



ETIOLOGY, DIAGNOSIS AND THERAPY IN PATIENTS WITH BRUXISM-REVIEW ARTICLE

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Abstract: Introduction: In the dictionary of prosthetic terminology, bruxism is defined as an unconscious oral habit of rhythmical, unfunctional clenching, grinding and making chewy sounds with the teeth while making movements that are not part of the masticatory function and that lead to occlusal trauma. It has multifactorial etiology which is associated with occlusal, psychological or environmental factors or habits that can compromise the orthognatic system which leads to negative consequences. **Purpose:** With the help of literature data the purpose of this article is to show the occurring, the diagnosis of bruxism, its etiological factors, clinical manifestations and its therapy with occlusal inserters (splints). **Material and methods:** Searching the data was completed by using information on the internet on Research gate, Pub med, Science Direct, by analyzing written articles and books and student books. Key words like bruxism, etiology and symptoms, injuries on the teeth from attrition, teeth grinding, muscle articular disorder, temporomandibular disorder, occlusal splints were used. From 180 articles that were analyzed and many internet pages, 45 articles were involved in writing this review article and two textbooks that process the most contemporary aspect form this area, are cited suitably and are shown in the literature. **Results:** From the analyzed literature results were obtained that the main consequences from the bruxism are muscle fatigue, pain, wasting of the incisal edges and occlusal surfaces of the teeth, and in severe cases, loss of teeth, dental implants, headaches, periodontal lesions and TMD (dysfunctions of the masticatory muscles and temporomandibular joint (TMJ)). These clinical manifestations can lead to increased problems associated with oral rehabilitation and damage to the prosthetic restorations. Results that followed showed subsequent reduction of the vertical dimension of the orofacial system. All these problems negatively affect the quality of life of the patient. Results for early diagnosis and identification of the etiological factors of bruxism are important for the prevention of the disease and progression of the lesions of the orofacial structures. This prevents pain of the craniofacial muscles, allowing it to restore the structures that have been lost and changed. Thus the achievement of physiological vertical dimension is allowed.

Conclusion: From all the data and results obtained from the researched literature it was found out that bruxism as a parafunctional habit is present in the modern way of living, which contributes to changes in the oral-sensory-motor system carrying complete changes in the orofacial region. For the treatment of bruxism multidisciplinary approach is inevitable, in order to prevent violations of the osteo-dental structures. Lately, its prevalence is increasing and is related to several factors such as stress, drugs, anxiety, changes in lifestyle and nutrition as well as distortion of the sleep. Therefore the therapist should be aware of its signs and symptoms, all aimed through modern diagnostic protocols and therapeutic modalities to ensure the best treatment plan of the patient.

Key words: Bruxism, grinding of the teeth, pressing of the teeth, occlusal splints, TMD, TMJ, Masticatory muscles.

Introduction: In the dictionary of dental prosthetic terms bruxism is defined as an unconscious oral habit of rhythmic dysfunctional pressing, clenching and grinding of the teeth when performing movements that are not part of the masticatory function that lead to occlusal trauma. It represents an oral parafunctional activity, which is not related to normal physiological functions, such as speech, breathing, chewing.

Bruxism is a complex occlusal parafunction which can hardly be placed in several different categories of parafunctions (1). It is among the diseases that occur as a sleep disorder. According to the international classification of sleep disorders bruxism can be considered the condition when the night grinding or clenching of teeth occurs in combination with at least one of the following signs: damage to teeth, sounds associated with bruxism and pain due to inflammation of the masticatory muscles. In the dictionary of terms of dental prosthetics bruxism is defined as an unconscious habit of oral rhythmic dysfunctional pressing, clamping and gnashing of the teeth when performing movements that are not part of the function of mastication and lead to occlusal trauma. Bruxism episodes, duration and intensity of which they appear are different, individual to each patient. The appearance of bruxism can be seen from 6-20% of the population in each age starting from the eruption of deciduous teeth.

The bruxism is common in our population which is manifested by pinching and grinding of the teeth. However this parafunctional habit is characterized by different intensity and periodic repetition. This condition tends to decrease with age, while generally observed it has a common representation (2).

In most cases this parafunction is discovered when the patient goes for the first time to the

dentist. One of the most prominent clinical signs is abnormal wearing of the teeth, caused by clenching and teeth grinding. However this is not a decisive sign of bruxism because wearing of the teeth can occur when eating acidic foods or improper tooth brushing (erosion and /or dental abrasion). In this way the therapist should always consider the bruxism antagonist which are also worn, damaged or reduced (3).

