ISSN: 2378-3656

Ladino et al. Clin Med Rev Case Rep 2020, 7:316
DOI: 10.23937/2378-3656/1410316
Volume 7 | Issue 8
Open Access

Clinical Medical Reviews and Case Reports

REVIEW ARTICLE

Bruxism Management: A Comprehensive Review

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Introduction

According to the international consensus of experts for the diagnosis and treatment of bruxism, carried out by Lobbezoo, et al. [1], Bruxism is defined as a masticatory muscle activity that can occur while the person is asleep or awake. After several debates that emerged after the first consensus held in 2013, in which they defined bruxism as "an excessive activity of the chewing muscles, characterized by clenching or grinding the teeth and/or by the recurrent excessive effort made by the of the jaw [2]; the need to redefine bruxism was seen, emphasizing the "masticatory muscular activity" of the patient and the activity according to the moment in which it is performed: sleep bruxism (SB) or awake bruxism (AB); highlighting the need to separate the terms, since bruxism is generated in two moments and therefore different signs, symptoms and characteristics will appear. Additionally, it must be in mind that bruxism is not considered a disorder but rather a behavior because its effects do not necessarily produce damage as a disorder would.

The physiological predisposing factors of bruxism cannot be individualized, since this is the result of a combination of causes which produce a pathogenic, repetitive, and often unconscious action. Whenever bruxism is discussed in adults or children, the presence of dental contacts should be verified and established [1-3]; Additionally, establishing a specific etiology for bruxism is impossible, since there are causes and factors associated with its presence, which may or may not be etiological; However, in adult patients, possible causal factors have been reported such as: occlusal forces, emotional causes or those generated by the central nervous system [4]; psychological problems such as stress and anxiety at all ages; In addition, SB in children is associated with respiratory problems, physiological dental wear, caries, malocclusions and use of pacifiers.

About the frequency, according to the study by Rodrigues, et al. [5] the prevalence of bruxism in children ranges from 3.5% to 46%, while the study by Manfredini, et al. [6] shows that the prevalence of bruxism in adults ranges from 8% to 31.4%; without reporting differences between gender or age in the SB, and a slight predominance of the AB in women [3]. In an umbrella review, Melo, et al. [7] reported the prevalence of bruxism in adults and children according to the type of bruxism diagnosed; concluding that in adults AB occurs from 22% to 30%, and SB occurs between 10% to 13%, evidencing a decrease at older age and in children or adolescents the SB in a range from 3% to 49% [6,7].

Treatment for bruxism is suggested to be multidisciplinary, for both children and adults. Dental treatment includes some intraoral devices, which aim to protect teeth and restorations from possible wear and tear that may be generated as a result of parafunctional activity [8]; Treatment with physical therapy consists of performing exercises of the masticatory muscles and they should be performed without exerting excessive inten-

Citation: Ladino LG, Vargas M, Rodriguez J, López E (2020) Bruxism Management: A Comprehensive Review. Clin Med Rev Case Rep 7:316. doi.org/10.23937/2378-3656/1410316

Accepted: August 29, 2020: **Published:** August 31, 2020

sity, since this can generate microtrauma to the muscle fibers [9]. Likewise, other options include management with cognitive-behavioral therapies including psychoanalysis, autosuggestion, hypnosis, progressive relaxation, meditation, self-control, and sleep hygiene [10]. As alternative Biofeedback is a behavioral technique, consisting of the use of biological signals themselves to achieve a change in physiological functioning [11]. Regarding pharmacological treatment, medications such as benzodiazepines, anticonvulsants, beta-blockers, and antidepressants may be indicated; It is recommended that this type of therapy should only be performed in case other more conservative treatments have not been effective [12]. On the other hand, the application of botulinum toxin has been used for the management of bruxism, this is defined as a neurotoxin that is produced by a gram-positive bacterium called *Clostridium botulinum*. Botulinum toxin type A (BTZ-A) is a biological variable of these exotoxins that temporarily inhibits skeletal muscle at the time it restricts the production of acetylcholine and inactivates calcium channels in nerve endings [13].

