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BRUXISM AND PROSTHODONTIC MANAGEMENT

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Abstract

Bruxism can be described as non-functional abnormal, involuntary contact of teeth, if ignored it leads to occlusal trauma. Bruxism can occur during wakefulness or during sleep and each has a different set of causative factors. The early diagnosis and management can prevent the breakdown of the dentition and pain in the orofacial region. Although various treatment modalities are present, the successful management of bruxism lies in the precise diagnosis and isolation of the etiology

Keywords: bruxism, prosthodontic management, types of bruxism, risk factors, etiology, diagnosis, evaluate bruxism, effects of bruxism, treatment modalities

Introduction

Bruxism, which can be considered an umbrella term for clenching and grinding of the teeth, is the commonest of the many parafunctional activities of the masticatory system.[1] Bruxism is considered to have a multifactorial aetiology that includes currently poorly defined aspects of central nervous system function, genetic and behavioural factors.[2]

'Bruxism' originates from the Greek word brychein, meaning to 'gnash the teeth'. An early and common definition of bruxism was thus ''gnashing and grinding of the teeth for non-functional purposes''. Later definitions have been more specific, for example, ''involuntary, non-functional, rhythmic or spasmodic gnashing, grinding, and clenching of teeth, usually during sleep''. The same medical dictionary adds that causes of bruxism may be related to repressed aggression, emotional tension, anger, fear, and frustration.[1]

History

The term "bruxomania" is derived from French word "la bruxomanie," suggested by Marie and Pletkiewicz2 in 1907. In 1931, Frohman coined the term bruxism[3]. The term bruxism originates from the Greek word "brychein", meaning to grind or gnash the teeth. Miller put forward a differentiation between nocturnal grinding of the teeth which he called as bruxism and the habitual grinding of the teeth in the daytime, which he called as bruxomania.[3]

In 1960's, Ramfjord put forward the theory that occlusal factors were responsible for bruxism and he defined bruxism as the habitual habit of grinding teeth when the individual is not chewing or swallowing. In 1983 a distinction was made between clenching and grinding: clenching as centric bruxism and grinding as eccentric bruxism. However, the majority of the researchers now disfavour that malocclusion to be the main etiological factor and consider it to be multifactorial. In 1995, Vanderas defined bruxism as the non-functional movement of the mandible with or without an audible sound occurring during the day or night. And bruxism at night was recently classified as sleep related movement disorder according to recent classification of sleep disorders. In 2001, Lobbezoo and Naeije, stated that various neurotransmitters in the central nervous system appeared to modulate bruxism.[3]

According to GPT 9, bruxism is defined as "the parafunctional grinding of the teeth; an oral habit consisting of involuntary rhythmic or spasmodic non-functional gnashing, grinding, or clenching of teeth, in other than chewing movements of the mandible, which may lead to occlusal trauma.[4]

The American Academy Of Orofacial Pain describes bruxism as "diurnal or nocturnal parafunctional activity including clenching, bracing, gnashing and grinding of teeth." On the other hand The American Sleep Disorder Association defines it as "Tooth grinding or clenching during sleep plus one of the following: tooth wear, sounds, or jaw muscle discomfort in the absence of medical disorder."[5]

Types of bruxism

Bruxism can be classified into diurnal bruxism or awake bruxism and nocturnal or sleep bruxism. Bruxism during day time was known as awake bruxism and in night time was known as sleep bruxism. Awake bruxism was always related to stress, work pressure, & anxiety. Diurnal bruxism was more common in females than males. Whereas, sleep bruxism was considered as a sleep-related movement disorder. Sleep bruxers usually have sleep disorders like snoring and sleep apnoea. No gender difference was found in nocturnal bruxer. But it more prevalent in small children than in adults.[6]

Risk factors of bruxism

1 Age: Bruxism is more common in young children and noted to decrease by adulthood.

2 Stress: Increased stress and anxiety can cause bruxism.

3 Personality: Aggressive, competitive and hyperactive type of behaviour and personality can increase the chance of teeth grinding.

4 Family history: Sleep bruxism tends to give a family history, other members also may have teeth grinding or a history of it.

5 Medications and habits: Certain antidepressants can result in bruxism as an uncommon side effect. Habits like smoking, tobacco chewing, drinking caffeinated beverages may increase the risk of bruxism.

