

Masticatory Myofascial Pain Disorders



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KEYWORDS

- Temporomandibular disorders • Masticatory myofascial pain disorders
- Orofacial pain • Masticatory muscle pain • Interdisciplinary treatment

KEY POINTS

- Temporomandibular disorders (TMD) are a heterogeneous group of musculoskeletal conditions affecting the orofacial region. Masticatory myofascial pain disorders (MMPD) are the most common subtype.
- The pathophysiology of MMPD is complex and multifactorial. Given that psychological comorbidities and sleep disturbances are considered contributing factors, the use of validated tools for behavioral and sleep screening is recommended.
- Proper management of MMPD will require a multimodal and interdisciplinary approach, including home care programs, pharmacotherapy, physical therapy, oral orthotic devices, behavioral therapy, and injection therapy.
- The prognosis of MMPD will be determined by the complexity of the case and patient compliance with the treatment plan.

CASE PRESENTATION

A 28-year-old woman presents to the authors' clinic for a consultation at the request of her primary care physician. Her chief complaint is bilateral jaw pain, neck pain, and headaches ("this pain is killing me").

The patient states that she initially sought consultation with her general dentist shortly after her symptoms began, where she was evaluated and instructed to perform jaw stretching exercises daily at home. She was also recommended to use heat therapy consisting of hot compresses applied periodically to the affected areas. She reports that her symptoms "slightly improved" with this regimen but adds that she continued experiencing pain. She then had an oral orthotic appliance fabricated

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that only had contacts on her front teeth. She had to stop using this device after a short period of time as she felt it was not helping at all to alleviate her symptoms and was causing much more pain and discomfort because of the excessive pressure on her front teeth. Subsequently, she sought consultation for her symptoms with her primary care physician, who prescribed an over-the-counter nonsteroidal anti-inflammatory drug (NSAID) and a low dose of a muscle relaxant to be taken as needed along with a course of physical therapy. She reports that this treatment was “somewhat helpful” in controlling her symptoms but states that they continued being troublesome for her. She was finally referred to the authors’ clinic by her primary physician for further evaluation and management of her symptoms.

The patient states that her symptoms began abruptly around 4 years ago with no specific etiology and points to the preauricular, masseter, and temple areas bilaterally as well as to the cervical area. She does not report any history of trauma of any sort that might be associated with the onset of her symptoms. The pain is present every day, and she describes it as being continuous in duration, dull/pressure-like in quality, and moderate in intensity (Visual Analogue Scale or VAS = 6), but she adds that it fluctuates during the day, being usually more severe (VAS = 8) and throbbing in nature in the morning upon awakening. She reports having difficulty opening her mouth but denies having experienced or experiencing any bite changes, temporomandibular joint sounds, or episodes of jaw locking. Functional mandibular activities such as yawning or chewing hard foods, and several neck movements including side-bending and rotation exacerbate her pain. Daily life stressors also make her symptoms worse. She reiterated that prior treatments of a combination of neck and jaw stretching exercises, heat therapy with hot compresses, and relaxation techniques such as mindfulness along with over-the-counter ibuprofen and tizanidine 2 mg to be taken as needed seem to alleviate her symptoms (VAS = 2) but just temporarily.

Regarding the headaches, she states that they began shortly after her facial pain and adds that they seemed to be triggered by stressful events. She points to the fronto-temporal area bilaterally and describes them as pulsating in quality, and moderate (VAS = 6) in intensity. They occur once or twice a week, usually toward the end of the day, and last no longer than 2 to 3 hours or until she takes ibuprofen or acetaminophen. They are aggravated by routine physical activity. She reports sensitivity to light and sounds and mild nausea associated with her headaches but denies experiencing any visual, motor, or sensory disturbances or vomiting. She also denies experiencing autonomic symptoms such as upper eyelid ptosis, lacrimation, rhinorrhea, or conjunctival injection.

Her medical history is positive for seasonal allergies. She is otherwise healthy and denies having any other medical condition. However, she reports significant fatigue associated with her pain. She has not undergone any surgical procedure nor has she been hospitalized for this or any other medical condition. She reports being allergic to penicillin. Her family history is noncontributory. She uses an over-the-counter antihistamine as needed for her seasonal allergies and denies currently being on any other medication or medical treatment.