The etiology of bruxism is not entirely discovered (4). Little morphological factors such as dental occlusion and anatomy of the bone structure of the stomatognathic system can be connected to bruxism.

There are more recognizable etiological factors that lead to the diagnosis of bruxism. Psychosocial factors like stress and certain personal characteristics and pathophysiological factors (eg, illness, trauma, genetics, smoking, intake of caffeine, medications and illicit drugs), sleep disorders (sleep apnea and snoring) and involving dopaminergic system are often present in the etiology of bruxism. One thing is certain-there is not only one factor responsible for the occurrence of bruxism. But it is also evident that there is no generalized one sided treatment that is effective to eliminate or reduce its occurrence (5).

Other clinical signs in patients with bruxism are fractures of the teeth or dental restorations (fillings, or damage to prosthetic restorations (7) as crowns, bridges or dentures). Another change noticed can be the mobility of teeth, pain, hypertrophic facial muscles and reduced capacity to open the patient's mouth after waking in the morning. There is a possibility of frequent headaches, especially in the temporomandibular region (6).

Purpose: Based on own dental experience and with a purpose for deeply seeing the bruxism and funded by data from the literature, this article is aimed to show the appearance and the diagnosis of bruxism, its etiological factors, clinical manifestations, and treatment of using occlusal inserters (splints) (7).

Materials and Methods: For the purpose of this paper bibliographic review of the literature was carried out for bruxism. Its classification

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and etiological factors and major clinical manifestations and therapeutic modalities in the oral cavity were obtained with research on the internet, from specialized websites as Researchgate, Pubmed, Science Direct, and through the application of domestic and foreign literature, analyzing the written papers books and textbooks. Key words such as bruxism, etiology and symptoms, damage to teeth from attrition, teeth grinding, pressing the teeth, muscle-articular disorders, temporomandibular dysfunctions, TMD, TMJ, application of occlusal inserter for the treatment of bruxism were applied in the search database on the Internet. There were 180 papers read and analyzed and many internet pages, of which 45 papers were included in the preparation of this paper and two textbooks in Macedonian language that cultivate the most sophisticated aspect of this issue. The papers and textbooks used are cited in the article using numbers and are suitable shown in the section literature.

The criteria for selection of papers included the prevalence of the disease, clinical manifestations, diagnosis and the consequences. These papers are in English and they were used with permission from the authors for their use.

Results: Bruxism can be defined as a parafunctional activity on the masticatory system which includes clenching and grinding of the teeth at an unconscious level where the neuromuscular protective mechanisms are absent. This can cause injuries on the masticator system and TMJ dysfunction (8).

Episodes of occurrence of the disease are highly variable as in a patient and between different patients (8). The duration of the night grinding can be 5 to 38 minutes during the night as a part of the parafunctional activities. The strength of the contact between the teeth is measured, which can be three times higher than the functional activity of the masticatory system. Other authors proved that during the disease a collapse of the structures of the orofacial system can occur (8).

The authors describe the bruxism as an orofacial motor activity during sleep, characterized by repetitive or sustained contractions of the mandibular elevatory muscles, which can cause

muscle rigor, about 150-340 kg. directed, exactly pinpointed, exactly obtained voltage during active periods resulting in fractures and damage or wearing of teeth, periodontal problems, pain, muscle fatigue and headaches (9).

The earliest references to bruxism are described in the Bible, which is associated by the grinding dental pain and as "the first sentence of the Lord" (10). According to the illustrated medical dictionary Dorland, the word bruxism comes from the Greek word *brihein*, indicating clutching of the teeth (11).

Bruxism is one of the most relevant, complex and destructive dental disorders (12).

According to the degree of difficulty bruxism can be classified as moderate, severe and extreme (mild, moderate, severe), but there occurs evidence for lesions on the structures of the stomatognathic system (9).

According to the neuromuscular activity during the bruxism there can be a division into three types of bruxism: toned, periodic and combined (1).

By the way to perform these parafunctional movements bruxism has horizontal and vertical form. During the sleep the bruxism may be horizontal or vertical, but conscious daily bruxism known as bruxomania, can not be performed with a horizontal movement (1).