6 Other factors- Bruxism can be associated with medical problems like epilepsy, sleep related disorders, dementia, Parkinson's disease and gastroesophageal reflux disorder.[2]

Etiology

The etiology of bruxism is complex, controversial and multi-factorial. Peripheral, psychological and central or pathophysiologic factors have been associated with sleep bruxism

1. Central/ pathophysiologic factors:
   Sleep
   The central nervous system controls most of the voluntary and involuntary activities of our body. The involuntary activities are further controlled by the sympathetic and parasympathetic autonomic nervous systems. The parasympathetic responses mainly work during the rest phase and the sympathetic responses during the active phase.[7]

Rhythmic masticatory muscle activities are frequently observed during sleep in 60% of individuals; however, when it occurs 3 times more frequently with an intensity approximately 30% more than normal, it is supposed to be associated with sleep bruxism.[8] Since bruxism is associated with sleep, the sleep patterns have been studied extensively to find out the stages associated with it. Sleep is divided into two phases: rapid eye movement (REM) and the non-rapid eye movement (NREM) phases.[9] Bruxism occurs in the second stage of NREM sleep which is associated with sleep arousals. This phase is also associated with increased body movements, increased heart rates and respiratory changes and increase in muscle activity. According to studies 86% of bruxism is associated with the arousal phase of sleep and in 80% of times in bruxism episode leg movements are seen.[10]

2 Psychological factors

Psychological stress has been contributory to sleep bruxism; anxiousness, aggressiveness and hyperactivity are more frequently seen in individuals with sleep bruxism.

A few studies showed that when sleep bruxism patients experienced emotional or physical stress there was an increase in masseter EMG activity.[11] A study by Bayar et al., showed significant difference in depression, anxiety, hostility, phobic anxiety and paranoid ideation between non bruxers and sleep awake bruxers.[12] It has been observed that there is possible presence of TMD in bruxers. There are associations between psychopathological symptoms and TMD and bruxism is one of the major risk factor for TMD.[13]

2. Peripheral factors

The influence of occlusal interferences playing a role in bruxism has been found to be controversial. Ramfjord was the first to study the clinical phenomenon of bruxism with electromyographic (EMG) technique. The study held occlusal characteristics responsible for the initiation of the disorder especially the discrepancies between retruded contact position and intercuspal position and the presence of balancing contacts as major etiologic factor for bruxism. But Ramfjord EMG study lacked controls and used indirect measures for assessing bruxism, hence, the upcoming of better controlled studies have put aside the role of occlusal factor as an etiology of bruxism.[14]

A study was conducted by Sujimoto where the influence of occlusal factors on the magnitude of sleep bruxism was studied. The subjects were divided into three groups- high sleep bruxers, moderate sleep bruxers and low sleep bruxers. Bruxism was also divided into three types: grinding, clenching and tapping. It was found that while grinding and clenching were predominant, tapping was not prevalent during sleep. In high bruxers grinding was the predominant activity. They also found that molar tooth contacts caused high sleep bruxism activity.[15]

Diagnosis

Clinical manifestation and symptoms:

The diagnosis of bruxism involves a thorough clinical judgement and knowledge of recent diagnostic modalities in the field.

The criteria for screening patients with moderate to severe sleep bruxism are[16]

1) Tooth grinding sounds- 3 to 5 nights per week for over 6 months.
2) Tooth wear- on incisal edges on anterior teeth and occlusal surfaces of posterior teeth
3) Masticatory muscle pain or fatigue in the morning
4) Masseter muscle hypertrophy[16]

According to Lavinge And Manzini the criteria for sleep bruxism are:[5]

1) History of tooth grinding noise
2) Presence of wear facets on the teeth
3) Presence of headache in the temporal region
4) Fatigue of mandibular musculature during night time or day
5) Lockjaw or difficulty in opening the jaw
6) Presence of dental hypersensitivity
7) Hypertrophy of the masseter muscle

How to Assess Bruxism

Early identification and management measures play a crucial role in bruxism patients, as bruxism activity if left unattended can harm the quality of life by leading to tooth damage, occlusal disharmony and TMJ disorders. So when the patient comes to the dentist, some of the assessment methods are to be followed for accurate interpretation and treatment. They are questionnaires, clinical evaluation, intraoral appliances and electromyographic recording.

1. **Questionnaires**

Questionnaires form the simplest and easiest method of assessment. But the main disadvantage of this method of assessment is that it is subjective in nature. Bruxism events may or may not be accompanied by noise; hence most of the children and adults may not be aware of their bruxism activity. Hence the questions asked are [17]

a) Has anyone heard you grinding your teeth at night ?
b) Is your jaw ever fatigue or sore on awakening in the morning ?
c) Are your teeth or gums ever sore on awakening in the morning ?
d) Do you ever experience temporal headache on awakening in the morning ?
e) Are you ever aware of grinding your teeth during the day?
f) Are you ever aware of clenching your teeth during the day?

2. **Clinical evaluation**

The diagnosis of bruxism can be traced out by taking a good case history and evaluating the tooth mobility, tooth wear and other clinical findings of TMJ.