She is single and works full-time as a mental health counselor. She feels this occupation is stressful and the main source of her anxiety. She drinks 16 ounces of coffee and 24 ounces of water on average daily. She consumes one glass of alcohol 2 to 3 times a week, mostly wine and beer, but never alone. She currently smokes marijuana about once a month but denies using any other illegal substances. She has never smoked cigarettes. She states that she catches herself clenching her teeth often during the day and feels that she also does it at nighttime while asleep. She

Table 1 Commonly used questionnaires for behavioral and sleep disturbances screening			
Domain	Questionnaire	Case Patient's Score	Interpretation
Substance use	Tobacco, Alcohol, Prescription medications, and other Substance use (TAPS) tool	0	No use in the past 12 months
Anxiety	General Anxiety Disorder-7 (GAD-7)	10	Moderate anxiety
Depression	Patient Health Questionnaire (PHQ-9)	0	No depression
Sleep quality	Pittsburgh Sleep Quality Index (PSQI)	7	Poor sleep quality
Daytime sleepiness	Epworth Sleepiness Scale (ESS)	12	Mild sleepiness
Obstructive sleep apnea	Snoring, Tiredness, Observed apnea, high blood P ressure, Body mass index, Age, Neck circumference, and Male gender (STOP-BANG) questionnaire	1	Low risk

cracks her neck on a regular basis as it provides temporary relief for her neck pain (Table 1).

She feels that she has a relatively high level of stress, mostly because of work. She defines herself as an anxious person with some significant generalized worry. She is being seen regularly by a therapist and feels that this approach has been beneficial for her (see Table 1).

She reports occasional inability to fall asleep and adds that she sometimes wakes up tired in the morning. She denies snoring or experiencing episodes of apnea during sleep. As stated previously, she feels that she might clench and grind her teeth while asleep (see Table 1).

Her vital signs were within normal limits (Pulse = 65, BP = 129/78, relative risk (RR) = 12, Temperature = 99.0°F). The patient had a coordinated and smooth gait. She was alert and oriented with a full range of affect. She answered all the questions appropriately but reported feeling anxious, worried, and fatigued.

Upon visual inspection of the head and neck, no gross atrophy or asymmetry was observed. Her skin was warm, dry, and intact with no lesions, rashes, areas of discoloration, or masses. A forward head and neck posture with rotation and side bending to the right was observed.

Upon further examination, there was moderate pain bilaterally (VAS = 6) upon palpation of the masseter and temporalis muscles. There was also mild pain bilaterally (VAS = 3) upon palpation of the sternocleidomastoid muscles, the suboccipital area, the posterior cervical paraspinal muscles, and the upper shoulder area. There was no pain or discomfort upon palpation of the lateral and posterior aspects of the temporomandibular joints. The cervical range of motion was within normal limits. The unassisted opening was 32 mm without pain, and the examiner-assisted opening was 38 mm with moderate pain (VAS = 6) in the masseter and temporalis muscles bilaterally. The path of opening/closing was straight. The range of motion in the horizontal

axis was within normal limits bilaterally. There was no palpable or audible clicking, popping, or crepitus during the mandibular range of motion. There was no temporomandibular joint locking or subluxation during the examination. The clench and stretch tests were positive for pain in the masticatory muscles bilaterally and replicated the patient's chief complaint.

The dentition was sound and well restored. The oral mucosa and gingival tissues were pink and normal in appearance. The floor of the mouth was soft and nontender. The tongue appeared normal with no surface lesions, masses, or areas of discoloration. The tongue movements were normal. The hard and soft palate appeared normal, and there were no masses, lesions, or discoloration. The uvula was in the midline, and the palate had symmetric movement. The oral cavity was moist. The salivary flow was adequate upon palpation and stimulation of the glands. A Mallampati classification type I was observed. There was moderate pain bilaterally (VAS = 6) upon lateral resistance of lateral pterygoid muscle and palpation of the temporalis tendon, with referral toward the masseter and temporalis muscles. The occlusion was stable with posterior bilateral contacts. Signs of attrition were observed in the upper and lower molars.

The cranial nerve examination was normal.

