

# Disorders of the Masticatory Muscles

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## KEYWORDS

- Masticatory muscles • Persistent orofacial muscle pain • Myalgia • Myofascial pain
- Temporomandibular joint disorder • Fibromyalgia

## KEY POINTS

- It is clear that there are several types of disorders of the masticatory muscles, each of which may have a complex etiology, clinical course, and response to therapy.
- Masticatory muscle disorders include both regional and centrally mediated problems. Host susceptibility plays a role at several stages of these disorders, including pain modulation and response to therapy.
- Disorders of the masticatory muscles must be accurately identified and differentiated from primary temporomandibular joint disorders such as those involving pain from osteoarthritis, disc displacement, or jaw dysfunction.

## INTRODUCTION

Muscle disorders involving the masticatory muscles have been considered analogous to skeletal muscle disorders throughout the body.<sup>1,2</sup> However, emerging research has shed new light on the varied etiology, clinical presentation, diagnosis, and treatment of myofascial pain and masticatory muscle disorders.<sup>3–6</sup> This article reviews the etiology and classification of regional masticatory muscle disorders, the clinical examination of the patient, and evidence-based treatment recommendations.

Mechanisms behind masticatory muscle pain include overuse of a normally perfused muscle or ischemia of a normally working muscle, sympathetic reflexes that produce changes in vascular supply and muscle tone, and changes in psychological and emotional states.<sup>7</sup> Neurons mediating pain from skeletal muscle are subject to

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strong modulatory influences. Bradykinin, serotonin, substance P, prostaglandins, and neuropeptides sensitize nociceptors and can easily sensitize nociceptive endings. Painful conditions of muscle often result in increased sensitivity of peripheral nociceptors and hyperexcitability in the central nervous system with hyperalgesia.<sup>8</sup>

Muscle disorders can be divided into regional disorders, such as myalgia associated with temporomandibular joint (TMJ) disorder, and systemic disorders, such as pain associated with fibromyalgia.<sup>2</sup> The paucity of data on the etiology and pathophysiology of muscle pain limits the ability to clearly delineate all groups of muscle disorders. Frequently the clinician must rely on clinical judgment to establish a diagnosis. It is clear that well-designed controlled trials and additional research is necessary for the development of validated diagnostic criteria and treatment protocols.<sup>3,9-11</sup>

## CLASSIFICATION OF MASTICATORY MUSCLE DISORDERS

Chronic myalgia of the muscle of mastication (MOM) is one aspect of temporomandibular disorders (TMDs).<sup>2,3</sup> Historically, clinicians and researchers have subclassified TMDs into intracapsular disorders and masticatory muscle disorders such as local myalgia, myofascial pain, centrally mediated myalgia, myospasm, myositis, myofibrotic contracture, and masticatory muscle neoplastic disease.<sup>9</sup> Conflicting classification schemes and terminology have led to significant confusion among clinicians, and perhaps inaccurate diagnosis and treatment of patients. In fact, many studies continue to group muscle pain and painful TMJ disorders together under the term TMD, although these entities are pathophysiologically and clinically distinct.<sup>3,12-14</sup> Although the most common feature of most masticatory muscle disorders is pain, mandibular dysfunction such as difficulty chewing and mandibular dysfunction may also occur. The clinician needs to differentiate masticatory muscle disorders from the primary TMDs such as those that involve pain associated with osteoarthritis, disc displacement, or jaw dysfunction (**Table 1**).

The clinical features of masticatory muscle disorders are as follows.

