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Aspects of Orofacial Pain

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Abstract: ***Orofacial pain, like pain elsewhere in the body, is usually the result of tissue damage and the activation of nociceptors, which transmit a noxious stimulus to the brain. However, due to the rich innervation of the head, face and oral structures, orofacial pain entities are often very complex and can be difficult to diagnose. Orofacial pain can be divided into odontogenic pain (diseased tooth is causing the discomfort) and nonodontogenic pain. Nonodontogenic pain is the tenderness that does not come from the tooth or its surrounding tissues. Ninety per cent of orofacial pain arises from the teeth and oral structures. The prevalence of orofacial pain was for pain on opening the mouth (21%-49%), muscle tenderness (17%-97%) and self-reported joint pain (5%-31%). After ruling out dental problems, musculoskeletal and neuropathic pain conditions are the most common causes of facial pain. Due to the diversity of manifestations and different mechanisms of pain transmission, the differential diagnosis is crucial for the establishment of a successful management strategy.***

Keywords: Orofacial Pain

1. Introduction

The facial area includes the region demarcated as below the orbitomeatal line, above the neck, and anterior to the ears. However, the craniofacial region has a high density of anatomic structures, and pain often radiates from one area to the other

The prevalence of orofacial pain (OFP) is around 17% to 26%, out of which 7% to 11% is chronic. Most patients, therefore, suffer acute pain that is in the most part secondary to dental or intraoral soft tissue pathology. Most orofacial pain (probably over 95%) arises from diseases of the teeth and is thus termed 'odontogenic' but the pain may be musculoskeletal, dental, neural, or sinogenic in origin. Musculoskeletal disorders affecting muscles of mastication and cervical muscles, various neurovascular disorders such as headaches, vascular pains, can mimic various other conditions with etiology from a host of other anatomic structures

Chronic OFP can be defined as pain in the face, mouth or jaws that has been present intermittently or continuously for 3 months or longer. It can be unilateral or bilateral and characterized by a persistence of pain combined with signs of "chronification", such as a strong association with psychosocial problems, frequent changes of physicians, and multiple further areas of pain.

Orofacial pain pain that occurs in the mouth, jaw, face, or head often poses several diagnostic challenges as it is often complicated by co-existing psychiatric, psychosocial, or other health disorders. A multidisciplinary treatment plan involving a dental surgeons, neurologists and pain specialists is advised

Nociceptive pain is due to tissue injury or inflammation commonly by infections and the pain quality will be dull and continuous.In neuropathic pain, the pain quality will be intermittent, burning or shooting in nature with altered taste/paraesthesia.

Care and emphasis should be placed on correct diagnosis and treatment rather than on symptomatic management.

Etiology of OFP

The most basic etiologic classification of orofacial pain is into the following 3 groups:

1) Primarily somatic, arising from musculoskeletal (e.g. TMD pain or periodontal pain) or visceral structures (e.g. pulpal pain or pain from the salivary glands), and transmitted via an intact pain transmission and modulation system.
2) Primarily neuropathic, which occurs as a result of abnormal or damaged pain pathways, e.g. a surgical or traumatic injury to a peripheral nerve.
3) Primarily psychological.

Alternate classification is as following:-

1) Odontogenic: Pulpitis, apical periodontitis
2) Mucosal: Ulcers, herpes simplex, lichen planus
3) Musculoskeletal: Myofascial pain. TM capsulitis/arthritis
4) Neuropathic; Dysfunction or lesion of nervous system.. Common etiology are trigeminal and glossopharyngeal neuralgia, postherpetic neuralgia, primary stomatodynia ("burning mouth"), atypical odontalgia (phantom toothache"), traumatic neuropathies and combinations of both**. (1)**

2. Diagnosis

In order to accurately diagnose these orofacial pains, it is necessary for the practitioner to take a thorough history, perform a comprehensive examination and adjunctive testing procedures when necessary.

