Comorbid Psychiatric Disorders and Treatment Options in Temporomandibular Disorders and Bruxism

Temporomandibular Bozukluklar ve Bruksizmde Eşlik Eden Psikiyatrik Bozukluklar ve Tedavi Seçenekleri

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Abstract

Temporomandibular disorder (TMD) is a clinical condition in which chewing muscles, temporomandibular joint and the structures surrounding this joint are affected. Bruxism is a parafunctional habit that occurs as a result of overloading of stomatognathic structures with tooth squeezing and grinding, which is included in the etiology of TMD. TMD is seen in approximately 10% of the population and bruxism is seen in 8-20%. Many factors are effective in the etiology of TMD and bruxism, and there are interactions between these factors. Biomechanical, neuromuscular, biopsychosocial and neurobiological factors contribute to the disorder. The prevalence of psychiatric disorders is high in individuals with TMD and bruxism. Many psychiatric disorders, especially depression and anxiety disorders, accompany TMD and bruxism. The antidepressants used in the treatment of these disorders cause bruxism. This is one of the important challenges in the treatment of TMD and bruxism. The first step in the treatment of TMD and bruxism is to address the basic prevention methods. While amitriptyline use is prominent in TMD pharmacotherapy, in bruxism, buspirone and clonazepam are two important drugs used. The study of these drugs in small samples and the fact that the available information is mostly based on case reports clearly shows the necessity of further studies. The use of cognitive behavioral therapy in both disorders may be a solution. Regardless of the treatment option, both dentists and psychiatrists should be in a multidisciplinary working environment and should evaluate these disorders within the framework of the biopsychosocial model.

Keywords: Temporomandibular disorders, bruxism, depression

Öz

Temporomandibular bozukluk (TMB) çiğneme kaslarının, temporomandibular eklemin ve bu eklemin çevresindeki yapıların etkilendiği klinik bir durumdur. Bruksizm, diş sıkma ve taşlamayla stomatognatik yapıların aşırı yüklenmesinin bir sonucu olarak ortaya çıkan, TMB etiyolojisinde yer alan parafoksiyonel bir alışkanlıktır. TMB toplumun yaklaşık %10'unda, bruksizm %8-20'sinde görülür. TMB ve bruksizm etiyolojisinde birçok faktör etkilidir ve bu faktörler arasında etkileşimler vardır. Biyomekanik, nöromüsküler, biyopsikososyal ve nörobiyolojik faktörler hastalığa katkıda bulunur. Psikiyatrik bozuklukların prevalansı TMB ve bruksizm olan bireylerde yüksektir. Birçok psikiyatrik bozukluk, özellikle de depresyon ve anksiyete bozuklukları, TMB ve bruksizme eşlik eder. Bu hastalıkların tedavisinde kullanılan antidepresanlar bruksizme neden olur. Bu, TMB ve bruksizmin tedavisinde önemli zorluklardan biridir. TMB ve bruksizmin tedavisinde ilk adım temel önleme yöntemlerine değinmektir. Amitriptilin kullanımı TMB farmakoterapisinde belirgin olmakla birlikte, bruksizmde buspiron ve klonazepam kullanılan iki önemli ilaçtır. Bu ilaçların küçük örneklerde incelenmesi ve mevcut bilgilerin çoğunlukla vaka raporlarına dayanması gerçeği, ileriki çalışmaların gerekliliğini açıkça göstermektedir. Her iki hastalıkta da bilişsel davranışçı terapi kullanımı bir çözüm olabilir. Tedavi seçeneği ne olursa olsun hem diş hekimleri hem de psikiyatrlar multidisipliner bir çalışma ortamında olmalı ve bu hastalıkları biyopsikososyal model çerçevesinde değerlendirmelidir.

Anahtar sözcükler: Temporomandibular bozukluklar, bruksizm, depresyon

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TEMPOROMANDIBULAR disorder (TMD) is a clinical condition affecting the masticatory muscles, temporomandibular joint (TMJ) and the structures surrounding this joint. TMD has been considered as parafunction by the dentists; parasomnia by the physicians who are working on sleep disorders; and stereotopic movement disorders by some authors (Erberk Özen 2007). TMJ differ from other joints by some of their features. These features include both hinge and sliding movement on a single plane (ginglimoartrodial joint), articular face comprising of connective tissue (abrasion resistant and highly renewable), joint movements being limited by teeth as well as ligaments (other joints are limited only by ligaments), including enlargement central activity within the joint capsule, being the first developing cranial bone and being less susceptible to pain (Okeson 2013).

It is quite natural that the disorders of a joint with such different qualities are subject to many researches and are dealt with by many disciplines. In our study, we aimed to evaluate all aspects of psychiatric disorders in TMD and bruxism in the light of current literature.

Epidemiology

Epidemiologic studies carried out on TMD have shown that 75% of the society demonstrate at least one TMD related functional disorder symptom (joint noise, diversion at opening, locking at intervals etc.), and 33% demonstrate at least one symptom (facial pain, jaw pain etc.) (McNeill 1997, American Society of Temporomandibular Joint Surgeons 2003). These rates for TMD were determined in other studies as 56% and 41%, respectively (Okeson 2013). Joint restriction, one of the TMD symptoms, affect 5% of the population while myofascial pain (MFP), which is identified as the effect on the masticatory muscles, is seen in 30-33% of the population (Erberk Özen 2007, Leeuw and Klasser 2013).

TMD is seen in approximately 10% of the population. Diagnosis and treatment cost of TMD is very high (Ethunandan and Wilson 2006). In the United States, the Agency for Healthcare Research and Quality states that the TMD has caused a loss of 17.8 million working days per 100 million employees and the financial costs are billions of dollars. This loss is very serious given that 10-36 million people in the USA are affected by this disorder every year (Hoffmann et al. 2011).

The prevalence of TMD has been reported in a wide range (6-93%) due to differences in diagnostic criteria and study methods (Leeuw and Klasser 2013). However, only 3.6–7% of the patients who have complaints are seeking treatment. The majority of the applicants for treatment were women (Erberk Özen 2007, Leeuw and Klasser 2013). Women's awareness of their health, psychosocial factors, connective tissue characteristics, hormonal factors and cartilage tissue differences are effective in this situation (Leeuw and Klasser 2013). Tenderness around the TMJ area and joint noises are more common in women than in men. The fact that, generally, the muscle pain is formed on the back area in men, and on the neck, arm and shoulder area in women can partly explain this situation (Leeuw and Klasser 2013).

Symptoms are observed in all age groups but are more common between the ages of 20-40 (Suvinen et al. 2005). In this case, high levels of estrogen hormone in women has been proposed as a major cause. Because the estrogen hormone in the etiology of TMD is associated with the tonus of the ligaments (LeResche et al. 2003).

The presence of symptoms such as joint noise or diversion in approximately 50% of the healthy population is a confusing factor (Suvinen et al. 2005). Therefore, not every symptom of TMD or bruxism may be pathological. This literature information should be taken into consideration when conducting clinical interviews and interpreting the research results.

Etiology

The factors that cause TMD have been discussed for a long time (Marbach and Lund 1981, McNeill 1997, Okeson 2013). Many factors are effective in the etiology of TMDs and these factors interact with each other. Neuromuscular, psychosocial and neurobiological factors have important roles in the development of the disease. Although it was thought that TMD was initially based on dental problems (malocclusion, etc.), it was accepted that psychosocial causes were also included in the etiology (Michelotti et al. 1998, Yap et al. 2002).

The factors involved in the etiology of TMD can be classified into three groups. These groups are referred as preparatory (morphological, psychological, physiological and environmental variables), initiator (trauma, stress, etc.) and progressive (parafunction, hormonal and psychosocial factors) (Oral et al. 2009). Psychiatric variables are observed in each of these groups. In other words, psychosocial factors are present in all stages of the etiology of TMD. Emotional tension, especially seen in psychiatric disorders such as anxiety disorders and depression, increases muscle tonus with prolonged sympathetic system activation. The first chewing muscle affected by emotional tension is masseter (Dalkız and Baydemir 2003). High pressure resulting from increased muscle tonus breaks down the collagen fibers and creates malacia (chondromalacia) on the joint surface. If this malacia has caused a damage that exceeds the regeneration ability, impairment occurs in the joint function. Hypoxia begins in the tissues with increasing pressure for the joint. With the decrease in pressure, reperfusion occurs in the tissues. Hypoxia-reperfusion produces free radicals. The resulting free radicals both reduce the pain threshold and wash down the lubricant hyaluronic acid (Kazan 2018). As a result, both joint function and disc morphology get impaired.