Psychological therapies are recommended as initial treatment for bruxism in children, since they will not involve invasive treatments, they do not interfere with the growth and development of the maxillary structures and they do not present contraindications or sequential effects; these psychological complications can decrease anxiety and muscular hyperactivity characteristic of bruxomania episodes [14]. The purpose of this article is to generate clinical recommendations as a complement to the comprehensive treatment of patients, for decision-making about the therapies indicated in SB and AB.

Results and Discussion

41 studies were selected to generate recommendations according to the best available scientific evidence; the risk of bias was evaluated according to each study as follows: systematic reviews according to the method reported in each document, for observational studies it was evaluated using the Newcastle - Ottawa Scale tool and for randomized clinical studies the Jadad scale was used; in addition, the quality of evidence and the degree of recommendation were also evaluated according to GRADE.

Bruxism classification

Various terms have been proposed for the classification of bruxism over the years, starting from the factors that may influence its presence, and the different etiologies, for this reason, the great discrepancy in classifying it; according to its etiology they classify it into primary bruxism and secondary bruxism; according to the movement carried out by the jaw muscles, they classify it as centric and eccentric, but in most reviews, it is not specified whether the SB or AB are being investigated individually, so variability in the prevalence between the SB and AB in adults or youth, aggravating the situation the multiple methods that can be used to evaluate them [7].

In a first consensus carried out in 2013, they defined bruxism as an "excessive activity of the masticatory musculature, characterized by clenching or grinding the teeth and/or by excessive and recurrent effort made by the jaw" [2]; but the concept obtained according to the consensus in 2018, is a "masticatory muscle activity that occurs during sleep and/or wakefulness"; which is conditioned by a series of variables that interact with its presence; according to the moment in which the mandibular movement is performed, we can start from a classification: SB and AB; In addition to the moment in which the patient carries out the bruxomaniac activity, we must be sure of the evolution time of this "behavior", since it is so called, if the abnormal function time is less than a month and there are no pathological clinical consequences, therefore, it is only considered a habit or disorder, if there is dental wear; evident clinical sign of contact of the teeth in parafunction by the patient, in the same way considering the presence of bruxism as a risk or protective factor [1].

Oral pathognomonic signs to clinical diagnose of bruxism

According to the American Academy of Sleep Medicine (AASM), the evaluation of bruxism is based on reports of teeth grinding and sounds during sleep, however, it is very complex because there is no consensus to measure tooth wear due to parafunction, although not all episodes of this rhythmic activity of the chewing muscles are accompanied by the grinding or clenching of the teeth [15].

The clinical examination of the oral cavity allows identifying the characteristic signs of teeth grinding, among which are:

- Hypertrophy of the masseter and/or temporal muscles.
- Changes in facial symmetry.
- Indentation of the tongue.
- Dental wear.
- Fissured or cracked tooth syndrome.
- Gingival recession [15,16].

Tooth wear is the most reported evidence for both SB and AB, it is associated with other factors that can exacerbate injuries such as age, occlusal disharmony, consumption of carbonated drinks, consumption of medications, gastric reflux, and eating disorders. It was shown that although dental wear is a pathognomonic sign of bruxism, its presence should not be taken as an absolute evaluation criterion since other risk factors that may predispose to the presence of bruxism should be evaluated, and support us with the use of questionnaires to determine your diagnosis [17].

Restoration of severe dental wear associated with bruxism

There are two types of rehabilitation to perform prosthetic restoration of patients with severe wear caused by bruxism: 1) Minimally invasive: Which consists of carrying out all additive processes, can be performed with composite resin or dental ceramic; 2) Traditional: Which requires 360° preparation of dental tissue to restore with crowns.

