

The Relationship Between Tooth Wear and Bruxism in Patients with Temporomandibular Disorders: Review

Temporomandibular Düzensizliği Olan Hastalarda Diş Aşınması ve Bruksizm ile İlişkisi

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ABSTRACT Bruxism is a common parafunctional activity that includes grinding or clenching of the teeth. It may occur without any signs or harmful effects to the masticatory system but may as well cause increased tooth wear and pain. The purpose of the present study was to review the literature concerning this relationship in an attempt to further clarify the issue. Bruxism is believed to be a contributing or causative factor of temporomandibular disorders, and treatment is designed to decrease bruxism activity. However, much controversy exists over the interrelationship between bruxism and temporomandibular disorders. As a conclusion, it is not clear if there is association between bruxism and tooth wear in temporomandibular disorders.

Key Words: Temporomandibular joint disorders; bruxism

ÖZET Bruksizm, diş sıkma veya diş gıcırdatma şeklinde parafonksiyonel bir aktivitedir. Çiğneme sisteminde hiçbir belirti vermeden veya zararlı bir etki oluşturmadan meydana gelebilir, fakat dişlerde aşınma ve ağrıya neden olabilir. Bu çalışmanın amacı, aşınma konusuyla ilgili yayınlanmış literatürleri incelemek ve derlemektir. Bruksizmin temporomandibular düzensizliklere neden olduğuna inanılmaktadır ve tedavisi bruksizm aktivitesini azaltmaktır. Bununla birlikte bruksizm ve temporomandibular düzensizlik arasındaki ilişki konusunda tartışmalar da vardır. Sonuç olarak temporomandibular düzensizlikte diş aşınması ve bruksizm arasında ilişki olup olmadığı tam olarak açıklık kazanmamıştır.

Anahtar Kelimeler: Temporomandibular düzensizlikler; bruksizm

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The term of temporomandibular disorders (TMD) refers to a subclassification of musculoskeletal disorders affecting the masticatory muscles and/or the temporomandibular joint (TMJ).¹ The most common symptom is pain, which is usually aggravated by chewing or other jaw functions.²

Temporomandibular disorders are characterized by pain in the preauricular region, TMJ, or muscles of mastication; limitation or deviation in the mandibular range of motion; TMJ sounds (clicking, popping, and crepitus) during mandibular function.³ Common patient complaints are headache, neckache, earache, and other pains in facial region. TMD is often associated with pain and/or parafunctional activities, such as bruxism.⁴

There is uncertainty about the cause of TMD because of the limited knowledge regarding the etiology and natural history of course of TMD. The contributing etiologic factors of TMD can be divided into predisposing, initiating and perpetuating factors.⁵ Predisposing factors as the pathophysiological, psychologic or structural processes change the masticatory system to increase the risk of TMD. These factors cause initiation of symptoms which are related to trauma or adverse loading of the masticatory system. During bruxism, continuous and repetitive trauma, adverse loading of the masticatory system are occurred. Bruxism may result in adverse loading of the temporomandibular joint and muscles, and causes excess tooth wear, sensitivity and mobility.⁶ Perpetuating factors involve the behavioral, social, emotional and cognitive difficulties of the patient. The controversy of the importance of each contributing factors is existed.⁷⁻¹¹

The goals of treatment for TMD include the reduction of pain, minimalization of loading of the masticatory system, and restoration of the function.³ Treatment approach is education and self-care of the patient, exercises, physical therapy, relaxation, biofeedback, cognitive-behavioral interventions, occlusal splints, occlusal adjustment, occlusal rehabilitation, orthodontics, pharmacotherapy including intra-articular injections, and TMJ surgery. There are some general guidelines for management of TMD as a variant of musculoskeletal disorders. Therefore, TMD can be managed rather than cured.^{1,12,13}

Bruxism is the parafunctional grinding of teeth and an oral habit consists of involuntary rhythmic or spasmodic nonfunctional gnashing, grinding, or clenching of teeth, in other than chewing function of the mandible, which may lead to occlusal trauma.¹⁴ Bruxism is considered the most harmful behavior among the parafunctional activities of the stomatognathic system, being responsible of tooth wear, periodontal tissue lesions, and articular and/or muscular damage.¹⁵

The etiology of bruxism is difficult to understand, because the controversial character of many theories for bruxism in the literature.¹⁶

Peripheral (morphological) and central (pathophysiological and psychological) factors can be distinguished as the etiological factors. Nowadays, morphological factors, such as occlusal discrepancies and the anatomy of the bony structures of the orofacial region, are considered to play a minor role in bruxism. At present, pathophysiological factors have been suggested to be more important. Sleep disturbances, disorders in the dopaminergic system, medications, smoking, alcohol consumption have been linked to bruxism.¹⁷ Psychological factors such as stress and personality are discussed in relation to bruxism.¹⁸ However, bruxism is mainly centrally mediated, not peripherally.¹⁶

