

Dental and Neurological Approach in the Treatment of Bruxism

Bruksizm Tedavisinde Dental ve Nörolojik Yaklaşım

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ABSTRACT

Bruxism is a parafunctional habit characterized by teeth grinding and/or clenching. Although the etiology is not known exactly, it is considered to have a multifactorial nature. The potential etiological factors are stress, genetic factors, malnutrition, central nervous system dysfunctions, allergic/endocrine diseases, drug use, malocclusion and incorrect dental treatment practices. As a result of bruxism; fractures/abrasions of teeth, temporomandibular joint dysfunction, orofacial pain, loss of support/mobility in periodontal tissues can be seen. Dental treatment approaches include multidisciplinary approach, tooth realignment, restoration/renewal of restorations, occlusal appliances, splints, removal of temporomandibular joint irregularities and botox applications. However, there is no treatment method that permanently eliminates bruxism. This may be associated with the fact that the pathophysiology of bruxism is not limited to the oral region and teeth, but is also related to the autonomic nervous system. Autonomic symptoms include sweating in the palms, rapid breathing, balance/digestive disorders, tightness in the throat/chest, tinnitus, nausea, heart palpitations and difficulty swallowing.

Therefore, the addition of the methods regulating the sympathetic and parasympathetic nervous system to traditional methods may be useful for effective treatment of bruxism.

In this review, the fundamental knowledge is presented in line with current literature about the dental and neurological treatment approach for bruxism.

Keywords: *Bruxism, dental approach, autonomic nervous system, neurological consultation*

ÖZ

Bruksizm diş gıcırdatma ve/veya sıkma ile karakterize, parafonksiyonel bir alışkanlıktır. Etiyolojisi günümüzde tam olarak bilinmemekle birlikte, multifaktöriyel doğaya sahip olduğu öngörülmektedir. Etiyolojik faktörleri; stres, genetik faktörler, malnütrisyon, santral sinir sistemi disfonksiyonları, alerjik/endokrin hastalıklar, ilaç kullanımı, maloklüzyon ve hatalı dental tedavi uygulamaları olarak sayılabilir. Bruksizm sonucu; dişlerde kırık/aşınmalar, temporomandibular eklem disfonksiyonu, orofasiyal ağrı, periodontal dokularda destek kaybı/mobilité görülebilmektedir. Dental tedavi yaklaşımları; multidisipliner yaklaşım, dişlerde düzenleme, restorasyonların düzenlenmesi/yenilenmesi, oklüzal apareyler, splintler, temporomandibular eklem düzensizliklerinin giderilmesi ve botoks uygulamalarını içermektedir. Ancak bruksizmi kalıcı olarak ortadan kaldıran bir tedavi yöntemi henüz bulunmamaktadır. Bu durum, bruksizmin fizyopatolojisinin sadece oral bölge ve dişler ile sınırlı kalmayıp, otonom sinir sistemi ile ilişkili olmasından kaynaklanabilir. Otonom semptomlar arasında; avuç içlerinde terleme, hızlı soluk alma, denge/sindirim bozuklukları, boğaz/göğüste sıkışma hissi, kulak çınlaması, bulantı, kalpte çarpıntı ve yutkunma güçlüğü sayılabilir. Bruksizm tedavisinde geleneksel yöntemlere, sempatik ve parasempatik sinir sistemini düzenleyen yöntemlerin eklenmesi etkin tedavi için yararlı olabilir.

Bu derlemede bruksizmin tedavisinde dental ve nörolojik yaklaşım hakkında güncel literatür doğrultusunda temel bilgiler aktarılmaktadır.

Anahtar Kelimeler: *bruksizm, dental yaklaşım, otonom sinir sistemi, nörolojik konsültasyon*

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INTRODUCTION

Bruxism is a habit that is quite common in society. It is defined as teeth grinding and/or clenching occurring during sleep and/or while awake. Although the underlying neurochemical mechanisms of bruxism have not yet been fully resolved, the psychosocial factors such as stress and personality traits are considered as significant in its etiology.¹ As a result of bruxism, numerous problems can arise in the teeth, temporomandibular joint, and head-neck region. These problems significantly reduce the quality of life. Therefore, the primary aim of bruxism treatment is to prevent permanent damage to the teeth and temporomandibular joint and eliminate the pain.²

