

Temporomandibular dysfunction: an often overlooked cause of chronic headaches

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Objective: To review and discuss the role of temporomandibular dysfunction (TMD) as a cause of chronic headaches and facial pain.

Data Sources and Study Selection: A literature review was performed using the PubMed database for English-language articles published between January 1, 1981, and August 31, 2006, using the following keywords: *temporomandibular dysfunction*, *temporomandibular disorder*, *temporomandibular joint*, and *chronic headache*. Additional information was obtained from a review of current medical texts.

Results: Allergists and immunologists are frequently called on to evaluate patients with chronic headaches and facial pain. TMD is known to cause recurrent facial discomfort and headaches. Many individuals with the disorder present with headache or facial discomfort as their only chief complaint. They mistakenly think it is a “sinus” headache. Nearly 10 million Americans are affected by the disorder, and early studies estimate that TMD pain is the cause of chronic headaches in 14% to 26% of individuals with recurrent headaches.

Conclusions: TMD is a likely underdiagnosed cause of chronic headache and facial discomfort. As such, many patients with the disorder are routinely mislabeled as experiencing chronic sinusitis and are unnecessarily subjected to multiple courses of broad-spectrum antibiotics and other unnecessary therapy. TMD can be readily diagnosed by a careful history and physical examination. Patients typically respond well to conservative therapy, which includes behavioral modification and nonsteroidal anti-inflammatory drugs. The disorder should be suspected in individuals with a long-standing history of chronic daily headaches and facial pain without objective evidence of sinus, neurologic, or intracranial abnormalities.

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INTRODUCTION

Allergists and immunologists are routinely asked to evaluate and treat patients with recurrent headaches and facial pain. Many patients with these disorders think they have, or have been told they have, daily migraines or chronic sinus headaches caused by chronic rhinitis or chronic sinusitis. Often they have been inappropriately and unsuccessfully treated with broad-spectrum antibiotics on multiple occasions. Acute sinusitis with fever and purulent nasal discharge can cause facial discomfort and pain; however, there is little scientific evidence that chronic sinusitis causes headaches.

Headache is a highly prevalent and costly illness that affects up to 80% of the population^{1,2} and accounts for billions of health care dollars yearly.¹ Nearly 5% of individuals with headaches experience them on a daily basis.^{3,4} Reduced work productivity and absenteeism are greater among these individuals.⁵

Headache and facial pain are among the most common complaints of individuals with temporomandibular dysfunction (TMD),^{6–8} and it is common for them to present with headache as their only symptom.^{8,9} The International Headache Society endorses TMD as a distinct cause of recurrent headaches and has outlined general criteria for its diagnosis (Table 1).¹⁰

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TEMPOROMANDIBULAR DYSFUNCTION

TMD is a general term that describes varying degrees of jaw and facial pain arising from either a temporomandibular joint (TMJ) articulation disorder or an abnormality of the masticatory muscles known as myofascial pain disorder (MPD).¹¹ Articulation disorders of the TMJ may be the result of congenital malformations, trauma, rheumatoid or degenerative arthritis, neoplasms, or acquired internal derangements.^{11–13} In contrast, MPD is thought to be a stress-related chronic pain syndrome primarily involving the muscles of mastication.^{11–13}

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Table 1. International Headache Society Criteria for Headache or Facial Pain Attributed to TMD¹⁰

- A. Recurrent pain in ≥ 1 regions of the head or face fulfilling criteria C and D
- B. Radiographs, MRIs, or bone scintigraphy demonstrating a TMJ disorder
- C. Evidence that the pain can be attributed to the TMJ disorder based on ≥ 1 of the following:
 - Pain is precipitated by jaw movements or by chewing tough or hard food
 - Reduced range of motion
 - Noise from 1 or both TMJs during movement
 - Tenderness of the joint capsule(s) of 1 or both TMJs
- D. Headache resolves ≤ 3 mo and does not recur after successful treatment of the TMJ disorder

Abbreviations: MRI, magnetic resonance image; TMD, temporomandibular dysfunction; TMJ, temporomandibular joint.

