Suppression of Movement Disorders by Jaw Realignment

It is well established that movement disorders can develop from peripheral nerve injury in the craniofacial region [1,2]. Here, we discuss how mechanical realignment of the jaws and temporomandibular joints (TMJs) can be used to rapidly suppress a number of movement disorders, some of which may have been precipitated by peripheral nerve injury near the TMJ.

It has been estimated that over 20% of adults have, or have had, internal derangement of the TMJ [3]. An internal derangement of the TMJ occurs when the cartilaginous disc that lies on the superior surface of the condyle becomes displaced from its normal location. In many cases, the TMJ internal derangement, the auriculotemporal nerve (a small branch of the mandibular nerve) can become drawn into the compression zone of the TMJ. Neuroinflammation arising from an entrapped auriculotemporal nerve may spread to the trigeminal ganglion, or to the auriculotemporal nerve’s projections, which are located in the spinal trigeminal nucleus and reticular formation of the brainstem [4]. We hypothesize that neuroinflammation in these later sites could act as physiological drivers for aberrant reflexive behaviors, as well as suprabrainstem changes within the nervous system. The trigeminal nerve is a tonic regulator of the reticular formation, and thus has strong influence on the brainstem’s sensorimotor circuits [4]. Posture and locomotion, in particular, are controlled within descending motor pathways of the brainstem’s reticular formation.

Patients may not always recognize dysfunction or trauma to their TMJs, or suspect that the position of their jaws may be linked to their sensorimotor disorders. Evidence for this linkage, however, can easily be detected. First, instruct the patient to move their mandible forward so that their anterior teeth are aligned edge to edge. Then, place a stack of four to six tongue depressors (approximately 6–9 mm in height) bilaterally on the patient’s back molars and have the patient bite down. This maneuver produces a vertical distraction (i.e., a displacement) of the condyle within the TMJ. Vertical distraction of the TMJ space can produce a decompression of an entrapped auriculotemporal nerve in a TMJ. Through this action, the head of the mandibular condyle is moved inferiorly, away from the bilaminar zone of the TMJ. This reduces pathological compression of the superior and inferior stratum (retrodiscal) tissues, with their associated blood vessels and auriculotemporal nerve fibers. Vertical distraction of the TMJ also stretches muscles and tendons around the joint. Rapid suppression of movement disorder symptoms (dystonias, tremors, paresis, ataxias, and tics) can often be achieved within seconds to minutes using TMJ vertical distraction (see attached Supporting Information Movies S1–S6, recorded by ABS). If the vertical distraction of the TMJs is removed, the movement disorder rapidly returns, especially if the patient is encouraged to clench several times using their pathological bite.

If positive benefit is obtained from jaw realignment, we recommend that a magnetic resonance image of the TMJ be obtained to determine whether TMJ dysfunction is present. If an internal derangement of the TMJ is confirmed, an individualized oral orthotic can be constructed to obtain, and stabilize, the functional neurological benefits that result from jaw realignment [5].

Long-latency components of both cranial and spinal reflexes, involving cortical and subcortical circuits, can be affected by either bilateral teeth clenching [6], or by the Jendrassik maneuver [7]. Modifications of cranial and spinal reflexes may underlie some of the benefits of bilateral jaw realignment on movement disorders. In other patients, unilateral jaw clenching on tongue depressors may serve to normalize abnormal right-left asymmetries in sensorimotor activity by provoking differential proprioceptive afferent firing in, and around, the TMJs, as well as the periodontal ligaments. Normalization of asymmetric brain activity has been proposed to underlie the suppression of cervical dystonia by tactile “sensory tricks” [9].

"Sensory tricks” are well-known antagonists of many forms of craniofacial dystonias [9]. Recently, a sensory trick has been described in a case study of hemichorea-hemiballism, as well as in a case study of Parkinsonian tremor [10]. Future research is needed to determine whether the suppression of dystonic and nondystonic movement disorders by jaw realignment arises from the decompression of injured auriculotemporal nerves in the TMJs, the action of altered sensory-motor feedback loops within trigeminal-brainstem-suprabrainstem interactions, a combination of these, or other mechanisms.

We have already conducted fMRI studies on several individuals as they clench on a stack of tongue depressors. Distinctive changes in brain activity can be discerned in these experiments (data not shown). We anticipate that...
electroencephalogram and rTMS analyses may be able to determine whether jaw realignment alters brain oscillations and intracortical excitability, respectively, in patients with movement disorders. We also suspect that abnormal cranial reflexes and spinal reflexes may become more normalized in movement disorder patients, after their symptoms are suppressed by jaw realignment.

Although jaw realignment can potentially produce a number of neurological actions, clenching on a stack of tongue depressors serves as a useful clinical maneuver to screen for movement disorders that may be linked to TMJ dysfunction.

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References


Supporting Information
Additional Supporting Information may be found in the online version of this article:

Movie S1 Hemi-Blepharospasm.
Movie S2 CRPS Movement Disorders.
Movie S3 Post-Traumatic Dystonia.
Movie S4 Paroxysmal Kinesigenic Dystonia.
Movie S5 Paresis and Ataxia.
Movie S6 Tourette’s Syndrome.

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