It can also be classified as centric and eccentric (9). Centric bruxism consists of continuously pressing the teeth for a period of time with the destruction of their supporting structures but also conditions that include the masseters and temporomandibular joint. In eccentric bruxism there are isotonic muscle contraction and damage on the incisal edges of the teeth particularly in the anterior arch of teeth (12). However not all cases of wearing the incisal edges is the result of a parafunctional activity. It may be associated with other habits like biting nails, biting objects among other types of habits (9).

Bruxism can be classified as acute, subacute or chronic. The literature suggests that occlusal disharmony interferes with bruxism when the patient shows signs of/or muscle symptoms.

This occurs in centric relation and/or functional lateral or protrusive faze (13,14,15,16).

Some authors classify the bruxism as daily and nightly bruxism, each possessing their own different characteristics and causes (8,10). In other words bruxism occurred during the day is called daily bruxism (DB), while bruxism occurring during sleep is called nocturnal bruxism (NB). Daily bruxism is known as bruksomania (1) These two types of bruxism have different clinical entities that occur in different degrees of consciousness and have different etiologic factors. These two types of bruxism differ and need to be diagnosed and require different treatment plan (17). DB and NB are classified as primary when no clear medical causes, systemic or psychiatric disorders occur. Although in most of the literature bruxism is mentioned as a nighttime disorder, there are cases where its appearance was observed daily. Therefore the bruxism in accordance to its appearing can be divided as daily, nightly and combined (1).

There is a children's bruxism that occurs in one third of children with the highest incidence rate of up to 5 years of age. Most of the children in their development are faced by the occurrence of bruxism since there appears to be occlusal interference and early contacts with the natural eruption of teeth (1).

The primary bruxism occurs without a clear reason. Secondary bruxism is associated with clinical disorders, neurological or psychiatric disorders associated with iatrogenic factors or other types of sleep disturbance (9, 17).

Bruxism can be classified as well as by the complications arising from its destructiveness (1). The forces that occur in patients with bruxism may be expressed to such an extent to cause a devaluation of the successfully achieved prosthetic construction, made on an adequate plan.

But if prevention measures are not undertaken the existing bruxism may cause very severe complications, such as for example the loss of dental implants (1). Complications can range from an excess damage of the restorations and surrounding dentition, lack of oseointegration, to loosening or fracture of implant restoration.

So the recommendation made by dental prosthetic specialists include taking preventive measures and treatment protocols for the patients by wearing occlusal splints (7).

The functions of the organs in the human body are mainly controlled by the central nervous system (CNS), through voluntary and involuntary actions. Involuntary actions are controlled by the autonomic nervous system (ANS), which is divided into sympathetic and parasympathetic. The sympathetic system functions in stressful situations, while the parasympathetic system in situations of rest. During sleep there is a preponderance of the parasympathetic activity. However at the beginning of the sleep the rapid eye movement, which takes place 6-8 hours during sleep, there is a reduction of the parasympathetic activity and increased sympathetic activity⁽¹⁷⁾.

In this way action with bruxism are associated with the change from a deep sleep to superficial sleep, usually during phases 1 and 2 of non-REM sleep (8).

Many authors confirm that the etiology of the bruxism is multifactorial (1, 6, 18, 19).

The psycho-emotional factor is considered to be one of the most important etiological factors. It may be associated with the mental health of the bruxers because they use the stomatognathic system for discharge of their aggressiveness (20-26). However its etiology is associated with local, systemic (23) and neurological factors (11). On the other hand, local factors including the traumatic occlusion, dental trauma, early contact, an excess restorations, dental cysts, atypical eruption of milk and permanent teeth contribute to the emergence of bruxism. Malocclusions, incorrect restorations, periodontal calculus, tooth mobility, deformity of the lips, gingival hyperplasia and other factors related to the occlusal physiology favor the occurrence of bruxism (27, 28). The other system factors include nutritional deficiency, parasitosis, Down syndrome, gastrointestinal disorders, allergic reactions, uncontrolled enzymatic digestion, brain damage, adverse effects of drugs, mental retardation and central paralysis (29).

Nutritional factors such as consumption of beverages, coffee, tea, chocolate drinks, non-alcoholic drinks, and smoking habits may be involved, since stimulating the central nervous system, increasing anxiety and stress. Because of this they represent triggering factors for the emergence of bruxism (9, 29).

