

Bruxism Management Using Prosthodontic Approaches – Review Article

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Abstract – Bruxism (awake and sleep) is a common parafunctional exertion that can produce progressive tooth wear and tear, prosthetic failure, myofascial pain, and temporomandibular diseases. Prosthodontists play a central part in opinion, defensive and restorative operation, and long- term conservation of affected dentitions. Prosthodontic strategies include occlusal appliances (slivers), defensive restorative design and accoutrements, full- mouth recuperation for severe wear and tear, provisionalization and phased recuperation, implant and prosthetic planning for bruxers and spare measures (e.g., botulinum poison) when indicated. substantiation supports occlusal appliances for symptom control and protection of dentition although outgrowth studies vary in quality; botulinum poison shows pledge for reducing muscle pain and intensity but long- term data are limited. Implant survival may be reduced in bruxers and requires careful planning and conservation. A multidisciplinary, offered approach integrating behavioral measures, appliance remedy, restorative planning, and careful follow- up is recommended.

I.INTRODUCTION

Bruxism, which can be considered a marquee term for clinging and grinding of the teeth, is the commonest of the numerous parafunctional conditionings of the masticatory system (1) Bruxism is considered to have a multifactorial etiology that includes presently inadequately defined aspects of central nervous system function, inheritable and behavioural factor (2). It is considered a multifactorial condition influenced by psychological, pathophysiological, and occlusal factors. Chronic bruxism can lead to tooth wear, muscle fatigue, temporomandibular joint (TMJ) disorders, and damage to dental restorations, necessitating effective management strategies to prevent long-term complications. Prosthodontic interventions play a vital role in the management of bruxism by restoring occlusal harmony, protecting dental structures, and reducing the excessive forces

exerted on the teeth and TMJ through various appliance therapies and restorative approaches [21].

This original webbing can serve as an opening dialogue for clinicians to educate and inform cases about awake bruxism. Another critical way for clinicians to identify a case with a parafunctional habit is by damage to the tooth structure. This damage includes wear and tear angles, fractured teeth and restorations, mode lines, abfractive lesions, and eventually loss of teeth 3, 4. Other intraoral signs include indentations along the side of the lingo, as well as bony exostoses or tori. Periodontal changes, including widening of the periodontal ligament, tooth mobility, and recession, also may do 5.

still, they can use colorful ways, if a clinician (or case) desires a more definitive system of opinion. To separate between sleep and awake bruxism, for illustration, the clinician can measure the electro myographic exertion of the masticatory muscles 6, 7, 8. The dentist can define easy to- use electro myographic bias to use during sleep to confirm muscle exertion (for illustration, suck Strip, Great Lakes Orthodontics). After original webbing and dubitation of a parafunctional habit, more in- depth case questionnaires (with clear delineations) and at- home journaling can help further identify what type of parafunctional conditioning the case engages in and how frequently. 9, 10

Prosthodontic intervention aims not only to restore misplaced structures but also to help farther damage through occlusal stabilization and protection.

The prosthodontic management of bruxism primarily focuses on mechanical protection and functional rehabilitation. The use of occlusal splints, night guards, and bite appliances helps redistribute occlusal forces, alleviate muscle tension, and prevent further

dental wear. Moreover, advanced prosthodontic materials and restorative designs are employed to reconstruct worn dentitions and restore proper vertical dimension and esthetics. Recent developments in digital prosthodontics, such as CAD/CAM-fabricated splints and precision-fit restorations, have further enhanced the effectiveness and patient comfort in bruxism management [22].

In addition to appliance therapy, prosthodontic approaches are integrated with behavioral modification, stress management, and pharmacologic interventions to provide a comprehensive treatment plan. The role of the prosthodontist extends beyond mechanical correction to include identifying etiological factors and collaborating with other dental and medical specialists to address the systemic and psychological aspects of the disorder. A multidisciplinary approach ensures long-term stability and improved quality of life for patients suffering from bruxism [23].