### Features of Local Myalgia

- Sore MOM with pain in cheeks and temples on chewing, wide opening, and often on waking (eg, nocturnal bruxism)
- Bilateral
- Described as stiff, sore, aching, spasm, tightness, or cramping
- Sensation of muscle stiffness, weakness, fatigue
- Possible reduced mandibular range of motion
- Differential diagnosis: myositis, myofascial pain, neoplasm, fibromyalgia

### Features of Myofascial Pain

- Regional dull, aching muscle pain
- Trigger points present and pain referral on palpation with/without autonomic symptoms
- Referred pain often felt as headache
- Trigger points can be inactivated with local anesthetic injection
- Sensation of muscle stiffness and/or malocclusion not verified clinically
- Otologic symptoms including tinnitus, vertigo, and pain
- Headache or toothache
- Decreased range of motion
- Hyperalgesia in region of referred pain
- Differential diagnosis: arthralgia, myositis, local myalgia, neoplasia, fibromyalgia

**Table 1**  
**Diagnostic criteria for masticatory muscle disorders**

Disorder	Etiology	Diagnostic Criteria
Centrally mediated chronic muscle pain	Chronic generalized muscle pain associated with a comorbid disease	History of prolonged and continuous muscle pain Regional dull, aching pain at rest Pain aggravated by function of affected muscles Pain aggravated by palpation
Myalgia (local)	Acute muscle pain Protective muscle splinting Postexercise soreness Muscle fatigue Pain from ischemia	Regional dull, aching pain during function No or minimal pain at rest Local muscle tenderness on palpation Absence of trigger points and pain referral
Myofascial pain	Chronic regional muscle pain	Regional dull, aching pain at rest Pain aggravated by function of affected muscles Provocation of trigger points alters pain complaint and reveals referral pattern >50% reduction of pain with vapocoolant spray or local anesthetic injection to trigger point followed by stretch
Myofibrotic contracture	Painless shortening of muscles	Limited range of motion Firmness on passive stretch (hard stop) Little or no pain unless involved muscle is forced to lengthen
Myositis	Inflammation secondary to direct trauma or infection	Continuous pain localized in muscle area following injury or infection Diffuse tenderness over entire muscle Pain aggravated by function of affected muscles Moderate to severe decreased range of motion due to pain and swelling
Neoplasia	Benign or malignant	May or may not be painful Anatomic and structural changes Imaging and biopsy needed
Myospasm	Acute involuntary and continuous muscle contraction	Acute onset of pain at rest and during function Markedly decreased range of motion due to continuous involuntary muscle contraction Pain aggravated by function of affected muscles Increased electromyographic activity higher than at rest Sensation of muscle tightness, cramping, or stiffness

*Data from* de Leeuw R. Orofacial pain: guidelines for assessment, classification, and management. The American Academy of Orofacial Pain. 4th edition. Chicago: Quintessence Publishing Co, Inc; 2008.

#### Features of Centrally Mediated Myalgia

- Trigger points and pain referral on palpation
- Sensation of muscle stiffness, weakness, and/or fatigue
- Sensation of malocclusion not verified clinically
- Otologic symptoms including tinnitus, vertigo, and pain
- Decreased range of motion
- Hyperalgesia
- No response to treatment directed at painful muscle tissue
- Differential diagnosis: arthralgia, myositis, myofascial pain, local myalgia, neoplasm, fibromyalgia

#### Features of Myospasm

- Sudden and involuntary muscle contraction
- Acute malocclusion (dependent on muscles involved)
- Decreased range of motion and pain on function and at rest
- Relatively rare disorder in orofacial pain population
- Differential diagnosis: myositis, local myalgia, neoplasm

#### Features of Myositis

- History of trauma to muscle or source of infection
- Often continuous pain affecting entire affected muscle
- Pain aggravated by function
- Severe limited range of motion

#### Features of Myofibrotic Contracture

- Not usually painful
- Often follows long period of limited range of motion or disuse (eg, intermaxillary fixation)
- History of infection or trauma is common
- Differential diagnosis: TMJ ankylosis, coronoid hypertrophy

#### Features of Masticatory Muscle Neoplasia

- Pain may or may not be present
- Anatomic and structural changes: tumors may be in muscles or masticatory spaces
- Swelling, trismus, paresthesias, and pain referred to teeth
- Positive findings on imaging or biopsy

Some clinicians have stressed classifying myogenic disorders based on an anatomic system allowing for a simpler diagnostic process, because evaluation of the patient involves careful palpation of the masticatory muscles and joints.<sup>13,15,16</sup> The clinician needs to determine the etiology and pathophysiology that occur with the various masticatory muscle disorders, such as disorders caused by trauma. A thorough history and clinical examination, an understanding of pain neuroanatomy and neurophysiology, and an in-depth knowledge of research on muscle pain are important.<sup>16–18</sup> Various causes of myogenous pain are summarized in **Table 2**.