The history should include recording the exact nature of the pain and other symptoms as well as the history leading up to the persistent pain, previous doctors seen, past treatments

and their results, and list of medications taken with their effectiveness and/or side effects.

Appropriate physical examination should consist of touching different areas of the head, neck and inside the mouth, measurements and evaluation of the jaw, head and neck, and gentle provocation of the pain. This can be with light touch, cold or heat or pressure.

Persistent pain should be evaluated by a neurologist or anesthesiologist specially trained in pain management or, in the case of the head and neck, by an orofacial pain specialist. A comprehensive evaluation may include assessment of gait, pronator drift, Romberg sign, reflex testing; Hoffman and Babinski signs, auscultation of heart and carotids, fundoscopic examination, cervical range of motion at the atlanto-axial and atlanto-occiptial joints, a musculoskeletal evaluation with careful detail to myofascial tenderness and trigger points, maneuvers that provoke radicular signs (Spurling test), cervical facet examination, and Waddell signs of nonorganic pain (tenderness to palpation, stimulation, distraction, regional disturbance in function, and overreaction).

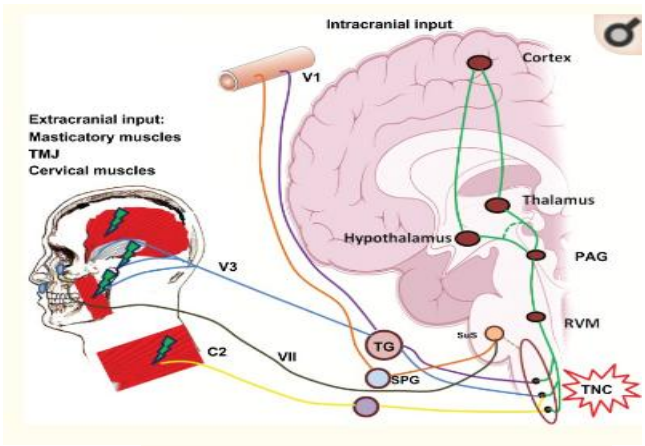

Figure 1: Nociceptive inputs arising from craniofacial structures

C2, C2 region of the cervical spinal cord; PAG, ventrolateral periaqueductal gray; RVM, rostral ventromedial medulla; SPG, sphenopalatine ganglion; SuS, superior salivatory nucleus; TG, trigeminal ganglion; TMJ, temporomandibular joint; TNC, trigeminal nucleus caudalis; VII, facial nerve; VI, ophthalmic branch of the trigeminal nerve; V3, mandibular branch of the trigeminal nerve.

After this, diagnostic tests could include magnetic resonance imaging (MRI), computer assisted tomography (CT) or other radiographs (X-rays). In addition bood tests, urinalysis, and other tests may be requested to make sure that there are no other factors that may be contributing to the neuropathic pain. To discern peripheral or central pain (or both), a series of diagnostic injections with a local anesthetic may be tried to gather important information to plan a more effective treatment. A battery of psychological tests may be appropriate, since anxiety and depression often accompany persistent pain.

Location and verification by using several simple procedures:

- Have patient identify the location of pain
- Have patient identify any incident that initiated the onset of the pain (e.g., accident, fall, biting on hard object)
- Visual inspection of the suspected tooth, teeth and hard or soft tissue
- Assess the area for swelling, fistula or presence of exudate
- Utilize light percussion – tap all teeth lightly with a small metal instrument near the painful site
- Have the patient apply biting pressure to individual teeth with a cotton tip applicator, toothpick
- Biopsy of lesion if any for histopathological examination (2)

Treatment of OFP

Adopt the 3 Step analgesic ladder recommended by the WHO.

Start with paracetamol only, add NSAIDS, then add weak opiate and lastly switch to strong opiate.