II. ETIOLOGY AND PATHOPHYSIOLOGY

Bruxism is a complex condition with multifactorial etiology, encompassing physiological, psychological, and peripheral factors. Traditionally, it has been categorized into sleep bruxism and awake bruxism, each with distinct underlying mechanisms. Sleep bruxism is generally regarded as a sleep-related movement disorder, whereas awake bruxism is often linked to psychosocial stress and habitual behaviors. From a prosthodontic perspective, understanding the etiology and pathophysiology is essential to design appropriate restorative and occlusal therapies that minimize damage and restore functional harmony [24].

The etiological factors of bruxism can be broadly divided into central and peripheral causes. Central factors involve the central nervous system (CNS) and include disturbances in neurotransmitter activity—particularly dopaminergic, serotonergic, and gamma-aminobutyric acid (GABA) systems—that regulate muscle activity during sleep. Studies have shown that fluctuations in these neurotransmitters may increase rhythmic masticatory muscle activity, leading to bruxism episodes [25]. Psychosocial factors such as stress, anxiety, and personality traits like hyperactivity and competitiveness also play a critical role,

particularly in awake bruxism. On the other hand, peripheral factors such as occlusal discrepancies and high dental restorations can contribute to increased masticatory muscle activity, although recent evidence suggests that occlusal factors alone are not the primary cause but rather modulators of the condition [26].

The pathophysiology of bruxism involves complex interactions between the central nervous system, masticatory muscles, and peripheral proprioceptive feedback mechanisms. During sleep, micro-arousals in the brain trigger an increase in heart rate and muscle tone, activating rhythmic contractions of the jaw muscles. These episodes of masticatory muscle activity are often preceded by autonomic nervous system changes, indicating a central origin rather than purely peripheral stimulation [27]. In chronic cases, repetitive excessive loading can lead to tooth wear, fractures of restorations, and temporomandibular joint strain. From a prosthodontic standpoint, this understanding guides the development of occlusal appliances that distribute forces evenly, reduce muscle hyperactivity, and prevent further structural damage.

III. CLINICAL FEATURES AND DIAGNOSIS

Clinical signs;

The clinical features of bruxism vary according to its severity, duration, and whether it occurs during sleep or wakefulness. Patients with bruxism often present with symptoms such as jaw muscle fatigue, facial pain, morning headaches, and tooth sensitivity. The most characteristic sign is abnormal tooth wear—flattening of cusps, loss of enamel, and exposure of dentin due to repetitive grinding forces. In advanced cases, fractures of teeth and restorations, mobility, and even pulpal pathology may occur as a result of excessive occlusal load. Soft tissue manifestations, including linea alba on the buccal mucosa, indentation marks on the tongue, and hypertrophy of the masseter muscle, are also commonly observed. From a prosthodontic standpoint, these features are significant because they influence restorative planning and occlusal rehabilitation.

Temporomandibular joint (TMJ) symptoms are another important clinical aspect of bruxism. Continuous parafunctional activity can lead to tenderness of the masticatory muscles, limited mouth opening, and joint sounds such as clicking or crepitus.

These manifestations often overlap with temporomandibular disorders (TMD), making differential diagnosis essential. Prosthodontists must assess the extent of occlusal wear and joint involvement before fabricating any occlusal appliance or restoring the dentition. The degree of wear facets and the pattern of attrition can also provide clues to the chronicity and direction of bruxing forces, helping in the selection of appropriate prosthetic materials and designs



IV. DIAGNOSTIC METHODS

Diagnosis of bruxism relies on a combination of clinical evaluation, patient history, and, in some cases, instrumental analysis. Clinically, visual inspection of tooth wear, palpation of muscles, and assessment of TMJ tenderness are initial diagnostic steps. Patient-reported symptoms such as morning muscle stiffness, awareness of clenching, or partner-reported grinding noises during sleep provide valuable diagnostic information. In complex cases, diagnostic aids such as electromyography (EMG) and polysomnography are used to measure muscle activity during sleep and confirm the diagnosis of sleep bruxism. Bite force analysis and occlusal wear mapping can further help in quantifying the extent of damage. For prosthodontic management, accurate diagnosis is critical to distinguish between active bruxism and historical wear, ensuring that restorative procedures are both protective and functional

Prosthodontic evaluation in bruxism cases should also consider the occlusal scheme, vertical dimension of occlusion (VDO), and the condition of existing restorations. A comprehensive diagnostic approach enables the clinician to design occlusal splints or restorative solutions that protect the dentition while minimizing further trauma. Hence, early recognition of bruxism through detailed clinical and instrumental assessment is vital for preventing progressive tooth

wear, maintaining occlusal stability, and improving patient comfort and function [28].