The current treatment approaches for bruxism include individualized methods (cognitive-behavioral therapy), pharmacological approaches, and dental approaches.³ However, it is not yet possible to completely eliminate the bruxism symptoms. Although occlusal bite plates can prevent the negative effects of bruxism, there is no conclusive evidence about their effectiveness, and bruxism may recur after discontinuation of occlusal treatment.¹

Despite the numerous studies on bruxism for over a century, its etiology has not yet been fully understood, and this situation poses a challenge for effective treatment. One of the complicating factors is increased sympathetic activity and decreased parasympathetic tone in bruxism patients, along with the appearance of findings related to the autonomic nervous system. Additionally, it has been reported that bruxism may be directly or indirectly related to various systems in the body, such as the hypothalamus-pituitary-adrenal axis and the brain-gut axis.⁴

The Definition of Bruxism

Bruxism is a parafunctional habit characterized by teeth grinding and/or clenching. Teeth clenching is described as a static relationship where the mandible forms an occlusion with the maxilla in a centric or eccentric position, while teeth grinding is described as a dynamic relationship that occurs when the mandible creates a forceful closure with the maxilla during different mandibular excursions.⁵ Bruxism is more commonly observed as teeth clenching while awake, whereas both clenching and grinding movements can occur together during sleep. Over the years, various terms have been used to describe this parafunctional activity, such as non-functional grinding of the teeth, Karolyi effect, occlusal habit neurosis, bruxomania, and traumatic neuralgia.⁶

Some researchers classify bruxism into two different types as: idiopathic and iatrogenic.⁷⁻⁹ The idiopathic bruxism is the habit of teeth clenching without any medical cause.¹⁰ The iatrogenic bruxism, on the other hand, is defined as bruxism caused by neurological disorders, psychiatric disorders, sleep disorders, or drug use.⁸

The Etiology of Bruxism

Although the etiology of bruxism is not fully known today, it is thought to have a multifactorial nature. The etiological factors can be listed as stress, genetic factors, malnutrition, central nervous system dysfunctions, allergic/endocrine diseases, drug use, malocclusion, and improper dental treatments.² These factors can be examined under the headings of local, systemic, psychological, occupational, and hereditary factors (Table 1).

Table 1: The Etiological Factors of Bruxism

LOCAL	SYSTEMIC	PSYCHOLOGICAL	OCCUPATIONAL	GENETIC
<ul style="list-style-type: none"> • Occlusal discrepancies • Inappropriate dental treatments • Malocclusion 	<ul style="list-style-type: none"> • Central nervous system dysfunctions • Medication use • Allergic/endocrine disorders 	<ul style="list-style-type: none"> • Stress • Tendency to be aggressive, anxious, and hyperactive • Social withdrawal 	<ul style="list-style-type: none"> • Negative perception of the work environment • Occupational responsibility 	<ul style="list-style-type: none"> • HTR2A gene • Family-acquired habits

The local factors include occlusal irregularities, improper dental treatments, and malocclusion. These factors cause hyperactivity in the masticatory muscles. Systemic factors include central nervous system dysfunctions, drug use, and allergic/endocrine diseases. Lobbezoo et al.¹¹ investigated the effects of the central nervous system on the etiology of bruxism and identified damage in five subcortical nuclei responsible for maintaining motor balance and coordination between the direct and indirect pathways to the basal ganglia in

bruxism patients. It has been reported that brain trauma can also cause bruxism.¹² Additionally, ischemic damage to the basal ganglia, cerebral palsy, Down syndrome, epilepsy, Parkinson's disease, and Rett syndrome have been reported to either cause bruxism or be observed in individuals with these conditions.¹³⁻¹⁸ Bruxism has also been diagnosed alongside several sleep disorders (e.g., restless legs syndrome).^{8,19} Some of these movement disorders occur spontaneously, while others are the result of drugs affecting the central nervous system.²⁰

Therefore, drugs affecting the neurotransmitter system are believed to play a role in the development of secondary bruxism.¹¹

Among the psychological factors, one of the causes of bruxism is emotional stress. A stressful life is believed to be a trigger for bruxism.²¹ Stress increases the frequency and severity of bruxism, while relaxation reduces it.²¹ The significant psychopathological disorders are rare in bruxism patients, but it has been shown that personality traits increase stress.²⁰ Bruxism patients have been observed to be prone to aggression, anxiety, and hyperactivity.^{22,23} Kampe et al.²⁴ observed that individuals with bruxism were more prone to psychosomatic illnesses and were more asocial compared to the general population.