Recently a new term, persistent orofacial muscle pain (POMP), has been introduced, to more accurately reflect the interplay between peripheral nociceptive sources in muscles, faulty central nervous system components, and decreased coping

**Table 2**  
**Etiology of myogenous pain**

<b>Etiology</b>	<b>Criteria</b>
Focal myalgia from direct trauma	History of trauma preceding pain onset Subjective pain in muscles with function Pain reproduced on palpation
Primary myalgia due to parafunction	No history of trauma Subjective pain in muscle with function Pain reproduced on palpation No trigger points
Secondary myalgia due to active local pathology or recent medications	History of recent joint, oral soft tissue, or pulpal disease or medication (eg, serotonin-selective reuptake inhibitors) that coincides with muscle pain Subjective pain in muscle with function Pain reproduced on palpation
Myofascial pain	No history of recent trauma Subjective pain in muscles with function Pain reproduced on palpation Trigger points and pain referral
Diffuse chronic muscle pain and fibromyalgia	Subjective pain in multiple sites aggravated by function Widespread pain involving more than 3 body quadrants >3 mo duration Strong pain on palpation in 11 of 18 body sites

Data from Clark GT, Minakuchi H. Oral appliances. In: Laskin DM, Greene CS, Hylander WL, editors. Temporomandibular disorders: an evidence-based approach to diagnosis and treatment. Chicago: Quintessence; 2006. p. 377–90.

ability.<sup>3</sup> POMP likely shares mechanisms with tension-type headache, regional myofascial pain, and fibromyalgia, and has genetically influenced traits that determine pain modulation and pharmacogenomics interacting with psychological traits to affect disease onset, clinical progression, and pain experience.<sup>3,4</sup> To date, these factors cannot be identified in the individual patient sufficiently enough to tailor focused, mechanism-based treatment. POMP is consistent with the condition often referred to as centrally mediated myalgia and, as such, treatment needs to be redirected from local and regional therapies to systemic and central ones.

## CLINICAL EXAMINATION OF THE PATIENT

The most effective approach for the diagnosis masticatory muscle pain involves careful review of the chief complaint, the history of the present illness (**Table 3**), the dental, medical, and psychosocial behavioral histories (**Box 1**), and a comprehensive evaluation of the head and neck including a cranial nerve assessment (**Table 4**).<sup>2</sup> In addition, imaging modalities may be important in ruling out other conditions. No one physical finding can be relied on to establish a diagnosis; rather, a pattern of abnormalities may suggest the source of the problem and diagnosis.<sup>11</sup> However, masticatory muscle tenderness on palpation is the most consistent examination feature present in TMDs.<sup>19–24</sup> In fact, the clinical features that distinguish patients from non-TMD or masticatory muscle pain most consistently reported in the literature are: restricted passive mouth opening without pain; masticatory muscle tenderness on palpation; limited maximal mouth opening; and an uncorrected deviation on maximum mouth opening and tenderness on muscle or joint palpation.<sup>2,19–24</sup>

Table 3 History of the present illness: pain characteristics	
Quality	Common patient descriptors: dull, sharp, tight, aching, tired, etc
Location	Unilateral vs bilateral Pain confined to a single muscle or referred to a distant area
Intensity	On a scale of 1–10 Mild, moderate, or severe
Onset, duration, pattern	How long has the pain been present? What if anything caused the pain? (eg, trauma) What has been the course of pain since its onset? (eg, episodic, constant, fluctuating)
Modifiers	What exacerbates or diminishes the pain? Does anything you do or use help or worsen pain?
Chronicity	How long has the pain been present?
Comorbid symptoms and signs	Are there any other conditions or symptoms associated with pain? (eg, depression, acute anxiety, nausea/vomiting, tearing, visual changes, dizziness, numbness/tingling, weakness, generalized pain)

