



RESEARCH ARTICLE

Utilization of alternative treatment for management of clenching and bruxism

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ABSTRACT

Temporomandibular disorders (TMDs) are a prevalent orofacial pain condition of non-dental origin affecting the temporomandibular joints (TMJ) and/or the associated orofacial muscles, often presenting as clenching and bruxism. Stress is a major contributor to increases in bruxism and clenching and discomfort increases as life stress increases. Traditional treatment has been with the use of mouthguards to alleviate stress on the joint. Alternative treatment utilizing low magnitude high frequency vibration (LMHFV) or photobiomodulation (PBM) has demonstrated useful in those patients having increases in daytime bruxism and clenching and can be a useful adjunct to nocturnal use of mouthguards. This article will discuss their applications and the authors personal experiences with their use.

Keywords: TMD, TMJ, bruxism, clenching, LMHFV, PBM

Introduction:

Temporomandibular disorders (TMDs) are a prevalent orofacial pain condition of non-dental origin affecting the temporomandibular joints (TMJ) and/or the associated orofacial muscles, often presenting as clenching and bruxism. These conditions have been linked to stress levels, with an increase in incidence with greater stress levels in the individual.^{1,2} This becomes a

habit that compromises the orofacial region as clenching and bruxism become chronic in nature and is associated with pain in the teeth and local facial musculature as well as the TMJ as clenching and bruxism become chronic in nature. (Figure 1) Additionally, some patients may exhibit these issues with acute episodes of stress and anxiety.

Areas affected with Bruxism and Clenching

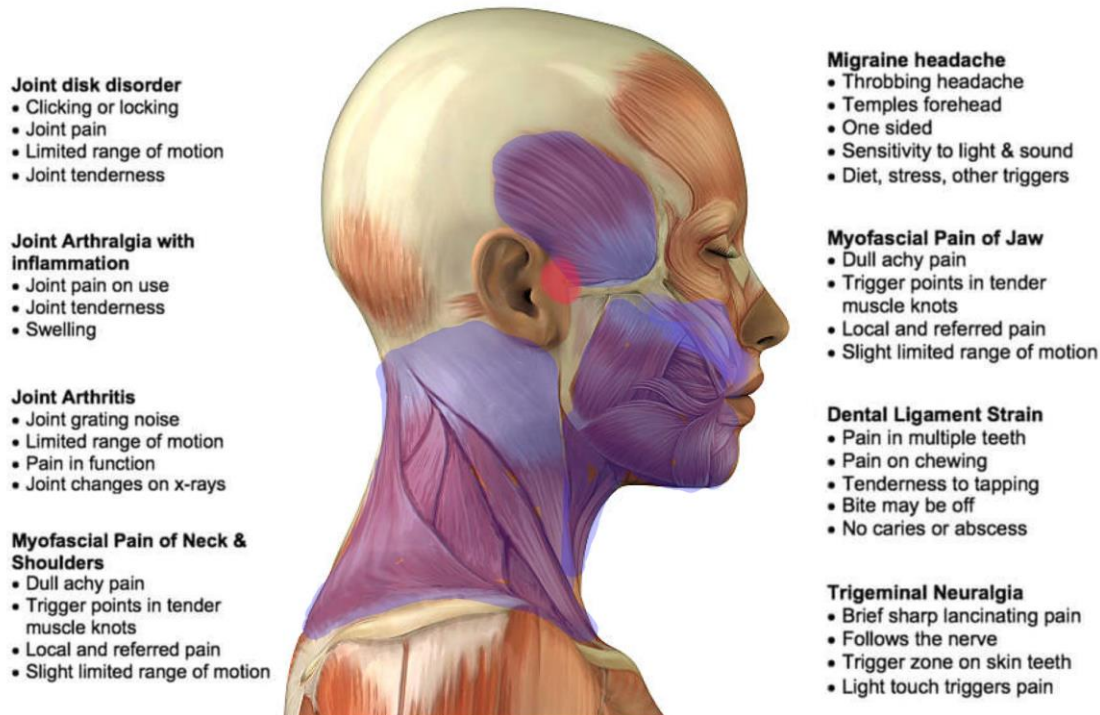


Figure 1: Areas affected by bruxism and clenching showing the muscles contributing to issues (blue) and TMJ (red).