The anterior area of the neck was soft and nontender. There were no palpable masses or lymphadenopathy. The thyroid did not present any masses and was mobile. The carotid pulsations were full and equal bilaterally, and no carotid bruit was heard upon auscultation.

A panoramic radiograph was taken ([Fig. 1](#)). The maxillary sinuses were symmetric and well aerated with no masses. The mandibular condyles were seated within the glenoid fossa. There appeared to be a distinct and intact cortical margin on both condylar heads with slight overlap superimposition of the glenoid fossa on the left. There were no signs of significant degenerative remodeling. The full dentition was present with erupted third molars in occlusion and minimal dental restorations. There were no signs of any gross dental or periodontal pathology. No bony lesions were observed in the maxilla or the mandible. The cortical margin of the mandibular bone was intact. No areas of calcification in the carotid artery system were observed.

Based on the history, clinical examination, and imaging study, this patient was diagnosed with masticatory myofascial pain disorder with referral, cervical myofascial pain disorder, and episodic migraine without aura. The awake and sleep bruxism and the anxiety, stress and sleep impairment were likely contributing to her symptoms.

As a treatment, a home care program was established. This program comprised patient education and reassurance, parafunctional behavior awareness and modification, a set of jaw and neck self-stretching exercises to be performed daily along

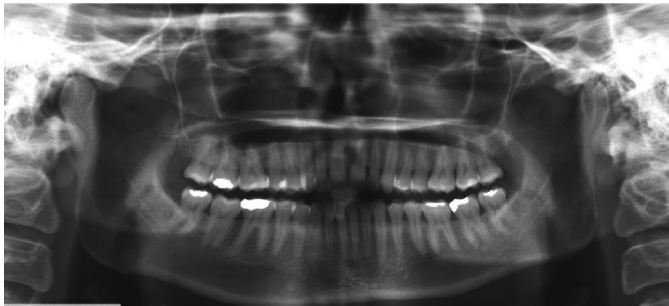


Fig. 1. Panoramic radiograph - Initial evaluation

with a gentle massage, and heat therapy with moist hot compresses. In addition, a course of pharmacotherapy consisting of meloxicam 15 mg to be taken once a day in the morning for 10 days along with cyclobenzaprine 10 mg to be taken at bedtime for 3 weeks was prescribed. A trial of magnesium 600 mg/d in divided doses to be used as a preventive medication for her migraine headaches was also suggested. An oral orthotic hard stabilization appliance to be used at nighttime consistently and during the day as needed was recommended. Lastly, the patient was referred for behavioral therapy evaluation and was advised to return to our clinic periodically for follow-up. She agreed to this treatment plan, and the oral orthotic appliance was made and inserted at this initial visit.

A few weeks later, at the first follow-up visit, the patient stated that she was following the self-management plan diligently. She was also using the oral orthotic hard stabilization appliance along with the prescribed medications and felt that this approach was being somewhat helpful to control her symptoms (VAS = 3) with her headaches presenting less frequently (3 episodes/month on average). She was also sleeping better. The patient reported that she preferred to hold off on consulting with a behavioral therapist but added that she decided to resign from her current job and pursue other professional opportunities. She stated that this decision had a positive impact on her life, as her level of stress and anxiety as well as her pain symptoms significantly decreased since then.

At the second follow-up office visit, the patient stated that she noticed a worsening in her symptoms and in her sleep quality shortly after completing the pharmacotherapy. She reported an increase in her bruxism, jaw pain/stiffness, and migraine headaches. She was using the oral orthotic hard stabilization appliance and following the home care program as she thought they were helpful in controlling her symptoms, but she discontinued the magnesium as it was not providing significant relief. The patient was prescribed nortriptyline 10 mg to be taken at bedtime and a course of physical therapy. Again, the benefits of behavioral medicine for the management of her pain and sleep symptoms were emphasized.

At the third follow-up office visit, the patient reported a significant improvement in her symptoms with occasional mild jaw pain (VAS = 1) and no headaches. She had been evaluated by a behavioral pain psychologist and was undergoing cognitive-behavioral therapy as well as practicing meditation regularly, which she reported as being helpful. Overall, she was doing well and felt that her symptoms had significantly improved since her initial evaluation. The patient was pleased with the outcome of the treatment plan. She was advised to continue with the home care program, the oral orthotic hard stabilization appliance, and the nortriptyline as prescribed along with the behavioral therapy treatment. At this point, she was asked to follow up as needed.

