

Differential Diagnosis of Temporomandibular Disorders (TMD) and Orofacial Pain: Guidelines for the Clinicians

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Abstract

Orofacial pain, including temporomandibular disorders, is a chronic problem that could affect the quality of sufferer's life and cause physical, psychological, and social consequences. Dentists are often confronted with this problem in their daily practice, however, they are not equipped with sufficient knowledge and guidelines to properly diagnose and manage their patients. This paper tries to provide the dental practitioner with the elementary information about pain in general and orofacial pain in particular to help them better understand orofacial pain in clinical set-up. Differential diagnosis of most common intra-oral and extra-oral orofacial pain conditions are tabulated in a simple way to allow the practitioner to generate a diagnostic decision in a straightforward manner and deal with these problems in a more efficient clinical approach.

Keywords: *Differential Diagnosis; Orofacial Pain; Temporomandibular Disorders; TMD; Jaw Movement*

Definition and quality of pain

Pain is the primary cause for patients to seek medical advice. It is defined as "an unpleasant sensory or emotional experience associated with actual or potential tissue damage or described in terms of such damage" [1].

Pain could be acute or chronic. Acute pain is a direct reaction to tissue damage caused by a sudden and unexpected factor (e.g. burn, cold or trauma) and it is considered to be a protective process to prevent further damage [2,3]. Acute pain is usually sharp and subsides rapidly, but if it persists for several days or weeks, depending on the damaged tissue healing period, it becomes persistent or chronic [4].

Chronic pain has been defined from a temporal perspective. It was considered as pain that persists after the normal period of tissue healing [5], or any pain than persists for 3 - 6 months or more [6]. More recently it was defined as pain that persists daily for three months or more in the last six months [7,8]. Unlike acute pain, chronic pain does not have this warning component against tissue damage and due to the sensitisation process, chronic pain may occur without any tissue damage [9].

Types of pain

Several distinct types of pain exist; it could be inflammatory, neuropathic, functional, nociceptive, visceral, muscular or other) [10]. Verbal description of pain is a useful tool that helps diagnosis in many pain conditions. However, and because of its affective component

and its subjective nature [11], pain language becomes diffuse and distinction between different qualities of pain is difficult for the patient to express and for the practitioner to understand and diagnosis becomes less precise [12,13].

Whenever and wherever there is a mechanical, thermal or chemical tissue-damaging stimulus, pain is signalled by specialized central neural pathways carrying information about stimulus quality, intensity and location from different peripheral nociceptors [14]. Many times the site of pain does not coincide with the site of pathophysiology [5] and this is termed as “referred pain”. Pain could occur in both areas at the same time, or just in either area. Pain that is referred to multiple areas is termed “radiating pain” [15].

Chronic orofacial pain

Orofacial pain, which includes painful TMDs, is any pain associated with intraoral and extraoral anatomical structures, including the teeth, palate, tongue, TMJ, face, head and neck. The term orofacial pain encompasses a wide range of vascular, muscular, neurological and psychological conditions, including common headaches, serious neoplastic conditions and advanced immunodeficiency disorders [16]. Studies show that the mouth and face are some of the most common areas that patients report pain [17,18], with 81.4% of myofascial pain sufferers reporting pain in the head and face [19].

Chronic TMDs

TMDs are the most common conditions that cause non-odontogenic orofacial pain [20]. It could affect normal jaw function [21] including speech, mastication and swallowing, possibly resulting in severe nutritional deficiencies; in addition to loss of income and impaired family and social activities [9].

Traditionally, chronic TMD pain was associated with parafunctional activity of masticatory muscles [22,23]. TMD patients reporting sleep bruxism often report pain in the early morning and non-voluntary parafunctional movement of jaw muscles during sleep may be the cause of this pain [24].

Mechanism of TMD related orofacial pain

In TMD conditions, both TMJ and muscle pain are common symptoms. Pain could be originating from the TMJ itself, or from other surrounding tissues and masticatory muscles. Thus, pain complaints among TMD patients vary in type according to the origin of their pain. The pain could coexist in both structures, could be radiating from the joint to the muscles, or could be referred from one structure to the other [10].

