A bibliographical survey of bruxism with special emphasis on non-traditional treatment modalities

Moti Nissani

Interdisciplinary Studies Program, Wayne State University, MI 48202, USA

(Received 21 June 2000 and accepted 12 March 2001)

Abstract: After proposing a common-sense definition of bruxism, this partial review distills its various symptoms and consequences from the literature. That literature suggests that the splint—the most popular treatment modality—falls short in some respects. The research literature is even less sanguine about the efficacy of such other traditional therapies as sound alarms and stress reduction. Given the limited success of traditional approaches, and given, moreover, the high incidence of bruxism and its harmful consequences, clinicians may occasionally be interested in experimenting with non-intrusive, safe, less widely known, treatment modalities. To meet this need, this review—unlike all other reviews of the subject—focuses on such comparatively unpopular or recent approaches.

Key words: bruxism; clenching; grinding; treatment; taste aversion.

Traditional treatments of bruxism are not always successful (1,2). By a very wide margin, the splint is the most widely used treatment, yet, a literature review discloses that it often fails to stop either teeth clenching or grinding. The literature likewise shows that other popular approaches (e.g., sound alarms) often fail to stop this habit. Given the limited success of these approaches, and given, moreover, the high incidence of bruxism and its harmful consequences, clinicians may occasionally be interested in experimenting with non-intrusive, safe, less widely known, treatment modalities. To meet this need, this partial bruxism review—unlike all other reviews of the subject—focuses on such comparatively unpopular or recent approaches.

What is bruxism?

The word bruxism is taken from the Greek word brychein: gnashing of teeth. No standard terminology exists, so we must try to clarify the confusion that still surrounds this subject. Bruxism can perhaps be defined as the involuntary, unconscious, and excessive grinding or clenching of teeth. When it occurs during sleep, it may be best referred to as sleep bruxism. A few people, on the other hand, brux while they are awake, in which case the condition may be referred to as wakeful bruxism.

The above terms are preferable to the widely-used nocturnal and diurnal bruxism, for the simple reason that one may engage in sleep bruxism during the day and in wakeful bruxism during the night. The distinguishing factor between these related conditions is sleep, not sunlight.

All forms of bruxism entail forceful contact between the biting surfaces of the upper and lower teeth. In grinding, this contact involves movements of the lower jaw and unpleasant sounds, which often awaken housemates. Clenching, on the other hand, involves silent, sustained, forceful tooth contact unaccompanied by mandibular movements.

It is important to note that the difference between bruxers and non-bruxers is one of degree, not kind. Most people probably grind or clench their teeth at one time or another, but such behavior does not a bruxer make. Moreover, some people may be able to sustain the bruxing forces involved with no apparent ill effects. Thus, we should perhaps talk about bruxism only when the habit is persistent enough, frequent enough, long enough, or intense enough to damage the teeth and to lead to other complications. One's grinding
or clenching of teeth fall under the rubric of *bruxism* only when they have already affected, or are expected to affect, one's well being.

**Biblical references**

Bruxism is probably as old as humanity itself. The Bible is often cited in this context, even though its relevance to the modern concept of bruxism is dubious. A typical passage appears in Job, chapter 16, verse 9: “He teareth me in his wrath, which hateth me: he gnasheth upon me with his teeth; mine enemy sharpeneth his eyes upon me.” In the New Testament, “wailing and gnashing of teeth” is often wished upon sinners and heretics. Another interesting passage appears in Luke 9: 17-18: “Master, I have brought unto thee my son, which has a dumb spirit. And wheresoever he taketh him, he teareth him: and he foameth, and gnasheth with his teeth, and pineth away.” In the Bible, then, teeth grinding seems to accompany such extreme emotional states as hate, anguish, fear, and possession by spirits. This is perhaps suggestive of our contemporary conceptions of wakeful teeth grinding. The Bible, however, makes no explicit reference to wakeful clenching or to sleep clenching or grinding.

