Evaluation and management of orofacial pain

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ABSTRACT

Challenging to diagnose and manage, orofacial pain is a common and costly problem with a profound effect on quality of life. Delayed diagnosis and management can lead to prolonged patient suffering and disability. This article describes the background, assessment, differential diagnosis, management, and referral of patients with orofacial pain.

Keywords: orofacial pain, odontogenic, temporomandibular joint disorder, neuropathic pain, headache disorders, cervical neck pain

Learning objectives

- Explain the anatomical locations and pathophysiology for origins of orofacial pain.
- Describe the relevant history, physical examination, and diagnostic tests recommended for thoroughly assessing orofacial pain.
- Discuss causes of orofacial pain that carry high morbidity and mortality.
- Propose management strategies to treat multiple causes of orofacial pain.

Orofacial pain is a common complaint, with reported occurrence estimates of more than 39 million, or 22% of patients older than age 18 years in the United States.[1] Orofacial pain occurs in the area above the neck, in front of the ears, and below the orbitomeatal line, as well as in the oral cavity (**Figure 1**).[2,3] This type of pain also includes dental pain and temporomandibular joint (TMJ) disorders, making it widely prevalent with significant effect on daily life, including eating, drinking, and speaking.[4]

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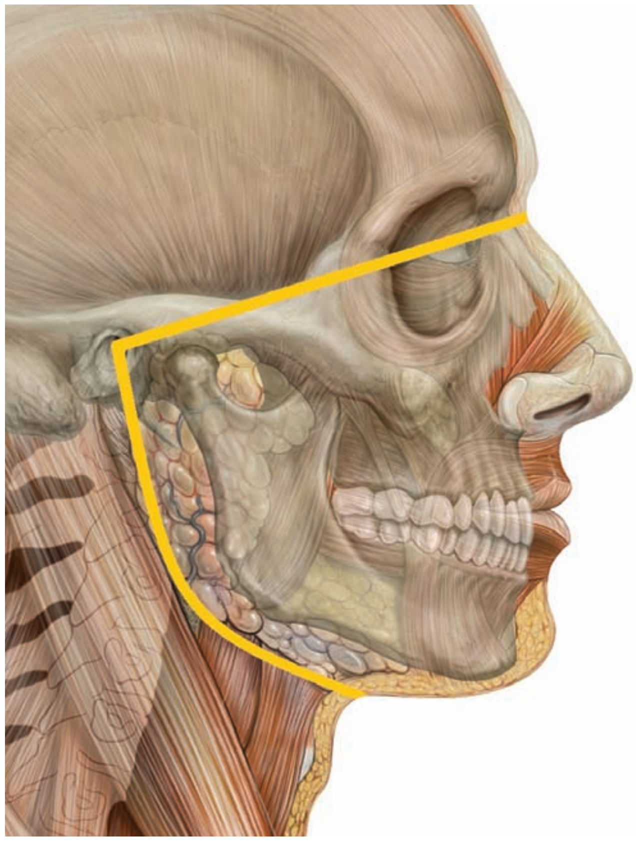

FIGURE 1. Area affected by orofacial pain

Risk factors for chronic orofacial pain include chronic widespread pain with increasing age, psychologic factors, and female sex.[5,6] Many orofacial conditions have overlapping presentations, leading to diagnostic uncertainty, significant morbidity, and high healthcare costs.[7] Recognition and understanding of orofacial pain using an evidence-based approach is important for proper evaluation and management, often beginning with a dentist or primary care provider, with referral to specialists as needed.

ANATOMY

The main sensory supply to the orofacial region is from the trigeminal nerve.[8] However, orofacial pain may originate from anatomical structures that are in the oral cavity or distant from it. Structures of the head and neck such as the

Key points

- Orofacial pain is challenging to diagnose and manage but is a common problem with a profound effect on patient quality of life.
- Risk factors for chronic orofacial pain include chronic widespread pain with increasing age, psychologic factors, and female sex.
- Many types of orofacial pain are neuropathic in nature and can be triggered by local trauma or systemic diseases.
- Providers must identify the site of pain and whether it coincides with the source of pain.
- Dental decay is a major cause of orofacial pain and common in children ages 6 to 19 years.