Muscle pain occurs in 75 - 90% of TMD patients [25]. It can be caused by activation of muscle nociceptors induced by direct trauma, inflammation or ischemia. The release of algogenic substances like bradykinin, prostaglandin and serotonin from the terminals of thin afferent fibres in the muscle cause sensitisation and activation of adjacent nociceptors responsible for pain [26]. However, pain referral to jaw muscles can occur because afferents from other trigeminal divisions and other cranial (e.g. facial, glossopharyngeal and hypoglossal) and upper cervical nerves, converge on the trigeminal brainstem sensory nuclear complex (VBSNC) [9,27]. This convergence is considered to be an integral mechanism underlying hyperalgesia, poor localisation, and referred pain that are all common in the orofacial area [9,26,28].

Myalgia has been reported as the most common muscle pain and described as dull aching and continuous pain that increases with palpation or muscle function [29,30]. Myofascial pain is defined by the presence of trigger points and spread or migration of pain on palpation [29]. Trigger points are described as sites of focal tenderness in a palpable taut band of muscle fibres that can produce pain on mechanical stimulus [10]. Parafunctional habits, such as bruxism and clenching, were suggested to be a possible cause for myofascial pain and/or arthralgia [29-31].

Similar neurophysiological mechanisms can occur in the temporomandibular joint as in the muscles as outlined above. Forces that overload the joint complex can disturb the normal relationship of the condyle, disc and eminence and can have destructive effects on the TMJ through excessive overloading [32]. The most common painful joint diagnosis is arthralgia. Disc displacements are common but usually not associated with pain [33]. Pain could arise due to stimulation of numerous nociceptors that exist in the posterior attachment of the TMJ from strain of discal attachments; from associated macro trauma such as blow to the chin or face; from associated micro trauma, which involves a source of low grade trauma to the TMJ over a long period of time such as prolonged opening, and/or compression; and due to the mechanical friction between the bony articular surfaces because of displacement of the disc that separates them [32].

Another possible cause of TMJ pain is disc deformation. Fibres in the intermediate thin zone are mainly collagenous with very few elastic fibres [34]. This means that this area, which is most heavily loaded during joint function, is more resistant to deformation due to traumatic compression of the disc resulting from some TMJ anomaly or pathophysiology. This would shift the disc deformation to more elastic and less resistant anterior and posterior areas [35] and that could cause increase compression to the highly innervated peripheral areas and produce significant joint pain and dysfunction. Finally, posterior displacement of the condyle may be a possible cause of TMJ pain by compressing the highly innervated tissue of the posterior attachment [33].

Orofacial pain and jaw movement

Several theories tried to demonstrate the relation between pain and jaw movement in patients with TMD. The Vicious Cycle Theory (VCT) described first by Laskin (1969) suggested that pain could cause muscle hyperactivity in a way that a sore muscle caused by prolonged contraction could cause muscle pain which in turn would excite the nociceptors inside the muscle, and this would lead to more muscle contraction, more pain and a continuation of the vicious cycle (for review see Mense and Simons 2001 [36]). In contrast the Pain Adaptation Model (PAM), proposed by Lund, *et al.* [37] suggested that pain would lead to decreased activation of the muscle responsible for producing movement. This will reduce speed and the detrimental effect of movement on an injured part and consequently promote healing.

In 2006 the author proposed the Hybrid Model, another theory that could explain the relation between pain and movement. This model suggested that both the PAM and the VCT are valid, applicable and work in conjunction in chronic orofacial pain patients, and that the pattern of muscle function, increase or decrease, depends on the origin of pain, whether from the muscle or from the temporomandibular joint (For review see Salame 2014) [38].

Differential diagnosis of TMD related pain and other orofacial pain conditions

There are 4 main classification and diagnostic schemes of chronic orofacial pain represented by the Diagnostic Criteria for Temporomandibular Disorders DC/TMD [39], the International Association for the Study of Pain [1] the International Classification of Headache Disorders second edition (ICHD-II) [40] and the American Academy of Orofacial Pain (AAOP) [16]. The focus of these classification systems includes a wide range of orofacial pain complaints such as musculoskeletal, neuropathic, neurovascular, odontogenic, non-odontogenic and other pain conditions.

To make things easier for the dental practitioner, the differential diagnosis of most common orofacial pain conditions, based on these classification schemes were summarised and presented in the following table 1-5.