**Incidence of bruxism**

No hard and fast figures on the frequency of bruxism are available. Most people unconsciously grind or clench their teeth now and then, so the key in the diagnosis of bruxism is not the presence or absence of the habit, but its frequency, destructiveness, social discomfort, or physical symptoms (3). Moreover, over 80% of all bruxers may be unaware of the habit (4), or ashamed of it, so they may dismiss evidence that they do in fact engage in self-destructive behavior. Also, it may take years for the first visible signs of worn teeth to appear; yet, often it is these signs that lead to a diagnosis of past or present bruxism. For these reasons, estimates of the prevalence of bruxism range from 5% to 100%. For the U.S. population, current estimates often settle on the 5-20% range.

Regardless of the exact number, the figures are disturbing. At the very least, one out of twenty people brux. More likely, one out of four does. Inarguably, then, bruxism is a widespread behavioral pattern that adversely affects a significant fraction of the world’s people.

**Etiology of bruxism**

The etiology of bruxism is controversial and uncertain (1,4). At present, the causes are suspected to be many, to overlap each other, and to vary from one patient to another. Putative causes include stress, personality types, allergies, nutritional deficiencies, malocclusion, dental manipulations, introduction of foreign substances into the mouth, central nervous system malfunction, drugs, deficient oral proprioception, and genetical factors.

**Symptoms, signs, and consequences of bruxism**

Sleep bruxism often exerts remarkably powerful forces on teeth, gums, and joints. One estimate puts it at three times the forces generated during chewing (5), while another puts it at ten times—powerful enough to crack a walnut.

While not a life-threatening condition, the sustained application of such forces often impairs the quality of life of affected individuals. Some suspected symptoms and consequences of chronic bruxism are:

I. It may lead to sensitive, worn-out, decayed, fractured, loose, or missing teeth (6). As long as bruxism continues, the situation keeps getting worse. Thus, “by 40 or 50 years of age, most bruxers . . . have worn their teeth to the degree that extensive tooth restorations must be performed” (7). For example, implant complications are more likely in people who habitually clench or grind their teeth (8,9). In one study, more than 75% of observed implant fractures occurred in patients with signs and histories of chronic bruxism. Hence, in cases of untreatable severe bruxism, the use of implants is strongly counterindicated (9, 10).

II. Long-term bruxism often causes changes of appearance, in at least three different ways. To begin with, damaged, worn-out teeth are not as appealing as healthy teeth.

Second, as the teeth wear out, they become shorter. As a result, when the mouth is closed, the upper and lower jaws are nearer than they used to be, and so are the nose and chin. The skin now may bag below the eyes and curl around the lips, causing the lips to seemingly disappear (11). The chin recedes, and the person looks comparatively old.

Third, bruxism involves excessive muscle use, leading to a build-up or enlargement (hypertrophy) of facial muscles, especially those of the jowl (where the masseter muscle is located). In long-term bruxers, this build-up may lead to a characteristic, square-jaw, appearance. Some patients resort to removing part of the masseter muscle by surgery or injections of toxic materials and thus partially regain their former, more aesthetically pleasing, looks (13, 14).

III. Long-term bruxers sometimes experience jaw tenderness, jaw pain, fatigue of facial muscles, headaches, neck aches, earaches, and hearing loss (15).
IV. Bruxism occasionally causes inflammation and blockage of some salivary glands. Most likely, the masseter muscles become disproportionately overdeveloped and block the opening of the nearby parotid glands. They thus interfere with the flow of saliva into the mouth, causing the saliva to accumulate in the glands. This in turn may lead to periodical swelling, pain, inflammation, and abnormal dryness of the mouth (16).

V. Bruxism may also damage the temporomandibular joints (TMJs). Bruxism is therefore believed by most researchers (but not all, cf. 17) to be one of the leading causes of temporomandibular disorders (TMDs) (18-20).

To be sure, besides bruxism, TMDs may be caused by such things as whiplash, a hard blow to the chin, malocclusion, nearby tumors, orthodontic treatment, arthritis, long-term scuba diving, or prolonged violin playing. But the important point here is that chronic bruxism may induce TMDs, and that TMDs can be unpleasant. Often, the first warning signs of TMDs are TMJ discomfort or pain, soreness of jaws and muscles, clicking or popping sounds when opening the jaws or while chewing, and difficulties in fully opening the mouth. If bruxism continues at this point, these symptoms become more severe. TMDs are often associated with chronic pain, which may last months or years. A sufferer may wake up, for example, totally unable to open the mouth. Or the jaw may suddenly lock or dislocate during chewing. Eventually, a difficult surgery of uncertain efficacy may be required.

