

BRUXISM: A MODERN VIEW (A LITERATURE REVIEW)

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Abstract

Activities of the masticatory system can be divided into functional, which includes chewing, speaking, and parafunctional, which includes clenching or grinding of teeth. Bruxism is the abnormal, non-functional contact of teeth which, if ignored, leads to the breakdown of dentition and to orofacial pain. As bruxism events bring about tooth and restoration damage, it is of major concern for dentists. According to the severity of clinical manifestations, bruxism occupies an important place among all parafunctions. This article reviews the current views on the etiological and pathogenetic mechanisms of bruxism.

Keywords: *parafunctions, bruxism, disfunction, temporomandibular joint, mouth guards.*

1. INTRODUCTION

In simple terms, bruxism is clenching and grinding of teeth when the individual is not chewing or swallowing, noted as the commonest of the many parafunctional habits of the dentofacial system. Bruxism activity is of major concern for dentists, as it leads to tooth wear and damage, restoration fractures, temporal headache and other temporomandibular disorders. Its prevalence is of 8-31% in the general population and of 14-20%, respectively, in children. People in the age group of 60 years are less likely to be affected, showing a prevalence of dropping down to around 3%. In most of the cases, bruxism does not cause serious complications, however, under severe conditions, it can lead to dental abrasion, damage of teeth and restorations, tension-type headaches, facial or jaw pain and temporomandibular disorders.

According to GPT 9, bruxism is defined as the parafunctional grinding of teeth, an oral habit consisting of involuntary rhythmic or spasmodic non-functional gnashing, grinding, or clenching of teeth, in other than chewing movements of the mandible, which may lead to occlusal trauma.

Bruxism is a common phenomenon, the emerging evidence suggesting that biologic, psychologic, and exogenous factors are more involved in its etiology than morphologic factors. Diagnosis should adopt the grading system of the possible, probable, and definite. The proposed mechanism for the bruxism-pain relationship at individual level is that stress sensitivity and anxious personality traits may be responsible for bruxism activities, that may lead to temporomandibular pain, which in turn is modulated by psychosocial factors. The purpose of our research was to examine literature sources and current views on the etiological and pathogenetic mechanisms of bruxism.

2. MATERIALS AND METHOD

The biomedical literature was searched for publications reporting the etiology and pathogenesis of bruxism with various types of movement disorders. As a whole, very few series were found, most papers corresponding to clinical reports. An advanced search used PubMed as a MeSH database with two key words (bruxism and temporomandibular disorder), yielding 961 studies. Exclusion criteria included non-English articles, studies on children or animals, limited/irrelevant studies, articles and reports published more than 10 years ago, which reduced the results to 273 studies, subsequently reviewed and assessed for quality using the NOS scale. Out of these 273 articles identified, after screening of abstracts, only 20 underwent full-text reading.

3. RESULTS AND DISCUSSION

During the study, the latest scientific medical literature data on the issue of bruxism was

studied and analyzed. For the first time, bruxism is referred to by M. Karolyi in 1901 as a "traumatic neuralgia". He believed that bruxism is a consequence of the subconscious activity of the masticatory muscles, its own form of parafunctions of the masticatory muscles, which is one of the causes of the development of parodontosis and teeth loss. As known, bruxism can cause muscle spasm and pain in the masticatory muscles. This, in turn, leads to restricted mobility of the lower jaw and, as a result, to violation of articulation and chewing. According to the literature sources, bruxism is the cause of painful disfunction of the temporomandibular joint (TMJ) in 72% of cases. Accordingly, they designate spasms of the masticatory muscles, which are associated with the changes in the central nervous system.

In the literature, the term "bruxism" was introduced by Miller in 1938. It comes from the Greek word "bruchai" – gnashing of teeth. The terms "Karolyi effect", "stridor dentium" and occlusal neurosis are also used to denote subconscious strong gripping of teeth. The most commonly used is the term "bruxism".

W.Drum (1962) and E.Frohlich (1970) refer bruxism to parafunctions which, according to A.Breustedt [1962], can be divided into two groups: those associated with the activity of the masticatory muscles and those caused by the action of the tongue, lips and cheeks. According to the definition of Rozenzweig D., bruxism is characterized by involuntary subconscious contractions of the masticatory muscles with no need to chew food [1].

