

Review Article

Non-Odontogenic Toothache- A Review

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Abstract: Non-odontogenic toothache is a painful condition that occurs in the absence of a clinically evident cause in the teeth or periodontal tissues. The purpose of this review is to improve the accuracy of diagnosis and the quality of dental treatment regarding non-odontogenic toothache. Non-odontogenic toothache can be categorised into six groups according to primary disorders as follows: 1. Myofascial toothache 2. Neurovascular toothache 3. Cardiac toothache 4. Neuropathic toothache 5. Sinus toothache 6. Psychogenic toothache.

Keywords: Toothache, myofascial, neuropathic, cardio-vascular disease, trigeminal neuralgia.

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INTRODUCTION

Pain is one of the most commonly experienced symptoms in dentistry and, as such is a major concern to dentist. Pain is not a simple sensation but rather a complex neurobehavioral event involving at least two components. First is an individual's perception of the stimulation of specialized nerve endings designed to transmit information concerning potential or actual tissue damage (nociception) second is the individual's reaction to this perceived sensation (Ingle, J.I. *et al.*, 2008).

Now, what is pain? Definition is given by IASP (International association for the study of pain) "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Mersky, H. *et al.*, 1994)

Non-odontogenic pain that are felt in the tooth do not always originate from dental structures. Pain with different sites and sources of pain, known as heterotopic pains, can be diagnostically challenging (Soni, A. 2018)

The clinical presentation of non-odontogenic pain is varied and may mimic other pain disorders which may not originate in the orofacial region. The extent of pain may vary from very mild and intermittent

pain to severe, sharp, and continuous. Furthermore, pains that are felt in the tooth do not always originate from dental structures, so it is important to distinguish between site and source of pain to provide correct diagnosis and appropriate treatments. The site of pain is where the pain is felt by the patient, whereas the source of pain is the structure from which the pain actually originates (Balasubramaniam, R., *et al.*, 2011; Sajjanhar, I., *et al.*, 2017).

Types of Non-Odontogenic Pain

The various types of non-odontogenic pains which may be mistaken as dental pain includes

- Myofascial toothache]
- Neurovascular toothache
- Cardiac toothache
- Neuropathic toothache
- Sinus toothache
- Psychogenic toothache (Ingle, 2008, Soni, A. 2018 & Balasubramaniam, R., *et al.*, 2011).

Myofascial pain

Myofascial pain of the masticatory muscles is a frequently observed primary disorder associated with nonodontogenic toothache and symptoms including spontaneous and continuous dull pain. It was reported that 11% of myofascial pain patients complain of non-odontogenic toothache, and the masseter muscle often

appears as the causal muscle. A significant number (49–85%) of cases of myofascial pain of the head and neck muscles involves nonodontogenic toothache induced by referred pain (Wright, E. 2000).

A diagnosis of non-odontogenic toothache caused by myofascial pain can be effectively made based on the fact that five seconds palpation of the trigger points of the involved muscle increases the pain. The guidelines of the American Academy of Orofacial Pain (AAOP) indicate that trigger point injection is useful for diagnostic decision making as well as for treatment. There are several scientifically verified papers regarding the reproducibility of sites of referred pain originating from trigger points (Sajjanhar, I., *et al.*, 2017 & Wright, E. 2000).

The clinical characteristics of the toothache of myofascial origin are as follows:

- Pain is dull aching, non-pulsatile, and typically more constantly aching than that of pulpal pain.
- There is lack of dental pathology to explain the pain.
- Pain is not increased by local provocation of the tooth.
- Pain is increased with the function of involved muscle (trigger point). Pain is increased with extended use of involved muscle or by palpating the affected muscles, and may have tendency to exacerbate with emotional stress (Soni, A. 2018).

Treatment

As toothache is caused by myofascial problems, behavioural modification (soft food diet, resting the jaw, self-massage, hot packs, etc.) is beneficial. Physical therapy is effective for treating toothache and includes the following treatments: stretching exercises, massage, thermo-therapy and posture correction. Muscle relaxants can be used for pain relief, but their use should be limited to a few weeks. Pharmacologic therapies that demonstrated efficacy for myofascial pain causing non-odontogenic toothache involved ibuprofen and low-dose amitriptyline. There are only a few reliable studies that sufficiently support the efficacy of occlusal splint therapy in treating myofascial pain. Acupuncture has a statistically significant effect on temporomandibular disorders compared with a placebo, but the actual effect is controversial (Romero-Reyes, M. *et al.*, 2014).

