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Review

## **BRUXISM: DIAGNOSIS AND TREATMENT, A NARRATIVE REVIEW**

C. Lorenzi<sup>1</sup> and A.M. Pujia<sup>2</sup>

<sup>1</sup>Department of Chemical Science and Technologies, University of Rome “Tor Vergata”, Rome, Italy

<sup>2</sup>Department of Clinical Sciences and Translational Medicine, University of Rome “Tor Vergata”, Rome, Italy

*Correspondence to:*

Claudia Lorenzi, DDS

Department of Chemical Science and Technologies,

University of Rome “Tor Vergata”,

Rome, Italy

e-mail: [lorenzicla@libero.it](mailto:lorenzicla@libero.it)

### **ABSTRACT**

Bruxism is a parafunctional activity which involves the clenching and grinding of teeth. It can cause harmful effects on the health of the temporomandibular joint, masticatory muscles, dental elements and facial pain. The dentist is the specialist to whom patients are referred for bruxism. Therefore, it is crucial for the clinician to carry out a correct diagnosis and set up a correct treatment plan if necessary. This study aims to describe current diagnostic methods and treatment of this parafunction.

**KEYWORDS:** *bruxism, muscle, pain, awake bruxism, asleep bruxism*

### **INTRODUCTION**

Bruxism is an oral condition of great interest to researchers and clinicians in the dental, neurological and sleep medicine branches (1). Bruxism can be defined as “a repetitive jaw-muscle activity characterized by clenching or grinding of teeth and/or by bracing or thrusting of mandible”. In addition, bruxism has two distinct circadian manifestations: it can occur during sleep (indicated as sleep bruxism - SB) or during wakefulness (indicated as awake bruxism - AB) (1).

Bruxism represents a common clinical phenomenon: according to a recent systematic review (2), the prevalence of “generic bruxism” (i.e. without any distinction between awake and sleep bruxism) is between 8% to 31,4% in the examined population. A prevalence of 22-31% for awake bruxism and 13-23% for sleep bruxism is in the adult population.

### *Diagnosis*

The evaluation and diagnosis of bruxism are often complex as there is still no consensus in the literature on the

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diagnostic path to follow to set up guidelines. There are several diagnostic tools, which include:

- patient's reports: some patients are unaware of their teeth clenching and/or grinding activity during sleep;
- clinical evaluation: there are signs and symptoms of bruxism (e.g. tooth abrasion, muscle pain or soreness) and the presence of potential risk factors (e.g. skeletal class 2, tonsillar hypertrophy) that induce suspicion in the clinician;
- medical history questionnaire: it is useful to assess the patient's general and oral health, sleep quality, presence/absence of headaches, characteristics of pain, depression, anxiety, and stress;
- EMG: electromyography of the masticatory muscles;
- PSG A/V: polysomnography with audio/video recording.

Currently, a diagnostic approach through clinical evaluation and analysis of the medical history represents the simplest and most widespread method for evaluating and collecting data. However, it cannot discriminate between the two forms of bruxism (AB or SB) (3).

Medical history questionnaires are based on questions such as: "Do you happen to experience a sensation of pain or tenderness of the masticatory muscles upon awakening?"; "Does the partner report being awakened by the noise caused by teeth grinding?". These self-report investigations seem to be very useful for diagnosing AB, as they match the data obtained from the clinical examination. However, this does not seem valid for SB (4).

Clinical examination is always the first and irreplaceable approach to the patient, but it may not be sufficient to diagnose bruxism. In this regard, in 2013, a panel of ten international bruxism experts proposed a diagnostic classification system based on the tools chosen to make the diagnosis. In this document, the various diagnostic approaches differ on the potential to make a diagnosis of "possible", "probable", or "certain" bruxism (5):

1. possible sleep or awake bruxism: diagnosis based on self-reports and medical history;
2. probable sleep or awake bruxism: diagnosis based on self-reports plus the clinical examination;
3. definite sleep bruxism: diagnosis based on self-reports, clinical evaluation and a polysomnography recording;
4. definite awake bruxism: diagnosis based on self-reports, clinical evaluation and electromyography of the masticatory muscles.

