RETROSPECTIVE LITERATURE ON THE IMPLICATIONS OF BRUXISM FROM AN ORTHODONTIC PERSPECTIVE

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ABSTRACT

This study is a literature review in order to obtain a synthetic and topical perspective on the implications of bruxism from an orthodontic point of view.

In order to conduct this study, 52 articles and books were studied and included in the bibliographic references. Bruxism is a current oral health problem, with influences on the proper functioning of the whole body, requiring an early diagnosis and a complex, multidisciplinary management: psychological, pharmacological, physical and surgical.

In this context, the orthodontist must be aware of the multiple aspects of this problem, including the possible psychological implications of orthodontic appliances or the treatment results, as obtaining an ideal occlusion does not prevent or treat bruxism.

Keywords: bruxism, multidisciplinary management, orthodontic treatment, pathological implications
INTRODUCTION

Bruxism is a common problem in dental practice nowadays, regardless of the age group in which patients are placed [1,2].

Although, the manifestations of bruxism at healthy subjects can have a number of benefits (emotional discharge, an increase in bone density), but most often are risk factors for other conditions (severe pain in the masticatory muscles, advanced dental wear, prosthetic complications) [3,4].

Over the time, the scientific community has shown interest in this topic, developing a number of definitions and searching for the etiological factors of this parafunction, as well as for the possibilities of management and minimisation of negative effects [5-8].

Bruxism is defined as “a diurnal or nocturnal parafunctional activity, that includes grinding, gnashing or clenching of teeth” by The American Academy of Orofacial Pain [4].

The American Sleep Association defines it as “gnashing or clenching of teeth during sleep, accompanied by one of the following: dental wear, sounds and discomfort of the masticatory muscles in the absence of medical damage” [1].

In terms of etymology, “bruxomania” comes from the French word “la bruxomanie”, proposed by Marie and Pletkiewicz in 1907 [1,9].

Miller proposes a differentiation between terms, the night gnashing of teeth being called “bruxism”, while for the clenching produced during the day he prefers the term “bruxomania” [1].

Currently, the term “bruxism” includes both, diurnal (most commonly centric bruxism: teeth clenching by forcing the closure in a position of maximum intercuspation or in another position of necessity occlusion) and nocturnal manifestations (most commonly teeth gnashing) [1,10].

PURPOSE OF THE STUDY

The aim of this study is to obtain a synthetic and topical analysis on the implications of bruxism from an orthodontic perspective.

The objectives of this literature review are the evaluation of bruxism as a possible result of the disorders identified at the occlusal level and how parafunctions can influence the orthodontic treatment. It is also desired to synthesize information on the possibilities of managing bruxism, mainly by involving the orthodontist in this complex process.

MATERIAL AND METHOD

This study represents a retrospective of the specialty literature, being reviewed a number of 52 articles and books, these being included in the bibliographical references. The electronic databases were browsed, including PubMed, Cochrane and Google Scholar, using keywords regarding possible connections between bruxism and orthodontic treatment. After reviewing the
abstracts, the full text was accessed for the relevant articles. If references to other relevant papers were identified in those articles, but were not found after the keywords search, those articles were also accessed.

RESULTS

The etiology of bruxism is not fully known, most likely involving many factors in the mechanism of production. Risk factors are complex. Initially the peripheral factors are incriminated, especially morphological.

An important role is attributed to occlusion, mainly premature occlusal contacts or occlusal interferences, but also to the transition between occlusion in retruded position, in centric relation and in maximum intercuspation. However, nocturnal bruxism was found in similar proportions at subjects with or without occlusal interferences. Other peripheral factors involved in the appearance of bruxism were considered food consistency or acid reflux.

The most recent hypotheses bring into question the central control, the role of chemical mediators, such as the relationship with the sleeping stages [11-18].

Depressive state can be linked to nocturnal bruxism, but these connections are not fully understood, therefore a casual relationship cannot be established. However, the diagnosis of temporomandibular disorders in orthodontic practice could be helpful to identify the patients with depression and it may be possible to refer them to specialist care before starting the orthodontic treatment [19,20].