V. CONSEQUENCES OF BRUXISM

Bruxism, when persistent and untreated, can lead to a wide range of destructive consequences affecting the teeth, masticatory system, and temporomandibular joint (TMJ). The most evident consequence is tooth wear, resulting from repetitive grinding and clenching forces that exceed the normal physiological load. Over time, this can cause flattening of occlusal surfaces, enamel loss, and exposure of dentin, leading to tooth sensitivity and increased susceptibility to caries. Severe wear may also result in loss of vertical dimension of occlusion (VDO), which affects facial esthetics and functional efficiency. In prosthodontic terms, such damage complicates restorative procedures and requires complex rehabilitation to reestablish occlusal balance and aesthetics. In addition to dental wear, bruxism exerts excessive forces on the periodontium and supporting structures, which may contribute to tooth mobility, abfraction lesions, and even periodontal breakdown in susceptible individuals.

VI. SYSTEMIC CONSIDERATION ON BRUXISM

Bruxism is increasingly understood not merely as a localized dental phenomenon but as a parafunctional activity modulated by systemic influences. These influences involve interactions between the central nervous system, endocrine and hormonal regulation, psychological states, and broader body physiology. Such systemic modulation can affect the onset, frequency, intensity, and persistence of both awake and sleep bruxism.

Neurological mechanisms are central to the systemic understanding of bruxism. Disorders such as Parkinson's disease, Huntington's disease, and other movement disorders often lead to heightened muscle tone and involuntary orofacial motor activity, thereby predisposing patients to teeth grinding or clenching. In the context of sleep, associated conditions such as obstructive sleep apnea, snoring, and periodic limb movements provoke repeated micro-arousals, which in turn activate masticatory muscles via autonomic pathways. The imbalance in autonomic tone—especially sympathetic overactivity—can further exacerbate the excitability of mandibular motor

circuits and contribute to bruxism events during sleep. (Thomas et al., 2024)--[17]

Psychological and emotional stressors anchor a significant systemic pathway influencing bruxism. Chronic stress, anxiety, and mood disorders induce alterations in neurotransmitter systems—particularly serotonin, dopamine, and noradrenaline—which regulate central motor control circuits and muscle tone. Under sustained sympathetic dominance and elevated cortisol levels, a heightened baseline of muscle tension is maintained, increasing the propensity for clenching or grinding, especially in wakeful states. A systematic review and meta-analysis have demonstrated that individuals with elevated stress show higher odds of bruxism (OR ~2.07) compared to non-stressed cohorts (Chemelo et al., 2020)--[18]

Endocrine and hormonal perturbations further modulate the susceptibility to bruxism. In hyperthyroidism, raised metabolic rate and neuromuscular excitability can promote motor overactivity, including jaw muscle contractions. In women, cyclical changes in estrogen and progesterone during the menstrual cycle, as well as the hormonal shifts of pregnancy or menopause, may influence muscle tone and sleep architecture, indirectly affecting nocturnal bruxism. Chronic stress that elevates cortisol levels can perpetuate a cycle of muscle hypertonicity and disrupted sleep, creating a self-sustaining feedback for bruxism.

Certain systemic diseases and gastrointestinal conditions also play a contributory role. Gastroesophageal reflux disease (GERD) is postulated to provoke sleep micro-arousals during acid insult, which may trigger jaw muscle activity as a protective reflex. Additionally, bruxism has been observed in patients with neurological disorders such as epilepsy, and in chronic pain syndromes (e.g. fibromyalgia, temporomandibular disorders), where altered central pain processing and neuromuscular control might promote parafunctional jaw activity.