Polysomnography (PSG) currently represents the gold standard for diagnosing sleep disorders (including SB). PSG with audio/video recording is carried out in special sleep laboratories in neurology departments and allows the simultaneous recording of different physiological parameters (2, 6), including:

- brain activity via electroencephalography (EEG);
- eye movements during sleep via electrooculogram (EOG);
- muscle activity analyzed by electromyography (EMG);
- cardiac activity via electrocardiogram (ECG);
- pulmonary ventilation;
- snoring;
- airflow during breathing;
- oximetry.

All these parameters will then be analyzed to differentiate the various phases of sleep, rapid eye movement (REM) sleep from non-REM sleep, sleep from wakefulness, and to identify possible anomalies in the sleep architecture (the so-called micro-awakenings) (7).

Audio/video recording allows us to document the presence of dental clenching and/or grinding and to discriminate the rhythmic activity of the masticatory muscles from other motor activities, such as swallowing or head movements (2).

PSG allows a complete analysis of the physiology of sleep and represents a valid as well as necessary aid, especially in cases where the bruxist patient has other comorbidities related to sleep, motor and/or respiratory disorders (e.g. obstructive sleep apnea or restless legs syndrome, RLS) (2). However, the major limitations related to PSG are represented by the high cost and the fact that it is operator-dependent.

In order to overcome these problems, devices have been created that allow polysomnographic recording at home. This modality is currently the most frequently used. However, the limit is represented by the absence of recording parameters such as cardiac and brain activity and eye movements (8).

The first portable EMG device was introduced in the 1970s, and it was based on the assumption that the diagnosis of bruxism could be obtained simply by recording the muscle activity of the masseter and/or temporal muscles during

sleep (9). Currently, all equipment has a pre-registration calibration to identify an individual threshold in order to exclude physiological EMG activities such as cough, swallowing and soliloquy; these threshold values can be represented by the percentage of the maximum voluntary window frame (MVWF) or by the standard deviations of the electromyographic activity at rest (10).

Ikeda et al. (11) proposed diagnostic criteria for sleep bruxism with portable EMG equipment, emphasizing the need to combine an ECG recording with detecting the EMG signal. These latest generation portable EMG devices, which associate the EMG signal with heart rate analysis, seem to be the most attractive in terms of diagnostic validity, as they allow to distinguish between bruxist and non-bruxist subjects, and reliability, as they allow good reproducibility of the measurements obtained (2).

### *Treatment*

The purpose of bruxism treatment (as well as parafunctions in general) should be eliminating etiological factors. Therefore, the therapy is symptomatic and based on controlling and preventing the consequences it causes (2). The different therapeutic approaches can be summarized as behavioural therapy, physiotherapy, occlusal therapy and pharmacological therapy.

### *Behavioural therapy*

**Patient education (counselling):** Regarding behavioural therapy, if the patient manifests AB, the clinician's goal is to increase awareness of the presence of the parafunction, stimulating the subject to behave in self-control (2). The subject is instructed to maintain a mandibular rest position and to identify the difference between the state of contraction and that of relaxation of the chewing muscles (12).

**Sleep hygiene:** Maintaining sleep hygiene involves avoiding the intake of substances such as alcohol, caffeine and tobacco, which are associated with an increase in the frequency and prevalence of bruxism (13).

**Relaxing techniques:** Aim to improve the habits that influence the sleep-wake rhythm.

**Biofeedback:** The biofeedback technique assumes that the bruxist subject can interrupt his parafunction if an auditory and visual stimulus makes him aware of uncontrolled muscle activity; we speak of the so-called "aversive conditioning" (14). This technique offers good results, especially for forms of wakefulness bruxism.

**Cognitive-behavioural therapies:** These therapies aim to improve stress management.

### *Physiotherapy*

Physiotherapy is a non-invasive and reversible treatment modality, especially useful when temporomandibular pain is present. The goal is reducing inflammation, muscle tone and pain control; mainly involves relaxation exercises with diaphragmatic breathing, stretching, coordination and self-massage of the peri-oral muscles (2).

