

A REVIEW OF CURRENT CONCEPTS IN BRUXISM – DIAGNOSIS AND MANAGEMENT

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Abstract:

Bruxism, which can be considered as an umbrella term for clenching and grinding of teeth, is the commonest of the many parafunctional activities of the stomatognathic system. 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, Sleep bruxism, Awake bruxism, Current concepts in bruxism, Review of bruxism

Introduction:

Tooth grinding is an activity of significance to the dental specialist because of breakage of dental restorations, tooth damage, induction of temporal headache and temporomandibular disorders.¹

Bruxism, which can be considered as an umbrella term for clenching and grinding of teeth, is the commonest of the many parafunctional activities of the stomatognathic system.²The term Bruxism originates from the Greek word brychein, which means to grind. It was later adopted as 'Bruxism' to describe gnashing and grinding of the teeth occurring without a functional purpose.²

Bruxism can occur during wakefulness or during sleep. The American Academy of Sleeping Disorders proposed the terms Sleep and Awake Bruxism. Bruxism during daytime is

commonly a semi voluntary 'clenching' activity and is also known as 'Awake Bruxism' (AB) or Diurnal Bruxism (DB).³ Bruxism during sleep either during daytime or during night is termed as

'Sleep Bruxism' (SB).

Awake bruxism is linked to life stress caused by familial responsibility or work pressure. Sleep Bruxism is an oromandibular behaviour that is defined as a stereotyped movement disorder occurring during sleep and characterized by tooth grinding and/or clenching.⁴ Sleep bruxism was recently classified as sleep related movement disorder according to recent classification of Sleep Disorders.

Prevalence rate of Awake and Sleep Bruxism is about 20% and 8–16% respectively in adult population.⁵Awake bruxism occurs predominantly among females while no gender difference is seen for sleep bruxism.⁶Onset of Sleep Bruxism is about 1 year of age soon after the eruption of deciduous incisors.⁷ The disorder appears more frequently in the younger population.⁷The prevalence in children is between 14 to 20%.

Causes of bruxism :

Bruxism is said to have a multifactorial etiology.

Central /Patho-Physiological factors:

As bruxism often occurs during sleep, the physiology of sleep has been studied in depth, particularly the 'arousal

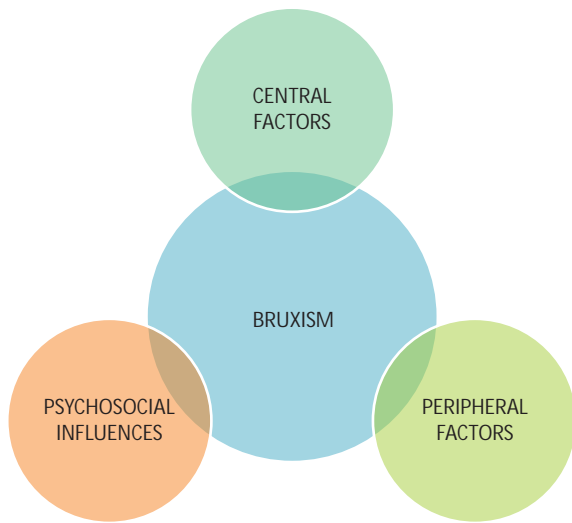
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response' in search of possible causes of disorder.

'Arousal response' is a sudden change in the depth of the sleep during which the individual either arrives in the lighter sleep stage or actually wakes up. This response is accompanied by body movements, increased heart rate, respiratory changes and increased muscle activity. A study showed 86% of bruxism episodes were associated with arousal response along with involuntary leg movements.⁸



This indicates that bruxism is a part of arousal response.

Acute use of dopamine precursors like L-dopa inhibits bruxism activity and chronic long term use of L-dopa results in increased bruxism activity.⁹ Amphetamine which increases the dopamine concentration by facilitating its release has been observed to increase bruxism.¹⁰ Nicotine stimulates central dopaminergic activities which might explain the finding that cigarette smokers report bruxism two times more than the non-smokers.⁹

Psycho social Factors :

Extensive studies have been conducted regarding the role of psychosocial factors in the etiology of bruxism but none of these are determinative due to the absence of large scale longitudinal trials.