Box 1 Questions regarding oral behavior and parafunction	
<i>DO YOU:</i>	
Clench or grind your teeth when asleep?	
Sleep in a position that puts pressure on your jaw? (eg, side, stomach)	
Clench or press teeth together while awake?	
Touch or hold teeth together while eating?	
Hold, tighten, or tense muscles without clenching or touching teeth together?	
Hold out or jut jaw forward or to side?	
Press tongue between teeth?	
Bite, chew, or play with tongue, cheeks, or lips?	
Hold jaw in rigid or tense position to brace or protect jaw?	
Bite or hold objects between teeth (eg, pens, pipe, hair, fingernails, and so forth)?	
Use chewing gum?	
Play musical instruments that involve mouth or jaw?	
Lean with hand on jaw or chin?	
Chew food on one side only?	
Eat between meals (food requiring lots of chewing)?	
Talk at length?	
Sing?	
Yawn excessively?	
Hold telephone between head and shoulder?	
<i>Data from</i> Ohrbach R, Markiewicz M, McCall WD Jr. Oral Behaviors Checklist: performance validity of targeted behaviors [abstract]. J Dent Res 2004;83:(Spec Issue A):T27–45.	

**Table 4**  
**Physical examination directed toward mandibular dysfunction**

Examination	Observations
Inspection	Facial asymmetry, swelling, and masseter and temporal muscle hypertrophy Opening pattern (corrected and uncorrected deviations, uncoordinated movements, limitations)
Assessment of range of mandibular movement	Maximum opening with comfort, with pain, and with clinician assistance Maximum lateral and protrusive movements
Palpation examination	Masticatory muscles Temporomandibular joints Neck muscles and accessory muscles of the jaw Parotid and submandibular areas Lymph nodes
Provocation tests	Static pain test (mandibular resistance against pressure) Pain in the joints or muscles with tooth clenching Reproduction of symptoms with chewing (wax, sugarless gum)
Intraoral examination	Signs of parafunction (cheek or lip biting, accentuated linea alba, scalloped tongue borders, occlusal wear, tooth mobility, generalized sensitivity to percussion, thermal testing, multiple fractures of enamel, restorations)

Data from Refs. <sup>2,19–24,27</sup>

Objective determination of the presence or absence of parafunctional jaw behavior is challenging.<sup>25</sup> Although the presence of these behaviors may not have proven diagnostic validity, their assessment remains important because it provides potential causative or perpetual factors and/or effects on the masticatory system.<sup>26</sup> An oral behavior checklist is a useful instrument for determining the presence or awareness of parafunctional behaviors.<sup>27</sup>

Interincisor separation (plus or minus the incisor overlap in centric occlusion) provides the measure of mandibular movement. Maximum interincisal opening (MIO) should be measured using a ruler without pain, as wide as possible with pain, and after opening with clinician assistance. Mouth opening with assistance is accomplished by applying mild to moderate pressure against the upper and lower incisors with the thumb and index finger. Passive stretching often allows the clinician to assess and differentiate the limitation of opening caused by a muscle or joint problem by comparing assisted opening with active opening. This action provides the examiner with the quality of resistance at the end of the movement. Often, muscle restrictions are associated with a soft end-feel and result in an increase of more than 5 mm above the active opening (wide opening with pain), whereas joint disorders such as acute nonreducing disc displacements have a hard end-feel and characteristically limit assisted opening to less than 5 mm (normal MIO is ~40 mm; range 35–55 mm). Measurements of lateral movement are made with the teeth slightly separated, measuring the displacement of the lower midline from the maxillary midline, and adding or subtracting the lower-midline displacement at the start of movement. Protrusive movement is measured by adding the horizontal distance between the upper and lower central incisors and adding the distance the lower incisors travel beyond the upper incisors; normal lateral and protrusive movements are approximately 7 mm.

