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When and How to treat bruxism in children? - A review of the latest literature

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ABSTRACT

Introduction and purpose
Bruxism is a stereotypical motor disorder characterized by involuntary grinding or clenching of the teeth during sleep or wakefulness. Bruxism affects 5-50% of children, and its frequency decreases with age. Bruxism is the most commonly occurring parasomnia, which in healthy individuals is a variant of physiology; however, when it leads to the development of associated pathologies such as dental abrasions, tooth loss, toothaches, headaches, or temporomandibular disorders, it is an indication for treatment.

Materials and methods
The literature included in the PubMed databases is searched through the words such as bruxism, temporomandibular disorder.

Description of the state of knowledge
In the diagnosis of bruxism, questionnaires filled out by patients and parents of children are most commonly used, although the most effective but less accessible diagnostic test is polysomnography. In the treatment of bruxism, pharmacotherapy, occlusal splints, and physiotherapy are used.

Conclusions
There is no gold standard for treating bruxism. There is still a need to search for other methods that would eliminate bruxism and prevent the development of associated pathologies.

Keywords: bruxism, occlusal splints, temporomandibular disorder

Introduction

Bruxism is a repetitive, unconscious activity of the masticatory muscles. It is characterized by abnormal or excessive contacts between the upper and lower teeth due to involuntary clenching, tapping, or grinding of the teeth, as well as stiffening or thrusting of the mandible with circadian symptoms, meaning symptoms that arise depending on the time of day or night, such as facial tension, headaches, neck pain, and insomnia. In relation to the masticatory system, stiffening can be interpreted as the strong maintenance of a specific mandibular position, and thrusting as the forceful movement of the mandible forward or to the side. [1-3] The majority of children display parafunctional behaviors such as chewing on foreign objects, biting their nails, biting the mucous membrane of their lips and cheeks, and routinely chewing gum. [3] Similar to adults, children experience two distinct forms of bruxism, namely awake bruxism (AB) and sleep bruxism (SB). SB is regarded as the most prevalent type of parasomnia in children. [4] This condition affects between 5% and 50% of the global pediatric population. [2]

Aim

The aim of our study was to present the consequences that bruxism can lead to in children, as well as the diagnostic methods for bruxism and the recommended therapeutic methods.

Material and methods

To compile this review paper, extensive searches were conducted across databases such as PubMed and Google Scholar. The search terms encompassed "bruxism" "occlusal splints", "temporomandibular disorder"," and "TMD." Articles considered were those published between 2009 and 2024, with the greatest focus on the last 5 years. This screening process aided in identifying articles pertinent to the paper's theme. Subsequently, a comprehensive analysis of the complete texts of possibly relevant articles was conducted, facilitating the extraction of the most relevant information. Original research and review articles were selected, drawing from the authors' research and clinical expertise. Ultimately, 44 research articles were cite.

Analysis of the literature

Epidemiology

It is considered that sleep bruxism (SB) is more common in children than in adults. It may emerge as early as the first year of life during the eruption of primary teeth, but typically begins when the primary dentition is stable. Its prevalence increases with age, reaching its peak between ages 10 and 14, and then declines into adulthood. [5] The occurrence of SB in childhood is similar between both genders; however, from late adolescence onward, more temporomandibular and clinical symptoms are observed in females. Depending on the diagnostic method employed, the prevalence of SB in children and adolescents varies significantly, with morbidity rates ranging from 5% to 50%. [1,2,6]

Etiology

Given the complex etiology of bruxism, pinpointing its causes is challenging. Contributing factors encompass pathophysiological, psychological, anatomical, and genetic components. Based on its etiopathogenesis, bruxism is categorized as primary – idiopathic (not associated with any other diseases) and secondary – iatrogenic (related to diseases or induced by specific medications). In children, potential causes of bruxism include malocclusion, postural abnormalities, stress, genetic predisposition, organic and functional central nervous system changes, neurotransmitter transmission disorders, craniofacial trauma, hematomas and brain hemorrhages, tetanus, epilepsy, and ADHD.[7-9] In their analysis, Kuhn et al. summarized that risk factors in children and adolescents, besides stress, are predominantly behavioral disorders and sleep disturbances. [8]