Bruxers differs from healthy individuals in the presence of depression, increased levels of hostility and stress sensitivity.¹¹ Bruxing children are more anxious than non bruxers. A multifactorial large scale population study to

assess sleep bruxism demonstrated that daytime time clenching could significantly be explained by experienced stress, although experienced stress and anticipated stress were unrelated to sleep bruxism as recorded with ambulatory devices.¹²

Peripheral Factors :

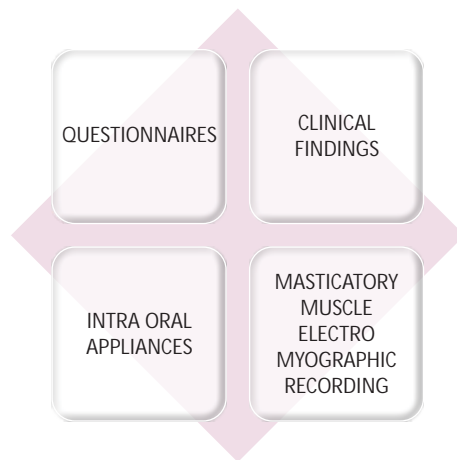
For an effective management of bruxism, establishment of harmony between maximum intercuspation and centric relation is required.¹³

However recent literature on this subject now agrees that there is no or hardly any relationship between clinically established bruxism and occlusal factors in adults.¹⁴

Assessment and Accurate interpretation of bruxism:

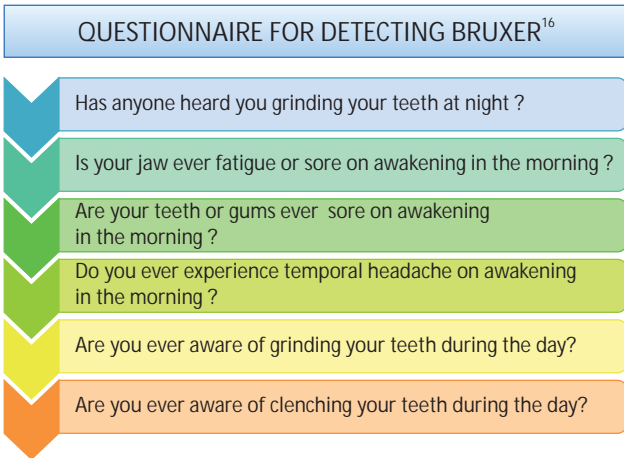
Although bruxism is not a huge handicap, it can influence the quality of human life, especially through dental problems, such as tooth wear leading to inefficiency of mastication, pain in the facial region and tooth fractures. Hence early identification and preventive measures go a long way to protect the occlusion.

Some of the methods of assessment are as follows:

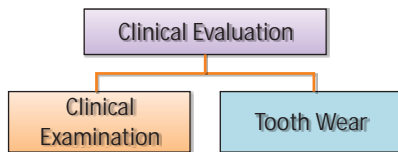


Questionnaires:

Questionnaires are adjuncts in both research and clinical situations. This method can be applied to large population but the limitation is the subjective nature of the response. Most bruxism episodes are not accompanied by noise. So a large percentage of adults and children are unaware of their bruxism activity and thus fails to identify themselves as the bruxers.¹⁵

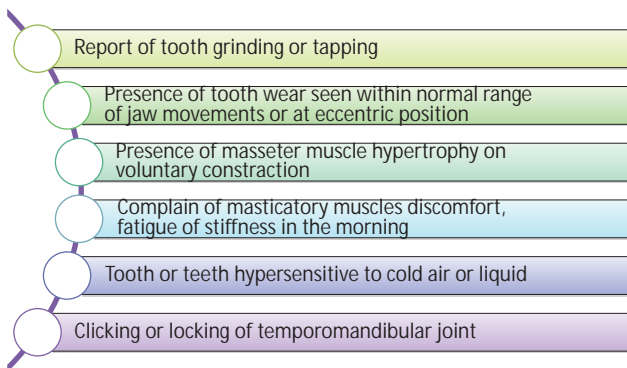


Clinical evaluation :



Tooth wear is assumed to be synonymous to bruxism. Several studies have demonstrated a positive relationship¹⁷ between tooth wear and bruxism but others show negative results.¹⁸ Guidelines that help to identify bruxism.¹⁹ Various systems for the classification and measurement of tooth wear have been introduced. One of the many classifications is the Tooth-Wear Index which categorises based on incisal and occlusal wear and was developed to investigate the prevalence and severity of tooth wear.

Guidelines that help to identify bruxism.¹⁹



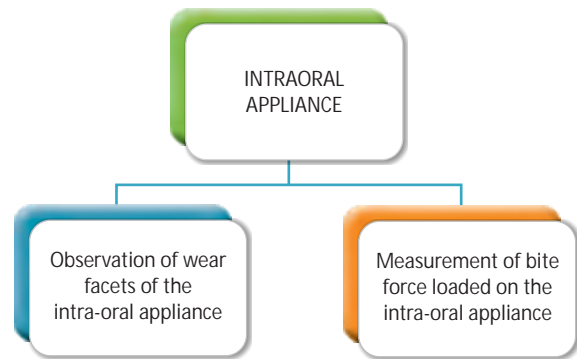
Tooth wear is a cumulative record of both functional and parafunctional activities and various factors such as age, gender, diet and bruxism are associated with tooth wear.²⁰ Erosion by aerated drinks is a major contributing

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.