Clinical signs of bruxism are as follows:¹⁹

1. Occlusal and incisal wear of the dentition
2. Mobility of teeth that are periodontally compromised
3. Fractures of teeth as well as restorations
4. Hypertrophy of the superficial belly of the masseter muscle as well as the anterior temporalis muscle
5. Widening of the periodontal ligament space as well as the ligament itself demonstrated on radiographs
6. Tenderness to palpation of the masticatory muscles
7. Resorption of the alveolar ridge in denture wearers

One of the most frequently reported sign of the bruxism is tooth wear.^{11,20} The term of tooth wear is the surface loss of dental hard tissues from causes other than dental caries, and trauma.²¹ Tooth wear is not reversible and cumulative with age. The problems associated with tooth wear increased for dental professionals since life expectancy increased and more people keep their natural dentition into although they are old. Tooth wear has divided into 3 categories: wear, abrasion, and erosion; regarding the etiologic factors and clinical manifestations.^{22,23} The occurrence and pattern of tooth wear is based on educational, cultural, dietary, occupational, and geographic factors in the population studied.²⁴⁻²⁶ The rate of wear depends on

individuals. Extrinsic factors such as the type of food eaten and intrinsic factors such as differences in enamel thickness and hardness are important for tooth wear. Likewise the loss of enamel followed by wear of softer dentin is continuous throughout the functional life of each tooth and tooth wear is seen as a general physiological phenomenon. However, the advanced tooth wear seen in some patients is not a sufficient explanation for functional tooth wear.

RELATIONSHIP BETWEEN TOOTH WEAR AND BRUXISM

Diagnosis of bruxism is difficult, even though many techniques for the diagnosis of bruxism exist.²⁷ The evaluation of tooth wear, measurement of masticatory muscle activity by electromyography, and observations in rhythmic masticatory muscle activities by polysomnography are currently used for the diagnosis of bruxism.^{14,28-32} There are several types of bruxism; the past and recent bruxism can be seen.³³ The presence of dull wear in teeth is the sign of past bruxism.³⁴ On the other hand, the diagnosis of recent bruxism could be done in sleep laboratories with electromyography.³⁵⁻³⁸ A careful clinical examination and a thorough case history (dental, medical, diet and eating habits, occupation, bruxism, or any other oral habits) are necessary for diagnosis of tooth wear. The severity and progression of tooth wear are monitored in several methods such as photographs, study casts, and tooth wear index, with the study casts, these are the most reliable method for individual patients.²¹ The quantity of the degree and extent of the loss of tooth substance are used in grading the severity of tooth wear for most index.^{39,40} Nevertheless, many aspects of tooth wear as indicator of bruxism have been questioned.

When opposing teeth are affected, the wear is uniform. Severe bruxism will cause substantial wear of occlusal surfaces and increased tooth mobility if the periodontal support is compromised, as well as muscle spasm and fractures of teeth and restorations.⁴¹

Tooth wear does not indicate that the patient is currently bruxing. If the cause of the tooth sur-

face loss was bruxism, it might have occurred in the past.⁴² If the diet is erosive, it can result with extensive tooth surface loss, which is not caused by bruxism.

There is still controversy about that the validity of tooth wear is an indicator of bruxism.⁴³ The correlation between the degree of tooth wear and the level of electromyographic bruxism activity could not be demonstrated.⁴⁴ Tooth wear to be a natural phenomenon associated with aging is suggested by numerous studies.⁴⁵⁻⁴⁹

The association between bruxism and tooth wear is proved by a numerous investigations,^{50,51} but called into question by others.^{52,53} It is reported that only 34.4% of bruxers showed evidence of tooth wear.⁴³

RELATIONSHIP BETWEEN TOOTH WEAR AND TMD

Signs and symptoms of TMD are not equally appeared between the genders, based on both clinical and population-based studies.^{9,54,55} TMD is seen in women patients more than men, but occlusal wear is prevalent in men.⁵⁶ The prevalence of TMD is higher in patients between 25 and 40 years of age, but tooth wear increases cumulatively with age.^{9,55} Numerous studies documented that tooth wear is correlated with age.^{45,48-50,57} On the other hand, no correlation between tooth wear and age is found.⁵³ This controversy can be explained by that the research was done among different populations.

A relationship between tooth wear and TMD symptoms has been exhibited in several studies,⁵⁸⁻⁶⁰ but these findings could not be supported by others.^{20,53} Seligman and Pullinger⁶¹ found that dental wear is not useful in differentiating non-patients from TMD patients. John et al.²⁹ reported that incisal tooth wear was not significantly associated with TMD after age and gender factor was eliminated. There is evidence that bruxism related pain is different from TMD related pain.^{62,63} Therefore the role of tooth wear as a major etiologic factor in TMD remains unclear.⁶⁴

A systematic review of TMD risk factor studies revealed methodological difficulties, which

might explain the ambiguous assesment of the relationship between tooth wear and TMD.⁵⁴

RELATIONSHIP BETWEEN BRUXISM AND TMD

Bruxism has been suggested as an initiating or perpetuating factor in certain subgroups of TMD; however, the exact role of bruxism in TMD remains unclear.^{10,65} It was supposed that the development of myofascial pain of the masticatory muscles was related to bruxism.⁶⁶

Causal conclusions are difficult,⁶⁷ because in causation of disease, predisposing, enabling, precipitating and reinforcing factors can be involved.⁶⁸ Concerning the role of bruxism in the etiology of TMD, all of these factors might be present. Lobbezoo and Lavigne⁶⁹ reported that there is no clear cause-and-effect relationship between bruxism and TMD eventhough a causal relationship was hypotthesized.