The primary finding related to masticatory muscle palpation is pain; however, the methods for palpation are not standardized in clinical practice.<sup>28</sup> The amount of pressure to apply and the exact sites that are most likely associated with TMD are unknown. Some clinicians have recommended attempting to establish a baseline (to serve as a general guide or reference) by squeezing a muscle between the index finger and thumb or by applying pressure in the center of the forehead or thumbnail to gauge what pressure becomes uncomfortable.<sup>9</sup> The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) guidelines recommend 1 lb (0.45 kg) of pressure for the joint and 2 lb (0.9 kg) of pressure for the muscles. Palpation should be accompanied by: asking the patient about the presence of pain at the palpation site; whether palpation produces pain spread or referral to a distant site; and whether palpation reproduces the pain the patient has been experiencing.<sup>9,29</sup> Reproducing the site and the character of the pain during the examination procedure helps identify the potential source of the pain. The distant origin of referred pain can also be identified by palpation.<sup>29</sup>

Palpation of the muscles for pain should be done with the muscles in a resting state.<sup>29</sup> There are no standardized methods of assessing the severity of palpable pain, and the patient should be asked to rate the severity by using a scale (eg, a numeric scale from 1 to 10, a visual analog scale, or a ranking such as none, mild, moderate, or severe). The RDC/TMD recommends using the categories of pressure only, mild pain, moderate pain, and severe pain.<sup>9</sup> These ratings may also be useful in assessing treatment progress in addition to asking patients what percentage of improvement they may feel. The lateral pterygoid is in a position that does not allow access for adequate palpation examination, even though there are examination protocols and descriptions for palpating this muscle.

Patients with TMDs often have musculoskeletal problems in other regions (neck, back, and so forth).<sup>30</sup> The upper cervical somatosensory nerves send branches that synapse in the spinal trigeminal nucleus, which is one proposed mechanism to explain referral of pain from the neck to the orofacial region and masticatory muscles.<sup>31–33</sup> The sternocleidomastoid and trapezius muscles are often part of cervical muscle disorders, and may refer pain to the face and head. Other cervical muscle groups to include in the palpation examination include the paravertebral (scalene) and suboccipital muscles.

Injections of anesthetics into the TMJ or selected masticatory muscles may help confirm a diagnosis. Elimination of or a significant decrease in pain and improved jaw motion should be considered a positive test result. Diagnostic injections may also be helpful in differentiating pain arising from joints or muscle.<sup>2,29</sup> In situations where a joint procedure is being considered, local anesthetic injection of the joint may confirm the joint as the source of pain. Injecting trigger points or tender areas of muscle should eliminate pain from the site and should also eliminate referred pain associated with the injected trigger point. Interpretation of injections in the context of all the diagnostic information is vital, because a positive result does not ensure a specific diagnosis. Recently, the use of botulinum toxin (Botox) has been advocated for trigger-point injections and for the management of tension-type headache.<sup>3,4,6,29</sup> In several case-control studies and randomized trials, descriptive analysis showed that improvements in both objective (range of mandibular movements) and subjective (pain at rest; pain during chewing) clinical outcome variables were higher in Botox-treated groups than in the placebo-treated subjects. Patients treated with Botox had a higher subjective improvement in their perception of treatment efficacy than placebo-treated subjects.<sup>2,6,29</sup>



## TREATMENT OF MASTICATORY MUSCLE DISORDERS

It is important for the clinician treating patients with TMDs to distinguish clinically significant disorders that require therapy from incidental findings in a patient with facial pain attributable to other causes.<sup>2</sup> TMJ abnormalities are often discovered on routine examination, and may not require treatment such as with asymptomatic clicking of the TMJ. The need for treatment is largely based on the level of pain and dysfunction as well as the progression of symptoms. With respect to disorders of MOM, the principles of treatment are based on a generally favorable prognosis and an appreciation of the lack of clinically controlled trials indicating the superiority, predictability, and safety of treatments presently available. The literature suggests that many treatments have some beneficial effect, although this effect may be nonspecific and not directly related to the particular treatment.<sup>1-3,9</sup>

