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Sleep and Bruxism: A Complex and Compelling Relationship

Uyku ve Bruksizm: Kompleks ve İlginç Bir İlişki

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ABSTRACT

Bruxism is a parafunctional habit characterized by grinding or clenching of teeth during sleep or wakefulness. Sleep is a crucial factor in the pathogenesis of bruxism, with several studies reporting an association between bruxism and sleep disorders such as obstructive sleep apnea and insomnia. In addition, bruxism has been linked to the occurrence of various sleep-related symptoms, such as snoring, sleep fragmentation, and daytime sleepiness. Furthermore, sleep quality and quantity may also affect the frequency and severity of bruxism episodes. Studies have shown that individuals who experience poor sleep quality and insufficient sleep duration are more likely to exhibit bruxism behaviors.

The relationship between sleep and bruxism is complex and multifactorial, involving biological, psychological, and environmental factors. Identifying the underlying mechanisms linking sleep and bruxism may aid in the development of effective diagnostic and therapeutic approaches for bruxism. This review aims to provide a comprehensive overview of the current knowledge on the relationship between sleep and bruxism, highlighting the key findings from clinical and experimental studies. The paper also discusses the potential implications of sleep-related factors in the development, progression, and management of bruxism.

Overall, the evidence suggests that bruxism is strongly associated with sleep disturbances and that clinicians should consider the possibility of underlying sleep disorders in individuals with bruxism.

Keywords: *Bruxism, Sleep, Temporomandibular joint disorders*

ÖZET

Bruksizm, uyku veya uyanıklık sırasında diş gıcırdatma veya sıkma ile karakterize parafonksiyonel bir alışkanlıktır. Uyku, bruksizm patogenezinde çok önemli bir faktördür ve çeşitli çalışmalar bruksizm ile obstrüktif uyku apnesi ve uykusuzluk gibi uyku bozuklukları arasında bir ilişki olduğunu bildirmektedir. Ek olarak bruksizm, horlama, uyku bölünmesi ve gündüz uyku hali gibi çeşitli uyku ile ilgili semptomların ortaya çıkmasıyla ilişkilendirilmiştir. Ayrıca uyku kalitesi ve miktarı da bruksizm ataklarının sıklığını ve şiddetini etkileyebilir. Araştırmalar, düşük uyku kalitesi ve yetersiz uyku süresi olan bireylerin bruksizm davranışları sergileme olasılığının daha yüksek olduğunu göstermiştir.

Uyku ve bruksizm arasındaki ilişki biyolojik, psikolojik ve çevresel faktörleri içeren karmaşık ve çok faktörlüdür. Uyku ve bruksizmi birbirine bağlayan altta yatan mekanizmaların belirlenmesi, bruksizm için etkili tanısal ve terapötik yaklaşımların geliştirilmesine yardımcı olabilir. Bu gözden geçirme, klinik ve deneysel çalışmalardan elde edilen önemli bulguları vurgulayarak, uyku ve bruksizm arasındaki ilişki hakkındaki mevcut bilgilere kapsamlı bir genel bakış sunmayı amaçlamaktadır. Bu makale aynı zamanda bruksizmin gelişimi, ilerlemesi ve yönetiminde uyku ile ilgili faktörlerin potansiyel etkilerini tartışmaktadır.

Genel olarak, kanıtlar bruksizmin uyku bozuklukları ile güçlü bir şekilde ilişkili olduğunu ve klinisyenlerin bruksizmli bireylerde altta yatan uyku bozuklukları olasılığını göz önünde bulundurması gerektiğini göstermektedir.

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Introduction

Bruxism is defined as the involuntary grinding or clenching of teeth, which may occur during daytime and sleep.[1] It is a common condition that affects both children and adults, has significant negative impacts on dental health and quality of life.[2]

The etiology of bruxism is multifactorial and includes psychological factors such as stress and anxiety, as well as dental factors such as malocclusion.[3] Some medications, including certain antidepressants and antipsychotics, may also increase the risk of bruxism.[2] Symptoms of bruxism include tooth wear and damage, jaw pain and discomfort, headaches, and disrupted sleep.[1] Diagnosis of bruxism typically involves a clinical examination by a dentist or sleep specialist, as well as potentially using tools such as a dental impression or electromyography to monitor muscle activity during sleep.[2]

Treatment for bruxism may vary depending on the underlying causes and severity of the condition and may include stress management techniques, dental appliances such as mouthguards, and medications such as muscle relaxants.[1]

Sleep is essential for maintaining physical and mental health.[4] Sleep deprivation may lead to various negative consequences, including impaired cognitive function, increased risk of accidents, cardiovascular disease, and compromised immune function.[5-8] Chronic sleep deprivation has also been linked to obesity, type II diabetes, and depression.[9] The consequences of poor sleep are not limited to adults, as children and adolescents also experience adverse effects such as impaired academic performance and behavioral problems. Therefore, it is important to prioritize sleep hygiene and ensure adequate sleep duration to promote overall health and well-being.[10]