Individual-related anatomical features and hormonal disorders are other factors in the etiology of TMD. In particular, the collagen density, quality and integrity of the ligaments show significant individual differences. These are some of the anatomical features that affect TMJ and the structures surrounding this joint. The tonus of the joint ligaments is closely related to the level of estrogen (LeResche et al. 2003). The increase in estrogen causes a decrease in the tonus of the ligaments. This is one of the reasons explaining the high incidence of TMD in women. In addition, findings such as increased TMD symptoms in the premenstrual phase and lower incidence of TMD pain with oral contraceptive use are studies that support the hormonal etiology (LeResche et al. 2003, Kazan 2018).

Symtpoms of TMD

The most common symptoms of TMD are pain in TMJ and masticatory muscles (palpation, function or spontaneous), limited jaw movements, and noise and crepitations in TMJ. The most common otological symptoms associated with TMD are tinnitus, dizziness, ear pain, ear fullness, hyperacusia and congestion (Stechman-Neto et al. 2016).

Classification of TMD and bruxism

In 1986, Welden Bell laid the foundations for the TMD classification. Although the American Dental Association reorganized it in 1990, it reached its current state with the co-organization of the American Academy of Orofacial Pain and the International Headache Society (Okeson 2013). TMDs are evaluated under four categories as chewing muscle disorders, TMJ disorders, chronic mandibular hypomobility and developmental disorders (Okeson 2013, Gezer and Levendoğlu 2016).

The classifications related to bruxism are varied and reached a conclusion over time. There are two main categories in classification according to etiology. The first one is primary (idiopathic sleep bruxism) bruxism. Primary bruxism has no identifiable biopsychosocial cause. Secondary bruxism has been associated with a medical condition. This is a medical condition that may be related to movement disorder, sleep disorder, psychiatric disorders or drug / chemical use. A recent classification differentiates bruxism from sleep and daytime bruxism (Eren et al. 2015). This classification has made it very easy for research on bruxism.

Diagnostic criteria of TMD and bruxism

A reliable and basic diagnostic criterion with international validity has been prepared in order for many occupational groups to reach a common decision on TMD. These diagnostic criteria, developed by the American National Institute of Dental and Craniofacial Research, are called Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). According to RDC/TMD, TMDs are divided into three groups as muscle disorders, disc disorders and inflammatory degenerative disorders. RDC/TMD is a two-axis system that diagnoses and classifies within the biopsychosocial model. Axis 1 defines the basic TMD subgroup, while Axis 2 defines biopsychosocial factors. Axis 2 includes the location and the severity of the pain in the face and body, the function loss caused by pain, mental disorders such as depression and anxiety, functional limitations of the jaw joint and general health status assessments (Schiffman et al. 2014, Kazan 2018).

Over time, the diagnostic criteria of TMD in Axis 1 were updated due to insufficiencies. In 2013, it was finalized as Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). According to DC/TMD, TMDs are evaluated under three categories as TMD-related pain and headache, intra-articular disorders and degenerative joint disorders. There was no significant change in axis II (Schiffman et al. 2014).

Dentists evaluated the psychosocial aspect of TMD under axis II diagnostic system, while psychiatrists tried to evaluate the biological aspect of TMD in their own diagnostic system. According to the revised text of the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV TR), TMD has been included in the diagnosis category of "Pain Disorder", among the somatoform disorders (APA 2000).

However, finding a place for TMD in DSM-5 is somewhat more difficult than in DSM-IV-TR. Because somatoform disorders were changed to "somatic symptoms and related disorders" in DSM-5 category, the diagnosis of pain disorder was no longer categoryized as a separate title (APA 2013). Pain disorder was defined in DSM-5 as the presence of the predominant pain in the diagnosis of "somatic symptom disorder". It may be possible to evaluate TMD under this category as well as under "Mental Factors Affecting Other Health Conditions", which include migraine, fibromyalgia and other

psychosomatic disorders. In our opinion, the second diagnosis is more appropriate for the evaluation of TMD. Because the criterion in this diagnosis, "The presence of a close temporal association between the development, exacerbation and delayed improvement of the health condition vis mental factors and the effect of this factors on the course of the health condition", describes the psychosocial factors in each step of the etiology of TMD (preparatory, initiator and progressive) quite well.

The most acceptable diagnostic criteria for bruxism are set out in the third edition of the International Classification of Sleep Disorders (ICSD). In this classification bruxism is placed under the category of "Sleep-associated Movement Disorders". Sleep Associated Bruxism must be diagnosed with abnormal abrasion of the tooth surfaces due to grinding of the teeth. In addition, at least one of the clinical conditions such as pain and fatigue in temporal jaw muscles, temporal headache and jaw locking should be present in the morning (Ursavaş 2014). Sleep Bruxism (Nocturnal Bruxism) is included in the Parasomnias of DSM-IV-TR as "Parasomnias Unspecified ". However, DSM-5 does not include bruxism. In addition to sleep bruxism, ICD-10 includes the diagnosis of psychogenic bruxism (F45.8 Other somatoform disorders). Psychogenic bruxism is defined as bruxism in which sensory, functional and behavioral disorders resulting from physical disorders are present and that is closely related to stressful events or problems over time, but not through the autonomic nervous system.

Comorbid psychiatric disorders in TMD and bruxism

Psychiatric disorders such as depression, anxiety disorders and somatic symptoms are frequently associated with TMD and bruxism. In the meantime, individuals with psychiatric disorders such as anxiety disorder and depression tend to experience recurrent chronic pain (Nazeri et al. 2018). TMD, which was evaluated by psychiatrists in the psychosomatic disease group, was seen by dentists as a disorder in which the psychosocial aspect should be evaluated. This is supported by the inclusion of Axis 2 diagnostic categories (depression, anxiety disorders, etc.) that include psychosocial assessments in the RDC / TMD diagnostic criteria established by dentists in 1992. Therefore, TMD should be considered as a whole and the results obtained from the studies should be interpreted in this respect.

Depression

It was reported that the majority of patients with chronic pain complaints often had comorbid psychosocial problems (Canales et al. 2019). TMD is one of the painful diseases that these psychosocial problems are frequently accompanied. Depression is one of the leading psychosocial problems. Many studies have shown that pain and depression are closely related in patients with TMD (Marbach and Lund 1981, Yap et al. 2002, Kindler et al. 2012, Nazeri et al. 2018). Patients with TMD are often associated with pain disorders such as generalized body pain, fibromyalgia, migraine, tension headache, painful bladder syndrome in addition to TMJ and muscle pain in this region. In addition to these disorders, other accompanying psychosomatic diseases such as chronic density syndrome and irritable bowel syndrome have been reported (Okeson 2013, Jariyasakulroj and Mitrirattanakul 2018).

The studies on depression in TMD and bruxism are summarized in Table 1. According to these studies, it is reported that both disorders are accompanied by severe depres-

sion, and the severity and extent of pain are associated with depression symptoms, and dental treatments initiated for these disorders are also good for depression symptoms (Table 1).

In the light of these studies, it is seen that depression and these disorders are closely related. Therefore, treating only physical conditions in TMD and bruxism will be insufficient in treatment. A perspective including psychosocial and behavioral aspects is absolutely necessary for the treatment of these diseases.

Anxiety disorders

Although the etiology of bruxism is evaluated as multifactorial, one of the most important factors is anxiety disorders. Recent studies have reported that occlusal disorders have limited or no effect on bruxism. Important evidence of this may indicate that bruxism persists after solving dental problems. However, the idea that anxiety and stress is a major cause of bruxism has become more accepted (Somtürk et al. 2010). Emotional tension in most psychiatric disorders, especially anxiety disorders, creates long-term activation in the sympathetic system and increases muscle tonus. The first chewing muscle affected in this process is masseter (Dalkız and Baydemir 2003).

Studies have shown that anxiety increases the risk of experiencing TMD (Manfredini et al. 2004a, Pallegama et al. 2005, Reissmann et al. 2014). Both state and persistent anxiety were found to be high in TMD patients when compared with healthy control groups (Pallegama et al. 2005). In a study aimed at identifying psychosocial problems in patients with TMD, anxiety levels of patients were significantly higher than healthy control group (Reissmann et al. 2014). It was stated that 31.3% of patients with TMD had severe state anxiety symptoms and 25.3% had moderate state anxiety symptoms. In the same study, the groups were compared in terms of persistent anxiety and 17.5% of the patients had severe anxiety and 29.5% had moderate anxiety symptoms. It is stated that women are 4 times more at risk for persistent anxiety than men (Reissmann et al. 2014). Other studies evaluating comorbid anxiety disorders in TMD and bruxism are summarized in Table 1.

