



# Orofacial Muscle Pain: New Advances in Concept and Therapy

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## ABSTRACT

This manuscript focuses on chronic myogenous pains affecting the masticatory muscles. The differentiation of myogenous masticatory pain into subcategories is proposed by separating myogenous pains according to their location and anatomic extent. Focal myalgia, regional myalgia, myofascial pain, and fibromyalgia are classified based on specific historical and clinical examination criteria. The probable mechanisms underlying chronic myogenous pains and trigger points phenomena are discussed. Treatment options of the myogenous masticatory pain conditions including physical medicine modalities, as well as several types of pharmacologic agents, are presented.

**P**ain in the masticatory musculature is broadly classified as masticatory myalgia or myogenous masticatory pain. The anatomic approach to myogenous masticatory pain classification includes focal masticatory myalgia; regional craniocervical myalgia, involving several muscles of the jaw and neck on the same side; and widespread chronic myalgia.

### *Focal Myalgia Due to Direct Trauma*

Focal masticatory myalgia can result from a direct trauma, such as an inadvertent anesthetic injection into muscle tissue during dental treatment.<sup>1-4</sup> When direct trauma results in cellular damage and inflammation within the muscle, the term myositis is used.<sup>5,6</sup> Patients



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typically exhibit strong focal pain and limited jaw opening due to secondary trismus.<sup>7</sup> This trismus of the jaw occurs as an acute response in an attempt to prevent painful movement, but if prolonged, it can lead to chronic loss of jaw motion due to contracture development.<sup>8,9</sup> The standard treatment for traumatic myalgia is jaw rest, ice application, nonsteroidal anti-inflammatory drugs, NSAIDs, and frequent daily active mobilization of the jaw until normal range of motion is achieved.<sup>10</sup>

#### *Primary Myalgia Due to Stress and/or Parafunction*

Focal and regional myalgias are often associated with stress and/or parafunction. A diagnosis of primary myalgia due to oral parafunctions includes both waking and sleeping clenching and tooth grinding, as well as other oral habits.<sup>11,12</sup> With regard to stress, current research cannot determine if the chronic pain is influencing the psychologic factors or vice versa.<sup>13-15</sup> If these behaviors are persistent, then a behavioral modification approach to treatment is recommended, which include use of an occlusal appliance and avoidance training. Psychological-based treatments which address the patients etiology will be helpful, especially when the patient is medication-resistant or side effect intolerant.

#### *Secondary Myalgia Due to Active Local Pathology*

Sometimes focal and even regional myalgia can develop in response to a local painful pathologic process such as an acute pulpal pain or a painful arthritis or internal derangement of TM joint.<sup>16</sup> When the myogenous process is a secondary myalgia, it is logical and appropriate to manage or minimize the

local pathology first and then re-examine the myogenous pain for resolution or persistence.

#### *Myofascial Pain*

The term myofascial pain can be used for focal or regional muscle pain when specific criteria are satisfied. Myofascial pain was classified by the International Association for the Study of Pain Subcommittee on Taxonomy

myofascial pain is not associated with any histologically evident tissue damage or inflammation. Several authors in recent years have offered explanations for this referred pain phenomena.<sup>18-23</sup> Myofascial pain therapeutic methods includes stretching of the taut bands and direct stimulation of the trigger point via needling or injection of a local anesthetic.<sup>24</sup> Also, methods to reduce stress either behaviorally or pharmacologically are indicated.

#### *Fibromyalgia*

Fibromyalgia is a widespread chronic myalgia disorder with specific published criteria and it is less common with a prevalence of 2 percent in the community.<sup>25</sup> The American College of Rheumatology, ACR, has set forth criteria for the diagnosis of fibromyalgia.<sup>26</sup> These criteria include specific duration, location, and examination findings

that must be satisfied. The duration criteria specify that a history of widespread pain has to be present for at least three months. Moreover, for pain to be considered widespread, it must involve both sides of the body and be located above and below the waist. The location criteria states that the pain must involve the multiple areas of the axial skeleton including the cervical spine, anterior chest and thoracic spine or lower back regions. Finally, the examination findings criteria specify that a "painful" response must be elicited in 11 of 18 tender point sites on digital palpation. The ACR criteria specify the exact location of these tender point sites and they also specify that a manual finger palpation force of approximately 4 kg is to be used during the examination and the allowable responses to palpation are no pain, tender, and painful.

**With regard to stress, current research cannot determine if the chronic pain is influencing the psychologic factors or vice versa.**

as pain in any muscle with trigger points that are very painful to compression during palpation and cause referred pain.<sup>17</sup> The subjective (history-based) criteria that patients should endorse include spontaneous dull aching pain and localized tenderness in the involved muscle(s); stiffness in the involved body area; and easily induced fatigability with sustained function. The objective (examination-based) criteria are a hyperirritable spot within a palpably taut band of skeletal muscle or muscle fascia; upon sustained compression of this hyperirritable spot, the patient reports new or increased dull aching pain in a nearby site; decreased range of unassisted movement of the involved body area; and weakness without atrophy and no neurological deficit explaining this weakness.