According to the definition of the College National d'Occlusodontologie, Paris, France, bruxism is a behavioral feature characterized by involuntary, constant (teeth gripping) or rhythmic (teeth grinding) movements of the masticatory muscles. The prevalence of bruxism among adults is of 6–20%. In other literary sources, the prevalence of bruxism is noted to be 8–31%, the authors claiming that the statistics is significantly underestimated, since most patients do not even know about their disease and often discover it only in doctor's office. The disease is more manifested at young ages rather than in people over 60 years. Bruxism is more common in females.

So far, there is no consensus on the etiology and pathogenesis of bruxism. Some experts

believe that bruxism is one of the forms of sleep disturbance, as evidenced by its ranging among the International Classification of Sleep Diseases. According to some authors, bruxism is a sleep disorder characterized by the parafunctional activity of the masticatory muscles in the form of gripping and gnashing of teeth, which ranks third among sleep disorders after snoring and somnambulism.

Bruxism can occur during daytime - diurnal bruxism or awake bruxism. Bruxism during sleep at daytime or nighttime is known as sleep bruxism. Awake bruxism is related to the stress due to familial responsibility or work pressure, anxiety, anger or frustration. Awake bruxism is more commonly seen in females compared to males. The prevalence rate of awake bruxism is noted to be 20%, whereas sleep bruxism is considered as a sleep related to oro-mandibular movement disorders [2]. Individuals who brux during sleep are more likely to have other sleep disorders, snoring and pauses in breathing (sleep apnea). Recently, it was classified as a sleep-related movement disorder. Sleep bruxism occurs with no gender difference. This is noted frequently in younger population and in children, with a prevalence rate of 14-20%.

The American Academy of Sleep Medicine classifies bruxism as a sleep disorder (parasomnia) with stereotypical rhythmic movements of the lower jaw and occlusal contact of teeth, while the American Academy of Psychiatry considers bruxism as a behavioral disorder [3].

Two types of bruxism are distinguished: awake and during sleep, but their combination is also possible. T. Kato identifies two forms of bruxism: primary (idiopathic) and secondary (iatrogenic). Gripping of teeth while awake and during sleep, with no somatic etiology, belongs to the primary form. Secondary bruxism is a neurobiological or psychological abnormality caused by sleep disorder or medication [4].

The conclusion about the polyetiological nature of bruxism is confirmed by pathological changes not only in the masticatory muscles, but also in the muscles of other parts of the body - the central nervous system and the endocrine system [5]. During bruxism, the function of the masticatory muscles acquires a traumatic effect and causes the occurrence of a pathological

process in the dentofacial system. To determine the etiology of bruxism, many studies have been conducted, the results of which do not allow unambiguous conclusions.

Nadler S.C. classified bruxism according to the causes of its occurrence:

- psychogenic causes;
- local, stomatogenic causes;
- diseases of organs and systems;
- professional reasons.

Most scientists are inclined to believe that anxiety and psychosocial factors play a leading role in the development of bruxism, as a somatic response to psychological stress [5,6].

A number of studies indicate a directly proportional relationship between the intensity of bruxism and psychological factors [6,7]. Short-term manifestations of bruxism during sleep can also be observed in emotionally stable people. The studies conducted by A.G. Lavigne consider that the manifestations of bruxism are caused by the action of the neurotransmitters dopamine and serotonin. The dopaminergic system has become central in the etiology of bruxism, since it plays a leading role in regulating stereotyped movements and in the occurrence of motor impairment during sleep [8]. Literature data indicates the inferiority of hypothalamic structures during bruxism, which may be the result of the experienced negative emotions, especially in the puberty period, causing stress hyperprolactinemia. The results of clinical and laboratory studies confirm that bruxism develops with moderate hyperprolactinemia, as a result of the decreased inhibitory effect of the dopaminergic system on the secretion of prolactin; it also stimulates the synthesis of the thyrotrophic hormone [9]. Pathological processes of the peripheral nervous system, leading to neurological and motor disorders, can also be the cause of bruxism. It is noted that bruxism is often accompanied by sleep disturbance (somnambulism, snoring, sleep apnea), enuresis, tremor, epilepsy. Available data indicates a connection between bruxism and the pathology of the spine, and also with psychotropic drugs administration.

Occlusive or anatomical anomalies are considered to be local etiological factors that interfere with smooth sliding occlusion: tooth interference, deformation of dentition, defects of dentition with blockage of the lower jaw

movements, errors in dental restorations, poor-quality orthopedic and orthodontic treatment.