	Quality Intensity Location	Onset Duration Exacerbation	Possible Related Symptoms	Differential Diagnosis
Disc Displacement with Reduction	Possible localized joint pain	Precipitated by joint movement	Reproducible joint noise	- Anatomic variation - Osteoarthritis
Acute Disc Displacement without Reduction	Possible localized joint pain	- Precipitated by forced mouth opening - Pain with palpation of the affected joint	- Persisted marked limited mouth opening with history of sudden onset - Deflection to the affected side on mouth opening	- Acute Synovitis/Capsulitis - Acute myospasm

Chronic Disc Displacement without Reduction	Possible pain as feeling of stiffness	Reduced from acute stage	History of sudden onset of limited mouth opening	<ul style="list-style-type: none"> - Osteoarthritis - Polyarthriris - Fibrotic Ankylosis - Neoplasia
TMJ dislocation	Possible TMJ pain	<ul style="list-style-type: none"> - At time of dislocation - Mild residual pain after the episode 	<ul style="list-style-type: none"> - Difficulty closing the mouth 	<ul style="list-style-type: none"> - Fracture
Synovitis and Capsulitis (inflammatory disorders)	Localised joint pain	<ul style="list-style-type: none"> - Mandibular function - Point tenderness on TMJ palpation 	<ul style="list-style-type: none"> - Limited range of motion - Pain at rest - Bilateral TMJ and multiple other joints involvement - Crepitus with condylar translation 	<ul style="list-style-type: none"> - Arthritis - Neoplasia
Osteoarthritis (Non-inflammatory disorder)	Localised joint pain	<ul style="list-style-type: none"> - Function - Point tenderness on palpation 	<ul style="list-style-type: none"> - Limited range of motion - Deviation to the affected side - Crepitus or multiple joint noise 	<ul style="list-style-type: none"> - Inflammation - Polyarthriris - Neoplasia

Table 1: Differential diagnosis of the most common aspects of temporomandibular joint articular disorders, based on the characteristic of pain and related symptoms.

	Quality Intensity Location	Onset Duration Exacerbation	Possible related symptoms	Differential Diagnosis
Myofascial pain	<ul style="list-style-type: none"> - Regional dull aching pain, reduced by vapocoolant and anesthetic injection 	<ul style="list-style-type: none"> - Function when the muscles are involved - Palpation of Trigger points 	<ul style="list-style-type: none"> - Sensation of muscle stiffness - Sensation of acute malocclusion not verified clinically - Ear symptoms, Tinnitus, Vertigo - Toothache - Tension-type headache - Decreased mouth opening - Hyperalgesia in the region of the referred pain 	<ul style="list-style-type: none"> - Osteoarthritis - Myositis - Neoplasia - Fibromyalgia

Myositis	<ul style="list-style-type: none"> - Pain in localised muscle area - Diffuse tenderness over the entire muscle 	<ul style="list-style-type: none"> - Following injury or infection - Continuous - Increased with mandibular movement (when muscles involved) 	Moderate to severe limited range of motion due to pain and swelling	<ul style="list-style-type: none"> - Local myalgia - Myofascial pain
Myospasm	Acute muscular pain	<ul style="list-style-type: none"> - Sudden onset - At rest as well with function 	<ul style="list-style-type: none"> - Continuous involuntary muscle contraction - Markedly reduced range of motion - Significant limitation in jaw function - Acute malocclusion 	<ul style="list-style-type: none"> - Myositis - Local myalgia
Myofibrotic contracture	Little or no pain	Exacerbated by forced lengthening of the involved muscle	<ul style="list-style-type: none"> - Limited range of motion - History of trauma, infection or long history of disuse 	<ul style="list-style-type: none"> - TMJ ankylosis - Coronoid hypertrophy
Protective muscle splinting	Severe pain	Function	Marked limited range of motion	

Table 2: Differential diagnosis of most common masticatory muscles disorders based on pain characteristic and related symptoms.

	Quality Intensity Location	Onset Duration Exacerbation	Age Gender	Related symptoms
Migraine without Aura	<ul style="list-style-type: none"> - Pulsating - Moderate to severe - Unilateral 	<ul style="list-style-type: none"> - Attacks 4-72 hs - Aggravation by routine physical activity 		<ul style="list-style-type: none"> - Nausea - Photophobia - Phonophobia
Migraine with Aura	<ul style="list-style-type: none"> - Neurological symptoms unequivocally localisable to cerebral cortex or brain stem (Aura) - Possible headache 	<ul style="list-style-type: none"> - Gradually developed over 5mn-20mn - Attacks < 60mn - Headache 4-72 hs 	<ul style="list-style-type: none"> - 20 yo-30 yo: 30% F/ 16% M - 30 yo- 40 yo: 26% F/ 16% M - 40 yo- 50 yo: 17% F/ 13% M 	Headache, nausea and/or photophobia follows the Aura (directly or <1h after)

