

Letters to the Editor

Bruxism, Temporomandibular Dysfunction, Tension Type Headache, and Migraine: A Comment

In reviewing the *Expert Opinion* paper titled: “Bruxism, Temporomandibular Dysfunction, Tension Type Headache, and Migraine”¹ we were concerned by several issues regarding the nociceptive trigeminal inhibition (NTI) splint.

Oral splints are utilized by dental practitioners to manage bruxism, although the mechanism for therapeutic benefit remains unclear. The basis for success or failure of any intraoral appliance depends on 5 criteria: (1) diagnosis; (2) accurate and comfortable fit; (3) proper thickness; (4) correct material; and (5) adjustment of the appliance. If any of the 5 are lacking, therapeutic success may be compromised.

With almost all dental materials and techniques, therapeutic success will also depend on the experience of the clinician providing the splint. One potential problem we see with comparison studies of differing appliance designs is the experience level of the investigator with the appliance in question. As with any intraoral orthotic device, the NTI must be fabricated and delivered with great care for it to be comfortable and retentive. It must also be adjusted precisely in order not to open the vertical dimension to a point of not exceeding tolerable rotation of the condyles, not allowing for posterior tooth contact or allowing contact of the opposing canine teeth on the appliance during excursive movements.

The commentary¹ reports that the NTI “has been associated with permanent bite changes, swallowing and unconfirmed aspiration.” It also suggest that its use is “contraindicated in patients with temporomandibular joint instability and the rotational forces that it places on the joint can be detrimental.” Dentists routinely place temporary restorations, removable partial bridgework and bonded restorations that all have similar or greater potential for dislodging compared with the NTI splint. Cases of aspirated NTI-tss devices could not be documented in a systematic review.² In a Pattern of Use of NTI-tss Survey³ involving 587 dental providers reporting on 78,711 NTI-tss-

treated patients, less than 2% reported adverse events associated with the device, and there were no documented cases of aspiration of NTI splints.

Any oral splint has the potential for adverse events. There are reports^{4,6} of other splint types causing irreversible bite changes after use. In patients with and internal derangement of the temporomandibular joint, up to 6% developed an anterior disc dislocation without reduction during the first few weeks of treatment.⁴ The percentage increased to 21% when only patients with previous intermittent jaw locking were included. In a study by Fujii and colleagues, bruxers with myofascial pain demonstrated occlusal changes at a greater frequency than those without myofascial pain while utilizing a maxillary stabilization appliance.⁵ May and Garabadian utilized theoretical joint loading modeling to demonstrate that an oral appliance with anterior only contact reduces temporomandibular joint loading.⁶ Gagnon et al found that in 10 patients with obstructive sleep apnea, one-half experienced a worsening of their apnea-hypopnea index and respiratory disturbance index after utilizing a maxillary full arch coverage splint.⁷

As the expert commentary mentioned, the mechanism by which an oral splint may be of benefit to a headache patient remains to be determined. It can be hypothesized that sustained isometric contractions of the muscles of mastication could lead to injury and subsequent nociceptive signaling from both the myogenous and arthrogenous components of the temporomandibular joint complex. This increase in nociceptive signaling to the trigeminal ganglion could trigger migraine. An oral appliance that decreases bruxism intensity would be an appropriate therapeutic intervention in bruxism patients who also have headache. As referenced in the expert commentary, the NTI splint will significantly reduce EMG activity of the jaw closing muscles during bruxism compared with baseline.⁸ According to Hattori et al, clenching on a full arch oral appliance does not significantly reduce the degree of muscle contraction as compared with clenching of the natural dentition.⁹ Other studies have also demonstrated an increase in bite force

Conflict of Interest: All authors have at some time been consultants to NTI-tss and Keller labs, who provide NTI splints

with the use of appliances that allow for posterior tooth contact.^{10,11} This is the main argument for considering an NTI splint in headache patients.

Pain and sensory input to the trigeminal sensory nucleus is not limited to the first and second divisions of the trigeminal nerve.¹² Trigeminal motor hyperactivity and dysfunction carried by the third division can result in chronic afferent barrages of pain and may result in central sensitization.¹³

Irrespective of the type of oral appliance selected, it is important that regular monitoring be carried out to ensure that the appliance is comfortable and is functioning appropriately, and that no unwanted issues such as irregular tooth wear, tooth movement, or occlusal changes are occurring. Because of the potential for negative outcomes with any oral appliance usage, great care should be taken to only prescribe oral appliance therapy for patients who are willing to engage in supervised observation and follow-up appointments.

We agree that the stomatognathic condition should be considered in the comprehensive evaluation of all headache patients.

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Pathophysiology of Chronic Migraine and Mode of Action of Preventive Medications: A Comment

Dr. Mathew has highlighted many neuroradiological studies that describe brain alterations of nociceptive pathways in patients with long-standing migraine who have repetitive attacks:¹

- Magnetic resonance imaging (MRI) and voxel-based morphometry demonstrates that migraineurs have decreased areas of gray matter in several brain regions involved in pain processing: the right superior temporal gyrus; right transverse temporal gyrus; right parietal operculum; right inferior frontal gyrus; and left precen-tral gyrus. Chronic migraine patients had significantly more gray matter reductions in the left and right anterior cingulate; left amygdala; left parietal operculum; left middle, left inferior, and right inferior frontal gyrus; and left and right insular lobe, than episodic migraine patients. There is a positive association between gray