Regarding occupational factors, the perception of a negative work environment has been reported in the literature as a potential risk factor for bruxism.²⁵ In a study conducted by Nekora-Azak et al.²⁶, the participants were grouped into nine job categories as: self-employed, civil servant, housewife, healthcare worker, student, retiree, engineer, office worker, and light manual laborer. The habit of teeth clenching was found to be highest among healthcare workers (57.8%) and lowest among engineers (30.8%).²⁶ This is associated with higher professional responsibility among healthcare personnel.²⁵

In a study on genetic factors conducted by Abe et al.²⁷, polymorphism in the HTR2A gene was found to be a high-risk factor for the development of sleep bruxism. Additionally, a study by Seraj et al.²⁸ involving 600 children aged 4-12 found that children with a family history of bruxism had a 2.6 times higher prevalence of bruxism compared to those without such a history. Bruxism is thought to be a hereditary or family-acquired habit.²⁹

The Signs and Symptoms of Bruxism

The symptoms and signs of bruxism vary from person to person. The most common complaints from patients include headaches, tooth wear, fractures, looseness, pain, sensitivity, joint injuries, and pain in the masticatory muscles. Although bruxism causes many pathological conditions, it is thought that the most commonly observed effect is tooth wear.⁹

As a result of bruxism, tooth fractures/wear, temporomandibular joint dysfunction, orofacial pain, and loss of support/mobility in the periodontal tissues may be observed. The fractures and recurring failures in restorations and prosthetics, bite marks on the tongue/cheeks, tooth sensitivity, jaw locking, and sounds in the temporomandibular joint are also common findings. The pain in the temporomandibular joint region, head and neck pain are caused by bruxism. These pain types originate from spasms of the masticatory muscles.

The increased tone, hypertrophy, pain, and tenderness when palpating the masticatory muscles are also observed in bruxism.¹ Costa et al.³⁰ reported in a study that the patients with bruxism most frequently complained of headaches, with bruxism being present in 71.4% of these patients. The pain is usually bilateral and localized in the temporal, frontal, and occipital areas, characterized by a feeling of tension/pressure.³¹

It has been reported that patients with sleep bruxism have higher tooth mobility in the morning than at other times of the day.¹ The non-functional activities that generate occlusal forces, especially when concentrated on a few teeth, can affect the blood flow from the apical foramen, leading to pulpitis.¹ Bruxism can also lead to attrition.³² The attrition caused by bruxism is more severe and progresses more quickly.³³ The wear related to functional activity is most commonly observed on functional cusps (maxillary palatal, mandibular buccal).¹⁸

Other intraoral and extraoral findings that may be associated with bruxism include facial asymmetry, inadequate lip closure, mouth breathing, and anterior/posterior crossbite.³⁴ Radiographic examination may present the loss of lamina dura/periodontal space, root and bone resorption, root fractures, and hypercementosis.^{35,36}

The Treatment Approaches in Bruxism

The excessive force exerted by the masticatory muscles on the teeth in bruxism is a risk factor for tooth wear, muscle and/or joint pain, joint locking, joint sounds, and prosthetic restorations.³⁷ Current treatments for bruxism focus on reducing excessive muscle activity and protecting structures that may potentially be affected, such as the teeth, masticatory muscles, and temporomandibular joint.³⁷

Dental treatment approaches include a multidisciplinary approach, tooth alignment, restoration adjustments/renewal, occlusal appliances, splints, resolution of temporomandibular joint disorders, and Botox applications. Since the etiology of bruxism is multifactorial, its treatment should also be addressed with a multidisciplinary approach.

The occlusal appliances or splints are used in bruxism treatment to prevent malocclusion and tooth wear.³⁵ It has been reported that occlusal splints reduce muscle activity during sleep.³⁸ The hard splints are more effective than soft splints, although this effect is not permanent.^{39,40} One positive aspect of occlusal splints in bruxism patients is the stimulation of protective reflex activity in the neuromuscular system and establishment of a negative feedback mechanism to prevent severe muscle activity.²

The occlusal adjustments include occlusal balancing, occlusal rehabilitation, and orthodontic treatment to ensure harmony between occlusal surfaces.⁴¹ However,

these are not sufficient to treat bruxism on their own. It has been reported that occlusal adjustments have no therapeutic value and should only be included in the periodontal treatment plan in cases of occlusal trauma.³⁵

One of the key points in bruxism treatment is the modification or adjustment of poorly prepared restorations. In the presence of bruxism, the restoration materials resistant to fracture and wear should be selected.⁴² Temporomandibular disorders are among the most common issues in dentistry.⁴³ They can lead to serious problems as they affect functions such as breathing and swallowing. The treatment often begins with the preparation of an intraoral appliance (night guard). For acute pain and locking, intra-articular lavage (arthrocentesis) and joint manipulation may be necessary.