In terms of allergies and intestinal parasites diagnosed, there are several studies that focus on explaining the relationship of these disorders with the bruxism. However, there is an intimate relationship between IgE levels, eosinophilia and bruxism. In allergies, as well as intestinal parasitic infections, levels of IgE and eosinophilia are high, followed by the emergence of oral manifestations (27).

The neuromuscular mechanism is explained as an interaction between the factors for presence of early occlusal contacts and the psychological stress in the patient (1).

Bruxism is detected in patients with neurological disorders who receive neuroleptic and anticonvulsant therapy and in patients with brain abnormalities that are taking levodopa including the risk factors using stimulants like amphetamines and antidepressants (11, 29, 30). The main reason for the parafunctional-bruxism is considered to be the disruption of sleep, which is explained by the theory of excitation (31). In etiology, despite local and systemic factors, there are factors such as professional practicing competitive sports (9).

Diagnosis and clinical evaluation of bruxism is complex because the bruxers and normal individuals may show parafunctional nocturnal activity (9).

Early diagnosis of bruxism is of great importance both for its treatment and for its prevention. Kapushevskaja in trials of patients at the Clinic for Dental Prosthetics for objective diagnosis of bruxism uses bruxoanalyzer applied to determine the horizontal type of bruxism while for determining the vertical type of bruxism bruxoquantifier is applied (32,41).

The diagnosis must focus on identifying the signs and symptoms reported by the patient or the dentist during clinical examination (14).

Parafunctional forces directly affect the enamel on the teeth that can be observed with their

abnormal wearing. It is used as the most common evidence of bruxism. This wearing may be limited to one tooth or the entire dentition (33, 34). Radiographic analysis may show loss of laminae changes of the periodontal space that can either disappear or be with an increased resorption of the tooth root, a fracture or changes in the pulp of the tooth, even the appearance of the pulpal stones (9).

The main lesions caused by the present bruxism can be summarized as: changes in teeth, periodontium, masticatory muscles, TMJ (7), headaches, behavioral and psychological effects. Other signs are also symptoms of the parafunctional hypermobility in the absence of periodontal disease, pulpitis, tooth pain (with normal pulp, partial crown fracture and migration of teeth). Muscle symptoms include fatigue, increased tension in masseters, especially in elevator muscles (m. Masseter and m. Temporalis). The most common symptom is muscle fatigue that represents resistance over a sustained effort, without clear signs or symptoms of pain or discomfort (9, 36).

Bruxism can cause problems with the movement of the body. In addition to that it can affect the masticatory muscles and back muscles of the cervical spine, which can cause muscle pain and chronic future permanent changes (20).

The harmful habit bruxism causes relevant changes in the structure of the stomatognathic system. Causing friction, inflammation, necrosis of the pulp and mobility of teeth. There may be the appearance of muscle pain and tenderness on palpation of TMJ, pain, cracking and other sounds from the joint as a lack of coordination of the lateral pterygoid muscles. In certain patients capitulum mandibulae may change and loss of the vertical dimension and mandibular displacement on the maximum intercuspidal position (MIP) (37) may develop.

Depending on the etiology and clinical signs observed during the clinical examination of the patient and including symptoms derived from the history, treatment and therapy vary from patient to patient. It is of significant importance for a differential diagnosis to be obtained (13).

The treatment requires a multidisciplinary approach, including psychology, psychotherapy and speech therapy, taking into account oral, medical and psychological aspects of the patient (10).

The plan of therapy should follow these objectives: reduction of physical and mental stress, treatment of signs and symptoms, reducing the occlusal interference and changes in the neuromuscular functioning model of the patient (3).

Early treatment involves reducing the psychological stress through the use of relaxation methods like exercises, massages and physiotherapy (38). This treatment reduces symptoms, but does not remove the cause. Habit may be reactivated when the tolerance of the patient to occlusal change decreases (10).

Specific treatment for muscle pain is based on methods that violate the mechanisms of activation of the cycle of pain (using spray with cool air), application of anesthetic block correlated with physiotherapeutic techniques such as exercises (10).

Occlusal therapy may include occlusal adjustment of the situation in the mouth. Although occlusal position works with minimal impact on the disease process of occlusal adjustment is an irreversible therapeutic method to minimize the damage caused by clenching and grinding of the teeth. But it is not a treatment for the disease (9). Applying interocclusal inserter (splints) (7), reduces the symptoms of bruxism. Their application may not stop the disease, but will not allow its progression, because it allows the exact condyle position in the fossa mandibularis (38,39).