Findings from the studies support the relationship between anxiety symptoms and TMD and bruxism. However, the researchers emphasized that the results should be well-interpreted. Because the reasons such as the scales used in the studies not being diagnostic, no standardization in the evaluation and high risk of bias can affect the results. All results indicate that there is a relationship between bruxism and anxiety symptoms, although it has a low level of evidence (Polmann et al. 2019).

Somatic symptoms and related disorders

Somatization is defined as the presence of physical complaints that cannot be explained clearly by a physical illness. Somatization disorder is a rare psychiatric disorder evaluated in DSM-IV-TR and its incidence is around 4% (APA 2000, Erberk Özen 2007). In DSM-5, this disorder is called and evaluated as "somatic symptoms and related disorders" (APA 2013). In the studies conducted before this change, the definition of somatization disorders was used to evaluate the physical complaints (Erberk Özen 2007).

In the studies, somatization subscale of the Psychiatric Symptom Screening List-90 (SCL-90) and 15-item Patient Health Questionnaire were frequently used to evaluate somatization symptoms (Yap et al. 2002, Yap et al. 2004, Shedden Mora et al. 2012,

Canales et al. 2019). The number of studies in which psychiatric evaluation is performed in patients with TMD is quite low. This led to the evaluation of comorbid somatic symptoms in addition to TMD symptoms in patients rather than somatization disorder (Somatic symptom and related disorder). This may be one of the main reasons for the high rate of somatization symptoms seen in patients with TMD.

In a study that tried to determine the psychosocial profiles of people with painful TMD, it was reported that 85% of the patients with myofascial pain and 59% of patients with TMJ had abnormal somatization scale scores (Manfredini et al. 2009). In a study similar to these studies, 191 subjects were evaluated and 47.6% of the sample had moderate-severe somatic symptom scale scores (Yap et al. 2003). In a recent study, severe somatic symptoms were observed in 50.9% and moderate somatic symptoms in 23.2% of patients with TMD (Canales et al. 2019). Comorbid somatization disorders in TMD and bruxism are shown in Table 1.

Pain is one of the leading symptoms when evaluating somatic symptoms. Recent studies have focused on sustained pain rather than identifying factors related to etiologic origin. Whether this pain is caused by muscle or joint, diffuse body pain associated with muscle pain, loss of function caused by pain, and its relationship with mental state have been the main subjects of the researchers. One hundred and ninety-six participants were evaluated with SCL-90, and patients with moderate to severe somatization symptoms had more muscle pain than normal patients. However, the same group of patients showed no difference in terms of joint pain compared to the control group. In the same study, it was also reported that patients with severe somatization symptoms had significant limitations in mandible function compared to patients with moderate and mild symptoms (Yap et al. 2004).

In a review aimed at investigating the determinants of varying central pain modulation in patients with chronic musculoskeletal pain, studies that included at least three-month follow-up and evaluated pain modulation according to robust clinical guidelines were examined. In the results of the study, it was found that having high sensory sensitivity, genetic sensitivity to pain, having higher somatic symptoms before the disease, low expectation of healing and pre-disease headache variables were important for central pain modulation (Clark et al. 2017).

The results obtained from the studies show that the symptoms of somatization associated with TMD and bruxism are quite common. However, as in depression and anxiety disorders, almost all studies for somatization disorders are scale-based. Therefore, the results of the studies should be well-interpreted.

Psychotic disorders

The relationship between psychotic disorders and TMD is not as well known as other psychiatric disorders. One of the main reasons for this is the association of psychosocial factors in the etiology of TMD with depression, anxiety disorders and somatization. Another reason may be the inadequate recognition of psychotic disorders by dentists. In fact, patients with psychotic disorders, one of the often neglected disease groups, are at serious risk of TMD because of both the emotional stress they experience and the side effects of psychotropic drugs (Gurbuz et al. 2009).

Sleep disorders, alcohol use, comorbid psychiatric disorders, especially depression, and serious drug side effects in schizophrenia patients may lead to increased parafunc-

tional activities in patients (Gurbuz et al. 2009). In addition, oral dyskinesias caused by psychotropic drugs are an important factor damaging muscle stiffness, degenerative changes in TMJ, mucosal lesions, teeth and dental prostheses. One of the important factors that increase the risk in schizophrenia patients is the decrease in pain activity and response to pain. This may lead to delayed disease diagnosis and progression of the disease (Gurbuz et al. 2009, Morales-Chávez et al. 2014).

Previous studies have demonstrated the relationship between TMD, bruxism and psychotic disorders when examining the effect of ecstasy (3.4-methylenedioxy-N-methylamphetamine) on oral health (Brand et al. 2008). Ecstasy has been shown to increase neuromuscular stimulation, cause rigidity in the muscles, pain and tenderness in the jaw muscles. It has been shown that 50-89% of the users have jaw squeezing after using ecstasy. It is well known that ecstasy also causes psychotic symptoms. Therefore, substance use in patients should definitely be questioned in cases where TMD and psychotic symptoms coexist (Brand et al. 2008).

Patients with schizophrenia and healthy controls were compared in terms of TMD symptoms (Gurbuz et al. 2009). Symptoms such as joint noise and diversion were significantly higher in patients with schizophrenia than the control group. However, joint pain was higher in the control group. Joint limitation was similar in both groups. While the frequency of joint pain did not change according to gender, diversion and joint noise were more common in women. In the same study, it was stated that the number of teeth in patients with joint pain was significantly fewer (Gurbuz et al. 2009).

In a study evaluating 65 people with severe psychiatric disorders (schizophrenia, bipolar disorder, dementia, mental retardation, etc.), the frequency of muscle pain was 10.7%, the limitation of jaw movements was 26.1% and the frequency of bruxism was 6.1% (Morales-Chávez et al. 2014).

Schizophrenia patients are at risk for development of TMD and bruxism. In the increase of TMD symptoms, external factors are involved as well as the nature of the disease itself. Generally, patients with poor oral health do not receive adequate oral care and treatment. Therefore, psychiatrists involved in the treatment of psychiatric symptoms should be questioning about the symptoms of TMD symptoms and should cooperate with dentists.

Sleep disorders

Sleep disorders and pain problems are common complaints in the general population. However, sleep disorders are closely related to many psychiatric disorders, especially depression and anxiety disorders. Patients with TMD have chronic pain and often complain about sleep disorders. Although polysomnography (PSG) is the golden standard for the detection of sleep disorders, it cannot be used very often due to its costly use, the need for serious equipment and the necessity of experts to interpret the results. In the studies, subjective assessment scales are preferred instead. In a study evaluating 3276 people with scales, it was reported that the pain experienced in TMJ increased as the duration of falling asleep and the number of wakes increased. It was reported that pain decreased with increasing sleep efficiency and pain was higher in women and hypnotic drug users. The two most important predictors of pain complaints in TMD were advanced age and low sleep efficiency (Lee and Kim 2018).

In a study examining the relationship between TMD symptoms, anxiety, depression and sleep disorders in adolescents, 61.4% (n = 355) of the sample had at least one TMD symptom and 32.4% had two or more TMD symptoms. One third of the participants had depression, stress and sleep disturbance while 65.2% had severe anxiety symptoms. In the hierarchical logistic regression analysis, the most important predictors that increase the risk of TMD symptoms are; anxiety disorder (OR = 2.16), impaired sleep (OR = 1.58) and daytime dysfunction (OR = 1.43) (Lei et al. 2016). In a study supporting the data of this study, 350 TMD patients were evaluated for daytime insomnia (Jariyasakulroj and Mitrirattanakul 2018). 28.57% (n = 100) of the patients had daytime insomnia. In this group, TMJ pain, TMJ dysfunction, stress, depression and anxiety disorders were reported to be more frequent and more severe.

In a study by Benoliel et al. (2017), sleep quality was compared in patients with TMD who had good (n = 177) and poor (n = 109) symptoms in terms of TMD symptoms. Headache, pain in other parts of the body, tooth erosion, teeth clamping, cheek biting, pain during TMJ movements, chewing and pain in cervical muscles were significantly more frequent in TMD patients with poor sleep quality.