Premature occlusal contacts are a trigger not only for people prone to stress, but for any other person, as these contacts can cause a certain muscle activity. It should also be noted that not all patients with an abnormal occlusion have bruxism.

Some authors note the possibility of a genetic predisposition to bruxism, but the mechanisms of inheritance remain uncertain [10,11].

Possibly, the development of bruxism may be related to alcohol abuse, smoking, use of narcotic substances and of certain drugs. The tendency to gnashing, noted in people with Parkinson's disease, may be a consequence of traumatic brain injury. In childhood, bruxism occurs in the period of cutting of temporary or permanent teeth.

The previous opinion about the connection of the disease with adenoids, helminthic invasion or pathology of the gastrointestinal tract was refuted, since no scientific evidence was found [12].

Sleep bruxism and bruxism while active differ according to the principles of their occurrence. The first, related to sleep disturbance, originates in the central nervous system and is associated with outbreaks of brain activity during sleep, or the so-called microstimulations. The other is more common in the way of gripping (clenching) during activity, being considered as a convulsive contraction of muscles. Clenching is body's natural response to stressful situations, contributing to psychological relaxation.

The clinical picture of bruxism is quite specific. During sleep, the patient starts to gnash the teeth, which can last several seconds or minutes. Such attacks are sometimes repeated several times during the night. The following clinical forms of bruxism are distinguished:

- initial or compensated form – characterized by functional disorders, such as gnashing of teeth or gripping without obvious morphological changes and complications;
- acute form – marked by sudden compression of teeth accompanied by pain;
- chronic form – characterized by a long-term disease, increased nervous excitability and the presence of complications (abnormal dental abrasion, impaired temporomandibular joints, decreased occlusal height, periodontal disease).

The diagnosis is usually made on the basis of the medical history and examination of the patient. On examination, no serious deviations are always noted, however, in chronic (severe) form of bruxism, the following symptoms will be noted: 1) dental abrasion; 2) cracks and fractures of crowns; 3) chippings and cracks of restorations; 4) circular abfraction of teeth; 5) teeth indentations on the mucous membrane; 6) the presence of teeth with aseptic necrosis; 7) hyperesthesia; 8) tension and fatigue of the masticatory muscles, especially after awaking; 9) hypertrophy of the masticatory muscles; 10) violation of the temporomandibular joints; 11) biting of lips, cheeks and tongue, onychophagia (nail biting) and other parafunctional habits [13].

Frequently, a patient is diagnosed with bruxism according to the descriptions of relatives. The consequence of injury of the alveolar tissues in bruxism is inflammation in the periodontal tissues, tooth loosening and tooth loss.

Patients with bruxism may also have secondary symptoms of neurogenic nature. These include:

1. Morning migraines and headache;
2. Pain in the jaws, temporomandibular joints, facial muscles and nerves;
3. Otalgia, tinnitus (ringing in the ears);
4. Pain in the maxillary sinuses;
5. Pain in the neck, shoulders, back;
6. Vertigo (vestibular vertigo);
7. Poor sleep, insomnia, somnolence during the day, weariness after awakening;
8. Stress, tension, depression, malnutrition;
9. High sensitivity or eye irritation;
10. Spasms of the masticatory muscles, discomfort during the occlusion of teeth.

The presence of several of these signs should alert the doctor, but they do not serve as direct symptoms of bruxism.

It should be noted that, with uncontrolled compression of teeth in patients with bruxism, due to the violation of proprioceptive sensitivity, the compression force may be 4 times higher than normal; the period of maximum interdental contact with bruxism is 3-4 hours per day, whereas, with normal functioning of the dento-facial apparatus, it is only 10-15 minutes per day [14].

Currently, the following methods are used to diagnose bruxism:

1. Clinical methods (questionnaire, history taking, examination of the patient, evaluation of diagnostic models of dentitions, photos);

2. Additional research methods (X-ray diagnostics, electromyography, polysomnography, use of diagnostic intraoral tires).

The most informative method for diagnosing bruxism is polysomnography. Its principle is to register brain and muscle activity, heart activity, respiratory flow, oxygenation of peripheral blood, as well as sound and video recording of patient's sleep.

As a result, we get a hypnogramme – a curve that contains information about the structure of sleep, the quality and quantity of its stages and phases. Study of the received data helps the doctor to identify the causes of sleep disorder, as well as to exclude epilepsy as a cause of bruxism [15].