Bruxism has a significant impact on sleep quality and duration.[11] Sleep is a vital physiological process that plays a critical role in the maintenance of physical and mental health. Poor sleep quality has been linked to a range of adverse health outcomes, including cardiovascular disease, metabolic disorders, cognitive impairment, and mental health problems.[12-13] Therefore, understanding the relationship between bruxism and sleep is of great importance in the promotion of overall health and well-being. A growing body of research has investigated the impact of bruxism on sleep architecture, sleep continuity, and sleep-related disorders such as obstructive sleep apnea. However, the underlying mechanisms that drive the relationship between bruxism and sleep are not yet fully understood. By exploring this relationship in more detail, this paper aims to contribute to the existing knowledge on the topic and inform future research directions.[2,14]

Bruxism

Bruxism is classified into two main types: diurnal bruxism and nocturnal bruxism. Diurnal bruxism refers to the habitual clenching or grinding of teeth during the daytime, often in response to stress, anxiety, or tension. On the other hand, nocturnal bruxism occurs during sleep, typically during periods of deep sleep or rapid eye movement (REM) sleep and is characterized by rhythmic or non-rhythmic contractions of the jaw muscles that lead to tooth grinding or clenching.[15]

Research has shown that both types of bruxism may have distinct etiologies, risk factors, and treatment approaches. For instance, diurnal bruxism has been associated with psychological factors such as anxiety and depression, as well as physical factors such as temporomandibular joint disorders (TMDs) and malocclusion.[3] In contrast, nocturnal bruxism has been linked to factors such as sleep apnea, snoring, and gastroesophageal reflux disease (GERD).[1] It is important to distinguish between awake and nocturnal bruxism as their underlying causes and potential consequences may differ. Moreover, accurate diagnosis and appropriate management of bruxism can help improve the quality of life for affected individuals and prevent or minimize associated dental and oral health complications.[3]

Bruxism, both awake and sleep, can have various causes, including stress, anxiety, and medication use. Stress and anxiety have been reported as significant contributing factors to the development of bruxism, with individuals who experience high levels of stress or anxiety being at a higher risk of developing bruxism.[2] Additionally, certain medications, such as selective serotonin reuptake inhibitors (SSRIs), have been found to increase the risk of bruxism, possibly by affecting the central nervous system.[16]

Dental problems can also contribute to the development of bruxism. Malocclusion, or a

misalignment of the teeth, has been associated with an increased risk of bruxism. Additionally, individuals with missing teeth or those who have had dental restorations that do not fit properly may be more likely to grind or clench their teeth.[17]

Other potential causes of bruxism include genetics and lifestyle factors such as smoking and alcohol consumption. It is important for dental clinicians to carefully evaluate and identify potential causes of bruxism to develop appropriate treatment plans.[15]

Symptoms of bruxism

Bruxism, characterized by teeth grinding and jaw clenching, is associated with several symptoms. One of the most common symptoms of bruxism is tooth wear, which may lead to tooth sensitivity, enamel damage, and an increased risk of dental fractures.[3] Bruxism can also cause muscle pain and stiffness in the jaw, face, and neck, as well as headaches and earaches. In some cases, bruxism can even cause temporomandibular joint (TMJ) dysfunction, which can lead to pain and difficulty opening and closing the mouth.[3,15] Sleep disruption is another symptom commonly associated with bruxism, particularly in cases of nocturnal bruxism.[15]

Diagnosis and treatment of bruxism

Diagnosis of bruxism can be challenging, as patients may not be aware of their symptoms or may not report them to their healthcare provider. However, dentists can play a crucial role in identifying the presence of bruxism by examining the patient's teeth for signs of wear and fracture. Additionally, imaging studies such as magnetic resonance imaging (MRI) or computed tomography (CT) scans may be used to assess the extent of damage to the jaw joint or surrounding tissues.[18]

Treatment options for bruxism may vary depending on the severity of the condition and the underlying cause. Behavioral interventions such as relaxation techniques and biofeedback have been shown to be effective in reducing the frequency and intensity of bruxism.[11] Dental devices such as mouthguards or splints may also be used to protect the teeth and reduce the impact of grinding and clenching.[19]

In cases where bruxism is caused by an underlying medical condition, such as sleep apnea or gastroesophageal reflux disease (GERD), treating the underlying condition may alleviate bruxism symptoms.[20] Medications such as muscle relaxants or antidepressants may also be prescribed in some cases.[21]