In most studies, patients with bruxism are excluded as they could have an undesired effect on the study results, especially concerning chipping, delamination, or fracture of different materials. For this reason, in most manufacturers' guidelines they dismiss the use of any material for bruxers, which implies that patients with bruxism must be reliably identified, although the diagnosis of bruxism should not be taken as an absolute contraindication for the use of ceramic materials or resins, but as a factor susceptible to failure.

Direct or indirect resin restorations are part of the minimally invasive restoration which is considered an option with improvements in the physical, mechanical, and chemical properties of its materials. The survival of direct restorations is slightly lower than the indirect restorations [18]. All-Ceramic and ceramic fused to metal crowns constitute the traditional rehabilitation in which a retentive design is sought by making the wear of 360% of the remaining surface; the degree and severity of bruxism must be evaluated to decide between the two treatment options. These metal-ceramic crowns report survival of 94% at 8 years but with the risk of suffering irreparable chipping and wear, which affect the microstructure and crown surface roughness, therefore, the ceramic surface treatment plays an important role in the wear of the opposite structure, since when the enamel is opposed to the unglazed and unpolished ceramic, the dental wear will be higher [19].

Ceramic veneers are another option; lithium disilicate and zirconia are the materials of choice preferably, although in the presence of parafunction, the success rate is reduced, so it is recommended to control this with strategies pharmacological or non-pharmacological when performing these procedures with the patient's knowledge of the risks of fracture and associated failure that is almost 8 times greater in the presence of bruxism [20]; in these patients the bite forces can exceed 800N, the occlusion against which the patient faces either with natural teeth or with other restorations and the design of the restorations play an important role, since at least in cases of previous veneer restorations functional designs must be made covering the incisal edge and part of palatal/lingual surface of the tooth with 1 mm chamfer [21].

If AB as SB persists, there is a limited prognosis for fragile material restorations such as larger overlays and restorations so these two factors should be considered when planning restorations in young patients where conservative approaches with minimal intervention they could make a long-term difference in your oral health [22].

Treatment of the Abfractions

It is specifically known that the etiology of non-carious cervical lesions (NCCL) is multifactorial, patients with a history of bruxism or clinical evidence of other forms of traumatic occlusion generally present higher occlusal stresses on their teeth, and in turn producing increased flexion. In the cervical region of the teeth, as a result, greater occlusal stresses are produced by bruxism, increasing the prevalence of NCCL, which could also result in the disunity of the restorations in class V cavities [23]. The materials usually used to restore abfractions are glass ionomers, resin-modified glass ionomers, and nanoceramic composite resins that have recently been introduced.

Glass ionomers have a wide range of clinical applications in NCCL because their adequate bond strength, biocompatible fluoride release characteristics, and tooth-like thermal coefficients; their disadvantages are low flexural strength, weak abrasion resistance, and sensitivity to contact with moisture, although the retention of the restorations in NCCL is directly related to the adhesion capacity and modulus of elasticity of the restorative system [24].

Pharmacological alternatives

Pharmacological therapy for patients diagnosed with bruxism consists of antidepressants, L-dopa inhibitors, antiepileptics, sympatholytics, antihistamines or dopaminergic, intramuscular injections: Botulinum toxin and homeopathic medicine. Even though some pharmacological treatments may be unsafe if used for long periods as a result of the inherent side effects or risks of dependency [25].

One of the recently used treatments is botulinum toxin type A since it produces relaxation in the muscles of mastication and in the same way a reduction in occlusal force, generating a decrease in pain at rest and the symptomatology of the masticatory muscles [26]; this can be evidenced in polysomnography studies where it's explained that given the contraction of the masseter and temporal muscles in the SB when applying a dose of 60 units in each masseter muscle and 40 units in each temporal muscle, symptoms are reduced, although the dosage may vary between patients depending on their bruxism [27].