Among the X-ray examination methods, orthopantomography and computed tomography are recommended, which permits to identify in patients with bruxism problems with periodontium, as well as restructuring of the bone tissue of the jaw in the area of attachment of the masticatory and medial pterygoid muscles, temporomandibular joint structures.

Electromyographic studies of bruxism can now be carried out at home with "BiteStrip". To do this, the patient attaches this device to the cheek along the masticatory muscle before sleep, so that the electrical activity of the masticatory muscles is continuously monitored.

There is also a method for determining problems with occlusion, widely used by Japanese doctors. Patients receive individually prepared special mouth guards (it is advisable to use them during sleep) made of polyvinyl chloride with a 0.1 mm thick food coloring. The direction and strength of the contact surfaces of the tooth surfaces during sleep are reflected on the mouth guard through the erasure of coloring. Thus, the doctor can get a true picture of bruxism.

Nowadays, the treatment of patients with bruxism does not have a unified strategy. Accordingly, the main task is to eliminate the symptom complex present in this pathology. Attention is drawn to the fact that, in the early stages of the development of bruxism, there are very few manifestations of this process, leading to its ignorance by both patients and doctors.

The treatment of bruxism should be firstly comprehensive, aimed at eliminating etiological factors, especially psychological stress. In addition, the dentist may refer the patient to a psychologist or psychiatrist for consultation [16]. Modern pharmacological agents can only partially affect the abnormal activity of the masticatory muscles. These groups of drugs include dopamine agonists [13], benzodiazepine and antidepressants. However, due to their effects, these drugs should be prescribed with caution [6]. Literature sources also discuss the use of botulinum toxin in order to eliminate the hyperactivity of the masticatory muscles, carried out with intravenous injections.

Along with the use of vitamins and mineral therapy (calcium, magnesium, vitamins of group B), prevention of this disease should be achieved.

Such patients need to maintain a healthy lifestyle, to exclude stimulants (coffee, tobacco, alcohol). Yoga, relaxation exercises and self-control skills over their psychological state are considered very effective. Also important in the prevention of this disease is a relaxing massage of the upper part of the body (head, neck, shoulders, back).

The most common and effective treatment of bruxism remains the use of an individual occlusal mouth guard, which does not allow teeth to close up during a spasm of the masticatory muscles, thus preventing their erasing. Occlusal mouth guards also relieve excessive stress on the temporomandibular joint, help avoid orthopedic fractures during bruxism attacks, without affecting the parafunctional activity of the masticatory muscles [17].

Most often, mouth guards are used at night, but they are also recommended to be worn daily during possible periods of psycho-emotional stress (stress at work, car driving, etc.). Mouth guards can be made individually in the dental prosthetic laboratories; also, standard mouth guards, namely double mouth guards (worn simultaneously on the two jaws) and single mouth guards are available on the market. The occlusal mouth guard is a removable orthodontic apparatus, made of flexible plastic, silicone, having a special shape, so that the patient does not feel any discomfort while wearing it [18].

The material from which the mouth guards are made is hypoallergenic, consisting of modern biopolymers that withstand quite heavy loads, and are not deformed for a long time. The mouth guard is not felt about an hour after wearing, it is easy to clean, and if necessary, it can be removed. Modern dentistry produces mouth guards of different colors but, most often, they are transparent [19].

It could be concluded that bruxism is to some extent associated with musculo-skeletal symptoms, even though the evidence is conflicting and seems to be dependent on many factors, such as age, on whether the bruxism occurs during sleep or wakefulness, and also on the quality of the diagnostic methodology regarding bruxism and musculo-skeletal signs and symptoms. The literature does not support a direct linear causal relationship between bruxism and such symptoms, pointing more in the direction of a multifaceted relationship dependent on the presence of other risk factors. Pain is by far the most commonly assessed symptom, whereas non-painful musculo-skeletal symptoms have generally not been systematically evaluated. In the light of recent findings indicating that non-painful symptoms may precede TMD pain, it is suggested to increase the scientific focus on non-painful musculo-skeletal symptoms in future studies. Also, they should use validated methods for case definition and outcome assessments [20].

4. CONCLUSIONS

Bruxism, as a form of parafunction of the masticatory muscles, still remains non-elucidated, since no specific algorithms have been developed for the treatment of this pathology, the use of existing occlusal mouth guards allowing only to limit the excessive influence of the masticatory muscles on the tissues and organs of the dentofacial system.

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