Among these, assessment of bruxism event by evaluating tooth wear is controversial as tooth wear is a cumulative record of both functional and parafunctional activities and various factors such as age, gender, diet and bruxism are associated with tooth wear.[3]

tooth wear is a cumulative record of both functional and parafunctional activities and various factors such as age, gender, diet and bruxism are associated with tooth wear. Erosion by aerated drinks is a major contributing factor to tooth wear. All modalities usually interact with each other to cause wear. So, the evaluation of tooth wear for determining actual bruxism is disputable and hence it is difficult to estimate the degree of contribution of bruxism to tooth wear alone.[17]

Guidelines that help to identify bruxism [16]

- Report of tooth grinding or tapping
- Presence of tooth wear seen within normal range of jaw movements or at eccentric position
- Presence of masseter muscle hypertrophy on voluntary contraction
- Complain of masticatory muscles discomfort, fatigue of stiffness in the morning
- Tooth or teeth hypersensitive to cold air or liquid
- Clicking or locking of temporomandibular joint

3. **Intra oral appliance**

Bruxism activity can be evaluated using intra oral appliances by assessing the wear facets on it and by assessing the bite load on the intra oral appliance But the accuracy of these methods has not been confirmed.

Korioth et al. reported that parafunctional dental activity at night on full-arch occlusal stabilization splints resulted in wear, which was both asymmetric and uneven.

The Bruxcore Bruxism Monitoring Device (BBMD) was introduced to measure the nocturnal bruxism activity.Bruxcore plate is used to evaluate the bruxism events by counting the number of abraded microdots on its surface and by scoring the volumetric magnitude of abrasion. The BBMD uses 0.51-mm-thick polyvinyl chloride plate that consists of four layers with two alternating colors and a halftone dot screen on the topmost surface. The number of missing microdots is counted to evaluate the abraded area and the number of layers

uncovered represents the depth parameter. Both of these parameters are combined so as to obtain an index for the amount of bruxism activity. The major disadvantage of this method is that it is difficult to count the number of missing dots with good accuracy.

Takeuchi et al. put forward a recording device for sleep bruxism, Intra-splint force detector (ISFD). It uses an intraoral appliance to measure the force being produced by tooth contact on the appliance. The ISFD detects the force by using a thin, deformation-sensitive piezoelectric film, which is embedded 1–2 mm below the occlusal surface of the appliance. But ISFD was not suitable for detecting the magnitude of force during steady-state clenching behaviour. [3]

4. Masticatory muscle electromyographic recording

Masticatory muscle electromyographic recording assesses bruxism by measuring the actual sleep bruxism activity directly. Hence the main advantage of EMG recording is that the occurrence of bruxism can be assessed without intra-oral appliances, which may change natural bruxism activity. In 1970s, sleep bruxism episodes were measured over an extended period in patient's homes, with the use of portable battery-operated EMG recording devices, which can measure masticatory muscle activity in a detailed and accurate way by evaluating the number, duration and magnitude of bruxism events.[18]

A miniature self-contained EMG detector-analyser (bite-strip) was developed as a screening test for moderate to high level bruxers, which measured the number of bruxism events by simply attaching it to the skin over the masseter muscle. Recently, a miniature self-contained EMG detector– analyser with a biofeedback function (grindcare, medotech, denmark) was developed as a detector and biofeedback device for sleep bruxism. It works by the online recording of EMG activity of the anterior temporalis muscle, online processing of EMG signals to detect tooth grinding and clenching and also biofeedback stimulation for reducing sleep bruxism activities.[19]

Polysomnographic (sleep laboratory) recordings for nocturnal bruxism generally include electroencephalogram, EMG, electrocardiogram and thermally sensitive resistor (monitoring air flow) signals along with simultaneous audio– video recordings. In this the sleep laboratory setting offers a highly controlled recording environment, so other sleep disorders like sleep apnoea and insomnia can be ruled out and sleep bruxism can be differentiated from other orofacial activities like swallowing and coughing that occur during sleep. A change in the environment of sleep can influence the actual behaviour of bruxism, which is considered as a major limitation in polysomnographic recordings

Effect of bruxism on prosthetic restorations

The most common mechanical failures reported in case of prosthetic restorations on natural teeth included loss of retention and fracture of material and the occurrence of such failures is greatest in patients with bruxing habits. Metal or metal–ceramic restorations seem to be the safest choice in cases of high load conditions, although under extreme conditions, there is no material that will last for too long. Due to the risk of chipping of ceramic veneers in metal–ceramic restorations, many clinicians prefer gold– acrylic FDPs for heavy bruxers. Clinical studies published on wear of materials in bruxism patients indicate only minimal differences in wear resistance of gold and ceramic materials, whereas resin-based materials showed 3–4 times more substance loss than gold or ceramics[20]

Zirconia, which is the present material of esthetics and strength, have demonstrated improved mechanical properties in laboratory studies and hence may be promising in the treatment of bruxism related tooth wear However, a systematic review of zirconia FDPs has shown that there are complications when the material is used clinically. Improvement of the veneering systems is especially required as chipping is considered to be the most frequent mechanical complication[3]