Intra-oral appliance:

Bruxism activity can be measured using the intra-oral appliance and is classified into two groups.²¹



Some studies describe a repetitive wear pattern on the occlusal splint,²² while other studies noted that parafunctional nocturnal dental activity on full-arch occlusal stabilization splints resulted in wear, which was both asymmetric and uneven.²³ However the accuracy of these methods has not been ascertained.

Bruxcore plate :

The Bruxcore Bruxism-Monitoring Device (BBMD) is an intra-oral appliance that measures sleep bruxism activity objectively.²⁴ The Bruxcore plate evaluates bruxism activity by counting the number of abraded microdots on its surface and by scoring the volumetric magnitude of abrasion.²⁴

A recording device has been designed for sleep bruxism, an intra-splint force detector (ISFD), which uses an intra-oral appliance to measure the force being produced by tooth contact onto the appliance.²⁵ The force is detected using a thin, deformation-sensitive piezoelectric film, which is embedded 1–2 mm below the occlusal surface of the appliance. It was confirmed, that the duration of bruxism events during simulated bruxism, i.e. clenching, grinding,

tapping and rhythmic clenching, evaluated with the ISFD, was correlated with that of the masseter EMG.²⁵

The ISFD did not correctly capture force magnitudes during sustained clenching because of the characteristic of the piezoelectric film, i.e. this transducer is best at detecting rapid changes in force, not static forces. ISFD was not suitable for detecting the magnitude of force during steady-state clenching behaviour.²⁵

Masticatory muscle Electromyographic recording :

One among the plethora of assessment tools, the EMG recording has been used to measure actual sleep bruxism activity directly. The main advantage is that the bruxism can be measured without intra-oral devices, which may change natural bruxism activity.

Portable EMG recording devices :

Since the 1970s, sleep bruxism episodes were measured over a period of time in patients' homes with the use of battery-operated EMG recording devices.²⁶ Criteria for the detection of sleep bruxism with the portable EMG recording system have been suggested but their validity in a large population has not yet been confirmed.²⁷ The isolation of sleep bruxism is difficult because of other confounding oro-facial activities (e.g. coughing and mumbling). Also, other sleep disorders cannot be ruled out for e.g. micro arousal, tachycardia and sleep-stage shift.²⁸

The recording the heart rate was suggested as one of the compensatory measures for improving the accuracy of sleep bruxism recognition. A surface EMG electrode with a built-in buffer-amplifier and a cordless type of EMG measurement system was developed as well, to improve the accuracy of recordings.²⁹

Miniature self-contained EMG detector analyser :

A miniature self-contained EMG detector-analyser (Bite-Strip) was developed as a screening test for moderate to high level bruxers.³⁰ Its salient feature is that the number of bruxism events can be objectively estimated 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.³¹

It is a type of contingent electrical stimulation (CES).

It enables 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.³¹

Although scientific confirmation is needed, it is considered as one of the potent devices for detecting and also for managing sleep bruxism.

The portable EMG recording system allows multiple-night recording in a natural environment for the subject with minimal expense.

Polysomnography :

Polysomnographic (sleep laboratory) recordings for sleep bruxism includes electroencephalogram, EMG, electrocardiogram and thermally sensitive resistor (monitoring air flow) signals along with simultaneous audio-video recordings.³²

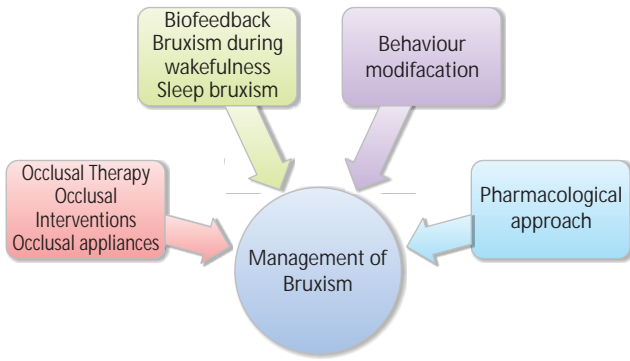
The sleep laboratory setting offers a highly controlled recording environment, hence other sleep disorders (e.g. sleep apnoea and insomnia) can be ruled out and sleep bruxism can be distinguished from other orofacial activities (e.g. myoclonus, swallowing and coughing).