Analgesic Pharmacology

1) NSAIDS: Non steroidal anti inflammatory analgesics:

a) COX -2 antagonists are preferred over COX-1 antagonists as the latter have high adverse GI effects
- Celecoxib: 100-200 mg q12h
- Etoricoxib: 60 mg bid

b) COX-1 & 2 inhibitors:
- Ibuprofen: 200-400 mg tds
- Ketorolac: 10 mg tid or 30 mg i/m
- Meloxicam: 15 mg tds
- Diclofenac; 50-100 mg bid oral/suppository or 50-75 mg deep i/m

Contraindications: Renal disease, Liver disease, peptic ulcer pts, CAD pts

ADR; Nausea, vomiting, GI bleed, edema, tinnitus, ecchymosis, Steven Johnson syndrome. NSAIDs have a CEILING EFFECT i.e. No relief if dose is increased

2) Narcotics:

These are Mu receptor agonists for severe pain not responding to NSAIDs. They have dose dependent side effects-Give max tolerated dose, can scale up to 4 hrly dosing
- Codeine: 15-60 mg tid,
- Tramadol: 50-100 mg tid : Good for neuropathic pain also.
- Pethidine: 25-50 mg i/m, i/v, s/c
- Pentazocine (Fortwin) 15-30 mg i/m, i/v, s/c.
- Morphine: 7.5 mg i/m, i/v
- Fentanyl: 25-50 mcg i/v, i/m, s/c

Combinations: Paracetamol 500 mg + Codeine 30 mg, Paracetamol 500 mg + Propoxyphene 100mg 4-6 hrly, Ibuprofen 400 mg + Oxycodone 5 mg

3) Adjuvant Drugs

a) Anti convulsants

They reduce neuronal excitability and indicated for post herpetic neuralgias, diabetic neuropathy, trigeminal

neuralgia, traumatic neuropathy, fibromyalgia and stomatodynia.

- Carbamazepine: 200mg bid and scaled up to 600 mg bid.
  ADR; allergy, dizziness, blurred vision, ataxia, bone marrow depression, hyponataemia
- Oxcarbazepin: 300-600 mg bid
- Gabapentin: 300-1200 mg tid
  ADR; Allergy, tremor, nystagmus, ataxia, edema, rhinitis, excess sleep, edema
- Pregabalin: 100 mg bid increases to tid
- ADR:thrombocytopenia, weight gain, dizziness, ataxia, blurred vision, dry mouth

b) Anti depressants:

- Nortriptyline: 10-75 mg hs
- Amitriptyline: 10-100 mg hs
  ADR: Dry mouth, blurred vision, urine retention, restlessness, tremor, palpitations
- Clonazepam: 0.5-4.0 mg hs. Good for stomatodynia, generalized neuropathic pain
- Doxepin: 10-50 mg hs
  ADR; Rash, drowsiness, ataxia, dry mouth, hypotension, neutropenia

c) Muscle relaxants:

Centrally acting drugs indicated for myofacial pain states.

- Baclofen: 10-20 mg bid.
  ADR: Drowsiness, dry mouth, hypotension, rash, pruritus, headaches, fatigue
- Tizandine: 8 mg tid

d) Local anesthetics

- Lignocaine: 5% gel applied 4 hrly. 2% solution: rinse 10 ml 4-6hrly
- Benzocaine: 10% gel. Apply qid

e) Steroids and counterirritants

- Dexamethasone: 0.5 mg 6 hrly rinse
- Capsaicin: 0.025-0.075% cream tid
- Benadryl(diphenhydramine): 12.5 mg 4-6hrly rinse (3, 4, 5, 6)

3. Specific Conditions & Their Management

1) Myofascial pain

The most common form of musculoskeletal pain affecting the head, neck and face is myofascial pain, which is a regional pain disorder. The main characteristic of myofascial pain is the formation of myofascial trigger points (TPs). These are localized area of tender nodules in tight, palpable bands of muscle. Muscles affected by active myofascial trigger points have a reduced active range of motion. More important, when provoked, myofascial trigger points cause the referral of pain in reproducible patterns remote from the site of the trigger point. Pain intensifies with palpation of the trigger point. The area to which pain is referred is known as the zone of reference and is often distant from the involved muscle. Referred pain is not necessarily in the same dermatome. Despite this, the pattern of pain referral is reproducible, consistent and serves as a guide to locate the primary source of pain. A jump sign occurs with firm palpation of a trigger. This form of palpation can result in a spontaneous reaction, which includes a verbal response or report of pain from the patient and a reflex withdrawal of the patient's head. A twitch response is the rapid, contractile motor effect elicited by "snapping palpation". (7, 8, 9, 10)