According to the American Association of Dental Research, it is strongly recommended that, unless there are specific and justifiable indications to the contrary, treatment of TMD patients, including those with disorders of MOM, initially should be based on the use of conservative, reversible, and evidence-based therapeutic modalities.<sup>34</sup> Studies of the natural history of many TMDs suggest that they tend to improve or resolve over time.<sup>12,14,15,19,21,35</sup> Although no specific therapies have been proved to be uniformly effective, many of the conservative modalities have proved to be at least as effective as most forms of invasive treatment in providing symptomatic relief. Because such modalities do not produce irreversible changes, they present much less risk of producing harm. Professional treatment should be augmented with a home-care program whereby patients are taught about their disorder and how to manage their symptoms.<sup>34,36</sup>

Treatments that are relatively accessible, not prohibitive owing to expense, safe, and reversible should be given priority, for example: education; self-care; physical therapy; intraoral appliance therapy; and short-term pharmacotherapy, behavioral therapy, and relaxation techniques (**Table 5**). There is evidence to suggest that multimodal therapy and combining treatments produces a better outcome.<sup>5,37</sup> Occlusal therapy continues to be recommended by some clinicians as an initial treatment or as a requirement to prevent recurrent symptoms. However, research does not support occlusal abnormalities as a significant etiologic factor in TMD including masticatory muscle disorders.<sup>2,38-41</sup>

Avoidance therapy and cognitive awareness plays a vital role in patient care but has little scientific evidence to support its use.<sup>2,17,24,25</sup> Generally speaking, common sense dictates that if something hurts, it should be avoided. Four behaviors should be avoided in the patient with masticatory muscle pain:

1. Avoidance of clenching by reproducing a rest position where the patient's lips are closed but teeth are slightly separated
2. Avoidance of poor head and neck posture
3. Avoidance of testing the jaw or jaw joint clicking
4. Avoidance of other habits such as nail biting, lip biting, gum chewing, and so forth (**Box 2**).

Many patients report benefit from heat or ice packs applied to painful MOM. The local application of heat can increase circulation and relax muscles, whereas ice may serve as an anesthetic for painful muscles. In addition, stretch therapy must be part of a self-care program. Stretches should be done multiple times daily to maximize effectiveness. The most effective stretching exercise is passive stretching, summarized in **Box 3**.

Table 5 Initial treatment of masticatory muscle disorders	
Treatment Component	Description
Education	Explanation of the diagnosis and treatment Reassurance about the generally good prognosis for recovery and natural course Explanation of patient's and doctor's roles in therapy Information to enable patient to perform self-care
Self-care	Eliminate oral habits (eg, tooth clenching, chewing gum) Provide information on jaw care associated with daily activities
Physical therapy	Education regarding biomechanics of jaw, neck, and head posture Passive modalities (heat and cold therapy, ultrasound, laser, TENS) Range of motion exercises (active and passive) Posture therapy Passive stretching, general exercise and conditioning program
Intraoral appliance therapy	Cover all the teeth on the arch the appliance is seated on Adjust to achieve simultaneous contact against opposing teeth Adjust to a stable comfortable mandibular posture Avoid changing mandibular position Avoid long-term continuous use
Pharmacotherapy	NSAIDs, acetaminophen, muscle relaxants, antianxiety agents, tricyclic antidepressants
Behavioral/relaxation techniques	Relaxation therapy Hypnosis Biofeedback Cognitive-behavioral therapy

*Abbreviations:* NSAIDs, nonsteroidal anti-inflammatory drugs; TENS, transcutaneous electrical nerve stimulation.