In a recent study, the relationship between TMD and sleep was examined by Pittsburg Sleep Quality Index (PSQI) (Natu et al. 2018). The study compared 142 healthy controls, 79 patients with mild TMD and 23 patients with severe TMD, and 69.6% of those with TMD had poor sleep quality. Patients with TMD had lower sleep quality and higher sleep disturbance and higher loss of daytime function than healthy controls. It was observed that individuals with severe TMD had a higher average in these subdimensions of PSQI than those with mild TMD. However, there was no difference between the groups in terms of the duration of falling asleep, total sleep time and drug use for sleeping. In the same study, depression, anxiety and stress were found to be higher in patients with TMD. Impairment of sleep quality is one of the most common complaints in depression and anxiety disorders, as well. For this, the relationship between sleep quality, TMD and psychiatric disorders should be considered as a whole. Otherwise, it is not possible to determine which of these disorders causes another.

Personality characteristics

In addition to psychosocial problems in the etiology of TMD, personality characteristics have been investigated in time. It was found that certain personality characteristics were observed more frequently in TMD (Michelotti et al. 1998, Ferrando et al. 2004). Illness behavior tendency is known to increase both pain and complaints. It has also been shown that response to treatments to reduce pain decreased (Erberk Özen 2007). Therefore, evaluation of personality characteristics is very important in the diagnosis and treatment of TMD. In order to reveal personality characteristics related to TMD, Minnesota Multidimensional Personality Inventory (MMPI), SCL-90, Five Factor Personality Inventory, NEO Personality Inventory and Cloninger's temperament and character inventory were used (Michelotti et al. 1998, Ferrando et al. 2004).

Abnormal MMPI profiles have been demonstrated in many diseases associated with chronic pain. Significant increases are observed especially in neurotic areas such as hypochondriasis, depression and hysteria. The increase in these personality characteristics does not appear in acute pain where anxiety is evident. This may be considered as a

result of the adaptation of personality traits to pain rather than as the cause of pain (Michelotti et al. 1998).

Michellotti et al. (1998) found in an analysis carried out with 50 TMD patients via MMPI that 62% (n = 31) of the participants had at least one pathological profile. 30% of the patients exceeded the pathological margin in at least two areas of hypochondriasis, depression and hysteria.

Ferrando et al. (2004) compared 89 TMD patients (muscle group, n = 45; joint group, n = 42) and 100 healthy subjects via NEO personality inventory. People with muscle related TMD had more distress, anxiety and depression, and less positive reinterpretation and use of humor than the control group. While people with joint-related TMD had more distress than the control group, the positive reinterpretation and the search for social support levels were lower. Muscle and joint disorders were generally similar, while humor use was significantly lower than in the muscle group. It has been reported that the coping strategy called as behavioral separation (abandonment of the target by the effect of stressor) is significant in the muscle group, and general distress increases in the joint group with decreased honesty and self discipline.

In a study carried out in our country by Darcan et al. (2008), 81 TMD patients and 80 healthy controls were compared using the Temperament and Character Inventory. Innovation seeking behavior, impulsivity, irregularity and easy fatigue temperament characteristics were found to be higher in patients with TMD. It has been reported that people with these features show an indecisive and neurotic character, can be easily grieved and show incompatibility with people. Based on these differences, the researchers predicted that cluster B personality characteristics and somatization symptoms might be more intense in the TMD group.

In a recent review , the common result of chronic pain is that high harm avoidance and low self-management temperament characteristics are important (Naylor et al. 2017). High avoidance of harm includes variables such as sensitivity to criticism, tendency to provide high level of assurance and pessimism, while low self-management includes variables such as low motivation, deviation from goals, low coping power. If we look at the clinical significance of these results, high avoidance of harm in individuals causes pain avoidance and pain-related rumination in patients as well as development and persistence of chronic pain. Low self-management such as low frustration threshold, poor coping strategies, and low motivation make it difficult to get out of the vicious circle of pain. Therefore, it may be beneficial to evaluate high harm avoidance and low self-management temperament characteristics and put them on the agenda for treatment.

Table 1. Studies on comorbid depression, anxiety disorder and somatization in TMD and bruxism

Author/Year	Study Sample	Study Design (Duration of Follow-up)	Scales Used (Diagnosis Criterium)	Study Results
Canales et al./2019	TMD patients with pain; n = 691 (571F/120M, OY=42,5)	Cross sectional	GCPS, SCL-90-D, SCL-90-S (RDC/TMD)	41% of the patients had severe depression and 50.9% had severe somatization. Both depression and somatization are higher in women.
Manfredini et al. /2009	TMD patients with pain; n = 96 MFA group (20F/6M, MA=38,8) TMJ Pain group (34F/7M, MA=38,5) Combined group (21F/8M,	Cross sectional	SCL-90 (RDC/TMD)	In the MFA group, 58% had higher scores than the threshold, 37% in the TMJ pain group and 59% in the combined group. In the MFA group, those who had above-threshold somatization scale scores were 85%, 59% in TMJ pain group and 69% in

	MA=37,6)			combined group. There was no difference in SCL-90 sub-dimensions between the groups.
Muzalev et al. / 2018	Patients with Bruxism; n=293 (252F/41M, MA=40,3)	Cross sectional	PHQ-D, PHQ-S, GAD-7 OBC GCPS (DC/TMD)	The severity of bruxism and pain was positively associated with depression, anxiety and somatic symptoms. Daytime bruxism is positively associated with pain intensity. However, there is no significant relationship between sleep bruxism and pain intensity. The effect of depression on the relationship between daytime bruxism and pain intensity was found to be more important than anxiety and somatic symptoms.
Manfredini et al. /2005	Patients applied to the dental clinic; n=105 With Bruxism, n=38 (20F/18M, MA=23,9) Without Bruxism, n=67 (26F/41E, MA= 25,0)	Cross sectional	MOODS-SR (RDC/TMD)	Mood psychopathology was higher in patients with bruxism than in those without (b) (28.9% to 8.9%). Depression, mania, cognitive impairment and vegetative dysfunction scale scores were higher in patients with bruxism.
Türkoğlu et al. /2013	Children with sleep bruxism; n=28 (MA=11,5) and Control group; n=6 (MA=12,1)	Cross sectional	CASI, STAI-C, CDI (ICSD)	Children with sleep bruxism had higher levels of depression, anxiety sensitivity, and state-trait anxiety. The most important variable predicting the presence of sleep bruxism is anxiety sensitivity.
Reissmann et al. / 2014	TMD group; n=320 (269F/51M, MA=39,4) and Control group; n=888 (503F/385M, MA=40,4)	Cross sectional	STAI GCPS RDC/TMD, Axis 2-Depression (RDC/TMD)	Depression and state anxiety scores were significantly higher in TMD group. 31.3% of patients with TMD had severe state anxiety symptoms and 25.3% had moderate state anxiety symptoms. In the control group, these rates were 10.0% and 22.2%, respectively. Among the groups compared in terms of continuous anxiety, 17.5% of the patients had severe and 29.5% had moderate continuous anxiety symptoms. In the control group, these rates were 10.9% and 21.7%, respectively. Women are 4 times more at risk for persistent anxiety than men.
Manfredini et al. / 2004a	TMD group; n=87 (49F/38M, MA=26,36) and Control group; n=44 (20F/24M, MA=24,7)	Cross sectional	MOODS-SR PAS-SR (RDC/TMD)	Disc displacement was found in 38 subjects in the TMD group, MFA in 31 subjects and TMJ disorder in 18 subjects. The proportion of patients who exceeded the threshold values of depression was 7.8%, 22.2% and 51.6%, respectively, when compared to TMD groups. 5.2% of patients with disc displacement, 11.1% of patients with joint disorders and 38.7% of patients with myofascial pain had an above-threshold scale for anxiety disorder. Stress sensitivity, panic, separation anxiety, hypochondriac occupation and agoraphobia symptoms of MFA patients are higher than other groups. Mood pathology was 26.4% in TMD group and 20.4% in control group. Anxiety