It is worth remembering that a “TM disorder, although not being life threatening, is certainly life altering.” It can, in fact, “devastate its victim” (21). First, patients must contend with chronic pain and other symptoms. Second, often, there is much anguish and humiliation before the condition is correctly diagnosed. Indeed, “the average TM disorder patient has been seen by at least seven physicians, dentists, psychologists, or other health professionals. Of these patients, 7 out of ten have been incompletely diagnosed or misdiagnosed” (21). Third, “it is unrealistic to expect” a cure for TMDs. “At best, we are only managing signs and symptoms to the best of our ability within the framework of the patient’s ability to cope with the disorder” (22). The best thing we can do for our bruxing patients, then, is to help them control bruxism and thereby minimize the chances of temporomandibular complications.

Conversely, when TMDs are traceable to bruxism, it is more or less useless to treat these disorders without addressing their underlying cause: “Surgical procedures that alter anatomic relationships without addressing factors contributing to pathogenesis may be more prone to failure and recurrence of [TMD] symptoms. It is clear that excessive loading on articular tissues is one of the causative factors that must be identified and addressed by all clinicians treating patients with TMJ pathology” (19).

VI. Dental fillings often contain solid mercury. Mercury, in turn, is not entirely safe. Right now, the consensus of the dental community in the USA is that the advantages of using mercury outweigh the comparatively small risks. According to the American Dental Association, for example, “there is insufficient evidence to justify claims that mercury from dental amalgams has an adverse effect on the health of patients” (23). In bruxers, though, the situation is a bit more complicated, for there is some evidence of higher levels of mercury in the blood of some bruxers with mercury fillings (24).

VII. Malocclusion is more common among bruxers than in the general population. To be sure, misaligned teeth may serve as the cause of bruxism, not as its consequence. But bruxism may often involve more pressure on one side of the mouth than on the other, thereby causing malocclusion. As well, as the teeth wear out and the
distance between the upper and lower jaws decreases, overclosure may develop.

VIII. Clenchers, as we have seen, destroy their teeth silently; hence, their habit does not directly impinge on members of their household. Grinders find themselves in a more uncomfortable position, for the people they interact with often find the grinding sound offensive, irritating, or disturbing (25,26). It may wake up light sleepers, for instance, and keep them awake for a long time.

The picture that emerges, then, is of a habit that is not life threatening in any way. Moreover, in its initial stages, because bruxism only involves minor symptoms and inconveniences, it is often ignored by both patients and clinicians. At a certain stage, however, the symptoms begin to noticeably affect one's quality of life. It is typically at this stage that a patient seeks professional advice.

**Splints**

By far the most common treatment regime for bruxism embodies the time-honored procedure of splint therapy (27,28). In the United States alone, some 1.6 million splints (aka nightguards, biteguards, occlusal splints, biteplates, removable appliances, or interocclusal orthopedic appliances) are annually prescribed by dentists in an effort to combat bruxism (29). Much current research on the treatment of bruxism has been centered on the use of such dental appliances.

There are many variations of this appliance. The most common is the customized, hard acrylic, variety.

Some dentists prefer a customized appliance made of soft, rubber-like, elastomeric material. Another, far less popular, variation is the hydrostatic splint, a water-bearing pressure-equalizing appliance (30). This prefabricated disposable splint does not require dental impressions nor the manufacture of customized appliances. Instead, it can be purchased through a dentist, ready-made for use, and it is alleged to fit the mouths of most users.

In view of their wide use, the central question about all splints is: Just how effective are they in treating bruxism?

At the moment, a clearcut answer to this question is unavailable. Sheikholeslam, Holmgren, and Riise (31), for instance, report long-term reductions in symptoms of bruxism in patients who wore a splint for six months. Others, however, feel that the splint does not diminish bruxing behavior over the long term, nor alleviate most symptoms and consequences. They insist, in fact, that the splint may only provide a measure of protection for the teeth, and, in the case of grinders, a moderation of the sound. And even this is purchased at a price: the splint is uncomfortable to wear, some patients remove it during sleep, and it may negatively affect one's bite, cause tooth decay, and lead to degenerative joint disease (32).

