

# Temporomandibular pain caused by sleep disorders: a review and case report

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Patients who present to the general dentist's office with complaints of temporomandibular joint pain may exhibit signs and symptoms such as muscle soreness, bruxism, joint soreness, limited range of movement, altered movement, and facial pain as well as tooth chipping or tooth movement. After examinations, radiographic evaluations, and a review of medical history, dentists may have a bias toward regarding these symptoms as oral or dental in origin. After a diagnosis of a temporomandibular disorder (TMD), bruxism, or muscular spasms due to occlusal instabilities is established, the treatment protocol often includes an oral appliance (such as a nightguard), exercises, and pharmacologic agents. However, patients with sleep-disordered breathing (SDB) can exhibit the same signs and symptoms as patients with TMDs, and these symptoms can be misinterpreted as being dental in origin. Dental treatment can actually worsen these medical conditions, putting patients at further risk for untreated and aggravated SDB along with its medical sequelae.

**Received:** October 5, 2016

**Accepted:** November 17, 2016

Patients often present to the general dentist's office with complaints of temporomandibular joint (TMJ) pain. These patients may exhibit signs and symptoms such as muscle soreness, bruxism, joint soreness, limited range of movement, altered movement, and facial pain as well as tooth chipping and tooth movement.<sup>1</sup> According to the National Institute of Dental and Craniofacial Research (NIDCR), TMJ disorders, also known as *temporomandibular disorders* (TMDs), fall into 3 main categories: *myofascial pain*, defined as "discomfort or pain in the muscles that control jaw function"; *internal derangement*, defined as "a displaced disc, dislocated jaw, or injury to the condyle"; and *arthritis*, defined as "a group of degenerative/inflammatory joint disorders that can affect the temporomandibular joint."<sup>2</sup> The NIDCR further stated that:

*A person may have one or more of these conditions at the same time. Some people have other health problems that co-exist with TMJ disorders, such as chronic fatigue syndrome, sleep disturbances or fibromyalgia, a painful condition that affects muscles and other soft tissues throughout the body.*<sup>2</sup>

Common symptoms of TMDs include pain in the TMJ or surrounding area, joint noises, limited range of motion, sensitive teeth, bruxism, and poor occlusion.<sup>3</sup> The range of the examined population that is affected by TMDs is estimated to be 8%-30%, depending on the study and its parameters.<sup>3</sup>

Patients with sleep-disordered breathing (SDB) can exhibit the same signs and symptoms as patients with TMDs, and these symptoms can be misinterpreted as being dental in origin.<sup>2,4-6</sup> This article will review the relationship between TMD symptoms and SDB and present a case report involving a patient who sought treatment for facial pain and occlusal changes.

## Temporomandibular disorder symptoms and sleep-disordered breathing

Bruxism has been highly associated with TMD, although the correlation between the level of pain in the TMJ and the severity of the bruxism is weak.<sup>7</sup> *Bruxism* is commonly defined as a parafunctional activity in which the surfaces of opposing teeth are forcefully rubbed against each other or the opposing teeth are strongly held together.<sup>8</sup> Bruxism can be destructive to the dentition, as the chewing forces at night can exceed those during the day.<sup>9</sup> Bruxism can be divided into 2 categories: awake bruxism and sleep bruxism.

The causes of bruxism are unclear and open to debate. The author was taught that conditions such as occlusal prematurities, uneven occlusal planes, malocclusions, missing teeth, and stress were responsible for the onset of bruxism. However, the current school of thought is that dental conditions play no role

in bruxism.<sup>10,11</sup> Although some researchers state that stress may be involved in the onset of awake bruxism, disturbances in sleep patterns seem to be a significant factor in sleep bruxism.<sup>12</sup> One hypothesis states that bruxism is the result of transient hypoxia found in SDB patterns.<sup>13,14</sup> This could be happening at the central nervous system level, independent of any dental factors.<sup>1,8</sup> Microarousals are also believed to cause activation of the jaw-closing muscles at night.<sup>15</sup>

It is not within the scope of this article to review in detail the broad spectrum of SDB entities; however, it is important to recognize the high probability that a person presenting to a dental clinician for treatment of TMD-like symptoms might be suffering from an undiagnosed medical condition. Smith et al found that 43% of their TMD patients had 2 or more sleep disorders.<sup>4</sup> Insomnia disorder was recognized in 36% of the patients in the study, among whom 26% had primary insomnia. In a survey of more than 300 patients, Levendowski et al found that 46% of men and 19% of women reported snoring frequently or always.<sup>5</sup> From this study population, 105 patients who were considered to be at high risk for sleep apnea took a portable sleep test, and 96% were found to have an apnea-hypopnea index (AHI) of 5 or greater (positive for sleep apnea); a significant group had an AHI of more than 20 (moderate to severe sleep apnea). None of these patients had been previously diagnosed by their medical providers as having sleep problems.<sup>5</sup> Dubrovsky et al utilized polysomnographic data gathered from patients with diagnosed TMD and found a pattern of sleep stage alteration and increased respiratory effort–related arousals (RERAs).<sup>6</sup> The authors found that myofascial pain was a predictor of increased sleep disturbance, nighttime awakenings, and increased RERAs.<sup>6</sup>

Of significance to dental clinicians is this confluence of symptoms that could have either a dental or a medical origin. It is necessary to try to determine which stream of information becomes dominant, as it has an important effect on the eventual treatment or referral. The diagnosis of the TMJ as a primary problem can dictate appropriate treatment. It is important to determine if sleep bruxism is an important contributor to the symptoms, however, as in such cases the original dental treatment plan might have to be altered to accommodate the medical source of the problem.