2) Temporomandibular disorders (TMDs)

The term TMD refers to a group of disorders affecting the TM joint, masticatory muscles and associated structures. TMD affects up to 15% of adults, with a peak incidence at 20 to 40 years of age. TMD is classified as acute or chronic and also as intra-articular or extra-articular. Temporomandibular joint (TMJ) inflammation can also occur in patients with juvenile idiopathic arthritis (JIA) may interfere with optimal joint and muscle function. These disorders share the symptoms of pain, limitation of mouth opening and joint clicks or noises. Pain is localized to the temporal and ear region may be myalgic or myofascial in origin, from misalignment of the articular disc or due to degeneration. Some cases may be due to bruxism - involuntary, unconscious and excessive cracking and clenching of teeth that most often occurs at night during sleep.

Acute TMD pain is often of short duration, self limiting and related to prolonged jaw opening following dental treatment or trauma. Chronic TMD pain is that lasting for more than three months.

In temporomandibular disorders ask the patient, "Does it hurt to chew?" In addition to provocability, musculoskeletal pain is also graded. The more the injured joint or muscle is moved or loaded, the greater the pain or discomfort

Diagnosis is most often based on history and physical examination. Diagnostic imaging may be beneficial when malocclusion or intra-articular abnormalities are suspected

Management is usually conservative. Most patients improve with a combination of noninvasive therapies, including patient education, self-care, cognitive behavior therapy, pharmacotherapy, physical therapy, and occlusal devices. Nonsteroidal anti-inflammatory drugs and muscle relaxants are recommended initially, and benzodiazepines or antidepressants may be added for chronic cases. Referral to an oral and maxillofacial surgeon is indicated for refractory cases when stabilization splinting can be undertaken. (11, 12, 13, 14, 15, 16)

3) Trigeminal neuralgia (TN):

The trigeminal nerve is the main nerve that provides sensation to the face. The nerve divides into three branches on either side of the face and the pain of TN usually follows one or more of these branches. The cause of TN may be a compression of the trigeminal nerve by an artery or vein within the brain. Also, patients with tumors in the brain and with Multiple Sclerosis may suffer from TN-like pain.

The pain appears suddenly as a sharp, shooting, lightning-like pain lasting a few seconds. There may be a specific trigger area that, when touched, causes the pain to recur. Patients are often unable to shave, comb their hair, or touch

their face for fear of triggering the pain. Sometimes the pain is triggered by the slightest movement of the affected part of the face. The disorder is more common after age 50 but can occur at any age.

TN patients need to be carefully evaluated before starting therapy. Several other, less common neuralgias can also involve other nerves of the face.

The first line of treatment for TN is usually with "anti-seizure medications".
1st Line: Carbamazepine, oxycarbamazepine, Gabapentin
2nd Line; Baclofen, Valproate, Lamotrigine, Tigabine, Topirimate

Patients are started on a very low dose which is increased to the lowest effective dose. It can take several weeks before it can be determined if a particular drug is effective. Some of these medications require periodic monitoring of the blood to avoid undesirable side-effects. There are several different medications available so that inadequate responses or side-effects from one medication can be substituted with other drugs.

When medication is ineffective, surgery or blocks may be recommended. Surgery is generally performed by a neurosurgeon while blocks are performed by specially trained anesthesiologists under USG/CT guidance. Patients should exercise caution before undergoing these procedures because permanent numbness and continued pain can occur. Microvascular decompression (MVD), is designed to take the pressure off the trigeminal nerve by placing a small cushion between it and a blood vessel.