Management of Bruxism:

Currently no specific treatment exists which can stop sleep bruxism, even though many methods including prosthetic treatment, have been tried over the years. A handful of therapies have been suggested including behaviour modification such as habit awareness, habit reversal therapy, relaxation technique and biofeedback may eliminate awake bruxism.

Occlusal therapy :

Management of bruxism via occlusal therapy enlists the aid of occlusal interventions and occlusal appliances.



Occlusal interventions :

A study has tried to justify the effects of occlusal adjustment on the myoelectrical activity of the jaw-closing muscles.³³ However, their brief daytime EMG recordings of postural activity and maximal voluntary clenching cannot be interpreted in terms of bruxism.

Other authors have stated that occlusal rehabilitation further mutilates the dentition beyond what bruxism has created.³⁴

At present, the current insights into the etiology of bruxism that the disorder is mainly regulated centrally and not peripherally, future research on this category of management strategies for bruxism seems futile.

Occlusal appliances :

By far, the treatment regime which has withstood the test of time is the procedure of splint therapy. Occlusal appliances are useful adjuncts in the management of sleep bruxism but do not cure bruxism. Occlusal splints are commonly used to prevent tooth wear caused by bruxism.

Literature describes the clinical and laboratory procedures for the various types of splints. These splints have different names (e.g. occlusal bite guard, bruxism appliance, bite plate, night guard, occlusal device) and slightly different appearances and properties, but in essence most of them are hard acrylic-resin stabilization appliances, mostly worn in the maxillary arch.

Hard splints are generally preferred over soft splints (e.g. soft splints are more difficult to adjust than hard ones) to prevent inadvertent tooth movements and because hard splints are more effective in reducing bruxism activity than

soft splints.³⁵'Nociceptive Trigeminal Inhibition (NTI) Clenching Suppression System'—a small anterior splint that is supposed to be effective amongst others in the management of bruxism.³⁶ No evidence for the NTI splint's long-term efficacy or safety is available so far.

In a study, it was shown that occlusal splint treatment resulted in a decrease in nocturnal EMG activities in about half of the patients, while in another half of the patients, no change or even increase in EMG activity was observed.³⁷

However, due to the scarcity of Randomised Control Trial on the efficacy of occlusal splints in the management of bruxism, it is prudent to limit the use of oral splints in the management of bruxism to the prevention or limitation of dental damage that is possibly caused by the disorder.

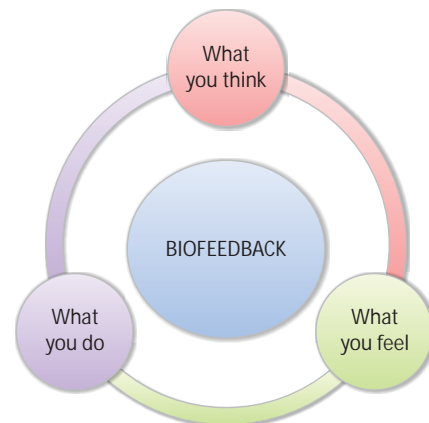
Behaviour modification :

Psychoanalysis, hypnosis, progressive relaxation, meditation, self-monitoring, sleep hygiene and habit reversal have been prescribed for the management of bruxism. Giving autosuggestion before falling asleep such as 'I will wake up if I grind my teeth' is reported by psychoanalysts to help the bruxer become aware of the habit, even while asleep. Unfortunately, autosuggestion lacks scientific strength and is not recommended.

More general relaxation techniques including meditation are supposed to produce a sense of self-esteem and control over one's body.

Biofeedback and cognitive behavioural therapy :

Biofeedback is based on the principle that bruxers can 'unlearn' their behaviour when aware of their adverse jaw



muscle activities. This technique has been applied for bruxism during wakefulness as well as for sleep bruxism.

While awake, patients can be trained to control their jaw muscle activities through auditory or visual feedback. For sleep bruxism, auditory, electrical, vibratory and even taste stimuli can be used for feedback.

Bruxism during wakefulness :

One of the early publications on the use of biofeedback in the management of bruxism during wakefulness was given in 1976.³⁸ It described an EMG technique that provides auditory feedback from muscle activity letting him know the degree of muscle activity or relaxation that is taking place.