According to the NIDCR, conservative treatment of TMJ disorders falls into 3 categories: (1) self-care, which involves eating soft foods, applying ice, limiting jaw movement, and stretching; (2) pain medications, such as over-the-counter nonsteroidal anti-inflammatory medications or prescription-strength pain relievers (including muscle relaxants and antidepressants); and (3) stabilization splints (nightguards or occlusal splints).<sup>2</sup>

If a dental clinician encounters a TMD patient who might have an SDB component, it becomes important to find out what medications—both prescribed and recreational—the patient is taking to help alleviate the discomfort. Many opiates, antidepressants, and muscle relaxants may have a disrupting influence on the sleep patterns of the individual, which could affect the severity of the TMD symptoms and hinder the resolution of the problem.<sup>16,17</sup>

Stabilization splints are commonly used to treat TMDs, and this article will focus on single- and double-arch devices. Single-arch devices are often used either to stabilize and decompress a TMD or to help protect the teeth in a patient who

presents with bruxism or clenching. However, some researchers have found that these appliances do not stop bruxism and that patients continue to grind their teeth.<sup>18</sup> Studies by Jagger and Macedo et al found occlusal splints to be ineffective in treating sleep bruxism.<sup>19,20</sup> Other studies have found that occlusal stabilization appliances actually aggravate the SDB condition.<sup>9,21-23</sup> Yap & Chua found that anterior stabilization splints can be effective in the short term due to the reduction of temporalis and masseter activity; however, the authors found that these devices should not be considered for long-term use.<sup>1</sup>

Double-arch appliances are usually not used for treatment of TMJ conditions. Often referred to as *mandibular advancement devices* (MADs), these devices position the jaw forward in a manner that varies from appliance to appliance. They resist the desire of the mandible to “fall back” toward the throat when the patient is in a supine position. An MAD positions the tongue, hyoid bone, and soft palate forward and thus activates the masseter and submental muscles to prevent closure of the airway.<sup>1</sup> This positioning helps to reduce the AHI, increase the oxygen saturation, and alleviate the main symptoms of obstructive sleep apnea.<sup>24</sup> Reduction in sleep bruxism activity was confirmed in an electromyography study conducted by Singh et al.<sup>25</sup> The MAD has been proven to be more effective in reducing sleep bruxism activity than single-arch devices.<sup>1,25,26</sup> Its design provides stabilization of the TMJ while offering protection to the dentition.

## Case report

A 66-year-old woman with a chief complaint of TMJ problems said that her bite was changing and the right side of her face hurt because her teeth were moving. Her bite was more “intense” on the right side. The symptoms had started several months previously and had become more severe in the last 2 weeks.

In the physical examination, the patient revealed that the right side of her face “felt different” to light pressure. The right masseter muscle was tender to palpation. There was no tenderness of the TMJ areas to palpation. The patient was able to open, with some discomfort, to 38 mm as measured interincisally. Her mouth opening could be increased but with greater discomfort. The mandible deviated to the right on opening. No joint sounds were heard or felt. The mandible moved laterally 8 mm to the left and 12 mm to the right. Both lateral pterygoid muscles were tender.

Intraoral examination revealed that tongue scalloping and coating were present. The Mallampati score was 3.<sup>21,27</sup> The anterior interdental papillae were slightly red and swollen. The oropharyngeal tissues were red, especially on the borders of the soft palate, uvula, and tonsillar fauces. The isolated adenoid tissues were red and slightly swollen.

The patient had a unilateral posterior open bite on the right side. Multiple posterior teeth were restored with crowns, and several missing teeth were replaced by fixed partial dentures. She had received no recent dental restorative treatment.

The patient reported that the teeth had touched comfortably on both sides “forever” and the change in bite was recent. She said that she was a “gagger.” She reported being tired in the morning. She found herself waking at night multiple times. At times she found herself “gasping” for air at night.

The patient's medical history included hypothyroidism, high blood pressure, high cholesterol, and primary biliary cirrhosis. Her surgical history included removal of a left kidney due to cancer, removal of the gall bladder, and hysterectomy. She was taking medications appropriate for her conditions.