Occlusal inserter may vary in material, rigidity, resiliency and extent of occlusal coverage. In this way, according to the therapeutic indications splints can lead to various intermaxillary relations (4, 6, 28). Depending on the complexity of the case it is usually recommended to be used at night for 45 days, with weekly suggested controls. The authors processed papers for implementation of various types of occlusal inserter, which are analyzed from different perspectives. Occlusal inserter can be made of different materials.

There are hard and soft occlusal inserters. Soft can be used to prevent further attrition caused by bruxism and various etiologic agents (40). Occlusal inserter can be made of high quality and modern way and with alternative methods. From Kapushevskaja's trials of patients treated with occlusal inserters made with the material eclipse was given the conclusion that they are superior to conventional occlusal inserter (41). Furthermore occlusal inserter (splints) may be separated from the treatment required for horizontal and vertical bruxism. For the treatment of patients with horizontal bruxism and TMD Kapushevskaja et al. recommend applying repositioning occlusal inserter, while in patients with bruxism and vertical musculofacial pain occlusal stabilization inserter should be used (42).

Despite the etiology of bruxism, the occlusal therapy can be suitable, because it promotes functional comfort, prevention of further damage to components of the masticator system. Pharmacological treatment with drugs such as dopamine agonists, anxiolytics, buspirone, nonbenzodiazepamic hypnotics, anticonvulsants and botulinum toxin are appropriate when bruxism is very pronounced (5, 23, 24, 25).

Discussion: Early diagnosis of bruxism is necessary to avoid damage to the TMJ and other oral or facial structures such as teeth and masticatory muscles. Possible lesions caused by bruxism can easily affect the quality of life of patients mainly due to the high association of pain and discomfort (43).

Bruxism diagnosis is usually made clinically and is based on the clinical history of the patient and the presence of typical signs, including tooth mobility, damage to teeth, masseteric hypertrophy, indenting the tongue, hypersensitive teeth, and pain in the masticatory muscles. It is possible for cracking or locking of the TMJ to appear (43).

However it is important to understand that bruxism as an isolated condition can not cause damage to the teeth. Another possible reason for the damage is acid erosion, which can occur in people who drink acidic juices as concentrated fruit juice or in people who have frequent

vomiting or regurgitation of stomach acid. People also demonstrate normal levels of damage to the teeth, associated with normal function. The presence of damage to teeth only indicates that it occurred at some point in the past and shows that the loss of tooth substance does not progress. People who grind their teeth and minimally apply parafunctional pressure on them also show no damage to the teeth (44).

The most common cause of sleep in bruxism is required after the patient squeaked and was pointed from his partner unpleasant sounds during sleep. Bruxism diagnosis is usually straightforward and involves the exclusion of dental, temporomandibular disease and rhythmic movements of the jaw resulting from disorders associated with seizures. This usually includes dental examination and electroencephalography possible, in case you need to diagnose the disorder attack. Damage to teeth may be perceived during a routine dental examination.

When a patient has daily bruxism and is awake he usually denies that he is pressing and clenching his teeth, because they're unaware of the habit (45). Generally in these patients sleep is relatively good. Usually the sleeping partner is the person who sleeps less awakening from the grinding sound of the bruxers.

Few authors have studied the effectiveness of sleep in patients with bruxism finding different values for REM sleep (46). That is why Bader finds its prolongation and Butros (47) et al. its reduction.

Conclusion: By considering bruxism and oral parafunctions and aided by authors who are also working in this area, it is aware that bruxism presents a high frequency of appearance in all age groups and is an important oral health issue. This parafunctional activity represents a significant change in the oral sensory-motor system by requiring a multidisciplinary approach to be designed to reduce injuries in osteo-dental structures.

It is noted that recently the prevalence of bruxism is growing and is associated with many symptoms such as stress, drugs, anxiety and sleep disorders.

Using the main scientific databases an opportunity is created for better understanding the main principles for treatment of the oral habit-bruxism as a significant health issue.

By considering bruxism dental professionals will certainly be helped better to understand the main key points of diagnosis, risk factors, prevention and treatment methods used. Also, this research can be beneficial for all other oral diseases to health. Prevention of the disease should be considered as a basic measure in the treatment of bruxism. Thus the risk of development of various oral diseases and their complications can be avoided.