CLINICS CARE POINTS

- Pre-existing psychological variables are etiologic risk factors for the development of temporomandibular disorders (TMD).¹ Thus, it is advised that a battery of standardized and validated tools for behavioral screening such as the GAD-7, the PHQ-9, and the TAPS tool be routinely completed by the patient with suspected TMD at the initial evaluation.
- Given the bidirectional relationship that exists between pain and sleep,² it is recommended that orofacial pain patients are screened for comorbid sleep disturbances at the initial evaluation via questionnaires such as the PSQI, ESS, and the STOP-BANG questionnaire. A

multidisciplinary approach, including a potential referral to a sleep physician, will be required to properly manage these patients.

- Bruxism can occur during wakefulness (awake bruxism) and during sleep (sleep bruxism). The available evidence suggests that biologic, psychological, and exogenous factors might play a more important role than morphologic factors in the etiology of this clinical entity. A multimodal approach involving reversible treatments such as patient education, oral orthotic devices, pharmacotherapy, physiotherapy, and behavioral therapy is recommended for the management of bruxism.³ In some cases, botulinum toxin injections might also be needed.⁴
- Low levels of magnesium have been linked to several neurologic diseases, including migraine headaches.⁵ National and international guidelines suggest the use of several nutraceuticals, including oral magnesium, for the prophylaxis of this primary headache disorder.^{6,7}
- Tricyclic antidepressants (TCAs) are commonly used in migraine prevention. Amitriptyline has the best evidence and is recommended as first-line therapy when comorbid sleep impairment is present.⁸ Nortriptyline represents a good alternative because of its more favorable tolerability profile. TCAs, particularly nortriptyline, are also effective in the management of chronic masticatory muscle pain.⁹

LITERATURE REVIEW

Introduction

TMD are a broad group of musculoskeletal conditions that affect the masticatory muscles, temporomandibular joints, and associated structures.¹⁰ Their pathophysiology is complex and multifactorial in nature. TMD are fairly common clinical entities with an estimated prevalence of 3% to 15% in western populations and a female-to-male ratio of approximately 2:1.¹¹ Around 50% of TMD patients are diagnosed with some type of masticatory myofascial pain disorder. TMD can manifest at any age, being the highest prevalence in young and middle-aged subjects (20 and 40 years of age) compared with the child and the elderly populations.¹² It is worth mentioning that this prevalence may differ for certain TMD conditions such as disc displacements and inflammatory-degenerative joint disorders, which are more predominant in subjects over the age of 30 and 50 years, respectively.¹³

The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), a validated screening and diagnostic tool published in 2014, describes the 12 most common types of TMD: myalgia, local myalgia, myofascial pain, myofascial pain with referral, arthralgia, headache attributed to TMD, 4 disc-related disorders, degenerative joint disease, and subluxation.¹⁴ The classification released by the American Academy of Orofacial Pain in 2018 presents an expanded TMD taxonomy that also includes less common temporomandibular joint conditions such as movement disorders and muscle/joint neoplasms.¹⁵ The International Classification of Headache Disorders (ICHD) 3rd edition, also published in 2018, classifies TMD as a subtype of secondary headaches, whereas the recently released International Classification of Orofacial Pain (ICOP) 1st edition categorizes them in two separated clusters of conditions, myofascial orofacial pain and temporomandibular joint pain.^{16,17}

Masticatory myofascial pain disorders (MMPD) are considered a subtype of TMD. They affect the muscles of mastication, but often coexist with other conditions including headache and cervical disorders, as well as chronic widespread pain and psychosocial disorders such as anxiety and depression. They might also present with masticatory muscle hypertrophy and parafunctional-related occlusal wear.¹⁵ Proper history taking, evaluation, and diagnosis are essential to effectively treat patients with MMPD.