It is estimated that nearly 10 million Americans experience the symptoms of TMD.^{11,12} Females are affected by the disorder more than males, with a 2:1 to 5:1 ratio, and the greatest incidence occurs in the third to fifth decades of life.^{11,13,14}

TMD CLASSIFICATION

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) have been established to standardize TMD evaluation and classification for clinical and research use. The RDC/TMD subdivide TMDs into 3 main groups: group I, muscular disorders; group II, intra-articular disk disorders; and group III, arthritic disorders.¹⁵ Group I disorders are the most prevalent, with group II and III disorders being encountered less frequently¹⁵; however, there is a paucity of information detailing the prevalence of each group in patients with TMD. A 2001 retrospective Italian study by Vollaro et al¹⁴ attempted to answer this question by using the RDC/TMD to evaluate and classify 825 individuals with symptoms of TMD. The study found that 59% of the patients with TMD experienced muscular pain, 13% had articular pain, 16% had articular pain with muscular pain, and 4% were diagnosed as having fibromyalgia (the remaining 8% of patients were unaccounted for in the study's English-translated abstract).

MYOFASCIAL PAIN DISORDER

The precise etiology of MPD is not fully understood, although stress seems to play a formidable role in the genesis of the disorder. The psychophysiologic model of MPD holds that psychological stressors lead to increased masticatory muscle tension and hyperactivity manifested by involuntary jaw clenching or teeth grinding. Continual overuse of the masticatory muscles results in fatigue and painful myospasms.¹¹⁻¹³ The spasmodic muscular fibers cause significant discomfort when stretched and are, therefore, maintained in an abnormally shortened state to avert pain. Chronic masticatory muscular contracture develops, which places abnormal strain on the TMJ. These excessive muscular forces have the potential

to disrupt the architecture of the TMJ, resulting in added joint dysfunction and arthralgia.¹²

A 2005 Japanese study¹⁶ investigated the association between stress and MPD by measuring and then comparing the neurochemical stress response of patients with MPD with that of controls. The participants were exposed to various psychological stressors that yielded an elevation in epinephrine, norepinephrine, and cortisol levels above baseline in both groups. Patients with MPD exhibited a significantly greater surge in plasma levels of these hormones after exposure to the stressful stimuli, suggesting that they have an inherently heightened neuroendocrine response to psychological stress.

BRUXISM AND TMD

A 2003 study by Manfredini et al¹⁷ found a significant association between TMD and bruxing behavior (involuntary jaw clenching or teeth grinding) ($P < .05$). Bruxism was prevalent in 68.9% of individuals with myofascial pain and in 87.5% of those with intra-articular disk displacement and myofascial pain. Another study by Guler et al¹⁸ examined the TMJs of patients with TMD with and without a history of bruxism. The results demonstrated an increased prevalence of mandibular condyle remodeling in the group with bruxing habits.

CLINICAL PRESENTATION

Symptoms of TMD vary among patients; however, headache and facial pain are common chief complaints.⁶⁻⁸ Headaches associated with TMD are temporal, periorbital, or frontal. Pain can also be experienced in the cheeks, the ears, and, occasionally, the neck.¹⁹ The discomfort may be unilateral but is usually bilateral. Some patients experience an ongoing sense of ear fullness that may be mistaken for a recurrent earache. A deep retro-orbital pain can also be felt when the lateral pterygoid muscle is in spasm,¹¹ which may be misinterpreted by affected individuals or a physician as sinus pain. Additionally, many patients complain of jaw clicking or locking with talking and eating.