In summary, the diagnosis of bruxism typically involves a comprehensive evaluation by a healthcare provider, which may include a physical examination, dental assessment, and medical history review.[14] Imaging studies, such as magnetic resonance imaging (MRI) and computed tomography (CT) scans, may also be used to assess the extent of damage to the jaw joint and surrounding tissues.[11] Treatment options for bruxism vary depending on the severity of the condition and its underlying cause. Behavioral interventions, such as relaxation techniques and cognitive behavioral therapy, may be effective for reducing stress and anxiety-related bruxism.[3] Dental devices, such as mouthguards and splints, can help protect the teeth from damage caused by grinding and clenching.[2] In some cases, medication such as muscle relaxants or botulinum toxin injections may be prescribed to alleviate symptoms.[1]

Sleep

Sleep is an essential physiological process that plays a crucial role in maintaining overall health and well-being. Adequate sleep has been shown to have positive effects on various aspects of physical and mental health, including immune function, cognitive performance, mood regulation, and cardiovascular health.[22] In contrast, chronic sleep deprivation has been associated with a range of negative health outcomes, such as increased risk of obesity, diabetes, hypertension, and depression.[23]

The amount and quality of sleep required varies across different age groups, with infants requiring up to 14-17 hours of sleep per day, while adults generally require 7-9 hours of sleep per night.[24] In addition to the quantity of sleep, the quality of sleep is also important. Sleep quality is determined by factors such as sleep onset latency, total sleep time, sleep efficiency, and the presence of sleep disturbances such as apnea or snoring.[23]

Given the importance of sleep for overall health and well-being, it is essential to prioritize healthy sleep habits and to identify and address any sleep disorders that may be interfering with optimal sleep. This may involve lifestyle modifications, such as establishing

a regular sleep schedule, avoiding stimulants such as caffeine and nicotine, and engaging in regular physical activity. In cases where a sleep disorder is suspected, a healthcare provider may conduct a comprehensive sleep evaluation, which may include polysomnography, multiple sleep latency testing, or other diagnostic tests, in order to identify and appropriately treat the underlying condition.[24]

Stages of sleep

Sleep is a complex physiological process that involves two main stages, non-rapid eye movement (NREM) and rapid eye movement (REM) sleep. NREM sleep is further divided into three stages, with stage 1 being the lightest stage and stage 3 being the deepest. During NREM sleep, the body repairs and regenerates tissues, strengthens the immune system and consolidates memories.[25] In contrast, during REM sleep, the brain becomes highly active and dreams occur, while the body experiences temporary muscle paralysis.[26] REM sleep is also important for emotional regulation, memory consolidation, and learning.[25]

The stages of sleep are typically monitored using electroencephalography (EEG), which measures brain wave activity, and other physiological measures such as eye movements and muscle tone. These measurements allow researchers to identify the different stages of sleep and to study the functions of each stage. In healthy individuals, a normal sleep cycle consists of several cycles of NREM and REM sleep throughout the night, with each cycle lasting approximately 90 minutes.[25]

The quality and quantity of sleep can have a significant impact on physical and mental health. Chronic sleep deprivation or disruption of the normal sleep cycle has been associated with an increased risk of cardiovascular disease, diabetes, obesity, and mental health disorders such as depression and anxiety. It is therefore important to maintain healthy sleep habits and to seek medical attention if sleep disturbances persist.[27]

Sleep is a complex physiological process that can be disrupted by a variety of factors, including physical, psychological, and environmental factors. Sleep disorders are common and can have a significant impact on an individual's overall health and well-being. Insomnia is a sleep disorder characterized by difficulty falling or staying asleep, which can lead to fatigue, mood disturbances, and impaired cognitive function.[28] Sleep apnea is another common sleep disorder, which is characterized by repetitive episodes of partial or complete obstruction of the upper airway during sleep. This can lead to disrupted sleep, daytime sleepiness, and an increased risk of cardiovascular disease and other health problems.[29] Restless legs syndrome is a neurological disorder characterized by an irresistible urge to move the legs, often accompanied by uncomfortable sensations in the legs that occur primarily at rest or in the evening or nighttime hours.30 Narcolepsy is a chronic neurological disorder characterized by excessive daytime sleepiness, cataplexy (sudden loss of muscle tone), sleep paralysis, and hypnagogic hallucinations.[31] Other sleep disorders include periodic limb movement disorder, which involves repetitive movements of the limbs during sleep, and circadian rhythm disorders, which result from a mismatch between an individual's internal biological clock and the external environment.[1]

Relationship Between Bruxism and Sleep

Bruxism, which involves grinding or clenching of teeth, is closely related to sleep. In fact, it is classified as a sleep-related movement disorder (SRMD) by the International Classification of Sleep Disorders (ICSD-3).[1] Bruxism occurs during sleep, specifically during the stages of non-rapid eye movement (NREM) sleep, and can be associated with arousal and disruption of sleep.[32] Research has shown that there is a strong association between bruxism and certain sleep disorders, such as obstructive sleep apnea (OSA) and periodic limb movements (PLMs), suggesting a shared pathophysiology.[33] In addition, some studies have suggested that nocturnal bruxism may be a potential risk factor for developing OSA.34 The relationship between bruxism and sleep is complex, and more research is needed to fully understand the underlying mechanisms and potential therapeutic interventions.