Although benzodiazepines have been reported to reduce motor activity related to bruxism, supporting studies are lacking; Saletu A, et al. [28] reported that 1 mg of clonazepam improves bruxism and sleep efficiency; but as an adverse effect, they observed that the apnea and

hypoapnea indices increased, although not significantly. Propanadol, an adrenergic receptor blocker, also shows a reduction in teeth grinding, but this produces a reduction in the quality of sleep, worsening sleep disorders such as apnea, insomnia, and behavioral disorder in the stage of rapid eye movements (REM). Clonidine significantly decreases the ratio of the rhythmic masticatory muscle activity index compared to clonazepam, but it was associated with an increase in cardiac frequency intervals before the onset of episodes of rhythmic masticatory muscular activity, given by the suppression of the activity of the autonomic nervous system, specifically in the significant decrease in the percentage of REM sleep; for this reason, clonidine is more effective than clonazepam in the treatment of SB [29]. Among the homeopathic medicines are Melissa Officinalis (MO) or limoncilllo, and Phytolacca Decandra (PD) with which a significant reduction of SB can be observed from the visual analogue scale (VAS), acting better MO, although in the anxiety scale there were no significant variations [30].

Non-pharmacological therapeutic alternatives

For the treatment of bruxism, a multidisciplinary treatment should be carried out, as mentioned above, and one of the approaches with which such management can be carried out is with a treatment based on physical therapy of the different muscles of mastication, cognitive therapy, and biofeedback. Jokubauskas L, et al. [11] evaluated the effectiveness of biofeedback as part of the management of bruxism, the effect of contingent electrical stimulation and the effect of biofeedback using a plate was investigated, in an approximate period of 6 weeks; where it is confirmed that biofeedback can be used as a therapy to reduce bruxism, but it does not have an effect in reducing pain that patients may present.

Electrotherapy, muscle relaxation, and manual therapies are used to manage with physical therapy. Amorim C, et al. [31] evaluated the effect of physiotherapy in combination with electro-therapeutic resources, occlusal plates, cognitive-behavioral therapies, postural awareness and muscle relaxation in patients with bruxism, where it was determined that the treatment carried out by biofeedback it is more effective than occlusal splints; Cognitive-behavioral therapies based on muscle relaxation and biofeedback through audio, reduction of masticatory muscle activity, however, further studies are required to support these treatments.

De Paula Gomes C, et al. [32] reported the effect of physiotherapy on masticatory muscles and the use of occlusal splints for the treatment of SB in 78 patients, where they concluded that the combined treatment had better results for the treatment of bruxism. On the other hand, Gouw S, et al. [33] determined the effect of physiotherapy in patients with SB, concluding that physiotherapy of the masticatory muscles was not effective in reducing bruxism in patients with absence of pain.

Occlusal splint design

For the treatment of bruxism, the use of occlusal splints has been reported in the literature, Riley P, et al. [34] evaluated the effectiveness of oral plates in patients with temporomandibular disorders (TMD), pain, bruxism, and the presence of dental wear, with no evidence that splints decreased clicking and pain at the temporomandibular level; likewise, Jokubauskas L, et al. [11] in a systematic review evaluated the effectiveness of different splints for the management of SB, in a total of 398 patients, 15 studies reported acrylic intraoral splints or devices and 1 study in flexible thermoplastic material, determining that intraoral splints or devices do not reduce bruxism but they can protect teeth against possible wear. The previous results are confirmed with a study by Bergmann A, et al. [35] in which they evaluated the effectiveness of a biofeedback splint and an occlusal splint for the management of temporomandibular pain and SB in 42 patients; the biofeedback splint showed a reduction of the SB compared to the conventional occlusal splint, likewise, the two types of splint contribute to the protection of the teeth against possible wear.