TMD pain is usually described as a persistent unilateral or bilateral dull ache that is provoked by yawning, excessive talking, or the chewing of gum.^{12,13} Pain originating from a TMJ articular disorder is typically well localized, whereas muscular pain tends to be more vague and diffuse. Patients with stress-related jaw clenching typically sustain headaches that intensify throughout the day and reach a maximum by late afternoon or evening. Those with involuntary nocturnal teeth grinding usually experience pain on waking that gradually improves as the day progresses.¹²

DIAGNOSIS

Differentiating between the types and causes of chronic daily headaches can be a challenging task (Table 2); therefore, a careful history and physical examination are necessary to diagnose TMD. Visual inspection of the face may demonstrate asymmetry, lateral deviation of the mandible, or reduced mandibular opening capability. An audible click or

Table 2. Differential Diagnosis of the More Common Causes of Chronic Daily Headaches

Type	Duration	Quality	Exacerbated by	Clinical findings and features
Migraine headache ¹⁰	4–72 h	Moderate-to-severe intensity, pulsatile pain. Associated with nausea, photophobia, or phonophobia.	Light, noise, walking, and climbing stairs.	Photophobia, phonophobia.
Tension headache ¹⁰	30 min to 7 d	Mild-to-moderate intensity. Bilateral, nonpulsatile pressing or squeezing pain. May be associated with phonophobia.	Noise.	Increased pericranial tenderness to palpation.
Cluster headache ¹⁰	15–180 min	Severe, unilateral, sharp periorbital pain.	Alcohol, histamine, and nitroglycerine associated with provoking attacks.	Ipsilateral hyperparasympathetic activity, ie, lacrimation, conjunctival injection, or rhinorrhea.
TMD induced	Variable	Deep, dull, or burning pain. Worse in morning when caused by involuntary nocturnal teeth grinding; worse in afternoon or evening when caused by stress-induced jaw clenching or excessive chewing.	Jaw movements, excessive talking, chewing gum or tough-textured foods, and stress.	Tender TMJ capsules, reduced mandibular opening capacity, noise or crepitus with mandibular movements.
Neoplasm induced ¹⁰	Continuous	Deep nonpulsatile pain, worse in morning.	Coughing, leaning forward, or bearing down.	Valsalva maneuver exacerbates pain, CT or MRI demonstrates intracranial neoplasm, $\pm$ neurologic deficit(s).
Analgesic overuse ¹⁰	Variable	Mild-to-moderate, bilateral, nonpulsatile, squeezing pain.	Markedly worse during analgesic use.	Analgesic use >15 d/mo for >3 mo. Headache frequency and intensity improves within 2 mo of discontinuing the analgesic medication.
Headache due to refractive errors ¹⁰	Variable	Mild-to-moderate pain, absent on waking.	Prolonged visual tasks.	Ophthalmologic examination reveals refractive error. Headache resolves with refractive correction.

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging; TMD, temporomandibular dysfunction; TMJ, temporomandibular joint.

crepitus with mandibular movements suggests an internal derangement between the mandibular condyle and the intra-articular disk.¹¹ Some patients will have teeth that are ground down or that demonstrate uneven wear. Firm bilateral palpation of the TMJ capsule, immediately anterior to the tragus, in the open and closed positions typically induces exquisite tenderness.¹² Tenderness is also commonly elicited with palpation of the masseter, temporalis, or pterygoid muscles in patients with MPD (Fig 1). Pressure applied over the affected muscle may reveal a distinctly taut muscular band, known as a “trigger point,” that when palpated induces localized tenderness, with pain referral to another location.²⁰ Trigger points are a characteristic feature of MPD.

Radiographic studies are frequently used to confirm the presence of a TMJ derangement; however, they are usually unnecessary to establish the diagnosis. Plain films may depict degenerative changes of the joint, whereas magnetic resonance imaging is required to examine the position and integ-

egrity of the intra-articular disk (Fig 1).¹⁵ Such studies will not be helpful for uncomplicated cases of TMD.

MANAGEMENT

The symptoms of TMD are largely managed with conservative therapy. Counseling, biofeedback, and cognitive-behavioral therapies are helpful modalities that have been found to ameliorate chronic pain associated with TMD.^{21–23} Patients with MPD respond particularly well to conservative therapy, with approximately 50% of patients experiencing resolution of their symptoms within 2 to 4 weeks.¹¹ Such conservative measures include patient education, dietary modifications, nonsteroidal anti-inflammatory drugs (NSAIDs), isometric jaw-opening exercises, and routine application of warm compresses followed by massages to the involved muscles.