Also, behavioral disorders, such as attention deficit or autism, have been associated with bruxism-type parafunctional disorders [8,20-23].

Family factors contribute to the appearance of bruxism, which may be an association between the genetic component and the habits that characterise the family environment [24,25].

Due to the complex etiology, the ideal occlusal conditions do not ensure the certainty of eliminating the manifestations of bruxism [14,22,26,27].

Bruxism causes symptoms that can be grouped into categories, depending on the organs or systems affected by the negative effects of this parafunction [28].

Regarding the dento-maxillary apparatus, there can be hot, cold or sweet dental hypersensitivity, attrition, changes in the vertical size of the occlusion, dental fractures, negative consequences for the periodontium, with gingival retractions, that can lead to the loss of the teeth. Fixed and mobilizable prostheses are also affected, especially ceramic ones, while appearing lesions of the oral soft parts by biting the jugal mucosa and the tongue [1,12,28].

Symptoms may also be observed in other apparatus and systems. In the ENT field, the patient accuses tinnitus, ear pain with possible hearing loss, ear infections or apnea.
From a neurological point of view, bruxism determines the appearance of constant headache, temporary pain, insomnia with the consequent presence of anxiety, depression, vertigo and stress. Patients with bruxism show hypersensitivity to light, orbital or periorbital pain and accommodative dysfunction [12].

At the same time, this parafunction presents an important damage to the muscular system: pain of the mandible lifting muscles, facial pain, muscle tension, myofascial pain, clicks in the temporomandibular joint, trismus and tingling in the arm, forearm and hand [12,29].

In addition, patients frequently experience difficulties when chewing and physiognomy changes [12].

Studying the symptoms in different grades of bruxism, Amorim et al. obtained results showing that subjects with severe bruxism have muscle pain, sleep quality and oral health changes, anxiety and dysphonia in a higher frequency compared to subjects with moderate bruxism. The study was performed on a group of 72 subjects, aged 18-60 years. Following questionnaires, patients were classified in subjects with moderate and severe bruxism. Both samples showed similarities in terms of pain and stress threshold. Higher pain intensities were observed at subjects with severe bruxism. At the time of evaluation, the pain severity of the masseter, temporalis, superior trapezius and sternocleidomastoid muscles was quantified using the Visual Analogue Scale (VAS), structured as a 10 cm horizontal line. In the present study, participants were instructed to mark the pain intensity [16].

Last month’s sleep quality was analysed using the Pittsburgh Sleep Quality Index (PSQI). The oral health evaluation was also performed using the Oral Health Impact Profile-14 (OHIP-14). Both evaluations, sleep quality and oral health, are based on a well-structured and validated questionnaire [16-30].

In that study, people with severe headaches, teeth clenching and toothache were highlighted. Studies have shown that 65% of the subjects with bruxism have tension-type headaches, probably due to the muscular hyperactivity of the masticatory muscles. The study concluded that people with severe bruxism have more symptoms. They show higher muscle pain, sleep quality and oral health changes, anxiety and depression in a greater extent compared to the subjects with moderate bruxism [16].

In clinical activity, there are several ways of diagnosis. Thus, the questionnaires can be used for research and evaluation in clinical activity. Although large groups of subjects can be questioned, the disadvantage of this method is the subjectivism of the obtained information.

The diagnosis of bruxism is based on the anamnesis (teeth gnashing sounds during night, jaw tiredness or pain every morning) and clinical signs such as: tooth mobility, dental abrasion,
masseter hypertrophy, dental hypersensitivity to air or cold fluids, clicks or blockages in the temporomandibular joints, lesions of the oral soft parts by biting the jugal mucosa and the tongue [1,32,33].

To investigate the prevalence and the severity of dental abrasion, the Individual Dental Abrasion Index can be used, which considers the damage extension in the incisal or occlusal direction. This analysis contains two stages. In the first stage, the abrasion extension at each tooth is evaluated using a 4-value scale [1,34]. The second step is to calculate the Individual Dental Abrasion Index using the abrasion scores obtained for each tooth.