Literature

1. Kapushevska B. Bruxism and occlusal parafunctions-general part. Technosan, Skopje 2014
2. Bader G., Lavigne G., Sleep bruxism, an overview of an oromandibular sleep movement disorder. *Sleep Med Rev.* 2000; 4: 27-43
3. Attanasio R. An overview of bruxism and its management. *Dent Clin North Am.* 1997;41: 229-241
4. Lobbezoo F., Hamburger HL., Naeije M., Etiology of bruxism. In: Paesani DA. *Bruxism- Theory and Practice.* London: Quintessence. 2010; 53-65
5. Carlsson GE., Magnusson T. *Chicago Quintessence. Management of Temporomandibular Disorders in the General Dental Practice,* 1999
6. Manfredini D., Landi N., Fantoni F., Segù M., Bosco M. Anxiety symptoms in clinically diagnosed bruxers. *J Oral Rehabil.* 2005; 32: 584-8
7. Kapushevska B. Bruxism and occlusal parafunctions-special part. Technosan, Skopje 2015
8. Okeson JP. *Management of temporomandibular disorders and occlusion.* 5th Ed. St. Louis: Mosby, 2003
9. Lobbezoo F., van der Zaag J., van Selms MK., Hamburger HL., Naeije M. Principles for the management of bruxism. *J Oral Rehabil.* 2008;35: 509-23

10. De-la-Hoz JL. Sleep bruxism: review and update for the restorative dentist. *Alpha Omegan*. 2013; 106: 23-8
11. Dorland. *Dorland's Illustrated Medical Dictionary*. 31st ed. Philadelphia: Elsevier 2007.
12. Murali RV., Rangarajan P., Mounissamy A. Bruxism: Conceptual discussion and review. *J Pharm Bioallied Sci*. 7 S265-70, 2015
13. Klasser GD., Rei N., Lavigne GJ. Sleep bruxism etiology: the evolution of a changing paradigm. *J. Can. Dent. Assoc.* 81: f2, 2015
14. American Academy of Sleep Medicine, The International Classification of Sleep Disorders. Revised Diagnostic and Coding Manual. 1st Ed. Westchester: One Westbrook Corporate Center; 1997.
15. De Luca Canto G., Singh V., Conti P., Dick BD., Gozal D., et al. Association between sleep bruxism and psychosocial factors in children and adolescents: a systematic review. *Clin. Pediatr.* 54: 469-78, 2015
16. Yamaguchi T., Abe S., Rompré PH., Manzini C., Lavigne GJ. Comparison of ambulatory and polysomnographic recording of jaw muscle activity during sleep in normal subjects. *J Oral Rehabil* 39: 2-10, 2012
17. Takeuchi T., Arima T., Ernberg M., Yamaguchi T., Ohata N., et al. Symptoms and physiological responses to prolonged, repeated, low-level tooth clenching in humans. *Headache* 55: 381-94, 2015
18. Leeuw R. American Academy of Orofacial Pain-guidelines for Assessment, Diagnosis and Management. 4th Ed. Chicago: Quintessence Publishing; 1996
19. Singh PK., Alvi HA., Singh BP., Singh RD., Kant S., et al. Evaluation of various treatment modalities in sleep bruxism, 2015
20. Kato T., Thie N., Huynh N., Miyawaki S., Lavigne G. Topical review: sleep bruxism and the role of peripheral sensory influences. *J. Orofac. Pain* 17, 191-213, 2003
21. Ohayon M., Li KK., Guilleminault C. Risk Factors for Sleep Bruxism in the General Population. *Chest* 119: 53-61, 2001
22. Kato T., Rompre P., Montplaisir J., Sessle B., Lavigne G. Sleep Bruxism: An Oromotor Activity Secondary to Micro-arousal. *J. Dent. Res.* 80: 1940-44, 2001.
23. Strausz T., Ahlberg J., Lobbezoo F., Restrepo CC., Hublin C., Ahlberg K., et al. Awareness of tooth grinding and clenching from adolescence to young adulthood: a nine-year follow-up. *J Oral Rehabil* 37: 497-500, 2010
24. Sutin A., Terracciano A., Ferrucci L., Costa P. Teeth Grinding: Is Emotional Stability related to Bruxism? *J Res Pers* 44: 402-5, 2011
25. Tsai C-M., Chou S-L., Gale EN., McCall WD. Human masticatory muscle activity and jaw position under experimental stress. *J Oral Rehabil* 29: 44-51, 2002
26. Lavigne GJ., Kato T., Kolta A., Sessle BJ. Neurobiological Mechanisms, 2003
27. Alves AC., Alchieri JC., Barbosa GA. Bruxism. Masticatory implications and anxiety. *Acta Odontol Latinoam* 26: 15-22, 2013
28. Lobbezoo F., Naeije M. Bruxism is mainly regulated centrally, not peripherally. *J Oral Rehabil* 28: 1085-91, 2001
29. Ohayon M., Li K., Guilleminault C. Risk Factors for Sleep Bruxism in the General Population. *Chest* 119: 53-61, 2001
30. Alonso-Navarro H., Martín-Prieto M., Ruiz-Ezquerro JJ., Jiménez- Jiménez F. Bruxism possibly induced by venlafaxine. *Clin Neuropharmacol* 32: 111-112, 2009
31. Manfredini D., Ahlberg J., Winocur E., Lobbezoo F. Management of sleep bruxism in adults: a qualitative systematic literature review. *J Oral Rehabil*. 2015
32. Kapushevskaja B., Bruxianalyzer and bruxoquantifier-For early diagnosis and prevention from bruxism, *Vox dentarii*, September 2014, number 29, pg. 18
33. Wahlund K., Nilsson IM., Larsson B. Treating temporomandibular disorders in adolescents: a randomized, controlled, sequential comparison of relaxation training and occlusal appliance therapy. *J Oral Facial Pain Headache*. 29: 41-50, 2015