Cluster headache	<ul style="list-style-type: none"> - Severe pain - Strictly unilateral - Orbitally, Supra-orbitally, and/or Temporally - 10% have chronic symptoms 	<ul style="list-style-type: none"> - Attacks: once every other day- 8/day (15 - 180 mns) - Attacks in series lasting for weeks or months - Separating remission periods of months or years 	5-6 times more frequent in men	<ul style="list-style-type: none"> - Conjunctival congestion - Lacrimation - Nasal congestion - Rhinorrhoea - Forehead and facial sweating - Miosis - Ptosis - Eyelid oedema
Chronic Paroxysmal Hemicrania	<ul style="list-style-type: none"> - Severe pain - Strictly unilateral - Orbitally, Supra-orbitally, and/or Temporally 	Similar to Cluster Headache but: <ul style="list-style-type: none"> - Shorter attacks (5-20mns) - More frequent (15/24hs) - Absolute effectiveness of Indomethacin 	Mostly females	<ul style="list-style-type: none"> - Autonomic dysfunction similar but not identical to cluster headache
Tension-type Headache	<ul style="list-style-type: none"> - Dull, non-pulsing - Tightness, pressure, soreness - Moderate - Occipital, Parietal, Temporal, Frontal - 90% Bilateral - If Chronic, severe pain 	<ul style="list-style-type: none"> - Episodic: 30mn-72hs (Avg 12hs) - If Chronic: 15 days a month 	Onset: 20yo-40yo	<ul style="list-style-type: none"> - Nausea and vomiting in chronic phase

Table 3: Differential diagnosis of most common primary headaches (neurovascular and tension-type) based on the pain characteristic and related symptoms.

	Quality Intensity Location	Onset Duration Exacerbation	Gender Age	Related symptoms
Trigeminal Neuralgia (Tic Douloureux)	<ul style="list-style-type: none"> - Brief, shock-like - Lacinating pain - Severe - Unilateral in face - 2nd /3rd division Trigeminal nerve 	<ul style="list-style-type: none"> - Precipitated without or by non-painful stimuli - Short-lived attacks(<seconds) 	<ul style="list-style-type: none"> - 50 yo - 107.5 males/million - 200.2 females/million 	<ul style="list-style-type: none"> - Sometimes: Lasting burning sensation

Glosso-Pharyngeal Neuralgia	<ul style="list-style-type: none"> - Severe, transient, stabbing/ burning - Ear, base of tongue, tonsillar fossa, beneath angle of mandible - Unilateral 	<ul style="list-style-type: none"> - Paroxysm (seconds-2mns) - Provoked by: Swallowing, Chewing, Talking, Yawning 		<ul style="list-style-type: none"> - Normal Neurologic Examination
Occipital Neuralgia	Paroxysms of jabbing pain/ distribution of greater or lesser occipital nerves	Occasional persistence of aching between attacks		<ul style="list-style-type: none"> - Possible reduction of sensation (Dysesthesia) - The affected nerve is tender to palpate.
Anesthesia Dolorosa	<ul style="list-style-type: none"> - Painful area of anesthesia or dysesthesia/ trigeminal nerve distribution 	<ul style="list-style-type: none"> - After Trigeminal nerve damage (Neurosurgical lesion) 		<ul style="list-style-type: none"> - Decreased sensibility to pain and temperature
Atypical Facial pain	<ul style="list-style-type: none"> - Deep, Pulling, Aching - Constant - Poorly localised - Unilateral 	<ul style="list-style-type: none"> - Spontaneous - After operation or injury - Daily, Continuous 	Much higher in Women	<ul style="list-style-type: none"> - No physical abnormalities of the jaw, face, nervous system - Depression/ Anxiety
Atypical Odontalgia	<ul style="list-style-type: none"> - Dull, Aching, Persistent - Increased and Decreased (Not resolved) - Easily located (Maxillary premolars/molars) 	<ul style="list-style-type: none"> - Months/years w/o change in clinical characteristics - Local provocation does not alter pain 	<ul style="list-style-type: none"> - More Women - 40yo-50yo 	<ul style="list-style-type: none"> - No local pathologic conditions
Herpes Zoster	<ul style="list-style-type: none"> - Pain/ Trigeminal distribution - 80% Ophthalmic division - Facial nerve 	<ul style="list-style-type: none"> - Herpetic eruption (within one week of onset) 		<ul style="list-style-type: none"> - Inflammation, necrosis, haemorrhage in the Ganglion
Post-Herpetic Neuralgia	Burning w/ Hyperalgesia and allodinia	<ul style="list-style-type: none"> - Produced by light touch - Possible: brief stabbing exacerbation 	<ul style="list-style-type: none"> - 60% > 60yo 	<ul style="list-style-type: none"> - Acute herpetic eruption (within weeks) - Anaesthetic scares

Table 4: Differential diagnosis of most common head and face centrally caused pain based on pain characteristic and related symptoms.