The fundamental mechanism underlying its development involves alterations in the sensitivity of neuromuscular spindles, receptors sensitive to stretching and heightened muscle tension, which persist beyond cessation of movement. The resultant pain arises from ischemia due to inadequate rest and muscle overuse. Significantly, episodes of uncontrolled reactivation of the cortical and autonomic nervous systems during unstable sleep periods play a crucial role. Excessive strain on the temporomandibular muscles may be attributed to uncontrolled heightened activity of the cortico-pontine pathway regulating facial muscle function during sleep. [1,4,10] Attention is drawn to the probable influence of disturbances in the function of neurotransmitter systems, including the dopaminergic system. [11]

It seems that the main culprit behind this functional disorder is psychological factors, particularly stress and anxiety. It is well-established that somatic anxiety correlates with heightened muscle tension. Oliveira et. al evaluated the correlation between anxiety levels in children with and without sleep bruxism (SB). Findings revealed a statistically significant distinction between these two groups, showing that children with bruxism exhibited higher scores on the State-Trait Anxiety Inventory for Children (STAIC) in contrast to those without bruxism. [12] Research indicates that children with elevated levels of neuroticism and conscientiousness have a twofold increased risk of experiencing sleep bruxism compared to children with low levels of these personality traits. [13]

Alfano et al. carried out research among teenagers employing polysomnography to track their sleep patterns. Their investigation unveiled that approximately one-third of the adolescents exhibited sleep bruxism, especially prevalent in those with tension-type headaches. [14]

Diagnosis

In healthy individuals, bruxism shouldn't be seen as a disorder but rather as a behavior that could act as a risk factor for certain clinical outcomes. Habitual bruxism could be viewed as a physiological occurrence. However, in some cases, it might evolve into a pathological activity, resulting in disorders of the stomatognathic system. [15]

SB can be evaluated using non-invasive techniques like self-reporting (questionnaires, interviews) and clinical examinations, or instrumental methods such as electromyography (EMG) for assessing the activity of chewing muscles and polysomnography (PSG). The

diagnosis is commonly established relying on reports from family members detailing the distinctive sounds generated during nocturnal teeth grinding. [5]
Because diagnosing bruxism is challenging, given that the child or parent typically reports the primary symptoms, ongoing efforts focus on creating the most precise questionnaires. [16,17]
The diagnostic criteria for SB comprise:
- teeth grinding or clenching during sleep;
- presence of one or more of the following:
  - irregular tooth wear;
  - audible sounds related to bruxism;
  - jaw muscle discomfort. [18]

A bruxism assessment system has been suggested as follows:
- possible SB - acknowledged through familial accounts or self-assessment of nocturnal noise or teeth grinding
- probable SB - determined by self-reported grinding and clinical signs of bruxism observed during functional examination, including heightened tooth wear, presence of antagonistic teeth, jaw muscle pain, fatigue, and hypertrophy
- confirmed SB - diagnosed based on reported teeth grinding and concurrent clinical findings (intra- and extraoral examination) corroborated by PSG or EMG, facilitating evaluation of jaw muscle electrical activity during grinding, alongside audio and video recordings during sleep studies. [19]

PSG tests are deemed the most effective diagnostic methods for bruxism, but their use in population studies is still unfeasible due to the high expenses and the need for skilled professionals. [5]

The clinical picture of bruxism in children

Dental symptoms

The primary concern for dentists related to bruxism is the pathological wear of the hard tissues of the teeth. Excessive clenching results in tooth damage and pain. Pathological fractures or increased tooth mobility are frequently observed. Prosthetic restorations can be damaged, and dental procedures may fail. Additionally, exposed dentin, uneven incisal edges, cervical lesions, enamel cracks and damage, and loss or damage to fillings can occur. Other symptoms might include gum recession, reduced saliva production, and limited mouth opening. [4,20]

Temporomandibular disorder (TMD)

Temporomandibular disorder refers to a variety of clinical issues affecting the jaw muscles, temporomandibular joint (TMJ), and related structures, presenting both acoustically and visually. TMD is among the most prevalent conditions in the orofacial area. Symptoms of TMD can encompass pain, impaired jaw function, malocclusion, deviation from the midline when opening or closing the jaw, limited range of motion, and joint locking. Acoustic symptoms include clicking, crepitus, or popping sounds in the TMJ, audible to the child during jaw movements or to the clinician during an examination. Other associated signs and symptoms may include headaches and sleep disturbances. [4,17,21]

