interdisciplinary treatment. There are a variety of strategies used to treat patients with TMD, which depend on the type of problem diagnosed or even the philosophy of each professional to find the most appropriate, in addition to several are the specialties of health involved in this process. The strategies range from life style counseling, psychotherapy, cognitive behavioral therapy, jaw restraint, muscle maneuvers, ultrasound, TENS, myorelaxative plaques, drug therapies, to temporomandibular joint (TMJ) surgery in extreme cases (BRANDÃO FILHO, *et al*. al, 2012). Of all currently used treatment methods for TMDs these can be characterized within two types: definitive treatment and supportive therapy. Definitive treatment refers to those methods aimed at controlling or eliminating the etiological factors that gave rise to the disorder. Support therapy refers to targeted treatment methods to alter the symptoms of patients (OKESON, 2000).

DISCUSSION

The use of the rigid occlusal plaque promotes a change in the occlusal position to a more stable position, this usually eliminates or reduces abnormal muscle activity and thus, the symptomatology is reduced. As seen, there are many works using occlusal plaques in the treatment of TMD signs and symptoms. Occlusal plaques have had a prominent place in the treatment of TMDs because it is a low-cost treatment and a high success rate. The literature presents several clinical studies in which the efficacy of TMD treatment with occlusal plaques. After the installation of inter-occlusal devices, there was a reduction in the signs and symptoms of TMDs (OKESON *et al*, 1983; CARRARO & CAFFESSE, 1978; QASIN, 2006). Regarding the types of plaques, soft or resilient plaques present the following advantages: easy to make, easily accepted by patients and are useful in dissipating tensions during parafunctional activity (WHIGH *et al*, 1995). However, they are significantly less effective in the reduction of electromyography activity, even causing a greater activity of the jaw lift muscles, whereas the use of the stabilizing plate

promoted a reduction in pain and muscle sensitivity (OKESON, 1987; AL-QURAN & LYONS , 1999). In addition to a significant increase in mandibular excursion, increased free functional space (OLIVEIRA, 1993). The rigid occlusal plate benefits the patient allowing the limitation of the function and reducing the likelihood of fatiguing burdens as it raises the patient's level of consciousness. In order for the patient to benefit from this mechanism, the plaque should also be used during the day. According to Ramjord and Ash (1984) the use of a well conceived is an effective therapy for most structural disorders of the chewing system. Various types of occlusal plaques are available with rigid or resilient materials and there are still many controversies related to this, but according to Okeson (2000), although resilient plaques can reduce the symptoms of TMDs, the hard acrylic ones reduce the symptoms faster and better, leaving the plates resilient properties indicated primarily as protection against tooth trauma and support structures. Still with respect to resilient materials, these should be avoided for the manufacture of occlusal plaques, although they are suggested in the literature (WRIGHT, 1998), are susceptible to chewing and can further stimulate the parafunctional habit. In addition, plates in resilient material are less durable and difficult to adjust. According to Okeson (2000), although resilient plaques can reduce the symptoms of TMDs, those of hard acrylic reduce the symptoms more quickly and better, leaving the resilient plates indicated mainly as protection against trauma to the teeth and supporting structures, and in cases of chronic sinusitis, when the patient reports great dental sensitivity resulting from physiological occlusal forces. The stabilizing occlusal plaque, also called plaque conventional or Michigan myorelaxation is the most used because it causes less risk of irreversible occlusal alterations to the patient: as anterior opening bite, dental extrusions pathological migrations. The plate benefits the patient allowing the function limitation and reducing the probability of fatiguing loads, because it raises the level of consciousness of the patient. For the patient to benefit from this mechanism, the plaque should also be used during the day (Portero *et al*, 2009).

According to Ramjord and Ash (1984) the use of a well and the additional therapy, if indicated, is the effective therapy for most of the structural disorders of the chewing system. Although occlusal plaques have shown great success number of TMD treatment studies, it is important to emphasize that they should not be used as the only modality of treatment, but rather as part of this or even as an adjunct to other therapies, such as medication, physical therapy, or psychological associations. It is necessary to discover the etiology of TMD for long-term success in treatment. Another important aspect to be observed is the importance of the patient in the treatment, being necessary their awareness about the need for correct use of the plates, as well as their perception of incorrect posture habits, tightening or bruxism during the waking state, as well as seeking to have healthier lifestyles and even awareness of the relationship between stress situations and TMDs. There is no occlusal plaque that is useful for treating all TMDs. There are TMDs that do not respond to plaque therapy, and other treatment modalities are necessary. Any therapy should only be instituted after a correct diagnosis and reversible procedures should be performed first. Although there are many studies on the use of occlusal plaques, its mechanism of action is not fully understood. There are many controversies about the efficiency of occlusal plaques in relation to other forms of therapy for TMDs, mainly due to incorrect initial diagnosis, leading to inadequate use of the plaque.

Conclusion

The occlusal plates are used as a reversible therapy, with the purpose of temporarily promoting an orthopedically more stable joint position and providing a more adequate muscular function. They can be used as protection for teeth and support structures against abnormal forces or of great intensity and duration. They have been shown to be successful in the treatment of TMD signs and symptoms, but should not be used as the sole treatment modality. They are palliative devices, that is, they treat symptoms and not the causes of TMD, because they are of multifactorial etiology.

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