				disorder was 18.3% and 15.9%, respectively.
Kindler et al./ 2012	TMD group; n=122 (MA=46,7) and Paired control group; n=2884 (MA=49,2) Muscle pain group; n= 50 (MA=48,7) and Paired control group; n=2984 (MA=49,1)	Prospective (5 years)	CID-S (Clinical examination and anamnesis)	Panic attacks, anxiety, generalized anxiety, specific phobia, depression and low energy were more frequent in both groups compared to control group. However, there was no difference between the groups in terms of social phobia and agoraphobia. In terms of comorbidities, headache, suboccipital muscle pain and migraine were more frequent in both groups compared to the control group.
Manfredini et al. / 2004b	Patients applying dental clinic; n= 85 (47M, 38F, MA=25) With Bruxism; n=34 (22F/12M, MA=24,7) Without Bruxism; n=51 (16F/35M, MA= 25,2)	Cross sectional	MOODS-SR PAS-SR (Clinical examination and anamnesis)	Stress sensitivity, expectation anxiety and assurance sensitivity are high in patients with bruxism. Total depression, mania and cognitive impairment were higher in patients with bruxism.
Cruz-Fierro N et al. / 2016	Patients applying dental clinic; n= 192 (135F/57M, MA=36,26) Group without bruxism; n=64, Group with sleep bruxism; n=26, Group with daytime bruxism; n=52 and Group with combined bruxism; n=50	Cross sectional	CSS (RDC/TMD)	Anxiety scale scores were significantly higher in patients with bruxism. Symptoms of somatic and emotional / cognitive anxiety are higher in patients with combined bruxism than those with only night or only day bruxism. There is a positive correlation between the severity of bruxism symptoms and coping strategies such as social withdrawal, self-criticism and emotion-oriented mismanagement.
Bayar et al. / 2011	Group without bruxism; n=16 (5F/11M, MA=30), Group with sleep bruxism; n=12 (12M, MA=24), Group with daytime bruxism; n=24 (3F/21M, MA=25,7) and Group with combined bruxism; n=33 (9F/24M, MA=27,1)	Cross sectional	SCL-90 (RDC/TMD)	There was no difference in SCL-90 sub-dimensions between those with daytime bruxism and those without bruxism. Somatization was significantly lower in patients with night (sleep) bruxism than those without bruxism. There is no significant difference between the other sub-dimensions. Depression, anxiety, hostility, phobic anxiety and paranoid thinking were significantly higher in patients with combined bruxism than those without bruxism. Somatization and anxiety were significantly higher in patients with daytime bruxism than those with night bruxism.
Kara et al. / 2012	Group with sleep bruxism; n=33 (17M/16F, MA=20,47) and Control group; n=32 (15M, 17F, MA=19,82)	Cross sectional	STAI OSI (Clinical examination and anamnesis)	State and trait anxiety levels were higher in patients with bruxism compared to the control group. OSI is higher in patients with bruxism. There was no difference between the total antioxidant levels between the groups.
Yap et al./ 2003	TMD diagnosed patients; n=191 (138F/53M, MA=33,6)	Cross sectional	RDC/TMD, Axis 2-Depression and Somatization Scales, (RDC/TMD)	39.8% of patients had moderate-severe depression and 47.6% had moderate-severe somatization scale.
Yap et al./ / 2004	TMD diagnosed patients; n=196 (140F/56M, MA=33,4)	Cross sectional	SCL-90 (RDC/TMD)	Patients with moderate to severe somatization symptoms have more muscle pain than

				those with mild somatization. However, there was no difference between the groups in terms of joint pain. Mandibular function limitation was significantly higher in patients with severe somatization than those with moderate and mild somatization.
Doepel et al. / 2018	TMD diagnosed patients; n=65 Localised (face and head) pain group; n=36 (25F/1M, MA=38) and Widespread (other areas) pain group; n=39 (33F/6M, MA=37)	Prospective (1 year*)	RDC/TMD, Axis 2-Depression and Somatiza-tion Scales, SCL-90 VPS, GCPS (RDC/TMD)	The reported stress level and general health level were similar in both groups. The initial depression scale scores did not differ between the groups. However, somatization symptoms are higher in the group with widespread pain. After the follow-up period, it was reported that the patients had improved TMD symptoms as well as somatization and depression symptoms. It was observed that the improvement in depression symptoms started at 10th week and maintained to be well after one year. The improvement in somatization symp-toms started in the 6th week in the group with local pain and in the 10th week in the group with widespread pain. In both groups, well-being continued at the end of one year. There was no difference between the groups in terms of both depression and somatization symptoms after one year.
Emshoff et al. / 2017	TMD diagnosed patients; n=126 Group with tension type headache; n=63 (62F/1M, MA=36,3) and Group without tension type headache; n=63 (56F/6M, MA=35,6)	Cross sectional	SCL-90 VPS, GCPS (RDC/TMD)	The presence of chronic tension type headache accompanying TMD is associated with severe depression (OR = 7.2), somati-zation (OR = 13.8), and pain (OR = 9.7).
Schmitter et al. / 2019	Patients applying dental clinic; n=42 (MA=45,1) TMD group and Group without TMD	Cross sectional	TICS, HADS EMG record (4 nights) (RDC/TMD)	Increased workload and performance pressure increase temporal muscle activity in patients with TMD. This relationship was not found in patients without a diagnosis of TMD.
Shedden Mora et al. / 2012	TMD group; n=36 (28F/8M, MA=27,4) Bruxism group without pain; n=34 (29F/5M, MA=25,7) Control group; n=36 (32F/4M, MA=24,3)	Cross sectional	SCL-90 SOMS-7, CES-D, PHQ, TMD-SL, EMG record (3 nights) (RDC/TMD) (ICSD) (DSM-IV)	Depression, anxiety and somatization symptoms were higher in TMD group, but there was no difference between the groups in terms of sleep quality and stress level. There was no difference between groups in terms of muscle activity in sleep. Muscle activity (activity per section) and somatization, stress level and depression symptoms were positively correlated. There was no significant relationship between muscle activity (activity per section) and anxiety symptoms (0.05 <p <0.10) and pain intensity.
Campris and Siqueira / 2006	Bruxism group with orofacial pain; n=70 (62F/8M, MA=37,5) and Bruxism group without	Cross sectional	RDC/TMD, Axis 2-Depression and Somatiza-tion Scales,	While 67.1% of patients with sleep bruxism with orofacial pain had severe somatization, 6.7% of the group without pain had severe somatization. Severe depression rates were

| | orofacial pain; n=30 (18F/12M, MA=33,0) | | (RDC/TMD) | also similar (50% to 13.3%, respectively). 41.7% of patients with only facial pain had severe somatization and 25% had severe depression symptoms. 59.1% of those with face and headache had severe somatization and 40.9% had severe depression symptoms. Severe somatization was observed in 80.5% and severe depression in 63.9% of the patients with pain in the face, head and body. |

*Evaluated the effect of oral device (appliance) treatment at 6th, 10th week and 6th month and 1st year.; CSS: Coping Styles Scale, CASI: Childhood Anxiety Sensitivity Index, CDI: Children's Depression Inventory, CES-D: Centre for Epidemiological Studies Depression Scale, DC/TMD: Diagnostic Criteria for TMD, M: Male, EMG: Electromyography, GAD-7: Generalized Anxiety Disorder-7 Scale, GCPS: Graded Chronic Pain Scale, HADS: Hospital Anxiety and Depression Scale, ICSD: International Classification of Sleep Disorders, F: Female, MFP: Myofascial Pain, MOODS-SR: Mood Spectrum Self-Report, OBC: Oral Behaviours Checklist, OSI: Oxidative Stress Index, MA: Mean Age, PAS-SR: Panic-Agoraphobic Self Report, PHQ-D: Patient Health Questionnaire - Depression, PHQ-S: Patient Health Questionnaire -Somatization, RDC/TMD: Research Diagnostic Criteria for TMD, SCL-90-D: Symptom Check List-Depression, SCL-90-S: Symptom Check List -90- Somatization, SOMS-7: Screening for Somatoform Symptoms, STAI: State-Trait Anxiety Inventory, STAI-C: State-Trait Anxiety Inventory-Children, TICS: Trier Inventory for the Assessment of Chronic Stress, TMD-SL: TMD Symptom List, TMJ: Temporomandibular Joint, VPS: Visual Pain Scale

Treatment

Since TMD and bruxism have a multifactorial etiology, a multidisciplinary approach is required in the treatment. Psychosocial variables, which are an important factor in the development and progression of TMD, should be evaluated with a detailed anamnesis and mental status examination. In addition to the psychiatric approach, the knowledge of basic patient education in the early stages of TMD and bruxism contributes positively to prognosis. In addition, the general knowledge of the methods used in the treatment of these disorders provides competence regarding on which stage of the disease and from which department a consultation should be sought. Therefore, in this part of our study, information will be given about general treatment methods and the focus will be on psychiatric treatments. Treatment methods will be examined under the categories of patient education, conservative therapies, surgical therapies and psychiatric therapies.

Patient education

In a significant proportion of patients, symptoms of TMD and bruxism improve over time with basic patient education or without treatment. It is reported that patients recovered by 50% in one year and 85% in three years (Yener and Aynali 2012). Therefore, conservative treatments should be applied before interventional treatments.

The basic protection methods related to TMD and bruxism should be explained to the patients in detail, the stages of the patients should be determined, the responsibility should be given to the patient for the improvement of these stages, if necessary, the previous interview should be summarized, if there are deficiencies, the treatment should be emphasized. The conservation program roughly includes what should and should not be done. These are presented in Table 2.