In a study by Bagis et al., the most prevalent symptoms of TMD in both women and men were found to be pain in the temporalis muscle (reported by 92% of participants) and pain during mouth opening (reported by 89% of participants).
However, symptoms such as temporomandibular joint pain at rest, masseter muscle pain, clicking, grinding, and the use of antidepressant medications were significantly more common in women. [22]
In their systematic review, de Oliveira Reis et.al determined that children with bruxism have a 2.97 times higher risk of developing TMD. However, the authors acknowledged a substantial risk of systematic error. Nevertheless, a qualitative analysis of individual studies suggested that children with bruxism are at an increased risk of developing TMD. [23]

Musculoskeletal system and headache
It can be inferred that bruxism is to some extent linked with musculoskeletal symptoms, although the evidence is inconsistent and appears to be influenced by various factors such as age, whether bruxism happens during sleep or wakefulness, and the accuracy of diagnosis. Most patients describe experiencing facial and neck discomfort, headaches, or ear pain, which may indicate the onset of TMD. [24]
Individuals with bruxism are also at risk of experiencing migraines and tension headaches. Canto et al. analyzed the correlation between migraines and sleep bruxism, although researchers did not find sufficient scientific evidence to confirm or refute the association between tension-type headaches and migraines associated with sleep bruxism in children. [25]
Patients suffering from episodic migraine experience diminished sleep quality and an elevated likelihood of encountering certain sleep disturbances, including insomnia, sleep-related bruxism, and restless legs syndrome. [26]

Neurological and psychiatric disorders
Furthermore, because of the awakenings associated with episodes of teeth grinding, individuals afflicted by this problem contend with increased daytime drowsiness, reduced mobility, and attention deficits during the day. [2,27]
Souto-Souza et al., in their research, found that children and adolescents diagnosed with ADHD are at a higher risk of experiencing bruxism (both sleep bruxism and awake bruxism) compared to individuals without this disorder. [28]

Treatment
There are multiple approaches to managing SB, which include pharmacological interventions (such as benzodiazepines, anticonvulsants, beta-blockers, dopaminergic medications, antidepressants, muscle relaxants, and others) and psychological therapies (including behavioral therapy focused on sleep hygiene, relaxation techniques, stress management, psychotherapy, hypnosis, and biofeedback). Moreover, dental methods (such as orthodontic treatments, occlusal splints, and bite correction) are used to protect and restore dental health and alleviate pain related to SB. [29]

Pharmacotherapy

One of the most extensively studied medications in the treatment of bruxism in children is hydroxyzine. Studies confirmed its effectiveness in SB therapy. Rahmati et al. studied the effects of hydroxyzine on treating bruxism in children.

Over 140 children were divided into an experimental group, which received hydroxyzine, and a control group, which used hot towels. The results were evaluated multiple times during the treatment and 4 months after the therapy concluded. The findings indicated that administering hydroxyzine for 4 weeks significantly reduced bruxism severity between the groups. However, 4 weeks post-treatment, no significant difference was observed between the control group and the experimental group in terms of treatment response. [30] A comparable study with a smaller patient group was carried out by Ghanizadeh et al. The findings showed that hydroxyzine was more effective than placebo in reducing the severity of bruxism. No serious adverse effects were reported. [31]

The use of diazepam and its efficacy in treating bruxism in children, however, has not been conclusively confirmed. Mostafavi et al. examined the impact of short-term diazepam therapy on bruxism in children. The participants were assigned to three groups: a control group (placebo), an experimental group 1 (low dose of diazepam: 2.5 mg or 5 mg depending on age), and an experimental group 2 (moderate dose of diazepam: 5 mg or 10 mg depending on age). The research indicated that after a 2-week observation period, bruxism severity decreased across all groups. However, increased drowsiness caused by the medication was noted in the experimental groups. [32]