*Data from Refs.* [2,17,40,41](#)

Physiotherapy helps to relieve musculoskeletal pain and restore normal function by altering sensory input; reducing inflammation; decreasing, coordinating, and strengthening muscle activity; and promoting the rehabilitation of tissues.<sup>14</sup> A licensed professional therapist is recommended for treatment. Despite the absence of well-controlled clinical trials, physiotherapy is a well-recognized effective and conservative therapy for many disorders of the MOM.

Physical Therapy Techniques

- Posture training
- Exercises
- Mobilization

Physical Agents and Modalities

- Electrotherapy and transcutaneous electrical nerve stimulations (TENS)
- Ultrasound
- Iontophoresis
- Vapocoolant spray
- Trigger-point injections with local anesthetic or Botox
- Acupuncture
- Laser treatment

**Box 2****Patient's instructions for self-care**

- Be aware of habits or patterns of jaw use.
  - Avoid tooth contact except during chewing and swallowing.
  - Notice any contact the teeth make.
  - Notice any clenching, grinding, gritting, or tapping of teeth, or any tensing or rigid holding of the jaw muscles.
  - Check for tooth clenching while driving, studying, doing computer work, reading, or engaging in athletic activities; when at work or in social situations; and when experiencing overwork, fatigue, or stress.
  - Position the jaw to avoid tooth contacts.
  - Place the tip of the tongue behind the top teeth and keep the teeth slightly apart; maintain this position when the jaw is not being used for functions such as speaking and chewing.
- Modify your diet.
  - Choose softer foods and only those foods that can be chewed without pain.
  - Cut foods into smaller pieces; avoid foods that require wide mouth opening and biting off with the front teeth, or foods that are chewy and sticky and that require excessive mouth movements.
  - Do not chew gum.
- Do not test the jaw.
- Do not open the mouth wide or move the jaw around excessively to assess pain or motion.
- Avoid habitually maneuvering the jaw into positions to assess its comfort or range.
- Avoid habitually clicking the jaw if a click is present.
- Avoid certain postures.
  - Do not lean on or cup the chin when performing desk work or at the dining table.
  - Do not sleep on the stomach or in postures that place stress on the jaw.
- Avoid elective dental treatment while symptoms of pain and limited opening are present.
- During yawning, support the jaw by providing mild pressure underneath the chin with the thumb and index finger or with the back of the hand.
- Apply moist hot compresses to the sides of the face and to the temple areas for 10 to 20 minutes twice daily.

**SPLINT THERAPY**

Splints, orthotics, orthopedic appliances, bite guards, nightguards, or bruxing guards are used in TMD treatment, and often for disorders of masticatory muscles.<sup>2</sup> Their use is considered to be a reversible part of initial therapy. Several studies on splint therapy have demonstrated a treatment effect, although researchers disagree as to the reason for the effect.<sup>5,14,15</sup> In a review of the literature on splint therapy, Clark and colleagues<sup>17,24</sup> found that patients reported a 70% to 90% improvement with splint therapy. A recent review of the research on splint therapy suggests that using a splint as part of therapy for masticatory myalgia, arthralgia, or both may be supported by the literature in case-control studies.<sup>40</sup> Conversely, there is insufficient evidence on review of published randomized controlled trials to support the use of stabilization splint

**Box 3****Patient's exercise instructions**

Certain exercises can help you relieve the pain that comes from tired, cramped muscles. They can also help if you have difficulty opening your mouth. The exercises described work by helping you relax tense muscles and are referred to as "passive stretching." The more often you do these exercises, the more you'll relax the muscles that are painfully tense.

*Do these exercises 2 times daily:*

1. Ice down both sides of the face for 5 to 10 minutes before beginning (ice cubes in sandwich bags or packs of frozen vegetables work well for this).
2. Place thumb of one hand on the edge of the upper front teeth and the index and middle fingers of the other hand on the edge of the lower front teeth, with the thumb under the chin.
3. The starting position for the stretches is with the thumb of the one hand and index finger of the other hand just touching.
4. Gently pull open the lower jaw, using the hand only, until you feel a passive stretch, not pain, hold for 10 seconds, then allow the lower jaw to close until the thumb and index finger are once again contacting; it is crucial that when doing these exercises not to use the jaw muscles to open and close, but rather manual manipulation only (the fingers do all the work!).
5. Repeat the above stretching action 10 times, performing 2 to 3 sets per day, 1 in the morning and 1 or 2 in the evening.
6. When finished with the exercises, one can place moist heat to both sides of the face for 5 to 10 minutes (heating a wet washcloth in the microwave for about 1 minute works well for this).