Some psychological factors have been associated with bruxism other than anxiety, which include depression, sociability, stress coping, and personality traits. While bruxism has traditionally been identified and treated as a nighttime issue, many patients also experience it during the day. Awake bruxism is associated with significantly higher levels of anxiety and stress, and may play a role in stress coping as a way of relieving psychological tension. Although typically we have identified and treated patients exhibiting this during sleep, many patients exhibit this when awake. That awake bruxism group presents significantly higher levels of the trait and a higher state of anxiety related to their stress levels.³ Awake bruxism may play a role in stress coping as a means of relieving psychological tension. A positive relationship has been found between awake bruxism and levels of anxiety but not between sleep bruxism and anxiety.⁴ Additionally, bruxism has been associated with increased tooth wear, fracturing of teeth or restorations and overall decreasing quality of life in those patients suffering from it.

Management of clenching and bruxism has centered around utilization of occlusal appliances to minimize or eliminate damage to the teeth, but a recent systematic review concluded there was insufficient evidence to support their use for long-term reduction of sleep bruxism.⁵ Simultaneously, these devices, when properly designed and equilibrated, take pressure off the TMJ while preventing maximum contraction of the muscles of

mastication.^{6,7} Appliances may be worn by the patient during sleep or throughout the day, particularly during periods of heightened stress when parafunctional activities increase. When sleeping or during awake hours when an increase in stress increases parafunctional activities. Unfortunately, this does not decrease muscle contraction and neural activity in those muscles, which can further increase clenching and bruxism. An alternative or adjunct to those occlusal appliances focuses on breaking the neural activity, allowing for muscle relaxation and a subsequent decrease in stress that would decrease further clenching and bruxism.⁸

Alternative treatment therapy has been utilized in management of TMDs as well as clenching and bruxism. Low magnitude high frequency vibration (LMHFV) has positive effects on the relaxation of muscles and an ability to help break the neural contraction cycle associated with clenching and bruxism and relief of associated pain. The authors will discuss their personal experience utilizing LMHFV in managing their own awake clenching and bruxism. Additionally, photobiomodulation (PBM) has been utilized in medical treatment and is discussed as a treatment option alternative to LMHFV.

Understanding why bruxism occurs:

Bruxism consists of masticatory muscle activity manifesting as a range of signs and symptoms in the orofacial region.⁹ Those symptoms include facial pain

either in the teeth, muscles of mastication or both, headaches,¹⁰ possible signs of tooth grinding, jaw-muscle discomfort with or without frank pain and/or tenderness in the TMJ.¹¹ Masticatory muscle motor neuron activity increases during bruxism which is triggered by periodontal receptors.^{12,13} There is a difference in bruxism when asleep and awake.^{14, 15}

Sleep bruxism is a nocturnal masticatory muscle activity when sleeping, characterized as either rhythmic (phasic) or non-rhythmic (tonic). In contrast, awake bruxism is a masticatory muscle activity when awake during the day characterized by repetitive or sustained tooth contact that may also involve bracing or thrusting of the mandible. Awake bruxism may be due to emotions such as anxiety, stress, anger, frustration or tension, or it may be a coping strategy or a habit during deep concentration. Yet, many patients as mentioned suffer with awake clenching and bruxism related to day-time stress and utilization of an oral appliance for bruxism does not eliminate or lessen the neural muscle stimulation that adds to further clenching and bruxism. It has been reported that 20-38% of the population has periodic or daily awake bruxism.^{16, 17}

LMHFV and its effect on bruxism:

No therapy has been demonstrated to effectively and permanently cure bruxism. Occlusal splints (night guards) protect teeth from pathological wearing and relax the masticatory muscles preventing full contraction of those muscles, but the palliative effects of those appliances seem to be transient.^{18, 19} It has been documented that those patients with obstructive sleep apnea have a greater incidence of bruxism during sleep and that should be addressed in those patients as part of their sleep apnea therapy.²⁰ It is difficult for those patients who have awake bruxism to wear the appliance during the day as it may interfere with talking and other social activities. Utilization of an intraoral vibration device either in conjunction with a nocturnal appliance during awake hours or in those patients who are only bruxing during awake hours has demonstrated to decrease muscle contraction during stress periods and the associated pain from bruxism.