Given the popularity of the splint, and some of the claims that have been made about its effectiveness, it may be worth while to cite at some length what appears to be, at this point, the emerging majority view in the research community: “The most common 'treatment' is a rubber device, worn over the teeth at night, called a mouthguard. This does not actually prevent or cure the bruxism, but it will prevent damage to the teeth when bruxism occurs” (33). “Occlusal splints worn at night did not significantly reduce bruxing-clenching activity in bruxing subjects” (3). Pierce and Gale (34) found that bruxing decreased by about 50% during two weeks of splint therapy, but that, following withdrawal of treatment, it returned to
baseline levels. Klineberg (35) concludes that occlusal splints “will protect the teeth, but will not alter the habit in the long term.” Splints, he says, become “worn when in use and wear and tear on the splint indicates continuation of the habit, even though patient[s] might report that they were no longer aware of clenching their teeth. The longer term effects of splint therapy indicate that clenching returns after the splint has been removed, or with continued use of it.” According to Rugh et al. (36), splint therapy is effective at first, but “the usual trend with longer treatment is to lose its effects. In other words, one usually sees a dramatic decrease or increase in EMG activity the first few nights of splint usage, followed by a gradual return to pretreatment EMG values.” Perl (8) says that, “there is no way of preventing the clencher or bruxer from engaging in such parafunctional habits. Regardless, the clinician may be able to decrease the potential for destruction by adding a nightguard to the treatment protocol.” Dao & Lavigne (37) say that although “splints may limit dental damage, their efficacy remains unestablished.” The comparative inefficiveness of the traditional splint is also “borne out by the common clinical finding that patients may bite large teeth marks into night bite guards and frequently fracture appliances” (38).

Moreover, the use of such splints may sometimes adversely affect the patient's occlusion, e.g., cause an open bite (39,40): “As with any technique, splint therapy has both positive and negative effects. If the complications are known and understood, they can be included in the treatment planning process and discussed with the patient before treatment begins. The most common complication of splint therapy is the creation of changes in the patient's occlusion” (32). Another complication of splint therapy is decay under the splint, which may in turn cause caries and gum inflammation. Still another problem is severe degenerative joint disease (32).

### Sleep feedback: sound alarms

In the treatment of bruxism, sleep feedback may involve electromyographic (EMG)-activated alarms (41). Bruxism requires tensing of certain facial muscles. This tensing involves an increase in electrical activity of the muscles, which can in turn be recorded by an electromyograph. The electrodes of this instrument are placed on the facial area where these muscles are located. When the tenseness exceeds a certain, predetermined level, an alarm goes off. The loudspeaker can be free standing, or, to prevent waking others, connected to earphones that the patient wears during sleep.

Most clinicians recommend overcorrection right after the alarm sounds. The patient is advised to fully wake up after each presumed bruxing episode and to stay awake for a few minutes, usually by performing such meaningless, harmless tasks as hand washing or recording time in a bruxism log (41). In either case, the alarm can be either turned off manually by the wakened bruxer or turned off automatically when the sleeper's facial muscles relax.

This approach is fairly unintrusive—one needs not insert anything into the mouth, but needs only attach electrodes externally, to the face. On the other hand, this procedure may fail to correct any bruxing behavior that is associated with muscle tension lower than the predetermined intensity or duration threshold. Another obvious problem is that muscle tension may occur in the absence of bruxism: “numerous other types of orofacial movements unrelated to bruxism... can easily be confused with bruxism if only EMG criteria are used for scoring” (42). So a patient may sometimes not receive a signal when a signal is needed, while at other times a patient may be jolted out of deep sleep for nothing.

To bypass this problem, many patents still rely on an alarm system, but take the more reliable bruxing activity itself (instead of enhanced muscle activity) as their point of departure. When the pressure exceeds a predetermined level, the alarm sounds.

![Fig. 6 Splint-induced open bite: after wearing a hard splint for a year, this patient can no longer bring his front teeth together.](image1)

![Fig. 7 A typical sound alarm setup for the treatment of bruxism](image2)
Feedback approaches suffer from machine breakdowns and are often unsightly, invasive, intimidating, and expensive; they thus do not lend themselves readily to wide use, and especially not to long-term use. As well, they are only partially effective. In evaluating EMG-activated studies, Pierce and Gale (34) found that bruxing only decreased by about 50% during two weeks of biofeedback therapy, but that, following withdrawal of treatment, the condition returned to baseline levels. Piccione et al. (43), to cite another example, found that “biofeedback does not appear to be effective in reducing nocturnal bruxing,” probably because, over time, “subjects learned to ignore the tone and to maintain sleep.”