Conservative treatment methods

1. Pharmacological treatments

The treatment methods used for TMD and bruxism have been a growing topic in recent years. The basic approach in treatment is based on pain reduction. Analgesics, anti-inflammatory agents, corticosterodies, psychotropic drugs (anticonvulsants, antidepres-

sants [AD], antipsychotics [AP], etc.), muscle relaxants and vitamins are used to reduce pain. These treatment options are sometimes used as monotherapy and sometimes in combination. Nonsteroidal anti-inflammatory drugs (NSAIDs) reduce pain formation by inhibiting prostoglandin synthesis, while muscle relaxants are another group of drugs used to treat TMD and bruxism. Benzodiazepines (Diazepam, Clonazepam, etc.) are an effective drug used in the treatment of both as muscle relaxant and in anxiety disorders (Mısırlıoglu et al. 2012). Omega-3, folic acid, vitamins B, C and E are the treatment options used both for the elimination of nutritional deficiencies and for their antioxidant properties (Yener and Aynali 2012, Yaltırık et al. 2017).

Table 2. Basic conservative methods in treatment of TMD and bruxism

Do`s	Don`ts
Feeding on a diet dominated by soft foods	Consuming hard nuts like nuts and peanuts frequently
Eat in small bites	Chewing one-sided
Remembering and applying the resting position of the TMJ joint (adjacent lips, teeth apart, tongue on mouth ceiling)	Avoiding parafunctional activities (such as chewing gum, biting pencils, sucking fingers, squeezing teeth)
Deep breathing (through nose)	Shallow breathing (through mouth)
Keeping head and shoulder in an upright position	Avoid leaning forward
Laying down	Weltering
Supporting the jaw while yawning or laughing	Not smoking, not using alcohol and substances
Exercise	

2. Physical therapy

Physical therapy is an effective treatment for muscle skeletal pain relief, tissue repair and regeneration (Yener and Aynali 2012, Yaltırık et al. 2017). Transcutaneous Electrical Nerve Stimulation (TENS), superficial and deep heaters, laser applications, cold and hot application, ultrasound, biofeedback, iontophoresis, phonophoresis, trigger point injection, acupuncture, therapeutic exercises, posture training and mobilization (soft tissue and joint) are commonly used methods (Karan and Aksoy 2004, Yener and Aynali 2012, Yaltırık et al. 2017).

3. Dental therapy

Dental treatments are aimed at achieving harmony between occlusal surfaces, stabilizing the joint and reducing abnormal muscle activity (Yener and Aynali 2012). Commonly used occlusal splints provide a balanced distribution of interdental force, prevention of wear on the teeth and correct maxillo-mandibular relationship. The splint types applied differ according to the characteristics of the disorder. Therefore, the most important factors affecting dental treatment are the choice of appropriate splint, the construction and application of the splint. Patient compliance must be considered in the evaluation of these treatment modalities (Kurita et al. 2000). Although there is no clear limit on splint life, prolonged use can lead to serious and irreversible damage (Mısırlıoglu et al. 2012).

4. Acupuncture

It is a treatment method that helps other methods used in the treatment of pain. It has been shown to be effective in acute tooth pain, idiopathic headache, masseter muscle pain, migraine and tension headache. A review on its efficacy in the treatment of TMD reported that acupuncture had similar efficacy to occlusal splints and was significantly superior to the placebo group. However, it should be kept in mind that the studies per-

formed in small sample groups and the follow-up periods are short (Fernandes et al. 2017).

5. Botulinum toxin therapy

Botulinum toxin A (BTX) causes temporary loss of function in the muscles and glands blocking the release of acetylcholine. In addition to spasmodic dystonia, cervical dystonia, myalgia, sialorrhea, blepharospasm, this toxin is used in the treatment of TMD and bruxism. It was used to reduce pterygoid muscle spasm in TMD and muscle spasm in masseter and temporal muscles in bruxism (Mısırlıoglu et al. 2012). There are studies showing efficacy in both TMD and bruxism (Chikhani and Dichamp 2003, Long et al. 2012). The fact that the results of the study are based on subjective evaluations decreases the reliability and there are uncertainties about whether the injection should be performed unilaterally or bilaterally, the dosage and the efficacy. Although the effect lasts for 3-6 months after injection, long-term injection is not recommended (Eren et al. 2015). More randomized controlled trials are needed to eliminate the uncertainties associated with botulinium toxin treatment and to establish a standard algorithm.

Surgical treatment methods

Most of the symptoms of TMD are improved with patient education and conservative treatment options. In one study, it was reported that only 5% of patients with TMD had a functional or pathological disorder that required surgical treatment (Dimitroulis 2011). Absolute indications for surgical treatment include ankylosis, neoplasia, dislocation and developmental disorders. However, surgical treatments are used for severe pain and severe joint limitations that do not respond to conservative treatments (Dimitroulis 2011). Although good response rates vary in treatment, complications can be seen frequently due to their anatomical neighborhood. Bleeding, infection, adhesion formation, increased degeneration, postoperative pain, damage on the outer – middle – inner ear structures, and damage on the facial and other cranial nerves are the most common complications (Yener and Aynali 2012). If there is no absolute and acute surgical indication as a treatment option, patient education and conservative treatment options should be considered first. However, surgical treatment should not be delayed when necessary.

Psychiatric approaches

While medical treatment is the priority in the acute stages of the diseases, psychiatric treatments come to the forefront as well as medical treatment in the chronic stage. The biopsychosocial theory of patients in all periods of disease should include a thorough understanding of the characteristics of the physical illness and the relationship between the patient as an individual and the social environment. In the biological aspect, characteristics such as hereditary characteristics, age, sex, affected organ, symptoms and severity of the disease, comorbidities and disease interactions should be considered. In the psychological dimension, personality characteristics, illness perception, coping strategies, past illness history, presence of psychopathology, adaptation ability and perception of the disease should be evaluated, while in the social dimension, variables such as marital status, cultural structure, interpersonal relationship styles and family relationships should be evaluated. (Özkan and Özkan 2016).

Psychiatric disorders, especially depression and anxiety disorders, are common in TMD and bruxism (Yap et al. 2002, Manfredini et al. 2004a, Pallegama et al. 2005). Antidepressants, which are mainly used in the pharmacological treatment of depression and anxiety disorders, can TMD formation by causing bruxism (Kuloğlu and Ekinci 2009). This is a clinical problem for both dentists and psychiatrists. This problem should be evaluated from a multidisciplinary perspective and treatment options should be followed in the light of current literature (Rajan and Sun 2017). In this part of our study, pain treatment, cognitive behavioral therapy (CBT), bruxism-causing psychotropics and treatment of bruxism will be discussed.

Pain treatment

The most common symptom in TMD is pain, which leads to seeking treatment (Stechman-Neto et al. 2016). One aspect of this pain originates from the disease, and one aspect originates from psychosomatic disease. Acute developing pain is a sensation in which the cause of symptoms is known, responds to adequate and appropriate treatment, shows a short-term course and is necessary for survival. However, the cause of chronic pain is sometimes unknown, the response to treatment is suboptimal, full recovery is often unlikely, the time course is uncertain and it is pathological (Stahl 2012).

Noraderenergic (presynaptic alpha 2 adrenoreceptors) and serotonergic neurons (5-HT1B/D / D receptors) in descending spinal pathways suppress the access of the body to the brain and reduce pain perception. If these neuron functions are impaired, inappropriate nociceptive inputs cannot be suppressed and normally neglected inputs are perceived as pain. This explains depression, fibromyalgia, irritable bowel syndrome and painful somatic symptoms in TMD. Selective serotonin reuptake inhibitors (SSRIs) and serotonin-noradrenaline reuptake inhibitors (SNRIs) suppress nociceptive inputs by increasing serotonergic and noraderergenic transmission from the descending pathway to the posterior horn. This prevents pain from occurring (Stahl 2012). Similarly, tricyclic antidepressants (TCA) which inhibit non-specific inhibition of serotonin (5-HT), noradrenaline (NA) and dopamine (DA) reuptake are effective in pain reduction. Dopamine also has an antinociceptive effect by increasing the ventral tegmental area on the striatum. It is not clear whether AD drugs that increase DA secretion affect this area (Magnusson and Fisher 2000).