meninges, cornea, oral/nasal/sinus mucosa, teeth, musculature, salivary glands, and TMJ may be involved. The orofacial region is highly innervated with sensory fibers, and the sensory supply is from both spinal (C2 and C3) and cranial nerves (CNs III, V, VII, IX, and X), with the cranial nerves also providing motor and autonomic supply (**Table 1**).[2]

PAIN

Orofacial pain can be episodic or continuous. It can be somatic or neuropathic in nature. Somatic orofacial pain is triggered by inflammation or direct injury and may be accompanied by symptoms of hyperalgesia and allodynia.[9-11] Many types of orofacial pain are neuropathic in nature and can be triggered by local trauma or systemic diseases. Episodic neuropathic pain is characterized by short, electrical-type pain, or continuous pain with a burning sensation. The development of an "inflammatory soup" of bradykinin, histamine, prostaglandins, neurotrophins (nerve growth factors), and interleukins plays an important role in this process. These substances introduce peripheral vasodilation, increased vascular permeability, plasma extravasation, and migration of leukocytes to the injury site. Nerve growth factors encourage the release of neuropeptides, substance P, and calcitonin gene-related peptide.[12,13] Therapies may be directed toward these processes with the aim of management. A cure may not be attainable.

PATIENT ASSESSMENT

History taking is of utmost importance in the diagnostic process. Obtain the patient's comprehensive medical, dental, and psychosocial history. Patients with orofacial pain may describe the pain as burning, lancinating, sharp, dull, episodic, or unremitting. The patient may experience paresthesias, dysesthesias, hyperesthesia, allodynia, or atypical odontalgia such as phantom tooth pain (chronic pain with no identifiable cause in a tooth or site of tooth extraction).[14] Patients may complain of headache, tinnitus, vertigo, photophobia, phonophobia, distortion in the sense of taste, or bruxism.[15] Determine the site of origin and radiation of pain and, if possible, distinguish dental from nondental origins of pain.

TABLE 1. Branches and innervation of selected cranial and cervical nerves[2]

Nerve	Somatic and visceral sensation to the orofacial area
Cranial nerve V (trigeminal)	Skin of the face, forehead, and scalp as far as the top of the head; conjunctiva and bulb of the eye; oral and nasal mucosa; part of the external aspect of the tympanic membrane; teeth; anterior two-thirds of the tongue; masticatory muscles; temporomandibular joint; meninges of the anterior and middle cranial fossae
Cranial nerve VII (facial)	Skin of the hollow of the auricle of the external ear; small area of skin behind the ear
Cranial nerve IX (glossopharyngeal)	Mucosa of the pharynx; fauces; palatine tonsils; posterior third of the tongue; internal surface of the tympanic membrane; skin of the external ear
Cranial nerve X (vagus)	Skin at the back of the ear; posterior wall and floor of external auditory meatus; tympanic membrane; meninges of posterior cranial fossa; pharynx; larynx
Cervical nerve 2	Back of the head extending to the vertex; behind and above the ear; submandibular; anterior neck
Cervical nerve 3	Lateral and posterior neck

Often, patients with orofacial pain also have a significant level of psychologic distress and social dysfunction. Psychologic conditions may be present before pain onset or as a result of experiencing pain. Obtain a detailed social history including major life events, psychosocial stressors, and the patient's ability to participate in activities of daily living with existing pain. The patient may expect a pain cure although a cure may not be possible if the condition is chronic. However, recognizing psychologic comorbidities is essential for diagnosis and successful pain management. This requires a multidisciplinary team approach to support the patient's psychologic and physical needs.[16]

During the physical examination, focus on tenderness during palpation; trigger points of pain; changes in sensation; weakness; asymmetry; and examination of the head and neck muscles, TMJ, cervical spine, cranial nerves, ears, nose, throat, and mouth.[17]

Laboratory studies and imaging studies are helpful in some instances, particularly in differentiating local versus systemic causes of orofacial pain (**Table 2**).