Other traditional approaches
Space only permitted a cursory look at two traditional approaches—the splint and sound alarms. Here we need only say in passing that similar uncertainties apply to electrical stimulation (44), psychotherapy of all kinds (45, 46); hypnosis, massed negative practice (4,34), exercise (47); drugs; and equilibration therapy (48, 49).

Undoubtedly, such traditional approaches as the splint, sound alarms, and stress reduction will continue to be used in the future, sometimes successfully. But one often runs across a patient who has tried one or more of these approaches, yet whose bruxism is unabated. Occasionally, traditional approaches may be deemed unsuitable, for a variety of reasons. In such cases, familiarity with the following options may be of some use to dentists, physicians, and clinical psychologists.

Wait and see
In some cases, bruxism may vanish spontaneously. In others, grinding and clenching may occur so seldom, or are so weak, as to hardly justify any action.

In particular, young children often require different therapeutic approaches than adults. To begin with, the damage to their teeth is transitory for the most part, for only the primary teeth may be affected, not the permanent teeth. Moreover, bruxism in children usually resolves spontaneously. In one study, for example, 126 children between the ages of 6 and 9 years were diagnosed with bruxism. Five years later, upon re-examination, only 17 children retained the bruxing habit. Thus, juvenile bruxism is probably “a self-limiting condition which does not progress to adult bruxism and which appears to be unrelated to TMJ symptoms” (50). This suggests that, “observation and reassurance, rather than intervention, are warranted in most cases” (4). Obviously, however, even in children, when the damage is severe (15), or when the habit persists, treatment is mandatory.

Thus, if bruxism occurs only sporadically and intermittently, especially in children, waiting may provide the best strategy. If the condition does not spontaneously disappear in a few months, keeps recurring, or is accompanied by worrisome side effects (such as hearing loss or locked jaw), then action is required.

Bruxism as a side effect of drugs and medications
In some cases, bruxism may be traceable to drugs. Smoking (51) and alcohol (33) may cause, or at least exacerbate, the condition. Antidepressant and antipsychotic medications may trigger bruxism in non-bruxers (52,53). For example, within a few days of initiating venlafaxine therapy for depression, a man with a bipolar disorder developed bruxism. In another study (1), daily intake of the antidepressants fluoxetine (=prozac) or sertraline triggered sleep bruxism in four non-bruxers. It should be noted that the effect of anti-depressants is still uncertain (54). Still, clinicians need to bear in mind the possibility that drugs or medications may induce or exacerbate bruxism.

Clinicians should routinely inquire about their patients’ habits of consuming tobacco, alcohol, and antidepressants. Cutting down on smoking or drinking may help improve bruxism. If bruxism developed shortly after the beginning of antidepressant therapy, the prescribing clinician should be notified and consulted about the desirability of reducing the dose of the antidepressant, switching to another antidepressant, or taking a drug that will counteract the bruxism-inducing effect of the antidepressant. Thus, the effects of venlafaxine may be counteracted with gabapentin; while the effects of fluoxetine and sertraline may be neutralized with buspirone.

Nutritional supplements
Magnesium’s vital role in nerve and muscle function led at least two researchers to the suspicion that bruxism may be traceable to insufficient consumption, or inefficient utilization, of this metal. Magnesium-deficient diet is said to cause frequent teeth grinding in both sleeping and awake pigs (55). In humans, the suggested treatment involves magnesium supplements. According to Plöcenjak (56), for instance, prolonged magnesium administration nearly always provides a cure for bruxism. This confirms the earlier report of Lehvila (55), which claimed remarkable reductions (and sometimes even disappearance) in the frequency and duration of grinding episodes in six patients who took, once a day, a tablet of assorted vitamins and minerals (which included 25 mg { in children } or 100 mg { in adults } of magnesium), for at least five weeks. When
the supplements' intake stopped, the symptoms returned.