Pharmacologic agents and exogenous substances represent another systemic vector for bruxism modulation. Medications that alter neurochemical balance—especially selective serotonin reuptake inhibitors (SSRIs), antipsychotics, and certain

dopaminergic agents—are well documented to induce or exacerbate bruxism. Furthermore, stimulants like caffeine, nicotine, and amphetamines increase sympathetic drive, while alcohol and recreational drugs disrupt normal sleep staging, all of which can aggravate both awake and sleep bruxism.

Finally, genetic and neurochemical predispositions underlie the systemic susceptibility to bruxism. Polymorphisms in genes regulating dopaminergic, serotonergic, or GABAergic receptors have been associated with increased bruxism risk. Dysregulation in these neurotransmitter systems can impair fine motor inhibition and facilitate repetitive or sustained masticatory muscle contractions. (Thomas et al., 2024)--[17]

VII. PROSTHODONTIC MANAGEMENT APPROACHES

Occlusal Splints

Occlusal splints are the cornerstone of prosthodontic management for bruxism.

Types

1. Hard acrylic stabilization splint (Michigan splint) – provides even occlusal contact and allows muscle relaxation.
2. Soft splints – indicated for short-term use; less durable but comfortable.
3. Dual-laminate splints – combine a soft inner layer and hard outer layer.
4. Mandibular advancement devices – beneficial in sleep bruxism with airway issues.

Functions:

- Distribute occlusal from attrition
- Decrease masticatory muscle hyperactivity
- Improve TMJ function



Occlusal Therapy

Selective grinding may be indicated when occlusal interferences are evident.

Re-establishment of a stable occlusion in restorative or prosthetic work helps minimize triggers.

Proper occlusal scheme design is crucial, emphasizing mutually protected occlusion and canine guidance to distribute forces appropriately.

VIII.RESTORATIVE AND REHABILITATIVE APPROACHES

Key considerations:

Use high-strength materials (metal-ceramic, monolithic zirconia, lithium disilicate).

Maintain flat cuspal inclinations and broad occlusal contacts to reduce stress.

Ensure metal occlusal surfaces in posterior regions for bruxism patients.

Implant prostheses should follow implant-protected occlusion principles to minimize overload.

Full-mouth rehabilitation may be required in severe wear cases, restoring vertical dimension and occlusal harmony.

In advanced cases, restorative intervention may be required to restore worn dentition.

Digital Prosthodontics and 3D Technologies

Recent advancements have introduced CAD/CAM-fabricated occlusal splints, which ensure better accuracy and fit.

3D printing enables rapid and customized appliance production.

Digital scanners help in monitoring wear progression. Emerging AI-based systems can record and analyze nocturnal muscle activity to guide personalized treatment.

Adjunctive and Interdisciplinary Management

Prosthodontic management should be combined with other therapies for comprehensive care:

Behavioral modification and stress management

Biofeedback therapy for muscle control

Pharmacologic therapy (e.g., muscle relaxants, botulinum toxin injections)

Sleep hygiene measures and CBT (Cognitive Behavioral Therapy) for anxiety and sleep disorders

Collaboration with sleep medicine specialists, psychologists, and neurologists for holistic care.

IX.EVIDENCE BASED PRESPECTIVE

Systematic reviews and randomized controlled trials indicate that

Occlusal splints reduce muscle activity but may not completely eliminate bruxism.

Hard splints show superior durability and comfort compared to soft ones.

Digital splints demonstrate improved accuracy and patient acceptance.

However, long-term outcomes are variable, and individualized treatment remains the best approach.

Future Directions

Development of smart splints with embedded sensors to detect and record bruxing activity. Use of AI and machine learning for early diagnosis and treatment customization. Bio adaptive materials that can absorb stress without degrading over time. Longitudinal studies to evaluate the long-term success of prosthodontic interventions

X.CONCLUSION

Bruxism is a complex, multifactorial condition that poses significant challenges to oral health and prosthodontic rehabilitation. Prosthodontic management, particularly through occlusal splints and restorative approaches, plays a central role in mitigating damage and maintaining function. With advancements in digital technologies and interdisciplinary care, the prognosis for patients with bruxism continues to improve. A tailored approach that integrates occlusal protection, behavioral management, and modern fabrication techniques offers the most effective outcome.

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