The effect of AD on chronic pain is different from its effect on depression. The mean duration of action of ADs is 2-4 weeks, but it affects pain within 1-2 weeks. Antidepressants can show pain relief even without depression (Obata 2017). Drugs that inhibit both NA and 5-HT reuptake have been shown to have pain relieving characteristics compared to drugs that inhibit 5-HT reuptake only (Obata 2017). This suggests that noradrenaline is an important neurotransmitter in pain reduction. Stimulation of the alpha 2 receptor in neuron bodies in the spinal cord is known to be highly effective in controlling allodynia and hyperalgesia symptoms (Kimura et al. 2012). In this way, GABA and acetylcholine act as mediator neurotransmitters.

TCA, SNRI, SSRI, gabapentin and pregabalin are used primarily for the treatment of TMD. When deciding which medication to choose, patient preferences, lifestyles, risk factors, side effects and comorbidities should be considered.

In a study evaluating the efficacy of therapies by means of the number needed to treat (NNT) for chronic pain was 2,1 for TCAs, 5 for SNRIs, 6,8 for SSRIs, and 6,4 for ga-

bapentin, 4,5 for pregabalin and 2,6 for opioids (Finnerup et al. 2010). The data obtained from these studies show that TCAs are more effective on pain than other drugs.

Tricyclic antidepressants, especially amitriptyline, can be used as the first treatment option for pain (Rajan and Sun 2017). Starting at a daily dose of 10 mg / day, the dose can be increased to 150 mg / day. However, it may not be easy to increase the dose due to drug side effects. Especially sedation, dry mouth and constipation are the most common side effects. Imipramine may be preferred in patients who cannot tolerate amitriptyline. However, a similar side effect profile applies to this drug. There is a linear relationship between the dose of amiptriptyline and the effect of pain. In a study, 75 mg / day drug dose showed more pain-relieving characteristics than 25 and 50 mg / day drug dose. However, it has been reported that drug side effects are more frequent. The linear relationship between amitriptyline and pain was not observed with antidepressant effect. This should be taken into consideration.

Sleep disorders are common in depression and anxiety disorders accompanying TMD. These drugs may be advantageous for patients with sleep disorders. Sleep latency is shortened with daily doses that can be taken before bedtime.

In a study aiming to compare the efficacy of amitriptyline with CBT, participants were classified into four groups; Amitriptyline only, CBT only, CBT + amitriptyline and placebo group (Calderon Pdos et al. 2011). As a result of the study, a similar decrease in pain was shown in all four groups. There is an average 55% reduction in pain intensity. However, amitriptyline + CBT group was the only group where the pain continued to decrease at 4 weeks after the completion of treatment. In this group, besides pain, depression symptoms improved and quality of life and sleep quality improved.

SNRIs include duloxetine and venlafaxine. Both drugs have been reported to be effective in chronic pain control. However, it is widely believed that duloxetine is more effective in reducing pain than venlafaxine. The initial dose of duloxetine is 30 mg once a day. The dose can be increased to 120 mg / day. It is widely known to be effective especially in neuropathic pain, migraine and fibromyalgia (Scrivani et al. 2008). Nausea and constipation are common side effects. Venlafaxine can be started from 37.5 mg / day and increased to 300 mg / day. While 75 mg / day shows an SSRI-like activity, noradrenergic effect starts at 150 mg and dopaminergic activity starts at 300 mg / day. Venlafaxine, similar to duloxetine, may cause side effects such as nausea and constipation, and it can increase the blood pressure (Stahl 2012). Pain relief effects for venlafaxine and duloxetine have been reported to be independent of AD effect and to be seen at lower doses and earlier than AD doses (Gultekin and Ahmedov 2006). In a recent study of patients with TMD, participants were classified into two groups: arthrosynthesis group and post-arthrosynthesis 12 weeks duloxetine group (Singh et al. 2018). Although there was a decrease in pain in both groups, pain was significantly reduced from the group using duloxetine at 4, 6 and 12 weeks. Joint restriction improved significantly in the duloxetine group. Among the groups after arthrosynthesis, anxiety and depression were similar, while IL-6 levels decreased in both groups. However, no difference was observed between the groups in terms of IL-6 levels.

Although SSRIs have been shown to be effective in the treatment of pain, it is known to be less effective than other treatments. However, they are often preferred because they are easier to tolerate, have better patient compliance and less adverse effects (Obata 2017). In a recent review, the effect of SSRIs on pain was evaluated (Patetsos and Horjales-Araujo 2016). While contradictory results were observed with sertraline

(good results in 4 of 9 studies), citalopram (2/7) and paroxetine (4/9), significant reductions in pain have been reported in fluoxetine (9/10), fluvoxamine (3/3) and escitalopram (3/3). According to the results of this review, fluoxetine appears to be one step ahead of other SSRIs. However, the researchers say that the results of the study should be analyzed well. Because it states that 23 of the 36 studies included in the review contain any methodological deficiencies that may have high bias risk and only 4 studies are evaluated with low bias risk.

Although anticonvulsant drugs (gabapentin, pregabalin) are typically used for neuropathic pain, it is a potential treatment option for TMD pain, including the orofacial region (Hersh et al. 2008). Gabapentin in particular is an attractive agent because it has a relatively low side-effect profile compared to other anticonvulsants and is shown to be effective in various chronic pain syndromes. A structurally similar anticonvulsant pregabalin is also effective and well tolerated in neuropathic pain. In a randomized controlled trial, gabapentin has been shown to significantly reduce pain intensity in the temporal and masseter muscles compared to placebo in patients with myogenic origin TMD (Kimos et al. 2007). In this study, while the initial dose of gabapentin was 300 mg, the mean dose at 8 weeks was reported to be 3315 mg / day. Dizziness, sedation and forgetfulness were the most frequently reported side effects as gabapentin dose increased. Anticonvulsants may be considered as an alternative in patients with long-standing pain.

Another group of drugs that can be used for pain control may be antipsychotics. In a review of eleven studies, the effect of typical antipsychotics (flupentixol, fluphenazine, haloperidol, sulpiride, pimozide, etc.) on various pain groups (somatoform pain disorder, cancer and pain after heart attack, etc.) was generally evaluated (Seidel et al. 2013). Five studies have shown that the mean pain intensity is reduced. However, the small sample size in the studies limits this effect. A review of the effect of atypical antipsychotics has been shown to be effective in olanzapine and quetiapine pain control (pain caused by cancer, migraine, chronic headache, fibromyalgia) (Fishbain et al. 2004). The therapeutic effect of atypical antipsychotics on depression and anxiety disorders at low doses and the effect on serotonergic pain pathways seem to be possible mechanisms for pain reduction.

Cognitive behavioral therapy (CBT)

Recently, CBT has been used in various psychosomatic diseases and treatment efficacy has been confirmed in many studies (List and Axelsson 2010, Matsuoka et al. 2017). CBT includes many subtitles used in the treatment of TMD such as relaxation, pain management, detecting false thoughts, creating alternative thoughts, providing cognitive restructuring, avoiding fear, stress management and relapse prevention (Matsuoka et al. 2017). In addition to these issues, biofeedback method has been used together with CBT treatment (Shedden Mora et al. 2013). In biofeedback treatment, patients monitor muscle activity by electromyography. In the meantime, they practice by relaxing their muscles. Patients gain control of their muscles and increase their awareness. This technique is similar to the basic idea of relaxation exercises. Therefore, relaxation exercises and breathing exercises are also used in the treatment of patients diagnosed with TMD. The short-term efficacy of biofeedback treatment has been proven (Turk et al. 1993). Researchers who saw this effect aimed to use this treatment with CBT. Thus, both short-term and long-term pain control efficacy was achieved. In a study comparing bi-

ofeedback-based CBT with occlusal splint (Shedden Mora et al. 2013) clinical improvement was similar in both groups (45% and 48%, respectively). However, pain intensity and morbidity decreased significantly in the CBT group, while pain coping skills and treatment satisfaction were found to be higher. The well-being of the biofeedback-based CBT group continued for 6 months.

Although the effectiveness of CBT is effective in TMD, the high cost and the difficulty of finding a qualified therapist make access to this treatment difficult. CBT is mainly applied by psychiatrists and psychologists. One study showed that dentists who received basic CBT training on 8-hour TMD were also successful in reducing pain and interventions related to TMD (Dworkin et al. 2002). From this study, it can be said that CBT will be used more frequently in the treatment of TMD in the future

Psychotropics causing bruxism

Although SSRIs are used for pain control in TMD, it is recognised in the literature that they also trigger bruxism (Kuloğlu and Ekinci 2009). Increased serotonin after SSRI treatment reduces DA secretion in the mesocortical pathway. It is assumed that decreased dopamine causes disinhibition in movements and constitutes the most important mechanism in formation of bruxism. Literature data such as changes in DA binding at D2 receptors in patients with bruxism, as DA agonists reduce symptoms of bruxism and DA antagonists increase symptoms of bruxism suggest that DA is an important neurotransmitter in bruxism (Kuloğlu and Ekinci 2009, Stahl 2012).