DIAGNOSIS AND CLASSIFICATION

The complex relationship of physical and psychologic factors makes it difficult to correctly diagnose orofacial

pain. An incorrect or omitted diagnosis is one of the most frequent causes of inappropriate treatment or treatment failure. Providers must identify the site of pain and whether it coincides with the source of pain. When these coincide, as in the case of acute injury or infection, the diagnosis is more easily identified; when they do not, the diagnosis can be elusive.[2]

Early in the diagnostic process, rule out serious, life-threatening intracranial or extracranial disorders or diseases that may require immediate care (**Table 3**). Remember that many intracranial structures are insensitive to pain, so a diagnosis may rely on concomitant symptoms and signs. Extracranial pathologic signs correspond better to the location of the pain and a cause may be easier to determine (**Table 4**).[18,19]

ODONTOGENIC OROFACIAL PAIN

Dental decay is a major cause of swelling and orofacial pain, and is the most common chronic disease of children ages 6 to 11 years and adolescents ages 12 to 19 years.[20] Nine out of 10 adults in the United States have some degree of tooth-root decay.[21] Initially, dental decay is asymptomatic but once decay is beneath the enamel, patients may have pain when their teeth contact hot, cold, or sweet substances. Similar symptoms may result from gingival recession and periodontal disease. If decay progresses through the dentin and enters the pulp, inflammation and infection may occur, with symptoms of deep, throbbing pain on exposure to hot foods or drinks that are relieved with ice or cold water.[22] The cause of acute dental pain includes dental caries, irritation of the root surface, periodontal disease, dental abscess, cracked tooth syndrome, trauma, fracture, impaction, and eruption pain. Tooth decay, inflammation of dental pulp, periodontal infection, and abscess may lead to facial abscess and cellulitis. Prompt recognition and referral to a dentist is essential.

NONODONTOGENIC OROFACIAL PAIN

Dental symptoms may be referred from nondental structures. Referring structures may include aphthous ulcers, herpetic infection of the gums, and the oral mucosa. Orofacial pain also can be caused by pathology in the skin, sinuses, the TMJ, ears, and vasculature. Acute swelling of the parotid, submandibular, and sublingual salivary glands may be due to inflammation or obstruction of salivary flow. Salivary obstruction may be caused by dehydration, anticholinergic medications, or previous radiation therapy.[22] Ductal obstruction may lead to decreased salivary flow and consequent bacterial or viral infection.

Cancer Oral and pharyngeal cancers are among the most common cancers internationally, mainly due to the widespread use of tobacco and alcohol.[23] In the United States, cancers of the oral cavity account for nearly 2.3% of cancers and patients with metastatic disease have a relatively low 5-year survival rate.[24] The most common cause of cancer pain is local tumor invasion (primary or metastatic), involving inflammatory and neuropathic mechanisms.[25] Early signs include nonpainful lesions such as leukoplakia and erythroplakia. Lesions present for more than 2 weeks warrant a thorough investigation, as early detection and treatment can reduce deaths from disease.

TMJ disorders Problems involving the masticatory muscles, the TMJ, or both, and are the most prevalent orofacial pain conditions for which patients seek treatment.[26,27] The TMJ is complex and its components include bones, ligaments, synovial fluid, disk, capsule, and the muscles of mastication (temporalis, masseter, medial, and lateral pterygoid muscles).

TMJ disorders are considered the major causes of nonodontogenic orofacial pain, are more common in young and middle-aged adults, and are twice as common in women

TABLE 2. Assessing orofacial pain[17,48]

History
- Pain: characteristics, location, whether deep or superficial, onset, radiation and referral, intensity, duration, events surround the pain and associated features (lacrimation or other autonomic signs and symptoms), precipitating and provoking factors, aggravating factors, relieving factors, previous management strategies and response, patient's perceived cause of pain
- Medications
- Past medical history
- Oral health history
- Psychosocial history
- Review of systems

Physical examination
- Comprehensive examination of the head and neck. Inspect the skin and topographic anatomy, particularly the ears, nose, mouth, teeth, periodontium, and oropharynx. Note color, swelling, or orofacial asymmetry. Palpate the TMJ and masticatory muscles, noting temperature. Test for strength, provocation, and assess and measure range of mandibular movement. Palpate soft tissue including lymph nodes, cervical muscles, and assess cervical range of motion. Examine and palpate intraoral soft tissue.
- Test CNs V, VII, IX, and X for weakness and asymmetry.