Effect of bruxism on implant restorations

In a prospective 15- year follow-up study of mandibular implant-supported fixed prostheses, smoking and poor oral hygiene had a significant influence on bone loss, whereas occlusal loading factors such as bruxism,

maximal bite force and length of cantilevers were of minor importance.30 Systematic reviews have concluded that there is no causative relationship between occlusal forces and loss of osseointegration[21]

Although bruxism was included among risk factors, and was associated with increased mechanical and/or technical complications, it had no effect on implant survival. Several studies have indicated that patients with bruxism have a higher incidence of complications on the superstructures of both of fixed and removable implant-supported restorations.[3]

Effect of bruxism on dentures

It is considered, clinical experience indicates that bruxism is a frequent cause of complaint of soreness of the denture-bearing mucosa. In a similar way, heavy bruxism may have deleterious effects on the residual dentition and the denture bearing tissues in patients with RPDs, although this has not been systematically studied. A study mentioned the management of four patients with severe sleep bruxism, and who were using conventional RPDs. Each patient was provided with a splint-like RPD, called a night denture, and followed-up for 2–6 years using the night denture. The study concluded that the night denture appeared to be effective in managing problems related to sleep bruxism in patients with RPDs[22]

Current Treatments of Bruxism

Treatment aims to find and remove the causes of bruxism, change the behaviour that causes bruxism and repair the damage that bruxism often causes. The treatment aspect includes

1. **Occlusal therapy**

Occlusal splints have been considered as the first-line of management for preventing dental grinding noise and tooth wear in case of sleep bruxism. These splints have different names such as occlusal bite guard, bruxism appliance, bite plate, night guard, occlusal device. They are classified into hard splints and soft splints. Hard splints are preferred over soft splints because soft splints are difficult to adjust than hard splints and hard splints are effective in reducing the bruxism activity. A study compared occlusal splints versus a medication doses gabapentin, and found that both treatments reduced similarly the muscle activity associated with sleep bruxism after 2 months of therapy[23]

2. **Behavioural modification**

Psychoanalysis, hypnosis, meditation, sleep, hygiene measures with relaxation techniques and self-monitoring have been considered for the treatment of bruxism. The treatment of sleep bruxism usually begins with counselling of the patient with respect to the sleep hygiene. It includes to instruct the bruxer to stop smoking and drinking of coffee or alcohol at night, to limit the physical or mental activity before going to bed, and to ensure good bedroom conditions like quiet and dark[24]

3. **Biofeedback**

Biofeedback works on the principle that “bruxers can unlearn their behaviour when a stimulus makes them aware of their adverse jaw muscle activities”. Mittelman described an EMG technique that provides the daytime bruxer with auditory feedback from his/her muscle activity letting him know the degree of muscle activity or relaxation that is happening.39 Nissani used a taste stimulus to awaken the patient, in case of sleep bruxism [40] . In recent years, contingent electrical stimulation (CES) has appeared in an attempt to reduce the masticatory muscle activity associated to sleep bruxism. The rationale for CES includes the inhibition of the masticatory muscles responsible for bruxism by applying a low-level electrical stimulation on the muscles when they become active, i.e. during the bruxism episode. Experimental studies have used CES in patients with signs and symptoms of sleep bruxism and myofascial pain, and found a reduction of the EMG episodes per hour of sleep while using CES, but with no changes in pain and muscle tension scores[3]

4. Pharmacological therapy

Certain drugs have paralytic effect on the muscles, by inhibiting acetylcholine release at the neuromuscular junction (NMJ) therby decreasing bruxism activity in severe cases like coma, brain injury etc. In a study, botox injections over a period of 20 weeks showed decrease in bruxism activity in 18 subjects. This study suggested that botulinum toxin inhibited the release of acetylcholine at NMJ [43] . Shim et al. found that the amplitude of the muscle contraction during bruxism events was reduced after 4 weeks of injection, but with no changes in the rhythm or number of bruxism episodes per hour of sleep[25]

Conclusion

Bruxism is a harmful and involuntary oro-motor condition that involves clenching, bracing, gnashing and grinding of teeth. The etiology of bruxism is complex, controversial and multi-factorial. Peripheral, psychological and central or pathophysiologic factors have been associated with sleep bruxism. Its management involves a holistic approach with high level clinical expertise and thorough understanding of the factors governing the situation. Since there is no specific treatment available, maximum efforts must be taken to prevent its adverse effects. In the absence of definitive evidences, bruxism can be manged by occlusal appliances, counselling, change in lifestyle and pharmacological intervention. When the prosthetic treatment is indicated, efforts must be made to reduce the heavy occlusal loading on all components thus maintaining the integrity of the prosthesis.

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