Balloon Compression, Glycerol Injection, and Radiofrequency Lesioning and Radiosurgery (Gamma Knife) can be the other options of treatment of TN. (17, 18, 19, 20, 21)

4) Glossopharyngeal neuralgia

This is a rare disorder that manifests as pain in the throat, which commonly occurs during chewing and swallowing. Pain (usually one-sided) may also occur in the pharynx, on back of the tongue and in the area of the ear. It is estimated that the incidence of glossopharyngeal neuralgia is 70-100 times lower than the incidence of trigeminal neuralgia.(22)

a) Sinusitis

One of the most common sources of orofacial pain are sinus disease of maxillary sinus (sinus located inside upper jaw) of the upper jaw and inflammation of the associated nasal mucosa which can be very sensitive and painful. Unfortunately, many of the upper teeth are unnecessary removed due to misdiagnosis, whereby sinusitis was misdiagnosed as toothache.

Symptoms of chronic sinusitis are bloating and pressure in the middle part of the face – in the upper jaw, the upper teeth and the area of the eye. The pain from sinusitis can be one-sided (unilateral) or both-sided (bilateral). This pain is not located in the area of only one upper tooth, but in the entire upper teeth region. When testing teeth show signs of vitality (pulp of upper teeth is not affected). The pain usually increases when lying down or when folding the body.

b) Phantom Tooth Pain

Some patients develop persistent tooth pain and go from dentist to dentist only to be told there is nothing wrong with their teeth. This pain often, but not always, follows a dental procedure such as a root canal or filling. Unfortunately, many patients undergo unnecessary root canal treatment, gum surgery, and even extraction in a vain attempt to treat their pain. The pain actually starts in the peripheral nerves and progresses to become a chronic pain state.

Injections of local anesthetics and steroids may be effective. Some patients find relief by applying specially prepared creams with various combinations of medications mixed in them. In patients where the pain is central rather that peripheral, oral medications may be needed on a daily basis. These often include antidepressants and anti-seizure medications and in some cases even narcotics.

c) Herpes Zoster

This is an acute viral infection caused by the varicella zoster virus characterized by sudden attacks of lancinating, dysesthetic pain in the area of the face covered with crops of vesicules on an erythematous base (dewdrops on a lotus). Lesions are typically unilateral and do not cross the midline of the body. The site is usually hyperesthetic, and pain may be severe. Lesions usually continue to form for about 3 to 5 days. The diagnosis is straightforward but, in some cases, it can mimic the characteristics of pain that occurs with toothaches of pulp origin. If the diagnosis is equivocal, detecting multinucleate giant cells with a Tzanck test can confirm infection. An acute attack of herpes zoster may be followed by ache from neuralgia along the course of the facial nerve. (23)

Treatment with oral antivirals decreases the severity and duration of the acute eruption and the rate of serious complications in immunocompromised patients; it may decrease the incidence of postherpetic neuralgia.

Treatment of herpes zoster should start as soon as possible, ideally during the prodrome, and is less likely to be effective if given > 72 hours after skin lesions appear, especially in the absence of newly forming lesions. Famciclovir 500 mg 3 times a day for 7 days and valacyclovir 1 g 3 times a day for 7 days have better bioavailability with oral dosing than acyclovir, and therefore for herpes zoster, they are generally preferred to oral acyclovir 800 mg 5 times a day for 7 to 10 days. Corticosteroids do not decrease the incidence of postherpetic neuralgia.

5) Chronic Regional Pain Syndromes (CRPS)

CRPS follows peripheral nerve damage and becomes neuropathic after involvement of the sympathetic nervous system. In addition to the pain, the patient often complains of a burning feeling triggered by light touch or other stimulation.

Treatment usually consists of antidepressants, pain medication, and medications used to control blood pressure.