	Quality Intensity Location	Onset Duration Exacerbation	Gender Age	Related symptoms
Odontalgia I: Denti-no-enamel defects	<ul style="list-style-type: none"> - Bright to dull pain - Mild to moderate 	<ul style="list-style-type: none"> - Evoked: Heat, cold, mechanical - Intermittent - < seconds 	<ul style="list-style-type: none"> - No difference - Any age - Extremely common 	<ul style="list-style-type: none"> - Dental caries - Fracture - Crack - Lost restoration
Odontalgia II: Pulpitis	<ul style="list-style-type: none"> - Sharp, dull, throbbing - Severe 	<ul style="list-style-type: none"> - Evoked (Heat and cold) or spontaneous - Daily - mns-hrs 	<ul style="list-style-type: none"> - No difference - Any age - Very common 	<ul style="list-style-type: none"> - Deep dental caries - Fracture - Lost restoration
Odontalgia III: Periodontitis and abcess	<ul style="list-style-type: none"> - Severe throbbing in teeth/ gingiva - Hypersensitivity to stimuli - Aching mild to intense - Well localised/ Wide spread 	<ul style="list-style-type: none"> - Hot and cold stimuli - Continuous - Precipitated by dental procedure 	<ul style="list-style-type: none"> - Female preponderance - Adults 	<ul style="list-style-type: none"> - Emotional problems - Possible: Hypotensive therapy, TMJ, oral dysesthesia, psychogenic pain
Atypical Odontalgia (tooth pain not associated w/ lesion)	<ul style="list-style-type: none"> - Dull, aching persistent - Well localised - Mostly molars 	<ul style="list-style-type: none"> - Months to years - Increase and decrease w/o provocation - Never resolves 	<ul style="list-style-type: none"> - Mostly females - 30yo-60yo 	<ul style="list-style-type: none"> - Repeated therapy fails to resolve pain
Glossodynia and sore mouth (Burning tongue/ Oral dysesthesia)	<ul style="list-style-type: none"> - Burning, tender, annoying, nagging, tiring, discomfoting - Tip/ lateral border of tongue, anterior hard palate, lips and alveolar mucosa - Bilateral 	<ul style="list-style-type: none"> - Constant - Increase from morning to evening - Increase w/ tension, fatigue, speaking, hot food - Decrease w/ sleeping, eating, cold, alcohol, topical anesthesia, distraction 	<ul style="list-style-type: none"> - Mainly women - Postmenopausal - > 50 ys 	<ul style="list-style-type: none"> - Dry Mouth (63 %) - Persistent disguising taste - Altered taste perception (35%) - Thirst (37%) - Depression/ Anxiety - Denture intolerance

Cracked tooth syndrome	<ul style="list-style-type: none"> - Sharp tooth pain - Moderate 	<ul style="list-style-type: none"> - Brief on biting or chewing - Few seconds - Percussion 	<ul style="list-style-type: none"> - No difference - After 30 yo - Fairly common 	<ul style="list-style-type: none"> - Possible visible crack - Manipulated cusp might move away
Dry socket	<ul style="list-style-type: none"> - Dull, may throb - Moderate - Face, jaw, mouth, upper neck 	<ul style="list-style-type: none"> - 2 days after extraction - W/o stimulation - Constant - Mechanically Exacerbated 	<ul style="list-style-type: none"> - No difference - Any age - Fairly common 	<ul style="list-style-type: none"> - Tender submandibular lymph nodes - Severe halitosis

Table 5: Differential diagnosis of most common intraoral pain disorders based on pain characteristics and related symptoms.

Conclusion

Due to the similarity between the signs and symptoms of different orofacial pain conditions, definitive diagnosis proved to be difficult and not always accurate. Proceeding to a treatment plan without precise diagnostic decision could be harmful to the patient, especially when irreversible measures are applied and/or substantial medication are required, such as anti-depressives and anti-epileptic drugs. The making of a differential diagnosis that takes in consideration more than one specific condition would be a must when dealing with orofacial pain and consequently alternative treatment plans must be considered.

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