### *Occlusal therapy*

Occlusal therapy can be reversible (occlusal plates) or irreversible (occlusal adjustments).

**Occlusal adjustments:** It is no longer an accepted method for the treatment of bruxism; its meaning has only historical value as it is known that occlusal factors are unable to determine the muscle hyperactivity underlying this oral condition (15). Furthermore, this method can lead to unjustified damage to the already weakened teeth (2). Currently, the "occlusal adjustment" procedure is justified in cases where it is strictly necessary, always aimed at guaranteeing occlusal stability and the oral health of the subject.

**Occlusal stabilization plate:** It represents the most widespread treatment of bruxism. It is a custom-made intraoral device positioned between the dental arches, inducing an increase in the vertical dimension of occlusion, which is frequently reduced in bruxist subjects (2). This tool protects the teeth from wear damage, reduces the overload of the periodontal apparatus, muscles and TMJs, eliminates any occlusal interference, modulates muscle activity, and ultimately reduces parafunction (2). Most occlusal plates are constructed of rigid acrylic resin or composite material and applied at the level of the maxillary arch (15, 16). During reversible occlusal therapy, it is advisable to carry out a constant follow-up to ensure that the occlusal contacts are always homogeneous over time.

If the patient presents with sleep apnea, the choice of lower plates is preferable to maintain adequate space for the

tongue; in fact, it seems that the upper occlusal plates can worsen apneic episodes during sleep (5). It must be said that intraoral devices are especially effective in the treatment of bruxism in the short term (2-6 weeks) and not in the long term (6 months) as there is a physiological mechanism of neuromuscular plasticity and adaptation, with consequent reduction of efficacy over time (17).

#### *Mandibular advancement devices (MAD)*

MAD is used to treat obstructive sleep apnea of mild and moderate degrees. Such devices are initially very uncomfortable for the patients but are associated with two times more significant reduction in bruxism episodes than occlusal plates (18).

#### *Pharmacological therapy*

Drug therapy represents a therapeutic approach to sleep bruxism. The most used drugs are muscle relaxants, catecholaminergic precursors such as L-dopa, benzodiazepines (19), anxiolytics (buspirone) (20), antipsychotics (hydroxyzine) (21), beta-adrenergic antagonists (propranolol) (22), antiepileptics (gabapentin) (23). The administration of these molecules can lead to a reduction in episodes of bruxism in various ways. The use of benzodiazepines, for example, is recommended only for relatively short periods and where the pain is associated; these drugs can suppress muscle hyperactivity both for their muscle relaxant effect and as they act by reducing anxiety and stress, negative factors associated with this oral condition (19). Botulinum toxin A has recently been proposed as a potential therapeutic approach to reduce hypertonia and pain in the chewing muscles (3).

Botulinum toxin is widely used for various clinical purposes, from therapeutic to aesthetic; one of its main indications, besides the purely cosmetic ones, includes the treatment of conditions associated with pain (migraine, cluster headache, myofascial pain, chronic low back pain, etc.) and excessive muscle contraction (bruxism, oesophageal spasm, vaginismus, and sphincter dysfunction) (24, 25).

The rationale for using this substance in bruxism is based on the possibility of obtaining entirely complete muscle relaxation (2); however, it must be said that the authors currently agree in asserting that the use of botulin should be reserved for cases of bruxism accompanied by marked muscle hypertrophy and symptoms of muscle fatigue that cannot be managed with more conservative approaches (24).

## CONCLUSIONS

Currently, there does not seem to be a single therapy that is valid in all cases of bruxism; often, the most appropriate treatment involves a multi-specialist approach, both in the diagnostic and therapeutic phases. Nevertheless, the literature agrees with the assumption that a potentially preferable strategy is based on the so-called “three P approach” (plates, pep-talk and pills), i.e. reversible occlusal therapy, cognitive-behavioural therapy and drug therapy, where necessary (14).

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