Laboratory studies
- Complete blood cell count—look for anemia or infection
- Ferritin, vitamin B12, folate, and zinc levels—look for secondary causes of neuropathic pain
- A1C level—look for diabetes related to neuropathy
- Antibody screen to exclude connective tissue disorders
- Erythrocyte sedimentation rate or C-reactive protein level if an inflammatory condition such as giant cell arteritis is suspected

Imaging studies
- Plain dental radiographs to identify caries, infection, or bone loss

TABLE 3. Red flags: symptoms that may indicate serious disease[17,26,49]

Patient age	Signs and symptoms	Condition to consider
Over 50 years	Temporal area pain mimicking TMJ disorder, swollen tender artery, jaw claudication	Giant cell arteritis
	Progressive neuropathic pain	Primary or metastatic carcinoma
	New-onset head pain with increasing severity of nausea, vomiting, early morning occurrence with or without focal neurologic signs	Mass effect or increased intracranial pressure
Under 50 years	Trigeminal neuralgia	Multiple sclerosis
	Intermittent bilateral pain at the angle of the jaw	Cardiac ischemia
	Orofacial pain, facial paralysis, trigeminal neuralgia, tinnitus, hearing loss, or imbalance	Acoustic neuroma
	Focal neuropathy with pain or altered sensation	Tumor invasion of nerve
	Earache, trismus, altered sensation in mandibular branch distribution of cranial nerve V	Infratemporal fossa or acoustic nerve impingement

than men.[28-30] Pain typically is localized in the muscles of mastication and/or the preauricular area. Pain is described as dull, aching, and occasionally sharp aggravated by function such as chewing or yawning. Patients may show limited range of mandibular opening, deviation of the mandible on the affected side upon opening, and/or closing and TMJ sounds described as clicking, popping, or crepitus. TMJ disorders may be concurrent with headaches, muscle soreness, and other body pains.[31,32] As these are common findings in the general population, often pain-free, and not progressive, do not overmanage these patients in the absence of pain and/or impaired function.[33]

Causes of TMJ disorders include direct trauma (mandibular fracture), indirect trauma (acceleration or deceleration injury—whiplash), microtrauma (grinding and clenching), anatomical factors including severe skeletal malformations, and systemic pathophysiologic conditions such as arthritis and fibromyalgia.

The goals of patient management include decreasing pain, decreasing TMJ load, restoring function, and improving patient quality of life. A management program should be conservative and include patient education, diet modification (a soft diet instead of hard food), use of orthotic appliances (occlusal mouth guards), physical therapy, and prescription muscle relaxants.

Episodic neuropathic pain disorders *Trigeminal neuralgia* is a chronic paroxysmal pain condition resulting from segmental demyelination of trigeminal sensory fibers in the nerve root or brainstem.[34] Demyelination can be a result of vascular compression of CN V nonvascular compression of the cerebellopontine angle, or myelin loss due to multiple sclerosis.[27] The pain is described as severe, electric-like shocks, occurring unilaterally most often in the regions of the second and third divisions of CN V. When present, episodes of pain last seconds to minutes, with numerous episodes occurring daily; however, pain may remit for months at a time. The pain can be triggered by talking, eating, touching the face, and other sensory stimuli. Initial evaluation includes a complete neurologic examination that reveals no cranial nerve deficit, along with CT or MRI. Treatment options include medical therapy with anticonvulsants, the antispasmodic agent baclofen, or gabapentin. Surgical treatments include microvascular decompression, open trigeminal rhizotomy, and minimally invasive procedures such as percutaneous balloon compression, radiofrequency rhizotomy, glycerol rhizolysis, and radiosurgery.[27]

Promptly refer patients with neurologic signs and symptoms to a neurologist.

Glossopharyngeal neuralgia is a rare facial pain syndrome characterized by severe paroxysms of pain in the sensory distribution of the auricular and pharyngeal branches of the glossopharyngeal (CN IX) and vagus (CN X) nerves. The pain is unilateral, located at one side of the throat, ear, base of the tongue or beneath the angle of the jaw, and is of a deep, stabbing, agonizing quality.[35] Due to the overlap of symptoms with other cranial neuralgias, glossopharyngeal neuralgia often is misdiagnosed. Clinicians should rule out this syndrome, as it is associated with life-threatening cardiac dysrhythmias. First-line management is identical for trigeminal and glossopharyngeal neuralgias but surgical treatment differs.[36] Patients with either type of neuralgia should be referred to a neurologist or neurosurgeon for management.