In addition to the conventional occlusal splint, the use of splints for trigeminal nociceptive inhibition has also been reported, as in a study by Dalewski B, et al. [36] where they evaluated the effectiveness of said splint and an occlusal splint in 30 patients, demonstrating that there is no influence on the masseter and temporal muscles after the use of the occlusal splints and the splint for trigeminal nociceptive inhibition to reduce SB; so its use remains a controversial topic.

Recommended treatment in children

For the management of bruxism in children, it must be considered that they are in a stage of development and growth of the maxillary structures, so each intervention carried out should be done with caution. Chisini L, et al. [14] suggest psychological treatment, physical therapy and the use of occlusal plates, but it is necessary to have an exhaustive control and periodic controls if this type of treatment is carried out, since, for example, the use of splints will possibly restrict Adequate maxillary growth so they are only indicated in deciduous dentition. Additionally, also pharmacological therapies such as flurazepam 15 mg/day, hydroxyzine 25-50 mg/day, and 5-25 mg/day for 4 weeks and diazepam 2.5 and 5 mg/day were reported; However, caution should be exercised in not prolonging the medication, since they can generate different side effects. Ierardo G, et al. [37] indicate that medicated hydroxyzine in doses of 25-50 mg may decrease bruxism, but not with sufficient evidence from Mostafavi S-N, et al. [38] evaluated the effectiveness of diazepam in reducing bruxism in 90 children and determined that there is no reduction in SB in children; Homeopathic medicines such as Melissa

Officinalis have also been suggested, which have sedative and anxiolytic properties, evidencing a reduction in bruxism in children [30].

Bruxism and dental implants

A possible association of the loss of implants due to excessive occlusal forces has been reported, for this reason, it is important to know whether excessive masticatory muscle activity may or may not be a factor that contributes to biological and mechanical failures in implants, Zhou Y, et al. [39] investigated the possible association between implant failure and bruxism in 2,233 patients, with a follow-up of 1 to 10 years, showing that failures in implant rehabilitation and bruxism are related, which is confirmed in a study of 3,549 implants which concludes that bruxism may be associated with an increased risk of implant failure [40].

Chrcanovic B, et al. [41] analyzed the complications that can occur in implants placed in SB patients, where it's suggested that implant failures are influenced by bruxism, generating mainly mechanical failures on implant-supported restorations; other authors such as Chitumalla R, et al. [42] report mechanical failures for screwed and cemented restorations in 640 implants in SB patients, however, Chatzopoulos G, et al. [43] investigated the association between temporomandibular disorders and self-reported bruxism with implant failure, and it was found that the relationship of bruxism and temporomandibular symptoms were not significant, that there is no negative association when has adequate and periodic monitoring of patients that performed bruxism with implant-supported restorations.

Association between bruxism, temporomandibular disorders, and orofacial pain

Over time, a possible association between bruxism and temporomandibular disorders has been discussed in both adults and children, Andrade N, et al. [44] investigated the history of sleep, and orofacial disorders in 66 children aged 3 to 7 years, and 34 of them had SB, reporting a possible association between bruxism and orofacial disorders; De Oliveira L, et al. [45] also evaluated the possible association between bruxism and temporomandibular disorders and it is evident that children diagnosed with SB have a 2.97 times greater probability of presenting temporomandibular disorders.

Tesseroli J, et al. [46] investigated whether the presence of generalized pain could influence the polysomnographic characteristics of 47 adult patients diagnosed with bruxism and pain in the muscles of mastication, where the patients who presented generalized pain had less sleep quality and efficiency, Ohlmann B, et al. [47] evaluated the possible relationship between SB and temporomandibular disorders (TMD), concluding that there is no clear relationship between SB and temporomandibular disorders, this conclusion can be corroborated in a study by Wieckiewicz M, et al. [48] where the distribution of TMD was evaluated in 77 patients with bruxism, all with signs and symptoms of TMD; the most common diagnosis was myalgia, followed by disc displacement with reduction and temporal tendonitis, evidencing that bruxism was not directly related to TMDs.

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