The evaluation of bruxism can also be done using intraoral appliances, by observing the abrasion aspects (occlusal splints, Bruxcore plate) and by measuring the forces exerted on them [1,35-37].

Following the study that used the intraoral appliances, it was reported that the nocturnal parafunctional dental activity led to wear on the fully arched occlusal stabilisation plates which was asymmetrical and uneven. The Bruxcore Bruxism Monitoring Device (BBMD) is an introral device which measures the bruxism activity during sleep and the Bruxcore plate evaluates the bruxism activity by counting the abrasion surfaces and measuring the volumetric size of the abrasion [36,37].

The force is detected using a thin piezoelectric film, which is sensitive to deformation and embedded 1-2 mm below the occlusal surface of the intraoral appliance [38].

Another method of bruxism evaluation is the electromyographic recordings of the masticatory muscles, which have the advantage of quantifying parafunctional muscle activity without intraoral appliances, which can alter the normal activity. The study concluded that a stand-alone EMG detector-analyser is a potentially useful device for detecting sleep bruxism [1].

The electroencephalogram, the electromyogram, the electrocardiogram and thermally sensitive resistance signals (airflow monitoring) together with simultaneous audio-video recordings are other methods used in the evaluation of bruxism. The evaluation of the activity of bruxism during sleep was determined using the EMG activity of the masticatory muscles (masseter, temporalis). Studies have concluded that polysomnographic recordings allow multidimensional analyses of sleep-related physiological behaviors and EMG-based evaluations. These are reported to be highly reliable. One reported drawback was that changing the sleep environment may influence the actual behavior of bruxism [1].

The treatment of bruxism is complex: psychological, pharmacological, physical, but also surgical [39].

Stress reduction is achieved through deep breathing exercises, relaxation, psychotherapy, but also by treating the
biofeedback of the underlying dental diseases. During a biofeedback session, a therapist applies electrical sensors to different parts of the body. These sensors monitor the body’s physiological reactions to stress, such as teeth grinding and then provide back the information through auditory and visual cues. These sounds may take the form of an audible signal or a flashing light. With this feedback, patients begin to associate teeth grinding with stress and learn to change their behavior [40].

Psychotherapy offers a psychological evaluation and an appropriate treatment [8,39].

Hypnosis is a beneficial adjunct in the treatment of bruxism (Gastone L., 1983). There are several interesting cases of hypnosis in the treatment of bruxism. However, there is a lack of scientific research on this topic.

Acupuncture/acupressure can also be used for relaxation in the treatment of bruxism [8,39].

From a pharmacological point of view, benzodiazepines (Clonazepam, Diazepam) and Trazodone can be used in the treatment of bruxism (a recommended and effective drug treatment for insomnia). Clonazepam significantly improved the treatment of bruxism. Clonidine decreased the sympathetic nervous system tone in the minute before the onset of nocturnal bruxism. Carbamazepine inhibits the central nervous system and is used occasionally in severe cases of bruxism. Calcium can also be useful in the treatment of bruxism and is often used to treat involuntary muscle movements [23,41,42].

Physical and surgical treatment of bruxism can also be done using occlusal and protective appliances and splints. The role of these appliances is to protect the teeth, but without correcting bruxism. Thus, the purpose of the appliances and splints is to stop bruxism by eliminating occlusal interference and by preventing teeth abrasion, avoiding occlusal loading [43,44]. Acrylic plate can also be used in the long-term treatment of bruxism.

Ellison and Stanziani (1993) state that “no satisfactory treatment for bruxism has been found”. The restoration of the vertical occlusion dimension affected by bruxism can be done with prosthetic crowns [15,45,46].

Following a study evaluating the short-term efficacy of individualised transparent splints, Bargellini et al. found that they reduce tonic muscle contractions, which reduces the occlusal load, but does not influence the isometric contractions significantly (in case of teeth clenching). Regarding the number of nocturnal bruxism episodes, a significant reduction was observed in the first month of treatment, but after the next 3 months no significant differences were observed [47].