34. Machado E., Dal-Fabbro C., Cunali PA., Kaizer OB Prevalence of sleep bruxism in children: a systematic review. *Dental Press J Orthod* 19: 54-61, 2014
35. Inglehart MR., Widmalm SE., Syriac PJ Occlusal splints and quality of life - does the patient-provider relationship matter? *Oral Health Prev Dent* 12: 249-58, 2014
36. Badel T., Ćimić S., Munitić M., Zdravec D., Kes VB., et al. Clinical view of the temporomandibular joint disorder. *Acta Clin Croat* 53: 462- 70, 2014
37. Alóe F. Sleep Bruxism Treatment. *Sleep Sci* 2009 :49-52
38. Singh BP., Berry DC. Occlusal changes following use of soft occlusal splints. *J Prosthet Dent* 54: 711-15, 1985
39. Adibi SS., Ogbureke EI., Minavi BB., Ogbureke KU. Why use oral splints for temporomandibular disorders (TMDs)? *Tex Dent J* 131: 450-5, 2014
40. Kapushevska B., Dereban N., Mitic K., Petrovski D., Baftijari F., Stavreva N., Jurukovska Shotarovska V., Fabrication and treatment of soft occlusal splints in everyday dental practice; VII Macedonian Dental congress with international participation, Ohrid 11-14 Juni, 2015
41. Kapushevska B., Technical fabrication and clinical application of eclipse occlusal splints, *Journal of harmonized research (JOHR) in Medical and Health Science*, Bilaspur, Chattisgarh, India 2014, 1 (1): 38-46
42. Kapushevska B., Stojanovska V., Mijoska A., Use of bruxchecker in patients with different types of bruxism, *Acta Stomatologica Naissi*, July 2014, Vol. 30., p. 1325-1331
43. Shetty S., Pitti V., Satish Babu CL., Surendra Kumar GP., Deepthi BC. "Bruxism: a literature review". *J Indian Prosthodont Soc* 10:141-8, 2010
44. Manfredini D., Winocur E., Guarda-Nardini L., Paesani D., Lobbezoo F. "Epidemiology of bruxism in adults: a systematic review of the literature". *J Orofac Pain* 27: 99-110, 2013
45. Kawakami S., Kumazaki Y., Manda Y., Oki K., Minagi S. Specific diurnal EMG activity pattern observed in occlusal collapse patients: relationship between diurnal bruxism and tooth loss progression. *PLoS ONE* 9: e101882, 2014
46. Gary Bader, Gilles Lavigne. Sleep bruxism an overview of an oromandibular sleep movement disorder, *Sleep Medicine Reviews*, Vol 4, No 1, p 27-43, 2000
47. Bader G, Kampe T, Tagdae T, Karlsson S, Blomqvist M. Descriptive physiological data on a sleep bruxism population. *Sleep* 1997; 20: 982-990