Vibration therapy has been previously reported to improve comfort related to TMJ and associated neck issues, focusing on the application of vibration to the cervical region to relax the neck muscles and their connection to the TMJ.²¹ This approach demonstrated a decrease in pain perception related to tension in the cervical muscles and TMJ.²²⁻²⁴ However, the cervical application of vibration did not significantly affect the muscles of mastication or reduce clenching by disrupting neural activity in these muscles.

Vibration has been employed in sleep appliances to aid in minimizing TMJ pain and sleep bruxism.²⁵⁻²⁷ Biofeedback related to the vibration decreases neural activity that leads to muscle contraction, decreasing bruxism and its associated effects on the patient. One study reported on the use of a vibration device nocturnally, administered for 30 minutes at 30-minute intervals, which resulted in a reduction of episodes of sleep bruxism.²⁸ This has been supported by other studies reporting on use of a nocturnal vibration device

for similar duration and cycles.²⁹ Nocturnal vibration use does not aid patients who are clenching and bruxing during awake hours. The use of an intraoral device providing LMHFV (low magnitude high frequency vibration) during awake hours or when an acute episode occurs with minimal treatment time required is ideal to minimize the need for patient compliance.

An intraoral device for treatment of bruxism has advantages that extraoral devices do not afford. Lightly occlusion on the soft bite plate allows vibrations to be conducted through the teeth, transmitted to the underlying bone, and further dispersed to the muscles of mastication and the TMJ area. This allows treatment with LMHFV to the entire orofacial region covering all areas that would be affected by bruxism by simple occlusion on the biteplate of the device. Those patients who are in full dentures on one or both arches can be treated with the LMHFV intraoral device using the denture to occlude into the bite plate and conduct the vibrations to the muscles of mastication and aid in management of their bruxism. Treatment involves use of the device for 5-minutes daily or two sessions when an acute episode presents. This improves patient compliance as use is not time consuming and the device is "pocket" sized allowing it to be carried with the patient during daily activities.

Authors' personal experiences with LMHFV for awake bruxism:

We live in stressful times due to the pandemic with reported increases in TMJ and bruxism issues.³⁰⁻³² Additionally, we practice in a stressful occupation.^{33, 34} As practitioners, we encounter stressors that heighten neural activity and muscle contraction, leading to bruxism. Interacting with stressed patients further compounds our stress, exacerbating our own bruxism while at work. Those factors are additive to us as practitioners dealing with patients who are also stressed when presenting for dental care. This adds to our stress, thereby increasing our own bruxism while at the office. Having utilized a LMHFV device for various dental applications with our patients, including accelerating osseous graft conversion, improving implant integration and stabilizing mobile teeth, with an understanding of the mechanisms of vibration usage, we were requested by the sponsor to try vibration for awake bruxism treatment on ourselves. This is counter intuitive as current therapies utilize continuous nighttime mouthguards for the condition.

The primary author utilized the PerioTech device (PerioTech, Palm Beach Gardens, FL) by initially applying LMHFV for 1 session (5 minutes) in the morning and repeated in the evening daily. During an acute incident of bruxism, a 3rd session of LMHFV treatment was added at peak bruxism to aid in breaking the cycle. An immediate decrease in muscle tension and related soreness was noted after each session of LMHFV with improvement in comfort and less associated pain. After three days of twice-daily use, the incidence and severity of bruxism decreased. Following 14 days of this regimen, the frequency and intensity of awake bruxism significantly reduced, allowing for a switch to once-daily maintenance. When an acute episode occurred an additional session of LMHFV was added at the time of the incident or as soon as was practical.

The co-author also used the LMHFV device. He has been treated with occlusal adjustment and 3 different mandibular occlusal guards in an attempt to decrease TMJ discomfort. While these slightly diminished morning discomfort, the author was still aware of diurnal clenching. For the past 2 years, he has utilized an orthotic mandibular repositioning device to increase airway space, decreasing sleep apnea. This sleep appliance prevents night-time clenching but cannot be worn during the day when clenching is noted. After the first use of the LMHFV device, there was an immediate decrease in discomfort in the masseter muscles, where the primary effect of clenching was observed. With twice a day, five-minute usage, he noted there was no more discomfort in the musculature. After one week, there have been no further incidents of diurnal clenching.