Other orthodontic appliances commonly used in the treatment of bruxism are the functional ones, such as Andresen activator or Twin Block. In 2017, the results of a study conducted by Kapusevska et al. on life quality of
patients treated with such orthodontic appliances were published. The study was performed on children with bruxism, aged 7-12 years. Better results were observed in terms of life quality and functionality within the group of subjects treated with the Andresen activator. As such, it is a variant for the treatment of bruxism at children, producing a minimal decrease in life quality [48].

Another relationship between bruxism and orthodontic treatment is presented in a study conducted by Prado et al. in Brazil and published in 2016. In this study it was observed that in 75% of the cases bruxism stopped after starting the orthodontic treatment [49].

Another research also carried out by Prado et al. shows that the probability of developing nocturnal bruxism increases 2.7 times in the case of adolescents wearing fixed orthodontic appliances, while only a reduction in the manifestations of bruxism is observed in the case of interceptive treatment [50]. Considering the aspects presented in this study, it can be stated that it is necessary for the orthodontist to identify children with emotional problems and to pay more attention in the implementation of the treatment, as it can interfere with life quality.

A study conducted by Khoury in 2016 reveals that nocturnal bruxism is present at 8.6% of the population, its prevalence decreasing with age, similar for both genders. In 47.6% of the cases, patients have sleeping difficulties and a third of those with nocturnal bruxism claim to have pain [24].

The management of bruxism involves multidisciplinary efforts, based on the identification of causes and the application of targeted and varied therapy, taking into account as many aspects as possible for each subject. Management options include occlusal adjustments (coronoplasty), orthodontic interventions performed with occlusal splints, inclined planes, orthopedic interocclusal appliances (especially to prevent tooth wear and to reduce nocturnal teeth clenching) or balancing therapy (the correction of malocclusions, restorative treatment and pulp therapy followed by the use of crowns in the cases with severe attrition, psychotherapy when stress and depression are associated, physiotherapy when muscle pain and stiffness are associated, medication - anti-anxiety agents, sedatives, tranquilizers, muscle relaxants, biofeedback to lower muscle tension, electrical methods - electrogalvanic stimulation and behavioral changes [2,17,21,51,52].

Regarding orthodontic therapy, splints fabricated from materials of variable hardness in the office or laboratory, usually covering the mandibular or maxillary teeth or inclined planes that cover all dental surfaces can be used to prevent constant attrition. Bargellini et al. conclude that individualised transparent splints reduce tonic-type muscle contractions leading to a reduction in the occlusal load, but do not
influence the isometric contractions significantly, which characterise teeth gnashing [2].

Another aspect worth considering as an orthodontist is the association between the patients’ emotional frustration grade and the application of orthodontic appliances, which can lead to bruxism after treatment or an improvement is not observed in the cases of those who already had such manifestations. This perspective studied by Prado et al. demonstrates once again the complex nature of the connections between physical and mental manifestations and the need for collaboration between disciplines in order to manage bruxism [49].

CONCLUSIONS

Bruxism is a current problem, with various implications in orthodontic practice. Early diagnosis of bruxism can prevent further damage to the structures of the dento-maxillary apparatus and to health, in general. Transparent occlusal splints can reduce the occlusal load by diminishing teeth clenching, but do not produce noticeable effects when teeth grind. The Andresen activator is a better way to treat bruxism at children with mixed dentition.

BIBLIOGRAPHY

Dent Assoc 2015;81:f2
43. Graber TM, Rakosi T, Petrovic AG 1985 Dentofacial orthopedics with functional appliances; page no. 496-519.
44. Contemporary Orthodontics by William R. Proffit; 4th edition; Ch-12: Treatment of Nonskeletal Problems In Preadolescent Children; Pg no.: 443-449
45. Bruxism Theory and Practice by Daniel A. Paesani. Ch. No. 1, Introduction to Bruxism, pg. no. 3, 22, 23