Classification

The DC/TMD further divides myalgia (pain of muscle origin) into more specific sub-classes known as local myalgia, myofascial pain, and myofascial pain with referral, which can all be differentiated by provocation testing with palpation. In general, all these conditions can be modified by jaw movement, function, or parafunction. Local myalgia is defined as pain of muscle origin localized only to the site of palpation. Meanwhile, myofascial pain is similar to local myalgia with the difference being pain spreading beyond the site of palpation but within the boarder of the muscle. Lastly, myofascial pain with referral is described as local myalgia; however, the pain spreads beyond the boundary of the muscle, often to other portions of the head and face. The DC/TMD proposes a dual-axis criteria comprised of an Axis I for the physical assessment and an Axis II which focuses on the pain-related disability and on the psychosocial status of the patient, being both essential to achieve a proper diagnosis and subsequent management of TMD.¹⁴

The International Classification of Orofacial Pain Disorders (ICOP) 1st edition subcategorizes pain of muscle origin differently than the DC/TMD. This new classification adds a temporal distinction between conditions, with the aim of possibly improving therapeutic outcomes after further studies. The ICOP builds its diagnostic subcategories on whether the pain is primary or secondary. Under the umbrella of "primary myofascial orofacial pain," the terms "acute," "chronic," and "chronic infrequent/chronic frequent/chronic highly frequent" are used along with the description of "with/without referral." Within the subtype of secondary myofascial orofacial pain, the diagnostic terms of myositis, tendonitis, and muscle spasm are used.¹⁷

Pathophysiology

The pathophysiology of MMPD is complex and controversial, with little evidence available on the presence of gross pathologic change in the muscle tissues in those patients suffering from these conditions.¹⁸ Current literature supports the involvement of intrinsic and extrinsic variables such as environmental, emotional, behavioral, genetic, and physical factors in the initiation and maintenance of chronic muscle pain and dysfunction.¹⁹

Peripheral and central sensitization are believed to play an important role in the pathophysiology of MMPD. After muscle nociceptors become sensitized, neuropeptides are released peripherally increasing the response, and surpassing the normal threshold. This can translate to long-term changes in the central nervous system, known as central sensitization, which plays a role in the maintenance of chronic pain.²⁰ These neuroplastic changes have much in common with other comorbid conditions such as tension-type headache (TTH) and fibromyalgia.¹⁸

Sleep disturbances and psychological comorbidities such as anxiety and depression are considered strong contributing factors for MMPD with the potential to enhance the perception of pain. Thus, patients should be screened for any of these conditions and referred to the appropriate specialist. There are other elements such as genetics, gender, and lifestyle habits that can influence the perfection of pain. Certain genes (e.g., catechol-O-methyltransferase or COMT gene) code for different pain sensitivities making some individuals naturally more sensitive to pain than others.²¹ Women are also more likely to suffer from these pain conditions.¹¹ Lastly, lifestyle habits such as nutrition, exercise, and smoking are also thought to contribute to MMPD, but further studies are needed.

Treatment

Treatment options available for the management of MMPD are numerous and include various noninvasive modalities such as home care programs, pharmacotherapy, physical therapy, oral orthotic appliance therapy, behavioral therapy, and injection therapy. Given the complex and multifactorial nature of the pathophysiology of MMPD, an interdisciplinary approach including multiple modalities of treatment will be required. The treatment goals will be to decrease pain, increase mandibular range of motion and decrease disability, improving the overall quality of life of the patient.¹⁹

A comprehensive home care program is an essential component of any musculo-skeletal pain management plan. This program should comprise a set of jaw and neck self-stretching exercises along with gentle massage and heat therapy with moist hot compresses over the affected areas. For some patients, the use of cold compresses might also provide pain relief. However, if the case is too complex or the patient does not comply with the recommended program, he or she should be referred to physical therapy for further management. Patient education and reassurance as well as awareness and modification of mandibular parafunctional habits will also play an important role in the management of MMPD.¹⁵