Earlier, a similar logic led Cheraskin & Ringsdorf (57) to study the effects of nutritional supplements on teeth grinders or clenches. Of these, 16 took calcium, vitamin A, vitamin C, Vitamin B5 (pantothenic acid), iodine, and vitamin E. When surveyed a year later, they reported that bruxism vanished. In contrast, the 15 bruxers who only took vitamins A, C, E and iodine showed no improvement. It seemed reasonable to conclude that the active agents were calcium and pantothenic acid (vitamin B5).

More research is clearly needed in this area. Indeed, if such claims apply to even a small proportion of bruxers, they merit a close look because taking these supplements is comparatively convenient, safe, and free of side effects.

Until such claims are confirmed, narrowed down, or refuted in a large-scale, double-blind study, the best strategy may involve taking the following on a daily basis: magnesium (approximately 100 mg), calcium (150 mg), and pantothenic acid (50 mg), combined with at least the following: vitamins A (1,000 IU), C (300 mg), E (60 mg), and iodine (0.1 mg=100 mcg). If bruxism subsides, patients should be advised to continue taking these pills. If no improvement is observed after 8 weeks or so, this approach may be given up.

Notes:
1. In these nutritional studies, bruxers typically take a number of vitamins and minerals, not just one; thus, it is not yet possible to pinpoint the effective nutritional agent. Moreover, these supplements often work synergistically or cooperatively; so a few minerals and vitamins need to be taken to correct a deficiency in one. That is why, until we know more about the subject, all the supplements above should be taken, not just magnesium or calcium.
2. The available evidence tells us little about optimal dosages, so there is an element of uncertainty in deciding how much to take.
3. Children should take proportionately less. For instance, an eight-year-old weighing about 32 kg should take about half the recommended dosage.
4. Magnesium should be avoided in cases of renal impairment and acute dehydration. It should not be taken if it causes diarrhea, other adverse reactions, or if it interferes with other medicines. One should refrain from prescribing more than 100 mg a day, as taking too much, or prolonged treatment, may cause fatigue and respiratory problems. Taking too much magnesium may even cause hypermagnesaemia, leading to nausea, vomiting, lethargy, and blockage of the bladder. As in the case of most drugs, dosage should be roughly determined by weight. In my view, roughly 1.5 mg a day per kg of body weight is all that should be taken (so a person weighing 66 kg needs to take no more than 99 mg of magnesium).
5. A large-scale experiment on the effectiveness of nutritional supplements is long overdue.

Vacuum prevention
Long (58) believes that “to clench the jaw for a long time, an intraoral vacuum must be formed and maintained.” To prevent the formation of such vacuum, one may construct the simple appliance shown below. Over this appliance two plastic straws are fitted, which are in turn held in place with two rubber washers aimed at preventing the creation of vacuum.

It remains to be seen just how effective this approach is. In view of its simplicity, low cost, and few probable side effects, further experimental and clinical evidence would be of interest. In the meantime, some reservations come to mind.

The appliance itself may often float in the mouth of a sleeping patient, or even be expelled. The evidence that a vacuum is required for sustained clenching is sketchy, at best. The appliance is said to prevent prolonged clenching, not to prevent clenching of short duration, nor

- Fig. 8 This anti-clenching appliance attempts to prevent vacuum formation (58).
- Fig. 9 The same appliance worn by a clencher.
to prevent grinding. Thus, it may merely lead to a change in the pattern of bruxing, with more numerous bouts of shorter duration, so that the total amount of bruxing remains the same. The total effect may be equivalent to breathing through the mouth, which is not as healthy or comfortable as breathing through the nose. Indeed, it is difficult to see how the same effect could not be achieved by the simpler means of plugging one's nose before going to sleep. The appliance cannot serve as a cure; it must be worn to mitigate clenching. Apart from subjective patient reports, it would be difficult to know whether this treatment is effective.