Different from traumatic myalgia,

There is substantial evidence that fibromyalgia sufferers have central neuronal changes in their pain system.<sup>27-29</sup> In general, fibromyalgia is treated using multimodal approaches that simultaneously target the biological, psychological and environmental/social factors that maintain the pain.

### Chronic Myogenous Pains Mechanisms

The pathophysiologic mechanisms underlying various types of muscle pain have only recently become better understood, although many of the details remain controversial or unknown. At this time, it is reasonable to say that muscle pain could be grouped according to one of the following mechanisms: (1) local cellular and humoral inflammation, i.e., myositis; (2) accumulation of endogenous chemicals within the contractile elements of the muscle proper or within the soft tissues in and around the muscles; (3) altered neurogenic tissues within the muscle, e.g., sensitized muscle nociceptors; and (4) central sensitization and plasticity of the pain pathways from trigeminal nucleus or spinal cord to the cortex.

### Muscle Hyperactivity

For many years it was hypothesized that stress caused an elevated level of background waking, resting or background muscle hyperactivity in jaw muscles, and this in turn caused chronic human jaw or neck muscle pain.

This concept developed because many electromyographic data collected on patients with muscle pain compared to nonpain subjects showed that the former had elevated resting muscle activity in their painful muscles.<sup>30,31</sup> However, current data do not support the concept that stress causes elevated

nonfunctional muscle hyperactivity, which then causes muscle pain or even episodic tension-headache pain.<sup>32,33</sup>

### Muscle Hypoperfusion

The hypothesis that nontraumatic primary myogenous pain could be due to intramuscular hypoperfusion was recently reviewed in detail.<sup>34</sup>

Dynamic muscle blood flow in fibromyalgia has been studied by numerous

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researchers using different methods to monitor blood flow.<sup>35-37</sup> These studies have found there is a significantly reduced intramuscular perfusion in the focal myalgia subjects. These differences in vasodilative response in focal myalgia cases might be related to desensitization of beta-adrenergic receptors, which occurs with long-term exposure to stress-associated neurotransmitter epinephrine.<sup>38</sup> Overall, these studies suggest there are demonstrable changes in intramuscular perfusion of chronic regional myalgia involving the masseter and trapezius muscles. This hypoperfusion occurs in these subjects both during and after muscle activity.

### Muscle Pain Location

Non-traumatic primary myogenous pain occurs in roughly the same anatomic locations from patient to patient

in the masticatory and craniocervical systems. It was recently described that the slow time to peak motor units, which are presumably the slow twitch type 1 fibers, are clearly more sensitive to ischemia than the "fast" time to peak group.<sup>39</sup> What would explain why postural muscles, which have a much higher proportion of slow twitch (type 1 fibers), are much more likely to exhibit diminished perfusion and show ischemic injury sites.<sup>40-42</sup> Studies have shown that pH values of 6 or lower can be reached during ischemia and sustained contractions or exhaustive exercise.<sup>43,44</sup>

### Muscle Nociceptor Sensitization

Considering what is now known about muscle pain mechanisms, specifically about jaw muscle activity, intramuscular blood flow and the effect of prolonged stress on masticatory muscle blood flow, the following hypothesis can be suggested: Prolonged stress may be causing local intramuscular hypoperfusion, which seems to selectively target muscles with higher proportions of type 1 (slow twitch) fibers that are involved in postural maintenance. Secondly, this focal hypoperfusion induces an ischemic condition and local muscle pain. Thirdly, once the pain develops to a sufficient level in the muscle or fascial tissues, this causes a reactive muscle activation (taut bands and even whole muscle splinting or trismus), which is most evident when the patient actually attempts to function. Fourthly, depending on the type and amount of algescic chemical released, the focal muscle pain can produce a peripheral nociceptor sensitization and even a more central pain pathway sensitization. Lastly, when this occurs, myo-



facial pain trigger points are likely to develop and some susceptible patients will develop more widespread pain.

### Chronic Myogenous Pains Treatment

#### *Self-directed Treatments*

Self-directed means nonmedical office-based treatments and include nutrition (e.g., herbs, nutritional supplements); relaxation-meditation techniques (e.g., yoga, relaxation exercises, breathing techniques, aromatherapy); daily exercise (e.g., gentle aerobic exercise and stretching); avoidance of stimulants (e.g., caffeine, sugar, and alcohol); participation in a local support group; and thermal therapy for pain relief.<sup>45,46</sup>

#### *Physical Medicine Treatments*

Physical medicine treatments include manual physical therapy procedures including therapeutic massage, myofascial release therapy and acupressure; local trigger point injections therapy; botulinum toxin injections; acupuncture therapy; and other forms of manual therapy as osteopathic or chiropractic manipulation.