Neurovascular toothache

The relationship between toothache and neurovascular headaches such as migraines, cluster headaches and other trigeminal autonomic cephalalgias (TACs) cannot be denied, as patients with neurovascular headaches commonly visit dental clinics with the chief complaint of toothache (Nixdorf, D. 2008 & Benoliel, R. *et al.*, 2010). Migraine without

aura, which arises in the mid face, has a throbbing and persistent quality similar to toothache. Van Vliet *et al.*, showed that 34% of 1163 cluster headache patients visited a dental clinic. Regarding cluster headaches, continuous intense pain occurs in the maxillary molar region for 15–180 min and then suddenly disappears. It is important to examine the available diagnostic criteria for various headaches following the International Classification of Headache Disorders (ICHD) (Torelli, P. *et al.*, 2004 & Van Vliet, J.A. *et al.*, 2003).

The clinical characteristics of the toothache of neurovascular origin are as follows:

- The pain is usually unilateral, spontaneous, variable, and throbbing-characteristics that stimulate pulpal pain
- Toothache is characterized by periods of remission and exacerbations over months or years
- Episodes of pain may possess a temporal behaviour appearing at similar times during the day, week, or month
- There is a lack of reasonable dental cause for the pain
- The effect of local anaesthesia is unpredictable
- The pain is frequently initially felt in a tooth (the maxillary canine and premolar usually) as a toothache.

Treatment

Treatment for neurovascular toothache following migraine, cluster headaches paroxysmal hemicranias and short-lasting unilateral neuralgiform headache attacks with conjunctival injection and tearing (SUNCT) is based on recommendations of the ICHD, and affected patients are referred to a neurologist, neurosurgeon or headache clinic. Pharmacologic therapy for migraines normally includes triptans, which are used in the acute phase as abortive therapy. Topiramate, valproic acid or amitriptyline are used for prophylactic treatment. Regarding cluster headache, oxygen inhalation, triptans and dihydroergotamine were used for abortive therapy, while verapamil, corticosteroids (short term), lithium, divalproex sodium and topiramate were used for prophylactic therapy (Torelli, P. *et al.*, 2004 & Yatani, H. 2014 *et al.*).

Cardiac toothache

There are many reports regarding toothache caused by ischaemic heart diseases such as angina. Kreiner *et al.*, reported that 71 (38%) of 186 ischaemic heart disease patients experienced facial pain during heart attacks with a significantly higher frequency in females. Eighty-five per cent (60/71) experienced chest and facial pain simultaneously, while 11 of 71 (15%) experienced facial pain only. Dentists need to be aware of the possibility of ischaemic heart disease in patients who visit the clinic with complaints of toothache only. Referred pain caused by ischaemic heart disease is described as ‘tight’ and ‘burning’ in contrast to the

'throbbing' and 'tingling' in odontogenic toothache. The common characteristic features of ischaemic heart disease (aggravation induced by exercise, improvement at rest, bilateral symptoms, etc.) should be considered in diagnostic decision making. An echocardiogram can be used to diagnose aortic dissection (Yatani, H. *et al.*, 2014 & Kreiner, M. *et al.*, 2015).

The clinical characteristics of the toothache of cardiac origin are as follows:

- The presence of aching pain in the jaw or tooth is cyclic.
- Pain may be episodic, lasting from minutes to hours, and varies in intensity.
- The toothache is increased with physical exertion or exercise.
- The toothache is alleviated with rest.
- The toothache is associated with chest, arm, or neck pain.
- The toothache is decreased with nitroglycerin tablets.
- Local provocation of the tooth does not alter the pain.

Treatment

Patients with cardiac pain referred to tooth/teeth must be referred to the cardiologist or other internal medicine specialists for treatment of the primary disease. Treatment includes anti-angina drugs (beta-adrenoreceptor blockers, nitric acid, etc.) and antithrombotic drugs (antiplatelet drugs, anticoagulants, etc (Yatani, H. *et al.*, 2014 & Fazlyab, M. *et al.*, 2015).

Neuropathic toothache

Pain and loss of function are intimately associated with the reaction of the nervous system to neural damage, and both provide important diagnostic clues that such damage has occurred. Neuropathic pain results from lesions to the peripheral nervous system (PNS) caused by mechanical trauma, metabolic diseases, neurotoxic chemicals, infection, or tumor invasion and involves multiple pathophysiological changes both within the PNS and in the CNS (Costigan, M. *et al.*, 2009).

