

Bruxism - the challenge of contemporary dental medicine

Khitiri M.¹, khitiri D.¹, Khitiri L.¹, Elizbarashvili M.¹, Kalandadze M.¹, Puturidze S.¹, Margvelashvili V.¹

Abstract

Background: The references of gnashing the teeth historically were described in negative annotations. In many cultures the gnashing of teeth has been associated with suffering, physical pain, madness and possession. Bruxism is mentioned in the Bible in several verses. Bruxism is said to have multiple causes. They include central factors, psychosocial factors and peripheral factors. The Bruxism Association underlined several factors of causes of bruxism: 1) sleep disorders, 2) Lifestyle factors 3) Stress, anxiety and other psychological components. Therefore, the treatment is multifaceted. Treatment aims to find and remove the causes of bruxism, change the behavior that causes bruxism and repair the damage that often causes

Aim: The aim of the study was systematical literature revision about historical view of bruxism.

Methods: The literature review was performed using the following databases to identify relevant scientific studies. The language was restricted to English. The year of publication was limited over the last 6 Years.

Results: More than 60 articles were found. 29 most relevant publications were chosen. Before 2013 there is no consensus about the definition and diagnostic grading of bruxism. A written consensus discussion was held among an international group of bruxism experts in 2013 as to formulate a definition of bruxism and to suggest a grading system for the operationalization.

Conclusion: Bruxism is a common parafunctional habit, occurring in male, female and children, in any ages. The management of bruxism should focus to prevent progression of dental wear, reduce teeth grinding sounds, and improve muscle discomfort and TMJ dysfunction. (TCM-GMJ June 2024; 9 (1):P57-P61)

Keywords: : bruxism, parafunction, grinding of teeth, occlusion, dental implants

Introduction

The references of gnashing the teeth historically were described in negative annotations. The phrase to “grit one’s teeth” refers to grinding or clenching of the teeth in anger or to accept a difficult or unpleasant situation and deal with it in a determined manner. In many cultures the gnashing of teeth has been associated with suffering, physical pain, madness and possession. Bruxism is mentioned in the Bible in several verses: (Psalm 35:16 and 112:10). (1)

In the beginning of the twentieth century, Moritz Karolyi, a Viennese dentist, described bruxism as: “traumatic neuralgia”. In 1907 the French term “Bruxamine” was introduced by Marie Pietkiewicz. (2) In the 1931 Bertrand Frohman created the term bruxism, which comes from the Greek expression:” brychien odontas“. Sigmund Freud,

scholar and psychiatrist also had a theory concerning bruxing in the oral cavity. He claimed it to be a prime significance in the psychosexual development and behavior of the individual.(3)

American Academy of Orofacial Pain defined bruxism as “diurnal or nocturnal parafunctional activity including clenching, bracing, gnashing and grinding of the teeth”. American sleep disorders association: Bruxism is defined as “tooth grinding or clenching during sleep plus one of the following: Tooth wear, sounds or jaw muscle discomfort in the absence of medical disorder”. (4)

Bruxism is also defined as the repetitive jaw muscle activity characterized by the clenching or grinding of teeth. Bruxism during daytime is commonly known as “Awake Bruxism “(AB) or Diurnal Bruxism (DB). Bruxism during sleep is termed as “Sleep Bruxism” (SB). These explanations don’t fully express the meaning of bruxism. First, it should be worked out is it disorder or behavior, moreover grading system needs to be scheduled (bruxism assessment).

Between 1966 and 2007 research and treatment were focused on occlusal adjustments and oral splints. In 1960’s a periodontist Sigurd Peder promoted the theory

From the ¹Ivane Javakishvili Tbilisi State University, Tbilisi, Georgia .

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Address requests to: Mariam Khitiri

E-mail: Mariamkhitiri@gmail.com

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that occlusal factors were responsible for bruxism. While therapy centered on the removal of occlusal interference remained unsatisfactory, behavior oral approaches in research also declined during 1966-1986.

Grading of Bruxism

Before 2013 there is no consensus about the definition and diagnostic grading of bruxism. A written consensus discussion was held among an international group of bruxism experts in 2013 as to formulate a definition of bruxism and to suggest a grading system for the operationalization. (5)

The experts group defined bruxism as a repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or bracing or thrusting of the mandible.

Bruxism has two distinct circadian manifestation: it can occur during sleep (indicated as sleep bruxism) or during wakefulness (indicated as awake bruxism). For the operationalization of this definition, the expert group proposes a diagnostic grading system of “possible”, “probable” and “definite” sleep or awake bruxism.

But even after that, still remain some questions. The experts discuss the need for an updated consensus and has the following aims:

- 1) To further clarify the 2013 definition and to develop separate definitions for sleep and awake bruxism.
- 2) To determine whether bruxism is a disorder rather than a behavior that can be a risk factor for certain clinical conditions.
- 3) To re-examine the 2013 grading system.
- 4) To develop a research agenda.