Various forms of pharmacotherapy are indicated in the management of MMPD. NSAIDs and steroids have been widely used for their analgesic and anti-inflammatory properties in these patients. However, their administration should be limited to the short term for the management of acute symptoms because of their adverse effect profile.²² Skeletal muscle relaxants such as cyclobenzaprine can be beneficial and are commonly used for muscle pain, although there is insufficient evidence to strongly conclude their effectiveness.²³ TCAs are also used in the management of chronic pain conditions, including MMPD, because of their analgesic effect. Aside from sedation, which might be beneficial for these patients, common adverse effects are dizziness, dry mouth, palpitations, nausea, increased appetite, and constipation. Nortriptyline is preferred over amitriptyline because of its more favorable tolerability profile.⁹ Of note, cyclobenzaprine is structurally similar to TCAs, which is important to consider when prescribing.²⁴ TCAs and selective serotonin reuptake inhibitors (SSRIs) and serotonin norepinephrine reuptake inhibitors (SNRIs) should be prescribed with caution in the elderly population and when managing polypharmacy. The clinician should also limit the prescription of benzodiazepines to the short term because of risk for addiction and screen the patient for potential substance use disorders before initiating therapy.^{22,25} The patient's Prescription Drug Monitoring Program (PDMP) should be consulted periodically and the primary care physician should be kept informed when prescribing controlled substances.²⁵

Oral orthotic appliances are commonly used in the management of TMD. Well-adjusted hard stabilization appliances have moderate quality evidence supporting their use, in particular for the management of myogenic TMD, when compared with other types of appliances and no treatment. Interestingly, they are equally effective when compared with other treatment modalities such as pharmacotherapy and physical and behavioral therapies. However, better-designed randomized control trials with larger samples sizes remain needed. Although still unclear, the hypothesized function of these devices includes a more even load distribution along with a reduction in the activity of masticatory muscles and an increase in the parafunctional habits awareness. Oral appliances can also serve to protect the teeth from the forces of attrition. Appliance therapy should always be considered as part of a broader rehabilitation treatment program.^{26,27}

Behavioral therapy has shown to be successful in treating habit and lifestyle variables that contribute to chronic pain including myogenic conditions. After a thorough evaluation, psychologists will manage comorbid anxiety, depression, poor sleep, and sometimes, catastrophizing. Extreme focus on pain is known as catastrophizing, which has been suggested to increase pain severity, and sometimes disable patients.²⁸ Behavioral therapy treatment modalities focus on education, coping strategies, encouragement to engage in physical activity, sleep hygiene, stress reduction and habit changes.²⁹ Motivation to comply with treatment plans and ultimately improve quality of life are fundamental goals for the patient.

For those refractory patients, injection therapy with trigger point and/or botulinum toxin type A (BoT-A) injections might be good alternative. Trigger point injections (TPIs) using local anesthesia (LA) have shown to combine the antinociceptive effects of the LA along with the mechanical disruption of needling muscle fibers, resulting in pain relief. Although LA has not been demonstrated to improve MMPD, it has been shown to reduce muscle soreness and discomfort at the time of the procedure.³⁰ Lidocaine 0.25% without vasoconstrictor is recommended because of its low muscle toxicity.³¹ TPIs are more invasive than other treatment modalities for MMPD; however, if pain reduction is not easily achieved, TPIs should be considered, because they have a low side-effect profile and are cost-effective for the patient.³² Botulinum toxin type A (BoT-A) has shown to reduce pain in about one-third of patients with refractory MMPD. The presence of muscle hypertrophy was found to be a positive predictor for BoT-A therapy in these patients.³³ Interestingly, muscle hypertrophy is not considered to be a diagnostic criterion for identification of masticatory myalgia or myofascial pain disorders, as per the guidelines of the American Academy of Orofacial Pain and the DC/TMD.^{14,15} BoT-A therapy can provide significant relief for up to 10 weeks, the reduction in size of the masticatory muscles being the most common adverse effect reported by these patients.³³ It is also an effective and well-tolerated preventive treatment for chronic headache disorders, in particular chronic migraine headache.³⁴

SUMMARY

MMPD are a common subtype of TMD affecting the muscles of mastication. Headache and cervical disorders as well as chronic widespread pain and psychosocial disorders are common comorbid conditions. Replication of the pain complaints along with a comprehensive history taking and clinical examination are the gold standard for diagnosis. MMPD present a complex and multifactorial pathophysiology. Their proper management will require a multimodal and interdisciplinary approach including various alternatives such as home care programs, pharmacotherapy, physical therapy, oral orthotic appliance therapy, behavioral therapy, and injection therapy. The treatment goals encompass the improvement of the patient's quality of life by decreasing pain, increasing mandibular range of motion, and decreasing disability. The prognosis will depend on the complexity of the case and on patient compliance with the treatment plan.

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