Episodic neuropathic toothache

Trigeminal neuralgia (TN) is a disorder associated with episodic neuropathic toothache. The paroxysm of trigeminal neuralgia is provoked by relatively innocuous peripheral stimulation of a 'trigger zone' at intra-oral or extra-oral sites. TN must be differentiated from pulpitis and local anaesthesia with 8% xylocaine spray administered at the trigger zone intra-orally reduces the episodes of paroxysmal pain. The absence of dental pathological findings should be confirmed using radiographic and clinical examinations (e.g. percussion pain of the tooth). The pathophysiology of TN is categorised as classical or secondary. In cases of vascular compression of trigeminal nerve root,

demyelination may occur resulting in classical trigeminal neuralgia. Tumours or other demyelinating disorders such as multiple sclerosis or other autoimmune diseases may be the cause of symptomatic secondary TN (Matwychuk, M. 2004 & Apicella, C. *et al.*, 2008).

The clinical presentation of an episodic neuropathic toothache involves:

- Pain quality is described as severe, sharp-shooting, and electric-like pain that lasts only a few seconds.
- There are pain-free intervals between the episodes of pain
- Pain is provoked by peripheral stimulation of a "trigger zone."
- The pain is not always restricted to a tooth but often a broader area.
- The pain is not altered by intraoral thermal stimuli.

Treatment

According to the guidelines developed by the American Academy of Neurology (AAN) and the European Federation of Neurological Societies (EFNS), there is strong evidence to support the use of carbamazepine as a first-line drug for trigeminal neuralgia. These societies recommend oxcarbazepine as the second choice and baclofen and lamotrigine as third choices. Toothache may disappear concurrently with improvements in paroxysmal neuralgia; however, it may be difficult to make a diagnosis in cases of comorbidity with odontogenic patholog. The surgical procedures include microvascular decompression, radiofrequency thermocoagulation and stereotactic radiosurgery (gamma knife surgery) for classical TN (Yatani, H. *et al.*, 2014).

Continuous neuropathic toothache

Herpes zoster (HZ) of the face may also be associated with toothache, and pulpitis-like pain suddenly appears in healthy teeth and becomes intense within a few days. Painful posttraumatic trigeminal neuropathy (PTTN) developing as a result of nerve injury that occurs during dental treatment is also a cause of persistent neuropathic toothache. The common types of neuropathic conditions that can produce continuous pain felt in a tooth are neuritic pain and deafferentation pain (Yatani, H. *et al.*, 2014 & Apicella, C. *et al.*, 2008).

The clinical presentation of a neuritic toothache involves:

- Pain is persistent, non-pulsatile, often burning pain felt in a tooth.
- Toothache accompanied by other neurologic symptoms (paresthesia, dysesthesia, and anaesthesia)
- Other teeth may feel "dead" or "strange."
- Associated gingival tissue may get affected.

The clinical presentation of a deafferentation toothache involves:

- Toothache is continuous, varies in intensity, with no periods of remission.
- Maxillary canines and the premolars are most commonly involved teeth.
- Condition is most commonly reported in middle-aged women with a history of trauma to the painful region.
- Pain is not changed by local provocation.
- Effect of local anaesthesia is unpredictable.
- Toothache not responsive to dental therapies.

Treatment

Pharmacological therapy for continuous neuropathic pain should be administered according to the guidelines developed by the National Institute for Health and Clinical Excellence (NICE), the IASP and the EFNS. Tricyclic antidepressants, serotonin noradrenaline reuptake inhibitors, the anticonvulsants gabapentin and pregabalin, and opioids are the drug classes for which there is the best evidence for a clinical relevant effect. Patches with a local anaesthetic have also been shown to provide relief when applied to affected areas (Yatani, H. *et al.*, 2014 & Apicella, C. *et al.*, 2008).

Sinus toothache

Sinus pain referred to teeth is due to referred pain from acute sinusitis. Toothache due to acute sinusitis frequently occurs in the maxillary pre molar and molar regions, but it is rare that chronic sinusitis is accompanied by toothache; it typically induces nasal congestion and dull headaches. According to a study of the symptoms of acute sinusitis, maxillary toothache was highly specific (93%), but only 11% of patients with sinusitis actually had pain from the tooth. Pain occurs in the maxillary molar teeth induced by cold stimulation or mastication, and dysesthesia arises with tooth clenching. The pain increases when the patient bends over. Sinus pain referred to teeth is diagnosed using computed tomography (CT) and histopathological examination showing sinusitis or malignant fibrous histiocytoma (Yatani, H. *et al.*, 2014, Apicella, C. *et al.*, 2008, Hegarty, A. *et al.*, 2011 & Woo Ha, J. *et al.*, 2019).