In March 2017 an international consensus meeting “Assessment of Bruxism Status” with bruxism experts from around the globe (Jari, Ahlberg, Reny De Alan, Takafumi, Kato, Frank, Lobbezoo....) took place in San Francisco, CA, USA, prior to the 95-th General Session and Exhibition of the International Association for Dental Research (IADR). The full-day meeting was organized by the International Network for Orofacial Pain and Related Disorders Methodology.

The aims for the consensus meeting were as follows:

- I) To further clarify the 2013 definition of bruxism, including definitions for sleep and awake bruxism.
- II) To determine whether bruxism should be considered a disorder or merely a behavior that can be a risk factor for clinical conditions (i.e. bruxism status).
- III) To re-examine the 2013 grading system based on data for reliability, sensitivity and specificity of each source of information / approach (i.e. bruxism assessment).

IV) To develop a research agenda for necessary studies on various bruxism topics (i.e. research agenda)

Bruxism’s international consensus defined.

I) Sleep bruxism is a masticatory muscle activity during sleep that is characterized as rhythmic (phasic) or non-rhythmic (tonic) and is not a movement disorder or asleep disorder in otherwise healthy individuals.

Awake bruxism is a masticatory muscle activity during wakefulness that is characterized by repetitive or sustained tooth contact and/or by bracing or thrusting of the mandible and is not movement disorder in otherwise healthy

individuals. During the bruxism masseter and temporal muscles were activated.

II) Bruxism status

In short, in terms of clinical consequences bruxism may thus be classified as any of the following:

- 1) Not a risk or protective factor: bruxism is a harmless behavior.
- 2) A risk factor: bruxism is associated with one or more negative health outcomes.
- 3) A protective factor: bruxism is associated with one or more positive health outcomes.

III) Bruxism Assessment

The outcome of the international consensus discussion is summarized under the following 4 headings: 1) non-instrumental approaches; 2) Instrumental approaches; 3) cut-off points; 4) Grading.

1) Non-instrumental approaches for assessing bruxism include self-report (questionnaires, oral history) and clinical inspection, both for sleep and awake bruxism. (6)

2) Instrumental approaches for assessment. Electromyographic (EMG) recordings during wakefulness or sleep bruxism. EMG evaluated in real time subjective information about masticatory muscle activities. Also used somnography, audio or video recordings. Counted the number of activities. EMG outcome measures power, peak amplitude and interval duration between activities. (34-36).

3) Cut-off points

Using cut-off points for everyone is the “gold-standard” assessment sleep or non-sleep bruxism, measuring bite time. Prolonged clenching can be a very plausible overload mechanism for the masticatory muscles and temporomandibular joint. (40)

4) Grading

In 2017 Lobbezoo et al. proposed a grading system for bruxism:

- 1) Possible sleep / awake bruxism is based on a positive self-report only.
- 2) Probable sleep / awake bruxism is based on a positive clinical inspection, with or without a positive self-report.
- 3) Definite sleep/awake bruxism is based on a positive instrumental assessment, with or without a positive self-report and/or a positive clinical inspection.

This research over the past 2 decades has shed light on the neurovegetative correlates of bruxism episodes (43, 44.) The authors underlined that future studies should be directed to better comprehension of the possible chemical correlates, both negative and positive ones.

Risk factors:

1. Age: Bruxism is more common in young children and noted to decrease by adulthood.
2. Stress: Increased stress and anxiety can cause bruxism.
3. Personality: Aggressive, competitive, and hyperactive type of behavior and personality can increase the chance of teeth grinding.
4. Family history: Sleep bruxism tends to give a family history; other members also may have teeth grinding or a history of it.
5. Medications and habits: Certain antidepressants can

result in bruxism as an uncommon side effect. Habits like smoking tobacco chewing, drinking caffeinated beverages may increase the risk of bruxism.

6. Other factors: Bruxism can be associated with medical problems like epilepsy, sleep related disorders, dementia, Parkinson's disease and gastroesophageal reflex disorder. (7–9)

Causes of bruxism

Why bruxism occurs is not always clear recent research concluded that neither occlusal interference nor factors related to the oral facial skeleton have or role in the etiology of bruxism.

The Bruxism Association underlined several factors of causes of bruxism: 1) sleep disorders, 2) Lifestyle factors 3) Stress, anxiety and other psychological components.

1) Sleep disorders

Recent studies suggest that sleep bruxism is secondary to sleep related arousals (defined by arise in autonomic cardiac and respiratory activity that tends to be repeated 8-14 times per hour of sleep). The rhythmic muscle activity that occurs in sleep bruxism peaks in the minute before rapid eye movement sleep.

This suggest that there is some mechanism related to sleep stage transitions that influence the motor neurons of bruxism.