Demonstration of a passive stretch using the fingers.

therapy over other active interventions in the treatment of myofascial pain. Splints appear to be better than no treatment, but only as effective as other active interventions for myofascial pain.<sup>40–43</sup> A systematic review and meta-analysis by Ebrahim and colleagues<sup>37</sup> reviewed 11 eligible studies of 1567 patients, and demonstrated promising results for pain reduction, very low evidence for an effect on quality of life, and significant research bias (**Box 4**).

## PHARMACOLOGIC THERAPY

Both clinical and controlled experimental studies suggest that medications may promote patient comfort and rehabilitation when used as part of comprehensive

Box 4

Splint therapy

- The appliance most commonly used is described as a stabilization appliance or muscle relaxation splint
- Designed to cover a full arch and adjusted to avoid altering jaw position or placing orthodontic forces on the teeth
  - Should be adjusted to provide bilateral, even contact with the opposing teeth on closure and in a comfortable mandibular posture
  - Should be reexamined periodically and readjusted as necessary to accommodate changes in mandibular posture or muscle function that may affect the opposing tooth contacts on the appliance
- At the beginning of appliance therapy, a combination of appliance use during sleep and for periods during waking hours is appropriate
  - Factors such as tooth clenching when driving or exercising, or pain symptoms that tend to increase as the day progresses, may be better managed by increasing splint use during these times
- To avoid the possibility of occlusal change, no appliance should not be worn continuously (ie, 24 hours per day) over prolonged periods
- Full-coverage appliance therapy during sleep is a common practice to reduce the effects of bruxism and is not usually associated with occlusal change

treatment. Although there is a tendency for clinicians to rely on “favorite” agents, no single medication has proved to be effective for the entire spectrum of TMDs.<sup>2–4,17,24</sup> With respect to pain associated with disorders of the MOM, analgesics, nonsteroidal anti-inflammatory agents, corticosteroids, benzodiazepines, muscle relaxants, and low-dose antidepressants have shown efficacy. Many of the medications used for fibromyalgia can be used for patients with masticatory muscle disorders (Table 6).<sup>30</sup> These agents are versatile and effective at treating the multiple symptoms associated with chronic muscle pain. The medications used for myofascial pain and masticatory muscle disorders are discussed in greater detail elsewhere in this issue by Nasri-Heir and colleagues.

Table 6 Medications used for fibromyalgia that may be beneficial for masticatory muscle pain	
Medication Class	Effect
Tricyclic antidepressants (TCAs)	Moderately helpful for pain More side effects (xerostomia, fatigue)
Serotonin-selective reuptake inhibitors	Fewer side effects than TCAs More effective for anxiety/depression than for pain
Muscle relaxants	Moderately helpful for local muscle pain More side effects (xerostomia, sedation)
Serotonin-norepinephrine reuptake inhibitors	Moderately helpful for fibromyalgia-related pain
Low-potency opioids	Moderately helpful for fibromyalgia-related pain
NSAIDs	Helpful for acute inflammatory pain but not chronic muscle pain or fibromyalgia-related pain

## SUMMARY

It is clear that there are several types of disorders of the masticatory muscles, each of which may have a complex etiology, clinical course, and response to therapy. Masticatory muscle disorders include both regional and centrally mediated problems. Host susceptibility plays a role at several stages of these disorders, including pain modulation and response to therapy. Disorders of the masticatory muscles must be accurately identified and differentiated from primary TMJ disorders such as those involving pain from osteoarthritis, disc displacement, or jaw dysfunction.<sup>44</sup>

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