Continuous neuropathic pain disorders *Atypical odontalgia* is pain in a tooth or surrounding area in the absence

of dentoalveolar disease, without the characteristics of cranial neuralgias, and with no known cause or mechanism. Frequently misdiagnosed, atypical odontalgia can lead to unnecessary treatments in an attempt to relieve pain. A patient presents with unilateral pain that may refer to other sites, occurs daily, and can be throbbing and burning in nature. The pain is not associated with sensory loss or other physical signs, and diagnostic findings are absent.[37] The diagnosis remains controversial, but a neurovascular mechanism may be at play. Patients may respond to tricyclic antidepressants, calcium channel blockers, and antiepileptics, as well as topical medications such as capsaicin and lidocaine.[27]

Burning mouth syndrome is an idiopathic condition characterized by a distinctive bilateral burning or tingling sensation in the lips, palate, gingiva, or tongue. This syndrome is associated with taste disturbance and xerostomia. Patients have a normal intraoral examination and no known pathology in the orofacial region. The syndrome is described as diurnal but frequently is accompanied by sleep disturbance. Pain may become more intense upon application of topical anesthetic. The condition is commonly seen in perimenopausal and postmenopausal women and may include insomnia and psychiatric disorders, such as depression and anxiety.[38] Burning mouth syndrome remains a puzzling condition and the pathophysiology is not understood. Therapy with low doses of anxiolytics, antidepressants, or anticonvulsants may be effective. Psychologic support also may be beneficial.[39]

Vascular and nonvascular cranial pain disorders Vascular and nonvascular cranial causes of orofacial pain are numerous and may lead to disability or death. Diagnosis can be difficult, as these disorders have no pathognomonic features. Identifying worrisome signs and symptoms and taking a careful history are essential.[26] The American Headache Society's mnemonic SNOOP can be used for screening and suggests the presence of a life-threatening disorder: **S**ystemic symptoms or disease, **N**eurologic signs or symptoms, sudden **O**nset, **O**nset after age 40 years, and **P**attern change.[40] Vascular disorders that may present with orofacial pain include ischemic cerebrovascular disease, intracranial hemorrhage, vascular malformations, arteritis, carotid or vertebral artery pain, and venous thrombosis. Nonvascular disorders include high or low cerebrospinal fluid pressure and intracranial inflammation, neoplasm, or infection.[26] Clinicians must pay close attention and facilitate a quick referral for patients with neurologic signs and symptoms.

Giant cell arteritis, also referred to as temporal arteritis, is the most common form of vasculitis. The cause is unknown. For the most part, giant cell arteritis presents in patients over age 50 years with moderate-to-severe headache, pain in one or both temporal or preauricular regions, polymyalgia, claudication of the masticatory muscles, and pain in the jaw and tongue. Superficial temporal arteries may be swollen and tender upon examination.[41] An elevated erythrocyte sedimentation rate, C-reactive protein level, and temporal artery biopsy may confirm the diagnosis. Prompt treatment with corticosteroids is important to prevent permanent visual loss or stroke.[42]

TABLE 4. Pain sensitivity of intracranial and extracranial structures[18,19]

	Sensitive	Insensitive
Intracranial	• Dura mater • Venous sinuses and their tributaries • Intracranial arteries (proximal portions) • Neural structures: • Trigeminal nerve (CN V) • Facial nerve (CN VII) • Glossopharyngeal nerve (CN IX) • Vagus nerve (CN X) • Upper cervical nerves	• Brain parenchyma • Pia mater • Arachnoid membrane • Ependyma • Choroid plexus
Extracranial	• Carotid, vertebral, and basilar arteries • Blood vessels in the scalp and skin • Skin • Mucosa • Muscles • Fascia • Synovium in the TMJ • Teeth • Periosteum	• Skull • Cervical vertebrae

Primary headache disorders Migraine and trigeminal autonomic cephalagias (cluster headache, chronic paroxysmal hemicranias, SUNCT, and hemicranias continua) can mimic odontogenic pain and musculoskeletal pain.