It is known that bruxism rarely occurs alone, it is found more frequently in those individuals who have an existing sleep disorder such as snoring, breathing pauses during sleep and Obstructive sleep apnea (OSA).

It is hypothesized that the direct and indirect pathways of basal ganglion, a group of five subcortical nuclei that are involved in the coordination of movements is disturbed in bruxism patients. (10)

An imbalance between both the pathways, result in movement disorder like Parkinson's disease and this imbalance occurs with the disturbances in the dopamine mediated transmission of action potential. In case of bruxism there may be an imbalance in both the pathways.

Other parasomnias such as sleep talking, violent or injurious behaviors during sleep, sleep paralysis, hypnagogic / hypnopompic hallucinations are also more frequently reported by bruxers.

2) Lifestyle factors

Demographic and lifestyle factors such as young age, higher educational status, smoking, caffeine intake and heavy alcohol consumption are associated co factors of bruxism. The use of psychoactive substances (tobacco, alcohol, caffeine, or medications for sleep, depression and anxiety) increases arousal and leads to problems falling asleep, staying asleep and daytime sleepiness. Bruxism is significantly higher in individuals whose lifestyle includes the use of these psychoactive substances.

3) Stress, anxiety and other psychological components.

Mental disorders, anxiety, stress and adverse psychosocial factors are significantly related to tooth grinding during sleep, and it has been found that nearly 70% of bruxism occurs because of stress or anxiety. One study found that shift workers who suffered stress due to dissat-

isfaction with their schedule were more susceptible to bruxism.

Many physical ailments have psychological components that may influence a person's vulnerability to illness as well as their ability to recover. Stress levels and personality characteristics are often considered as initiating, predisposing and perpetuating factors for bruxism. Some people are less resilient to stress and therefore suffer more from the physical and psychological consequences.

Treatment of Bruxism

Researchers suggested 4 principles of treatment: 1) accurate (valid) 2) applicable (feasible), 3) affordable (cost effective) and 4) accessible (suitable for everyday clinical use).

The practitioner dentist's and researchers from many clinics over the world underlined 5 dangerous side effects of bruxism:

1) Pain. Teeth grinding and clenching places constant stress and pressure on the jaw joints and the surrounding muscles. Patient might experience jaw pain and stiffness, facial pain and even earaches from frequent grinding.

2) Jaw disorders. Grinding can affect the structure of the joints and muscles, that make up the jaw and cause temporomandibular disorders (TMD). TMD can cause severe facial neck and shoulder pain, and lead to difficulty chewing. Talking and swallowing.

3) Tooth damage. Tooth damage is leading side effect of clenching and grinding. Frequent grinding can wear down tooth surfaces, tooth enamel, leading to height loss and increased tooth sensitivity. Additionally, constant stress and pressure can crack, chip, fracture or loosen teeth. Grinding can also damage fillings, crowns, bridges and implants.

4) Gum recession. Bruxism is a leading cause of gum recession. Grinding causes teeth to shift and loosen, creating pockets where bacteria enter and cause the gums to pull away from the teeth.

5) Headaches. Grinding can cause painful migraines and tension headaches from the constant stress and pressure placed on the face and jaw muscles.

Bruxism is said to have multiple causes. They include central factors, psychosocial factors and peripheral factors. Therefore, the treatment is multifaceted. Treatment aims to find and remove the causes of bruxism, change the behavior that causes bruxism and repair the damage that often causes.

The treatment aspect includes:

1) Occlusal therapy, 2) Behavioral therapy, 2) Biofeedback, 3) Pharmacological therapy.

1) Occlusal therapy. Occlusal splints have been considered as the first line of management for preventing in case of sleep bruxism. Tooth wear grinding, clenching. These splints have different names such as occlusal bite guard, bruxism appliance, bite plate, night guard, occlusal device. They are classified into hard splints and soft splints. Hard splints are more effective than soft for reducing the bruxism activity and for adjustment. (11). A Study found that occlusal therapy treatment reduced muscle activity with

sleep bruxism after 2 months of therapy. (12–14)

2) **Behavioral modification.** Behavioral therapy has been considered for the treatment meditation, normal sleep hygiene, walking on a fresh air, relaxation techniques, self-monitoring. For the beginning of the treatment of sleep bruxism it's very important with measuring patient's sleep hygiene. It includes to instruct person to stop smoking and drinking coffee or alcohol at night. Patient must sleep in dark room with calm environment, good bedroom conditions. (15,16)