Thorough education is a crucial asset in managing the symptoms of TMD. Patients with MPD should understand that their pain is a result of muscular overuse and spasm.¹¹ All

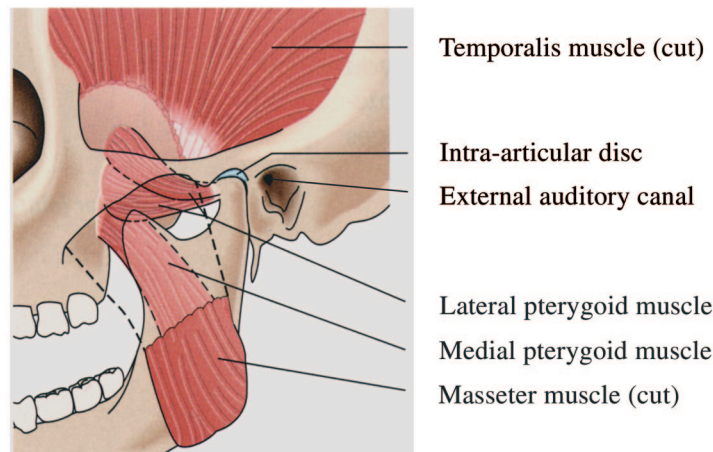


Figure 1. Portions of the masseter and temporalis muscles have been cut away to reveal the medial and lateral pterygoid muscles. The medial pterygoid muscles assist the masseter muscles in elevating the mandible, closing the mouth. The lateral pterygoid muscles assist in opening the mouth and produce side-to-side motions of the mandible during chewing. Illustration adapted from *Bates Guide to Physical Examination and History Taking*, 7th ed., 1999. Used with permission.

patients with TMD should avoid chewing gum, eating tough-textured foods, and nail biting. Oral decongestants, caffeine-containing herbal supplements, diet pills, and caffeinated beverages may also have to be avoided owing to their sympathomimetic actions and propensity to exacerbate anxiety. Some individuals with nocturnal bruxism may require the use of a bite appliance to be worn at night. The dental appliance serves an impediment to disrupt and prevent teeth grinding.

The NSAIDs are the most commonly used pharmacologic treatment for TMD pain.²⁰ Combined with jaw-opening exercises, NSAIDs are an effective treatment for TMD symptoms.²⁴ Affected individuals can perform isometric mouth-opening exercises by placing their chin in their palm and then slowly opening their mouth against the resistance supplied by the palmar surface. Judicious short-term use of skeletal muscle relaxants may also provide pain relief in those with acute masticatory muscle spasms. A 2002 study²⁵ found cyclobenzaprine to be superior to placebo for relieving TMD myofascial pain. Botulinum toxin type A, injected intramuscularly, is also being used successfully to reduce pain associated with masticatory muscular hyperactivity.¹²

Future advancements in the treatment of TMD pain may be aimed at reducing the localized effects of cytokines. Tumor necrosis factor α and interleukin 1 are implicated in the evolution of chronic pain and joint erosion in the TMJs of patients with rheumatoid arthritis.¹⁵ Interleukin 1 β is associated with TMJ hyperalgesia (enhanced intensity of pain sensation) and is rarely found in the synovial fluid of healthy TMJs.¹⁵

DISCUSSION

TMD is a likely underdiagnosed cause of chronic headache and facial pain. The preponderance of literature emphasizing

the association between TMD and chronic headaches is principally found in the otolaryngologic, dental, and oromaxillofacial journals and texts. TMD should be considered in all patients who complain of chronic "sinus headaches" and do not demonstrate objective evidence of sinus, neurologic, neoplastic, or vascular abnormalities. Ruling out vascular causes of chronic daily headaches (ie, migraines) can be challenging. Therefore, a careful history and physical examination are crucial to differentiate TMD headaches from those caused by a vascular origin. The percentage of individuals with recurrent headaches fulfilling the diagnostic criteria for TMD is uncertain; however, early studies estimate that TMD is the cause of headaches in 14% to 26% of patients with chronic headaches.⁹ Further research is needed to elucidate the prevalence of TMD among individuals with chronic headaches based on the current standardized RDC/TMD criteria.

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