The PerioTech LMHFV device was designed with specific technical metrics (frequency and magnitude) to provide positive effects for increasing bone density around implants, osseous grafts, periodontal applications such as mobile teeth, besides its applications discussed regarding bruxism and clenching that similar devices on the market do not provide.

Photobiomodulation (PBM) and TMJ pain management:

PBM, also referred to as low-level laser therapy (LLLT) and whole-body Photobiomodulation therapy (PBMT), has been utilized in physical therapy and pain management by our medical brethren for a significant period of time. It has been reported to provide systemic and local responses. Those include improvements in quality of life, pain, sleep disorders, tiredness, muscle spasm, morning stiffness, psychological factors, elastic properties of tissue, circadian rhythms, tender points, and fibromyalgia relief.³⁵ Additionally, PBMT has been reported to improve cerebral blood flow, neuronal bioenergetic functions, neuro-inflammation, oxidative stress, neural apoptosis, neurogenesis, and neurotrophic factors. PBM has a positive effect on the secretion of serotonin and endorphins, leading to a reduction in pain signaling.³⁶

With those medical applications, PBMT is a conservative approach to improve function and reduce pain symptoms in TMD patients. A systematic review demonstrated promising effects of PBMT on pain alleviation and improvement in maximum mouth opening.³⁷ A systematic review reported that PBMT effectively relieves pain and improves functional outcomes in patients with TMD.^{38, 39} Another systematic review of a large number of published studies reported that PBMT/LLLT was efficient in diminishing TMD pain. It also provides advantages as a therapeutic regimen as it is non-invasive, reversible, with fewer adverse effects,

and may also improve the psychological and emotional aspects associated with TMD.⁴⁰ PBMT has been shown to be effective in reducing orofacial pain as is associated with TMD or resulting from bruxism and clenching.^{41, 42} Osteoarthritis is a common occurrence as we age, affecting the joints of the body including the TMJ. PBM has demonstrated to improve patient pain levels and increased ability to open the jaws.⁴³ A systematic review reported that PBMT showed promising effects on the alleviation of pain and improvement in maximum mouth opening (MMO).⁴⁴ Further positive effects were reported by the patients following six sessions of PBMT.

Utilization of PBM in the red (600-700 nm) and near-infrared wavelength (780-1100 nm) together has been reported to be very effective in TMD treatment and with those patients with pain related to clenching.^{45, 46} Patient utilization of an intraoral PBM device, which only needs to be utilized for 5-minute sessions, affords ease of use for the patient, increasing compliance. The device is small and can be carried in their pocket or handbag. When placed intraorally and occluded on then activated, the light energy illuminates the oral cavity transmitting through the muscles and soft tissue to reach distant areas like the TMJ.

The PerioTech PBM device was designed with specific technical metrics (frequency and light output) to provide positive effects for increasing bone density around implants, osseous grafts, periodontal applications such as mobile teeth, besides its applications discussed regarding bruxism and clenching that similar devices on the market do not provide.

Conclusion:

Bruxism is a frequent issue that many patients deal with either on a daily or periodic basis. Awake bruxism is associated with stress levels, which have significantly increased due to the heightened and more frequent stresses of life during the pandemic. A majority of patients who are subject to bruxism have been treated with occlusal appliances. According to numerous articles in dental literature, these passive appliances do not break the neural activity which increases muscle contraction and enhances the bruxism activity. LMHFV is able to break the neural activity, thereby decreasing muscle contraction. The bruxism loop is disrupted with 5-minute sessions used twice daily initially then once daily for maintenance. PBMT has been shown to reduce pain associated with TMD, bruxism, and clenching. As with LMHFV, this treatment modality utilizes 5-minute sessions used twice daily initially then once daily for maintenance. Both treatment modalities require minimal time, and their ease of use increases patient compliance, making therapy successful for the patient.

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