A review on trigger-point therapy does offer an endorsement of this method, but it suggests that dry-needling is a viable therapy and injecting a local anesthetic or corticosteroid solution into the trigger point was not needed for improved efficacy.<sup>24</sup> Moreover, they suggested the needling effect may not be more than a powerful placebo treatment.

Botulinum toxin was examined in a randomized double-blind study.<sup>47</sup> They were not able to demonstrate statistically significant improvement between the group receiving normal saline and the other two groups receiving either 50

or 100 units of botulinum toxin injections, and it cannot be endorsed as evidence-supported treatment for trigger points based on current research.

One systematic review on acupuncture that focused on fibromyalgia endorses acupuncture as better than sham acupuncture.<sup>48</sup> However, a review on acupuncture for management of acute and chronic low back pain examined 11 clinical trials but stated that

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only two were of high quality.<sup>49</sup> It also concluded that the available studies were not of sufficient methodological quality to offer an endorsement.

#### *Pharmacologic-based Treatments*

Pharmacologic-based treatments include: nonsteroidal anti-inflammatory drugs; opioid pain medications; antidepressants medications (e.g., tricyclic antidepressants and selective serotonin reuptake inhibitors); benzodiazepines and other muscle relaxants; and sleep modifying medications. Deciding which medication and how much to use is difficult especially since many of the medications suggested are being used off FDA label, which means being used in a way not approved by the FDA.

Medications with enough literature where systematic review have been performed are the topical pain medica-

tions, muscle relaxants, and antidepressants. Of these, none demonstrate high efficacy and most of the reviews were based on chronic nonspecific musculoskeletal pain disorders, not masticatory specific myalgia, but all show some promise.<sup>50-53</sup>

A systematic review of topical medications contained NSAIDs for chronic muscle pain concluded they were effective and safe in treating chronic musculoskeletal conditions for two weeks.<sup>50</sup> A review on topical capsaicin for the treatment of chronic musculoskeletal and/or neuropathic pain concluded it was not shown to be an effective stand-alone topical treatment.<sup>51</sup>

A systematic review of muscle relaxants for myofascial face pain concluded that the use of muscle relaxants in patients with myofascial pain involving masticatory muscles seems to be justified but that current research can only be judged as weak, and consideration must be made of the risk-benefit ratio of these medications.<sup>52</sup>

A systematic review on the use of various antidepressants for fibromyalgia endorsed the use of antidepressants as having enough evidence to support their use in fibromyalgia.<sup>53</sup>

#### *Behavioral Treatments*

Behavioral treatments include various forms of therapy with a psychologist with the most common being cognitive behavioral therapy. Sometimes these methods are a component of a combined multidisciplinary program and sometimes they are stand-alone treatments.

A systematic review of behavioral therapy for both fibromyalgia and for chronic musculoskeletal pain suggest stand-alone behavioral therapy is not a powerful treatment and in fact, exercise

therapy was equal or better in efficacy.<sup>54</sup> The use of a multidisciplinary approach for fibromyalgia was reviewed and found not to be highly efficacious either.<sup>55</sup> A third review in this area concluded that nonpharmacologic treatments (mostly behavioral in nature) were better than pharmacologic treatment when compared directly.<sup>56</sup>

### Conclusion

Deciding which treatment is appropriate for chronic myogenous pain of the masticatory system begins with having a correct diagnosis. To do this, it is necessary to understand the etiology and the mechanism underlying the pain. If the correct etiology-mechanism-based diagnosis were available, then the appropriate treatment choice should logically follow.

### Treatment Recommendations Summary

■ Traumatic onset local myalgia with secondary trismus: jaw rest, ice application, NSAIDs and frequent daily active mobilization of the jaw until normal motion is achieved.

■ Local myalgia secondary to self-reported parafunctions: use of an occlusal appliance and avoidance training seems indicated.

■ Secondary local or regional myalgia: manage or minimize the local pathology first and then re-examine the myogenous pain for resolution or persistence.

■ All forms of nontraumatic chronic myogenous pain:

- Aerobic exercise will be beneficial and this exercise program could be supervised or self-directed, but a daily activity is recommended.
- Whole body thermal therapy (i.e., spa therapy or even hot baths daily)

should be considered in those who can tolerate the heat without other medical consequences. Thermal therapy may also involve local hot packs applied to the local or regional areas, but less evidence is available on this version of thermal therapy.

**If the correct etiology-mechanism-based diagnosis were available, then the appropriate treatment choice should logically follow.**

- Low-dose tricyclic antidepressants may be helpful as an adjunctive pain medication and to improve sleep.
- Muscle relaxants such as cyclobenzaprine and various benzodiazepines appear logical for acute myogenous pain, but long-term effects of these treatments in chronic myogenous pain are questionable.
- Myofascial pain: the use of injections with a local anesthetic or dry-needling of the most hyperirritable spots appears better than no treatment, but may not be better than a credible placebo.
- Chronic myogenous pain that is associated with anxiety and/or depression: psychological-based treatments which address the patients etiology will be helpful, especially when the patient is medication-resistant or side effect intolerant. ■■■■

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