3) **Pharmacological therapy.** Inhibiting acetylcholine release at the neuromuscular junction (NMJ) decreasing bruxism activity. Botulinum toxin A have paralytic effect on the muscles. Eng-King Tan and Joseph Jankovic in their study showed that locally administered botulinum toxin, or BTX, is an effective treatment for various movement disorders. Its usefulness in treating bruxism. The authors studied 18 subjects with severe bruxism and whose mean duration of symptoms was 14.8 ± 10.0 years. Medical or dental procedures had failed to alleviate their symptoms. The authors administered a total 241 injections of BTX A in the masseter muscles during 123 visits. The mean dose of the BTX A was 61.7 ± 11.1 mouse units, or MU (range 25-100 MU). The total duration of response was 19.1 ± 17.0 weeks, and the peak effect on a scale of 0 to 4, in which U is equal to total abolishment of grinding was 3.4 ± 0.9 . (17,18)

The study of Shim Y. J., Lee M. K., Kato T. found that the amplitude of the muscle contraction during bruxism was reduced after 4 weeks of injection, but with no changes in the rhythm or number of bruxism episode per hour of sleep. Acute use of dopamine precursors like L-dopa inhibits bruxism activity and chronic long-term use of L-dopa results in increased bruxism activity. (19–21)

Biofeedback

Biofeedback therapy is a technology that has been used as a cognitive – behavioral approach to acting on the regulation of excessive muscle activity in subjects with bruxism. (22) By using visual and/or auditory biofeedback, individuals can readapt their muscles behavior, reducing excessive masticatory muscle activity. (23)

In short biofeedback works on the principle that bruxer can unlearn their behavior when a stimulus makes them aware of their adverse jaw muscle activities. Mitelman described an EMG technique that provides the daytime bruxer with auditory feedback from his/her muscle activity or relaxation that is happening. (24)

EMG (electromyography) is a technology for evaluating or monitoring neuromuscular behaved. The signal is captured from the electrical potentials that the muscles emit during activity. Nissani used a taste stimulus to awaken the patient, in case of sleep bruxism. (25)

To reduce the masticatory muscle activity during sleep bruxism in recent years some doctors starting to use (CES) contingent electrical stimulation. The rationale for CES includes the inhibition of the masticatory muscles responsible for bruxism by applying a low-level electrical stimulation on the muscles when they become active, during the bruxism episode. (26)

Bruxism impact on the dental implants:

There are several studies which have suggested that the insertion of dental implants in patients being diagnosed with

bruxism negatively affected the implant failure rates. In 2016 B. R. Chrcanovic, J. Kisch, T. Albrektsson, A. Wennerberg published the retrospective study is based on 2670 patients who received 10096 implants at one specialist clinic, implant and patient related data were collected. Descriptive statistics were used to describe the patients and implants. Multilevel mixed effects parametric survival analysis was used to test the association between bruxism and risk of implant failure adjusting for several potential confounders. Criteria from a recent international consensus (Lobbezzo et al. Journal Oral Rehabilitation. 40, 2013,2) and from the International Classification of sleep disorders, revised: (diagnostic and coding manual, American Academy of Sleep Medicine, Chicago. 2014). were used to define and diagnose the condition. The number of implants with information available for all variables totaled 3549, placed in 994 patients, with 179 implants reported as failures. For bruxers implant failure rates were 13.0% (24/185) and 4-6% (155/3364) for non-bruxers. The statistical model showed that bruxism was a statistically significantly risk factor to implant failure. (27–29)

Several studies have indicated that patients with bruxism have a higher incidence of complications on the superstructures of both of fixed and removable implant-supported restorations

Methods

Data was researched by using information on the internet on PubMed, ScienceDirect, by analyzing written articles and books. Of the 100 articles that were analyzed, 45 articles and two books were involved in the writing of this review article.

Results and discussion

Results derived from the analyzed literature, classify the main consequences of bruxism, from fatigue, pain, wasting of the incisal edges and occlusal surfaces of the teeth to loss of teeth, dental implants, headaches, periodontal lesions and TMD in severe cases. All these problems negatively affect the quality of everyday life of the patient. Bruxism as a parafunctional habit needs multidisciplinary approach for prevention of the teeth, bone and prosthetic restorations. The prevalence of bruxism is growing related to stress, drugs, changes in lifestyle, bad nutrition and sleep problems. The clinician should follow signs and symptoms to ensure the best treatment plan for the patient.

Conclusion

Bruxism is a common parafunctional habit, occurring in male, female and children, in any ages. Bruxism during daytime is commonly known as “awake Bruxism” (AB) and during sleep is termed as “sleep Bruxism” (SB). In some patients it causes serious effects on TMJ, headache, teeth, facial muscles and e.t. and what is more important bruxism decrease their quality of life. As the etiology is multifactorial, there is no known treatment to stop bruxism. Today's known treatment strategy such as: splint treatment, medications, behavioral strategies, contingent electrical stimulation just reducing the effects of bruxism. The management of bruxism should focus to prevent progression of dental wear, reduce teeth grinding sounds, and improve muscle discomfort and TMJ dysfunction.

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