Facial migraine may follow the diagnostic criteria of migraine without an aura, and is a typical migraine headache localized to the face.[27,35] These unilateral headaches can be recurrent, and manifest in attacks lasting 4 to 72 hours. The pain is of pulsating quality, with moderate or severe intensity, aggravated by routine physical activity, and accompanied by at least by one of the following: nausea and/or vomiting, photophobia, and phonophobia.[35]

Cluster headache, most common in men, presents with attacks of severe, unilateral orbital, supraorbital, or temporal pain, or any combination of pain at these sites. Headaches last 15 to 180 minutes and frequency ranges from once every other day to eight times a day. The pain is associated with ipsilateral conjunctival injection, lacrimation, nasal congestion, rhinorrhea, forehead and facial sweating, miosis, ptosis, eyelid edema, restlessness, or agitation.[35]

Chronic paroxysmal hemicrania is more common in women, and is characterized by attacks of severe, strictly unilateral pain similar to the autonomic symptoms of cluster headache. These attacks present primarily with tooth pain that radiates to the maxillotemporal regions of the face, and are frequently relieved by indomethacin, thereby differentiating it from a cluster headache.[35,37] Treatment includes initial oral doses of at least 150 mg of indomethacin daily, up to 225 mg daily.[35]

Cervical spine disorders can contribute to orofacial pain and headaches.

Short-lasting, unilateral, neuralgiform headache with conjunctival injection and tearing (SUNCT)/short-lasting unilateral neuralgiform (SUNA) syndrome are headaches with cranial autonomic features are rare types of trigeminal autonomic cephalagias, and may be episodic or chronic.[35] Treatment has largely been based on case reports and series in the literature, and these syndromes are not responsive to treatments for cluster headache or paroxysmal hemicrania. Pharmacologic treatment with lamotrigine, topiramate, carbamazepine, or gabapentin has been used with some success. Botulinum toxin injections, nerve blocks, trigeminal decompression, deep brain stimulation, and greater occipital nerve stimulators have had varying success treating these syndromes.[43]

Hemicrania continua is a rare condition, more common in women, and characterized by continuous, fluctuating unilateral head pain present for more than 3 months. This type of headache has exacerbations of moderate or greater intensity, accompanied by a variable combination of autonomic features ipsilateral to the headache. A hallmark of this condition is the absolute positive response when treated with indomethacin with an initial oral dose of at least 150 mg daily and up to 225 mg daily as needed.[35,44] Successful treatment of the underlying primary headache disorder may afford relief of pain in the orofacial region and patients may benefit from evaluation and management by a headache specialist.

Cervical pain disorders Disorders of the cervical spine can contribute to orofacial pain and headaches due to biomechanical connection of head and neck structures.[17] Some conditions associated with orofacial pain referred from the cervical spine include sprain and strain of the cervical spine, cervical radiculopathy, cervicogenic headache, and occipital neuralgia.

Eagle syndrome This rare condition is characterized by recurrent pain in the oropharynx and face triggered by swallowing, yawning, or turning the head due to an elongated styloid process or calcified stylohyoid ligament. Obtain a complete history and perform a cervical spine examination that includes inspection, palpation, range of motion, symptom reproduction, and dynamic and static resistance tests of the head and neck. Follow with an appropriate referral for further management. Individualized management goals are reducing pain, restoring function, and preventing recurrence. Postural correction, therapeutic maneuvers, manual therapy, and pharmacologic management involving analgesics, anticonvulsants, antidepressants, steroids, muscle relaxants, or local injections of local anesthetics or botulinum toxin may be considered.[26]

Sleep disorders Patients' sleep can be significantly affected by orofacial pain and comorbidities.[45] The interrelationship between chronic pain and sleep is complex and may be overlooked by clinicians treating orofacial pain syndromes and sleep disorders separately.[38] Advise patients to follow a regular sleep-wake cycle, and optimize their sleep environment (a dark and quiet room with a moderate temperature and free of TVs and electronic devices).[46] Patients should avoid intense exercise, caffeinated beverages, smoking, and alcohol in the 3 to 6 hours before retiring. Encourage the use of cognitive behavioral treatments or medications to improve sleep quality and refer patients to a sleep laboratory for evaluation, as appropriate.[26]

OVERALL MANAGEMENT

Orofacial pain disorders arise from conditions involving the head, face, and neck, and may require multidisciplinary pain management along with pharmacologic and nonpharmacologic treatments.[47] Acute pain is often of dental origin and can be managed by dentists.[48] Less distinct or nondental pain requires a careful history and physical examination, which guides the next steps; diagnostic tests, refinement of diagnosis, management, and referrals to neurologists, orofacial pain specialists, psychologists, and specialized health providers. Orofacial pain is associated with high morbidity, negative social effects, and prohibitive healthcare costs if not accurately diagnosed and managed. **JAAPA**

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