Bruxism while sleeping:

In 1986 a technique was developed which used contingent arousal from sleep with actual awakenings.³⁹ Few other techniques used a taste stimulus to awaken the patient.⁴⁰ Other researchers in 2001 came up with the vibratory stimulation based inhibition system for nocturnal bruxism.⁴¹

In a demonstration of concept study, in 2003, the effect of contingent electrical lip stimulation on sleep Bruxism was evaluated.⁴²

In 2011, a study of the effect of electromyogram biofeedback on daytime clenching behaviour in subjects with masticatory muscle pain was published.⁴³ Electromyogram (EMG) biofeedback training was performed for a patient, consecutively for 5 days, to ascertain its effect on the regulation of daytime clenching behaviour. Their study concluded that daytime clenching was reduced in the short-term with the help of an EMG biofeedback system under natural circumstances.

Pharmacological management :

The pharmacological management of bruxism has been studied increasingly over the past decades.

A study involving 18 subjects with severe Bruxism was conducted with the administration of a total of 241

injections of BOTOX during a time period of 20 weeks.⁴⁴ The study suggested that drugs that have paralytic effect on the muscles through an inhibition of acetylcholine release at the neuromuscular junction (botulinum toxin) decreases bruxism activity especially in severe cases with comorbidities like coma, brain injury, Huntington's disease and autism.

Discussion :

Research focusing on the relationship between bruxism and prosthetic therapy is scarce.² There's no conclusive evidence that any prosthetic therapy can eliminate bruxism and likewise, no evidence to support that bruxism is caused by prosthetic therapy.

Several authors and studies have been mentioned while listing the current concepts in the diagnosis and management of bruxism. Despite of this, currently no treatment exists that can stop bruxism. Studies require randomised control studies over a larger population before being considered as the norm.

As far as intra oral devices are concerned, the major problem is that subjects have to wear these devices and this may change the original bruxism activity.

In the use of polysomnography, one major limitation is that a change in the environment for sleep may influence the actual behaviour of bruxism. Another is the expense as multiple nights/ recording is to be taken for the occurrence of sleep bruxism varies over a number of nights.

Handicaps in each technique come in various forms such as when a sound blast was applied as the aversive stimulus. The sound stimulus wakes up the patient, who is then supposed to switch off the sound, thus cutting off their bruxing and resume his/her sleep. The awakenings are a major disadvantage of such approaches because sleep disruption may lead to serious side effects like irritability, excessive daytime sleepiness and exhaustion.

In the pharmacological approach, although some seem promising, they all need further efficacy and safety assessments before clinical recommendations can be made.

A study was conducted to evaluate the efficacy of an occlusal splint (OS) vs Cognitive Behavioural Therapy (CBT) in sleep bruxism patients.⁴⁵ The CBT group comprised of problem solving, progressive muscle relaxation, nocturnal feedback, and training for enjoyment. The treatment took over 12 weeks. The OS group received a splint for the same period of time. Both groups were examined pre treatment, post treatment, and 6 month follow up for sleep bruxism activity. The analyses demonstrated a significant reduction in Sleep bruxism activity and increased positive stress coping in both groups.

Physical rehabilitation techniques have been thought to assist in correcting bruxism. The objective of developing or strengthening the jaw opening muscles is to 'hold the mandible in balance. This involves relaxing the jaw, parting the lips and creating a gap in between the teeth. The tongue should rest on the roof of the mouth and this position should be held comfortably for as long as possible. It encourages jaw relaxation and teaches proper jaw and mouth positioning.

Prosthetic planning should be based on scientific evidence. Systemic reviews have demonstrated survival rates of conventional fixed partial dentures at 94% after 5 yrs and 89% after 10 years.⁴⁶ The most common technical failure was fracture of material and loss of retention. In a prospective 15 year follow up study of mandibular implant

supported fixed prosthesis, smoking and poor oral hygiene had a greater role in bone loss, while occlusal loading factors such as bruxism, were of minor importance.⁴⁷

Literature on materials for use in FPD fabrication in patients with severe bruxism is sparse.⁴⁸ The choice of material is critical especially if opposing natural dentition. These choices often seem to be made from common sense rather than scientific data.⁴⁸ Some anecdotal reports include bruxism which is caused by high points on the occlusal surface of new restoration. This helps in grinding away the interference until equilibrium is reached after which the episodes of bruxism stops.

Conclusion :

Bruxism is a common parafunctional disorder occurring both during conscious and otherwise. There are no reliable methods for assessing bruxism which have reasonable diagnostic validity. Since there is no specific treatment available, maximum efforts must be taken to prevent its adverse effects. In the absence of definitive evidence, bruxism can be best managed by occlusal appliances, counselling, change in lifestyle and pharmacological interventions. When prosthetic treatment is indicated, effort must be made to reduce the heavy occlusal loading on all components thus maintaining the integrity of the prosthesis.

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