The botox applications are a very popular treatment method for bruxism patients. The agent used in this application is a neurotoxin produced by the gram-positive anaerobic bacterium *Clostridium botulinum*.⁴⁴ Botox application has been shown to be a safe and effective treatment that demonstrates superior clinical results compared to conventional methods such as occlusal splints, pharmacotherapy, and cognitive-behavioral therapy, particularly in patients diagnosed with severe bruxism.⁴⁴

The Difficulties in the Treatment of Bruxism

Numerous studies have been conducted over the years to eliminate bruxism. However, there is still no treatment method that permanently eradicates bruxism. This may be due to the fact that the pathophysiology of bruxism is not limited to the oral region and teeth but is also related to the autonomic nervous system. In addition to dental approaches, cognitive-behavioral therapy, pharmacological approaches, and lifestyle changes may be included in the treatment plan to eliminate bruxism. In cognitive-behavioral therapy, biofeedback, meditation, hypnosis, and psychoanalysis are used, while pharmacological approaches include muscle relaxants (benzodiazepines), anticonvulsants (gabapentin), dopaminergic drugs (L-dopa), tricyclic antidepressants (amitriptyline), and sympatholytics (propranolol).^{35,45} Lifestyle changes involve dietary modifications and stress reduction. The current view is that bruxism occurs more through central mechanisms than peripheral mechanisms.⁸ Further research is necessary to clearly clarify the etiology of bruxism for its effective treatment.

The Autonomic Nervous System Involvement in Bruxism

Autonomic symptoms of bruxism include sweating in the palms, rapid breathing, balance/digestion disorders, a feeling of tightness in the throat/chest, tinnitus, nausea, palpitations, and difficulty swallowing. There is strong evidence in the literature indicating decreased parasympathetic tone and increased sympathetic activity,

i.e., autonomic nervous system dysregulation, in individuals with sleep bruxism.^{46,47} This is important for clinicians as autonomic nervous system dysfunction should be considered when treating bruxism patients.⁴

Current literature on the pathophysiology of sleep bruxism supports the view that teeth grinding occurs as a final condition after micro-stimulation.⁴⁸ In individuals, sympathetic-cardiac tone increases approximately 4-8 minutes before a bruxism episode, leading to micro-stimulation (increased cortical EEG activity) and tachycardia, followed by rhythmic masticatory muscle activity, which participates in teeth grinding due to increased tone in the suprahyoid muscles.^{49,50}