In the literature, there are reported cases of bruxism related to almost all SSRIs (sertraline, fluoxetine, paroxetine, fluvoxamine and citalopram). In a review of movement disorders after SSRI use, bruxism was observed in 7.8% of 127 cases (n = 10) (Gerber and Lynd 1998). In this study, the onset of symptoms was between 1 day and 11 months (mean 2.3 months). SSRI dose reduction and drug addition (benztropine, procyclidine or buspirone) are preferred in the treatment of developing bruxism.

Similar to SSRIs, SNRIs are known to induce bruxism. It appears to produce more bruxism than venlafaxine duloxetine (Kuloglu et al. 2010, Chang et al. 2011). This may be due to the fact that venlafaxine is 30 times more selective than NA in inhibiting 5-HT reuptake (10 times in Duloxetine) and that venlafaxine acts as SSRI in low doses (<150 mg / day) (Rajan and Sun 2017). In the literature, it is supported by the case in which a patient improved with the transition from venlafaxine to duloxetine (Chang et al. 2011). There are also studies reporting that bruxism occurs with the use of duloxetine (Kuloğlu and Ekinci 2009, Onat and Malas 2015). In one of these cases, bruxism continued despite the reduction of duloxetine dose (60 mg / day to 30 mg / day), but the complaints improved on the fourth day after the addition of amitriptyline (25mg / day) to the treatment (Onat and Malas 2015).

Treatment of bruxism

Although the use of TCAs generally decreases over time, it is used in the treatment of chronic pain, insomnia and psychosomatic diseases. It is thought that TCAs may reduce the formation of bruxism due to the effects of suppressing REM sleep and prolonging the 4th phase of NREM sleep. However, the confirmed effect of amitriptyline, one of the most commonly used TCAs in the treatment of bruxism, seems to be insufficient for the treatment of bruxism. Two randomized controlled double-blind studies comparing

amitriptyline (25 mg / day) with a follow-up period of 1 week and 4 weeks reported no significant change in masseter muscle activity (Mohamed et al. 1997, Raigrodski et al. 2001). In these studies, as the sample was made in ten people, the researchers reported that the effect of amitriptyline should be done in large samples. In a similar design study, amiptriptyline (25 mg / day) did not change the bruxism but decreased stress perception (Raigrodski et al. 2001).

After the association of bruxism with dopamine reduction, dopamine agonists are being investigated in the treatment of bruxism. In a case report of pergolid, a D1 / D2 receptor agonist, (Van der Zaag et al. 2007) it was shown that bromocriptine, a D2 receptor agonist, (Lobbezoo et al. 1997) reduced symptoms of bruxism in a randomized double-blind study. These studies are quite difficult to use widely in treatment because of side effects. Buspirone, which increases DA secretion in prefrontal cortex after confirmation of dopamine effect in the etiology of bruxism, is one of the other drugs used in the treatment of bruxism. Buspirone induces an increase in DA secretion with 5HT1A partial agonist effect. Although there is no randomized controlled study in the literature on the effect of buspirone on bruxism, there are many case reports supporting its efficacy (Kuloğlu and Ekinci 2009, Garrett and Hawley 2018). Based on these case reports, although buspirone can be used in bruxism, further research is needed to clarify its effectiveness.

Another pharmacological treatment option for bruxism is benzodiazepines. Since benzodiazepines are also effective in anxiety disorders, they may be preferred primarily in patients with anxiety disorders accompanying bruxism. However, the possibility of creating addictions should be kept in mind. In this group of drugs, patient expectations, personality traits, psychiatric diseases, addictive potential, comorbidities (lung diseases, epilepsy, etc.) and other drugs should be taken into consideration. In a single blind-randomized study comparing clonazepam (1 mg / day) with placebo, it was shown to reduce symptoms of bruxism and accompanying periodic leg movements, and improve sleep quality and efficiency (Saletu et al. 2005). However, apnea and hypopnea were also increased and this increase was reported to be within normal limits. A recent randomized double-blind study compared clonidine, clonazepam and placebo groups (Sakai et al. 2017). Clonidine reduced rhythmic contractions in the masticatory muscles by 30% more than clonazepam. However, clonidine-related cardiological side effects were observed, but not in clonazepam. Researchers evaluating bruxism-related therapies have suggested that clonidine is one of the effective therapies but causes hypotension in the morning and that clonazepam is more ideal for a short-term treatment (Huynh et al. 2006). In a randomized controlled trial using diazepam for 2 weeks (2.5-10 mg / day) in children, diazepam showed a significant decrease in the severity score of bruxism, but this decrease was also observed in the placebo group (Mostafavi et al. 2019).

Although propranolol, lamotrigine, gabapentin, and tandospiron have improved symptoms of bruxism in the literature, further studies on these drugs are needed (Kuloğlu and Ekinci 2009).

In the light of this information, there are treatment recommendations to be followed mainly in bruxism caused by psychotropic drugs. These are listed below;

1. First, applying the basic protection methods shown in Table 2
2. Reducing the dose of antidepressant medication if basic protection methods fail
3. Cutting the antidepressant if necessary

4. Switching to an antidepressant from a different group
5. Adding buspirone (5-HT1A partial agonist) to the treatment
6. Adding benzodiazepines (especially clonazepam) that are known to have efficacy in anxiety and sleep disorders, although they have shown similar activity to placebo
7. Adding amitriptyline, which has been confirmed to be useful in pain control, although it does not produce the desired effect on bruxism
8. Adding dopamine agonists (bromocriptine) considering the side effects (exacerbating psychosis, hypertension, sedation, headache, etc.)
9. Paying attention to the interactions of the drug thought to cause bruxism
10. Avoiding multiple drug use
11. Treating additional psychiatric disorders with drugs that are unlikely to cause bruxism, and if possible using CBT
12. Using CBT to restore cognitive structuring for depression and anxiety disorders that are common in bruxism
13. Applying dentists for dental treatment

Prognosis

Surgical treatment options in TMD are as low as 5%. In other words, 95% of the patients are treated with conservative treatment methods (Yener and Aynali 2012). In particular, the implementation of the basic protection methods is low cost and the first treatment step to be applied. Bruxism is one of the major causes of TMD and requires treatment. As a result of high pressure in stomastognatic structures as a result of bruxism exceeding the regeneration limit in related tissues, TMJ causes pathological changes in teeth, supporting tissues and muscles. The pathologies that lead to the formation of disorders such as adhesion, disc damage and osteoarthritis (Mısırlıoglu et al. 2012). Bruxism not only causes TMD, but also brings aesthetic problems. Craniofacial changes such as skin atrophy, loosening of ligaments, bone deformities, decrease in superficial and deep fat compartments, hypertrophy of masseter and temporal muscles also occur (Aguilera et al. 2017). Treatment without such deterioration will be both easy and cost effective.

Conclusion

The etiology and treatment of both bruxism and TMD are controversial. Most of his research on psychiatric disorders associated with TMD and bruxism are cross-sectional. Therefore, it is not possible to reach a clear conclusion on whether psychiatric disorders trigger the development of TMD after it is predisposed to pain or whether psychiatric disorders occur after TMD develops. However, it is clear that psychosocial factors have an effect on the formation and progression of TMD. It is evident that symptoms of TMD (especially pain) have an effect on both the formation and progression of psychiatric disorders after the development of TMD.

Psychiatric disorders associated with TMD and bruxism are quite common and use psychotropic drugs in treatment. Bruxism caused by these drugs creates problems in treatment. However, the absence of non-severe symptoms of bruxism prevents the actual frequency of bruxism from psychotropic drugs. Undetected bruxism can be detected at an advanced stage during treatment controls. Therefore, when questioning drug side

effects, it should be questioned in bruxism. In cases with mild to moderate symptoms, awareness of the patient should be increased by considering basic prevention methods. Amitriptyline is prominent in TMD pharmacotherapy and buspirone and clonazepam are two important drugs in bruxism. The fact that these drugs are studied in small samples and that the available information is mostly based on case reports clearly shows the necessity of further studies. The widespread use of CBT in these two disorders can both come as a solution. Therefore, CBT should become more widespread in the treatment of TMD and bruxism. Regardless of the treatment option, both dentists and psychiatrists should be involved in a multidisciplinary work environment and evaluate these diseases within the framework of a biopsychosocial model.

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