Based on the findings and examination, it was determined that the change in occlusion the patient had reported may have been responsible for the TMJ and muscular pain she was experiencing. Since the occlusion, by her report, had been stable for decades, it was necessary to consider what might be responsible for the changes. The appearance of the tongue and oral tissues were consistent with oral breathing at night, and the scalloping of the tongue was consistent with posterior tongue thrust and swallowing. These findings were considered to be a recent change. Based on the observed conditions, a screening for SDB was suggested.

The patient filled out a modified Epworth Sleepiness Scale, which produced a low score.<sup>28</sup> Nevertheless, further screening with polysomnography was recommended. The patient was issued an Alice NightOne home sleep testing device (Philips Respironics) with instructions for use. The information was downloaded and read by a board-certified sleep physician. The patient was diagnosed as having severe sleep apnea with an AHI index of 39.5. She had a 2:1 ratio of central apneas (19.1) to obstructive apneas (9.7) per hour. She had 318 oxygen desaturations, including an average desaturation of 93% and a low of 84%. Her heart rate ranged from 59.9 to 250 beats per minute. She had 77 snoring episodes.

Based on the results of the screening and the high number of central apneas, the patient was referred to a neurologist. Overnight polysomnography was performed. In this case the AHI was 29.0, well within the moderate range of sleep apnea. The central events were minimal, but the number of hypopneas had greatly increased. Both tests confirmed that SDB existed, and the diagnosis was obstructive sleep apnea.

In consideration of the neurologic findings, as well as the patient's comorbidities, she was fitted for a continuous positive airway pressure (CPAP) device. Although the protocol is determined by the physician and CPAP therapy is a standard recommendation of the American Academy of Sleep Medicine, compliance among patients is poor.<sup>29</sup> McEvoy et al, in a recent study of thousands of users, found that they averaged 3.3 hours of use per night.<sup>30</sup>

The dental treatment plan included fabrication of an MAD; a referral to an ear, nose, and throat (ENT) physician; oral myofunctional training; and orthodontic therapy, if needed. Appliances are the preferred way to treat sleep bruxism; therefore, an MAD should be constructed to be worn in conjunction with a CPAP device.<sup>7,28,30</sup> Even if the CPAP mask is not worn as needed, there is still a benefit to using the MAD, providing end results similar to use of a CPAP device.<sup>31</sup> Referral to an ENT physician is recommended because open-mouth breathers are more prone to abnormal swallowing patterns. Liistro et al found a strong correlation between a high Mallampati score and nasal obstruction as well as an increased risk for obstructive sleep apnea.<sup>27</sup> Once the patient's upper airway was evaluated by the ENT specialist and possibly corrected, oral myofunctional therapy would be used to help retrain the tongue to swallow normally. If myofunctional therapy was successful, there would be no need for orthodontic or future prosthetic treatment to close the open bite on the right side.

The patient was seen in the office 3 months after initiation of CPAP therapy. She reported that she was sleeping better and felt more rested and that the facial pain had abated. Her range of opening had increased to 47 mm interincisally. She was less aware of the changes in her "bite." Monitoring of the patient will continue, and future treatment options will be adjusted based on her signs and symptoms.

## Discussion

When evaluating facial and TMJ pain in a dental patient who has not suffered trauma, the dental clinician needs to consider potential nondental contributing factors, including SDB. A significant portion of the dental population may have SDB issues that are undiagnosed. Sleep bruxism is a common symptom in patients with SDB, and the chosen mode of treatment must take into account that sleep bruxism has nondental origins and recognize the significant impact that sleep bruxism has on the dentition.<sup>10,11</sup>

If oral appliances are part of the treatment plan, it is important to realize the potential different outcomes of single-arch and double-arch appliances. Single-arch appliances are acceptable if no SDB issues are present or suspected. Research indicates that sleep bruxism is not dental in origin.<sup>10,11</sup> Sleep bruxism is most likely to be a symptom of an SDB problem, and that problem most likely has not been recognized or diagnosed before the patient sees the dental clinician. Even in patients with SDB issues, single-arch appliances could be used on a short-term basis to treat acute symptoms presenting and interpreted as TMD.<sup>1</sup> However, if SDB is suspected, a screening protocol should be initiated or a referral to a physician should be made. It is possible that a single-arch appliance can make SDB worse, especially over time.<sup>1,32,33</sup>

Based on the literature, single-arch appliances are not effective for sleep bruxism.<sup>32,33</sup> Rather, the double-arch MAD is recommended as the most effective appliance for treatment of sleep bruxism.<sup>32,33</sup> If the correct diagnosis has been established, an MAD may help alleviate TMD symptoms and provide protection to the dentition while resolving SDB issues.

## Conclusion

When patients present with complaints of temporomandibular joint pain, dentists should consider the possibility that the symptoms are primarily or secondarily related to SDB. In most states, diagnosis of SDB is the responsibility of a physician, not a dentist. Screening and testing for SDB can be done by dentists in most states, but dentists must be aware of the regulations in the state in which they practice. If a diagnosis of sleep bruxism or of SDB with signs of sleep bruxism is established and oral appliances are part of the treatment plan, a double-arch MAD is the recommended appliance.

## Author information

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