**Sleep feedback: human alarms**

One long-term experiment (26) involved a 28-year-old man with a six-month history of sleep grinding and a 24-year-old woman with a three-month history of sleep grinding. The treatment only involved the first two hours of sleep and consisted of the following sequence: 1. Baseline: During the first few nights, the spouses of both grinders were instructed to merely record grinding noises. 2. Waking: For the next few nights, they woke their spouses when grinding noises were heard. 3. Baseline. 4. Waking. 5. Baseline. 6. Waking plus overcorrection (an enforced wakeful period—performing a series of meaningless activities, e.g., face washing for ten minutes before going back to sleep). 7. Baseline. 8. Follow-up recordings taken at intervals of up to 18 months post-treatment. In both individuals, almost complete cessation of grinding occurred.

In a similar study (25), ice was applied to the cheeks of two profoundly retarded wakeful grinders when they were heard bruxing. Significant long-term reductions in the incidence of bruxism were observed in both patients.

Along with the magnesium therapy discussed earlier, such little-used behavioral approaches deserve further study. Yet, even if these approaches are shown to be effective in a large-scale investigation, they suffer from obvious shortcomings. They are inapplicable to clenchers. Moreover, the four individuals in these two studies may have simply learned to grind inaudibly, clench instead, or shift grinding behavior to periods when feedback was unavailable. Such approaches depend on the presence of another individual nearby, and on the willingness of that individual to lose sleep and provide the needed feedback over a period of many months.

**The NTI clenching suppression device**

This mini-splint is described as “a patented pre-fabricated, easily retro-fitted anterior-point-stop device, which suppresses clenching intensity in all excursive and protrusive movements” (59). The device is said to reduce clenching behavior.

![Fig. 10 Two views of the NTI clenching suppression system (59).](image)

Like the traditional splint, the device may cause an annoying anterior open bite. As well, as in the case of all other bruxism claims, a systematic, large-scale, double-blind study remains to be carried out. At present, we simply do not know if this device is more or less successful than the traditional, much larger, hard splint.

**A taste-based approach to the prevention of bruxism**

Here, a mildly aversive, safe liquid (e.g., sea water), is inserted into, and sealed in, small wax or plastic capsules (2). Two capsules are attached to a specially designed dental appliance, which comfortably and securely places the capsules between the lower and upper molars. The appliance and capsules are worn at night or at other times when bruxism is suspected to occur. Whenever bruxism is attempted, the capsules rupture and the liquid is released into the mouth. The liquid then draws the bruxer's conscious attention to, and forestalls, any attempt of teeth clenching or grinding. After replacing the capsules, sleeping patients resume sleep while awake patients resume their normal activities.

![Fig. 11 A removable appliance supporting liquid-filled capsules (2).](image)
On the positive side, this approach involves wearing a comfortable dental appliance similar to a child’s retainer; hence (unlike the splint), it is probably not associated with any worrisome side effects. It is based on the known, remarkable, effects of taste stimuli in aversive conditioning, and on documented research that the sleeping brain is capable of learning. It is less cumbersome than sound alarms, and, unlike sound alarms, it virtually precludes habituation. When worn, it eliminates bruxing behavior. Moreover, this appliance (attached to wax capsules) can be used to diagnose bruxism.

On the negative side, the first couple of weeks of therapy require will power. Also, as in the case of all other bruxism therapies, a large scale, double-blind, experiment confirming the effectiveness of this approach has yet to be carried out.

**Conclusion**

No attempt at comprehensiveness has been made here: Many bruxism therapies have only been mentioned in passing. Likewise, no effort has been made to resolve the many controversies about the etiology of bruxism, nor about bruxism’s complex linkage to temporomandibular disorders. Instead, a common-sense definition of bruxism has been proposed and its many symptoms and consequences have been distilled from the vast literature. That literature suggests that the splint—the most popular treatment modality—falls short in some respects. The research literature is even less sanguine about the efficacy of such other traditional therapies as sound alarms and stress reduction. More research, modifications of traditional approaches, and new approaches, are badly needed. In the meantime, a few recent or little-known claims deserve additional study and they may aid the management of intractable cases.

**References**

toxin type A treatment of cosmetically disturbing masseteric hypertrophy. Ned. Tijdschr. Geneeskd. 142, 529-532 (in German)


38. Trenouth, M.J. (1979) The relationship between bruxism and temporomandibular joint dysfunction as shown by computer analysis of nocturnal tooth contact patterns. J. Oral Rehabil. 6, 81-87


42. Miguel, A.M.V., Montplaisir, J., Rompe, P.H.,