Several studies have reported on the prevalence of bruxism, both in its generic form and specifically in relation to awake and nocturnal bruxism. Two studies investigating generic bruxism reported prevalence rates ranging from 8% to 31.4%, while two studies investigating diurnal bruxism found rates ranging from 22.1% to 31%. The prevalence

of nocturnal bruxism, however, was found to be more consistent across three studies, with rates ranging from 9.7% to 14.8% for "frequent" bruxism (mean ± SD: 12.8% ± 3.1%).[14,35] Another study of 141 patients with OSA found that the prevalence of bruxism was 59.6%, significantly higher than in a control group.[36] Additionally, research has shown a significant association between bruxism and other sleep disorders such as periodic limb movements during sleep (PLMS)[37] and rapid eye movement (REM) sleep behavior disorder (RBD).[38] These findings suggest that there is a strong relationship between bruxism and sleep disorders, and that individuals with sleep disorders may be at a higher risk of developing bruxism.

Bruxism has been shown to have a negative impact on sleep quality and duration. A study found that bruxism was associated with a reduction in the amount of time spent in the deeper stages of sleep, including slow wave sleep and REM sleep.[32] Additionally, individuals with bruxism often experience disruptions in their sleep, with frequent awakenings throughout the night.[2] These disruptions can lead to a feeling of unrefreshed sleep and daytime sleepiness, which can affect overall health and well-being. Furthermore, the loud grinding or clenching noises associated with bruxism can also disturb the sleep of bed partners.[11] Therefore, it is important to properly diagnose and treat bruxism to improve sleep quality and overall health.

Bruxism has been linked to various sleep disorders, and the potential causes of bruxism related to sleep disorders are still being investigated. One theory suggests that bruxism may be a compensatory mechanism that occurs during sleep to maintain airway patency and alleviate breathing problems associated with sleep-disordered breathing (SDB).[39] SDB encompasses a range of disorders, including snoring, upper airway resistance syndrome, and obstructive sleep apnea (OSA), and has been associated with increased risk of bruxism.[14,37] Additionally, certain medications used to treat sleep disorders, such as continuous positive airway pressure (CPAP) therapy, have been associated with increased incidence of bruxism.[40]

Other potential causes of bruxism related to sleep disorders include changes in neurotransmitter activity during sleep, which may affect the regulation of muscle tone and lead to increased muscle activity.[41] Psychological factors, such as anxiety and stress, may also play a role in the development of bruxism related to sleep disorders, as they are common in individuals with sleep disorders.[42] More research is needed to fully understand the mechanisms underlying the relationship between bruxism and sleep disorders.

Bruxism, a parafunctional activity involving clenching and grinding of teeth, has been associated with various sleep disorders in both children and adults. In children, studies have shown a high prevalence of bruxism among those with sleep-disordered breathing (SDB).[19,43] A recent meta-analysis reported that the odds of bruxism in children with SDB were almost four times higher compared to those without SDB.[32] In adults, sleep apnea has been found to be associated with a higher risk of bruxism, with one study reporting a prevalence of 42% in patients with obstructive sleep apnea (OSA).[15] Additionally, studies have found a higher prevalence of bruxism in individuals with other sleep disorders, such as restless legs syndrome and rapid eye movement sleep behavior disorder.[44] The relationship between bruxism and sleep disorders may be bidirectional, with poor sleep quality and quantity potentially exacerbating bruxism and vice versa.[33,45]

Conclusion

Bruxism is a common condition that can significantly impact an individual's sleep quality and overall health. The relationship between bruxism and sleep disorders is complex, with evidence suggesting that nocturnal bruxism is more prevalent than diurnal bruxism and that it may be associated with various sleep disorders. While significant progress has been made in understanding the relationship between bruxism and sleep, there is still much to be explored. Future research could focus on investigating the underlying mechanisms and pathways that connect sleep disorders with bruxism, as well as identifying effective treatments and interventions to address both conditions simultaneously. Additionally, there is a need for further investigation into the role of stress and psychological factors in the development and maintenance of bruxism and how these may interact with sleep disturbances. Advancements in technology and novel research methods, such as

wearable devices and biomarkers, may also offer new insights into bruxism and sleep disorders. By continuing to explore these areas of research, we can gain a better understanding of the complex relationship between bruxism and sleep and improve the diagnosis, treatment, and management of these conditions.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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