Physical therapy and/or a series of injections at nerve intersections or ganglia are helpful, particularly in the early stages of the disorder.superficial heat (warm-wet), deep heat (ultrasound), cryotherapy (ice pack, vapocoolant spray) and electrotherapy (electrical stimulation (TENS). These modalities reduce muscle tension, decrease inflammation and inactivate myofascial trigger points. In complex and chronic cases, physical therapy alone may not be satisfactory, or when physical therapy is not effective or the intensity of the pain is too high, trigger point injections may be necessary. Done with either a dry needle technique or by infiltration with local anesthetic, myofascial trigger point injections can reduce pain, improve the mandibular range of motion, improve the tolerance to exercise and improve the microcirculation at the affected areas.

When all else fails, botox injections andsympathectomy is the treatment of choice. (24)

6) Primary Stomatodynia or Burning Mouth Syndrome
Burning sensation in the mouth, usually on the tip of the tongue and classified as a painful cranial neuropathy that occurs daily for at least two hours and lasting for more than three months.

The pain is usually moderate to severe and 50% also experience taste alterations and xerostomia. Incidence is 1% of the population, with women outnumbering men, and postmenopausal women particularly affected.

It is a "diagnosis of exclusion, " diagnosed after all other possible conditions have been eliminated. The pain is not immediately visible, which often causes practitioners to dismiss the syndrome. While originally considered a painful condition caused, increased, or prolonged by mental, emotional, or behavioral factors (also called psychogenic pain), current evidence indicates that BMS is a chronic neuropathic pain condition that can be treated as such.

For proper diagnosis, a thorough dental examination and detailed medical history will be necessary. In certain cases, a neurological examination and psychiatric consultation may also be useful. Sensory testing to detect certain neuropathic issues and search for factors that can lead to BMS, such as nutritional deficiencies (iron, zinc, vitamin B), allergies, Type 2 Diabetes, acid reflux, oral diseases, or psychological factors (anxiety, depression, and stress) may be necessary.

The peripheral nervous system type of BMS responds to lidocaine blocks and topical clonazepam. While patients with central nervous system BMS may best be treated with non-invasive brain stimulation therapies or medications like clonazepam, amitryptyline, nortryptyline, impiramine, desipramine

7) Neurovascular conditions
These are often incorrectly diagnosed as odontogenic pains resulting in well-intentioned but inappropriate interventions.

8) Neoplastic Conditions
The practitioner should never forget to rule out life-threatening conditions, such as neoplastic conditions or central nervous system pathology, when consulting with an orofacial pain patient.Neoplasms such as gingival overgrowth or ulcerative gingivitis can occur in patients with leukemia

9) Miscellaneous causes

- Substance use disorder presenting with severe rampant decay ("meth-mouth"), drug-seeking behavior and hyperalgesia
- Parafunction (misuse of teeth or mouth) presenting as visible damage to the dental/oral/facial structures caused by self-inflicted destructive obsessive/compulsive behavior
- Spondyloenchondrodysplasia (SPENCD) is an autosomal recessive skeletal dysplasia by biallelic mutations in ACP5 gene encoding tartrate-resistant acid phosphatase (TRAP). Dentofacial abnormalities like midface hypoplasia, retrognathic mandible, and anterior openbite are usually seen. Computed tomographic images demonstrate delayed spheno-occipital synchondrosis, obtuse cranial base angle, overdeveloped and anteriorly displaced sphenoidal sinuses, and compressed ethmoidal sinuses. These patients may have orofacial symptoms like prolonged pain in the temporomandibular joint (TMJ) area

4. Conclusion

Orofacial pain (OFP) can arise from different regions and etiologies and present a challenge to the clinician since the orofacial region is complex and therefore, pain can arise from many sources. The clinician needs to have solid knowledge of the pain conditions that arise from these structures for proper diagnosis and a multidisciplinary approach of management is strongly recommended.. A multidisciplinary pain management approach should be considered for the optimal treatment of orofacial pain disorders including both non-pharmacological and pharmacological modalities.

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