Bruxism and myofascial pain are unrelated entities⁷⁰ while muscle hyperactivity is not the basis for chronic musculoskeletal pain conditions like myogenous temporomandibular disorders, muscle tension-type headache, fibromyalgia, chronic lower back pain, and post-exercise muscle soreness.⁷¹ Bruxism related pain is extreme in the morning, on the other hand, myofacial pain is extreme late in the day. It was reported that there is no association between bruxism and muscle sensivity, but there is an association between clenching and joint sounds.^{69,72}

It is a common believe that bruxism causes facial pain.^{72,73} Some investigations studied the association between muscle hyperactivity and muscle pain using experimental tooth grinding. Svensson and Arendt-Nielsen.⁷⁴ failed to induce an increase in pain with an experimental bruxing model. Christensen^{75,76} and Bowley and Gale⁷⁷ reported positive associations. In another study experimental bruxing activity produced pain similar to that experienced by patients with TMD but did not result in other signs and symptoms of TMD.⁷⁸ Haggerty et al.⁷⁹ found the lengthy periods of bruxing activity are more characteristic in TMD patients than normal

controls. Patients with TMD following experimental bruxing activity may include different levels of pain tolerance, different biological responses of musculature, occlusal discrepancies, and differing levels of muscle activity during bruxing activity. Marbach⁸⁰ did not find an association between bruxism and pain in TMD patients. Pergamalian et al.⁵⁷ reported that either bruxism or tooth wear were not associated in the TMD population. They also noted that there is no association between bruxism and severity of muscle pain symptoms and TMJ pain symptoms. Pullinger and Seligman⁶⁶ suggested that the effects of bruxism have been overestimated as a cause for TMD. These findings don't support the prevailing theory that continuous muscular contraction leads to continuous muscle pain. Clinical experiences shows that some patients have large condyles and severe dental wear yet do not have pain in their muscles or temporomandibular joints.

The association of bruxism and TMD remains unclear. Goulet et al.⁸¹ reported that 20% of patients with bruxism experienced jaw pain, there was a strong association between daily bruxing activity and 3 TMD symptoms (jaw and muscle pain, difficulty opening, and joint noises), but the patients in this study were not clinically examined. Villaros and Moss⁷² suggested that bruxism causes pain in the masseter muscle. Allen et al.⁷³ suggested that an awareness of bruxism was associated with symptoms of TMD. On the other hand, the other authors documented no association between the signs and symptoms of bruxism and of TMD.^{53,82} Bruxism was equated with dental wear in these studies, but the validity of tooth wear as an indicator of bruxism has been questioned.⁴³ Carlsson et al.⁵² reported that bruxism and tooth wear are possible predictors of TMD but more researches are needed for their predictive value in TMD.

In the study of Orhan and Sencimen⁸³ they compared temporomandibular joint of patients with and without bruxism by magnetic resonans imaging and found that there is no signal difference between two groups. Instead, they found a signal difference in mandibular condyle. So they suggest that bruxism effects mandibular condyle instead of disc.

Some studies suggested that 26% to 66% of patients with TMD bruxed their teeth.⁸⁴⁻⁸⁶ This is raised the question if bruxism may be an etiologic factor for TMD. However, Dao et al.⁸⁷ reported that more than half of the patients with bruxism were pain-free. The frequency of TMD associated with bruxism ranged from 36% to 59.3% in two investigations.^{86,88}

TMD patients often report headache, typically in the temporal area. Molina et al.⁸⁹ reported a headache prevalence of 66.3% in bruxers but did not identify the location or type of pain. The clinician must be aware of TMD and tension-type headaches⁹⁰ are different pain conditions, with different etiologies and treatments.

Bruxism can be considered as a form of exercise and therefore may cause physiological adaptation. The occlusal contact area increases as a result of tooth wear, which causes a distribution of occ-

lusal forces.⁹¹ The parafunction may train the jaw muscles and temporomandibular joints, which will become more resistant to overload.^{92,93} The parafunctional load does not necessarily lead to a pathologic situation. The development of TMD is a process of different risk factors in confrontation with adaptive forces of the stomatognathic system.²⁹

CONCLUSION

The correlation of tooth wear and bruxism is complicated, because there are multifactorial causes of tooth wear, the difficulties of measuring tooth wear, and the natural complex activity pattern of bruxism. There is still controversy about the validity of tooth wear as an indicator of bruxism. The data suggests that bruxism and TMD may be distinct entities and it does not support the relationship between bruxism and tooth wear in TMD.

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