In the treatment of bruxism, the effects of medicinal plant extracts such as Melissa officinalis leaf extract have also been investigated as a natural therapy. However, no statistically significant differences were found between the initial and final muscle activity in both the control and experimental groups in electromyographic studies or in intergroup comparisons. Melissa officinalis extract did not alleviate the symptoms of the condition. [33]

Occlusal Splints

Treatment options for temporomandibular joint disorders include the use of splints, removable devices that often resemble mouthguards. They are designed to alleviate pain in the mouth, face, or jaw. They are also utilized in addressing symptoms related to TMD, such as frequent headaches/migraines, jaw clicking, restricted mouth opening, or tooth wear resulting from teeth grinding (bruxism). [34,35]

The use of dental splints in children has not been thoroughly investigated due to their dental development and eruption of permanent teeth. Despite limited data on the use of dental splints in children, they remain the most commonly utilized treatment method because they provide tooth protection, and no adverse effects have been reported. [34,36,37]

In Giannasi's et al. study, the use of an acrylic resin occlusal splint in 9 patients effectively reduced symptoms of sleep bruxism and other sleep-related issues. [38]

In a study comparing the effectiveness of soft and hard occlusal splints for children with bruxism, no significant change in the outcome of jaw muscle activity was observed in either group. However, muscle pains upon palpation and dynamic pains in the temporomandibular joint position significantly decreased in patients using a soft occlusal splint ($p=0.01$). [39]

In their systematic review, Hardy et al. examined existing literature to assess the efficacy of occlusal splints in treating bruxism compared to no treatment and alternative treatment methods.

The findings indicated a lack of sufficient evidence to determine whether occlusal splint therapy for bruxism offers advantages over no treatment, other oral appliances, Transcutaneous Electrical Nerve Stimulation, behavioral therapy, or pharmacological therapy. [40]
Restrepo et al. assessed the efficacy of occlusal splints in reducing signs and symptoms of TMD, tooth wear, and anxiety in a pediatric bruxism population. Patients in the experimental group did not demonstrate a statistically significant difference in anxiety levels and tooth wear compared to the control group. Subjective and objective TMD symptoms did not decrease, except for a deviation in mouth opening. [41]

Other methods of treatment
Another proposed therapy to alleviate bruxism in children is physiotherapy. Nevertheless, it has only been examined in a few studies, thus its true impact on bruxism remains uncertain. [42]Quintero et al. examined the efficacy of physiotherapy in improving head posture and alleviating bruxism symptoms in a cohort of children with bruxism. Participants in the study group attended physiotherapy sessions once a week for 10 weeks. Statistically significant improvement in natural head posture was noted among individuals in the study group. The authors suggest that physiotherapy may be effective in reducing bruxism in children and adolescents. [43]
Another method under investigation by scientists is photobiomodulation. Salgueiro et al. concluded in their study that bite marks on the cheek mucosa may serve as an additional diagnostic sign in clinical SB diagnosis. Children with SB responded well to photobiomodulation therapy, as evidenced by a reduction in bite force and reported headaches. [44]

Conclusion
There is no one-size-fits-all approach to treating bruxism in children. Treatment involves addressing the oral-facial and dental consequences and evaluating any coexisting medical conditions. Several interventional options are available to control or alleviate bruxism. The appropriate indications, contraindications, and side effects of each treatment option should be carefully evaluated on an individual basis, considering that bruxism is not considered a disorder in healthy individuals. Studies demonstrate a reduction in rhythmic muscle activity of the jaw following the use of an occlusal splint and surgical interventions. The use of medications like diazepam did not show significant improvement among patients, although hydroxyzine was found to be an effective drug in reducing SB severity. Physiotherapy and photobiomodulation also hold significant potential for treating bruxism. Alternative treatment methods, such as medicinal extracts like Melissa officinalis L, have yielded inconclusive results in reducing bruxism.

Declarations

Author's contribution:

Conceptualization, supervision and project administration: Aneta Jerzak, Aleksandra Janocha, Katarzyna Jakubowska

Methodology: Paweł Ziemba, Katarzyna Jakubowska

Software, validation, formal analysis, investigation, resources, writing original draft preparation: Aneta Jerzak, Aleksandra Janocha,

Writing review editing and visualization: Paweł Ziemba

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