Treatment

The patients with toothache due to acute sinusitis should be referred to an otorhinolaryngologist for treatment of nonodontogenic sinusitis.

Psychogenic toothache

Biopsychosocial factors affect pain, and chronic pain is closely related to psychosocial problems, but there is no convincing evidence that psychological or emotional issues can induce pain. Pain descriptors are often diffuse, vague and difficult to localise. When the somatoform pain disorder is felt in

the teeth, multiple teeth are often involved. Pain may be sharp, stabbing, intense and sensitive to temperature changes, all of which are similar to pain symptoms of odontogenic origin. However, the pain is inconsistent with normal patterns of physiologic pain and presents without any identifiable pathologic cause. When accompanied by other psychiatric features such as hallucinations or delusions, there is a greater possibility that the pain is of psychogenic origin (Alberts, I. 2008, Park, H.O. *et al.*, 2012 & Fukuda, K. 2016).

Treatment

Patients with psychogenic toothache caused by mental disorders need to be referred to neuropsychiatrists or liaison treatment specialists and treated with pharmacological therapy (antidepressant or antipsychotic drugs, etc.). Given that psychogenic toothache is a somatoform disorder, dental treatment will not resolve symptoms of pain and may potentially elicit an unexpected or unusual response to therapy. Patients should be referred to a psychiatrist or psychologist for further management. We must mention that chronic pain can cause depression or somatisation as well.

Idiopathic toothache

There are no multidisciplinary studies on idiopathic toothache (i.e., persistent dentoalveolar pain: PDAP) as the diagnostic criteria for the condition is unclear. Some reports define idiopathic toothache as characterised by continuous pain in the teeth and/or periodontal tissues without objective pathophysiological or radiological findings at the site of pain and with an unknown aetiology that lasts over 4 or 6 months. Neuropathic and idiopathic toothaches are closer to each other, as studies from the last decade indicate that patients clinically diagnosed with atypical odontalgia (AO) may in fact suffer from 'definite' or 'probable' PPTN, if somatosensory disturbances can be demonstrated and if other confirmatory tests can be applied. The new IHS classification refers to this entity as PIFP (persistent idiopathic facial pain) and classifies it as a painful trigeminal neuropathy, while the term 'atypical odontalgia', used in this paper as a historical reference, is no longer in common use. Around 85% of patients with atypical odontalgia exhibit abnormal qualitative somatosensory responses. The most frequent somatosensory abnormalities in AO patients were somatosensory gain with regard to painful mechanical and cold stimuli and somatosensory loss with regard to cold detection and mechanical detection. As mentioned, quantitative sensory testing (QST) is useful in diagnostic decision making of atypical odontalgia in each patient. Atypical odontalgia patients complain of increased pain intensity following the application of topical capsaicin cream and have diminished blink reflex R2 waves in comparison with normal subjects (Alberts, I. 2008 & Malacarne, A. *et al.*, 2018).

Treatment

The efficacy of tricyclic antidepressants was shown to be 60–75% for idiopathic toothache with most common reports using amitriptyline. Tricyclic antidepressants are considered to have a high efficacy; however, only case series or case–controlled studies were available, and the evidence level is not high. Anticonvulsants are frequently used, as a considerable proportion of these patients may have neuropathic mechanisms underlying their pain.

CONCLUSION

Differentiating the many causes of facial pain can be difficult for busy practitioners, but a logical approach to history-taking is important and will aid more rapid diagnoses with effective management. Although primary care clinicians would not be expected to diagnose rare pain conditions, they should be able to assess the presenting pain complaint and refer to the appropriate secondary or tertiary care centre. It is important that primary care practitioners provide sufficient detailed information of history, examination and investigation findings in their referral letters to ensure appropriate direction of the referral within the secondary/tertiary care institution. Underlying causes of orofacial pain are wide ranging and complex, but a greater understanding of a patient's facial pain symptoms, towards establishing a diagnosis or differential diagnosis, can be achieved by obtaining a good pain history, carrying out a good clinical examination and instituting relevant investigations or referring to secondary or tertiary care when appropriate.

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