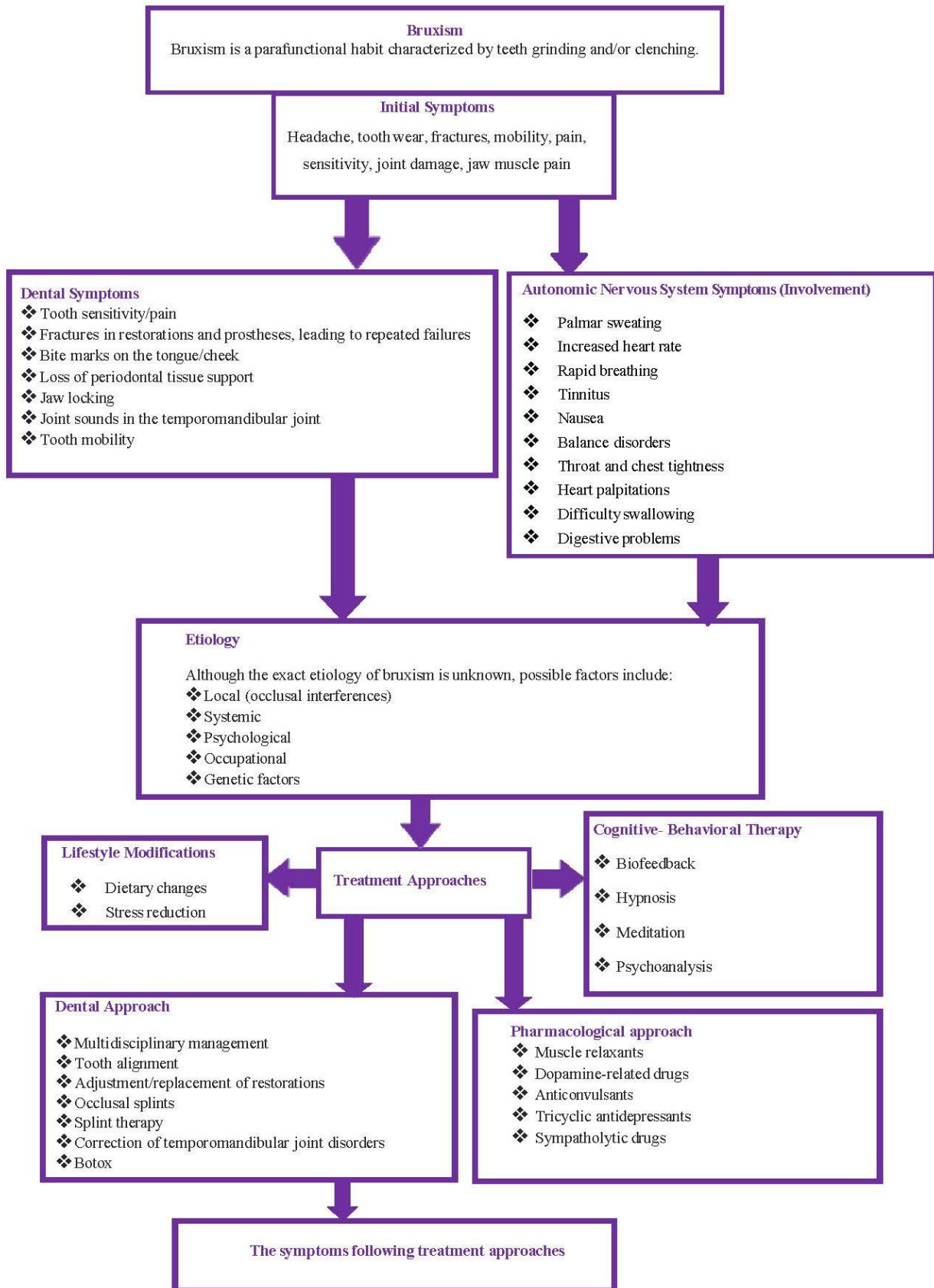
Tinnitus may also be seen in individuals diagnosed with bruxism. It is suggested that the increased activity of the masticatory and tensor tympani muscles due to bruxism affects the auricular system, resulting in tinnitus.⁵¹

Bruxism is an anxiety response to environmental stress.⁵² Therefore, symptoms of anxiety can also be observed in bruxism. Most individuals with generalized anxiety disorder complain of physical symptoms, including sweating in the palms, difficulty swallowing, difficulty breathing, palpitations, nausea, tinnitus, and dizziness.⁵³

Anxiety is often characterized by autonomic nervous system symptoms such as headaches, chest tightness, and gastrointestinal discomfort.⁵⁴ In a study by Salamon et al.⁵⁵, it was stated that heart rate and blood pressure values increased due to anxiety. In bruxism patients, careful evaluation of these symptoms for potential autonomic nervous system involvement and the need for neurological consultation would be beneficial.

Conclusion and Recommendations

In order to successfully manage the bruxism, many factors need to be considered, and the treatment approach is summarized in Figure 1. It is not very common for individuals with bruxism to consult a neurologist, but the possibility of an underlying neurological problem is not rare and should not be overlooked. Especially when autonomic nervous system involvement is concerned, bruxism cannot be treated with dental approaches alone. Therefore, adding methods that regulate the sympathetic and parasympathetic nervous systems to traditional approaches may be beneficial for effective treatment. Additionally, it would be meaningful for a neurologist to evaluate the etiological causes potentially related to central nervous system dysfunction in order to ensure a complete diagnosis and treatment. At this point, neurological consultation in patients not showing improvement in symptoms with other treatment approaches is crucial for both improving the quality of life and eliminating symptoms, as well as for successful treatment.



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