

Case Series of Four Different Headache Types Presenting as Tooth Pain

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Abstract

Case reports in the literature discuss various headache disorders that present as pain in the face. The current understanding of neuroanatomy and headache mechanisms suggests that headache pain originates within intracranial structures and is then referred to the face, jaws, and teeth. This case series describes four patients, one each with migraine headache, cluster headache, paroxysmal hemicrania, and hemicrania continua, all of which who presented to dentists with the chief complaint of tooth pain. This is the first report of hemicrania continua presenting as tooth pain. It is important that dentists be cognizant of headache disorders so that they may be able to identify headache pains masquerading as toothache. (*J Endod* 2006;32:1110–1113)

Key Words

Cluster headache, dental pain, headache, hemicrania continua, migraine disorders, Nonodontogenic, paroxysmal hemicrania, toothache

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Case reports in the literature describe various headache disorders presenting as pain in the face (1–4) and few have specifically outlined headache pain presenting as tooth pain (5, 6) despite it not being an uncommon occurrence within orofacial pain clinical practice (7). The current understanding of neuroanatomy and headache pain mechanisms suggests that headache pain originates from intracranial structures. Pain is then referred to the somatic counterpart of the intracranial structures involved, and is therefore perceived by the patient as pain in the corresponding extracranial structure, such as the face, jaws, or teeth.

Neuroanatomy

The trigeminovascular system is comprised of sensory fibers that densely innervate the cerebral blood vessels and dura mater (8). The trigeminal innervation is predominantly to the forebrain but extends posterior to the rostral basilar artery, whereas the more caudal vessels are innervated by branches of the C₂ and C₃ dorsal roots, which also synapse with the central trigeminal neurons at the level of the trigeminal nucleus (9).

The ophthalmic division of the trigeminal nerve innervates the vast majority of the intracranial structures (Fig. 1). The terminal portion of the tentorial nerve, a branch of the ophthalmic nerve, run along the dura of the parieto-occipital convexity and innervate the tentorium, the superior surface of the transverse and straight sinuses, and the caudal two thirds of the falx, including the superior and inferior sagittal sinuses. The anterior and posterior ethmoidal nerves, branches of the nasociliary nerve, innervate the cerebral surface of the cribriform plate. The other sensory components of the ophthalmic division provide somatic innervation of the cornea, ciliary body, iris, lacrimal gland, conjunctiva, part of the mucous membrane of the nasal cavity, and the skin of the eyelids, eyebrow, forehead, and nose (10). This extensive intracranial innervation by the ophthalmic nerve explains why the vast majority of headache pain, which is initially sensed and then referred to their somatic counterpart, is perceived by the patient as periorbital pain.

The maxillary division of the trigeminal nerve gives off a dural branch, the nervus meningeus medius, which supplies innervation to the dura of the anterior floor of the middle fossa (Fig. 1). The other somatosensory components of the maxillary division include innervation of the upper lip, gingiva, and teeth, the lateral surfaces of the nose, mucosa of the maxillary, ethmoid and sphenoid sinuses, the lower eyelid and conjunctiva, and skin on the cheek and the side of the head behind the eye (10).

The mandibular division of the trigeminal nerve generates the nervus spinosus, which supplies innervation to the falx between the portions supplied by the ophthalmic division (11). Also it has variable contributions to the dura of the anterior floor of the middle fossa, which is predominately innervated by branches of the maxillary division (Fig. 1). The other somatosensory components of the mandibular division include innervation of the lower lip, gingival, and teeth, temporomandibular joint, skin of the temporal region, auricle, skin of the lower half of the face, and muscles of the mastication. It also supplies innervation to the mucous membranes of the anterior two thirds of the tongue (10).

Review of Mechanisms

The current theory for headache is that antidromic release of neuropeptides and inflammatory mediators, such as calcitonin gene related peptide (CGRP), substance P, prostaglandins and neurokinin A, are responsible for neurogenic inflammation (9, 12, 13). Primary headaches such as migraine, cluster and paroxysmal hemicrania are

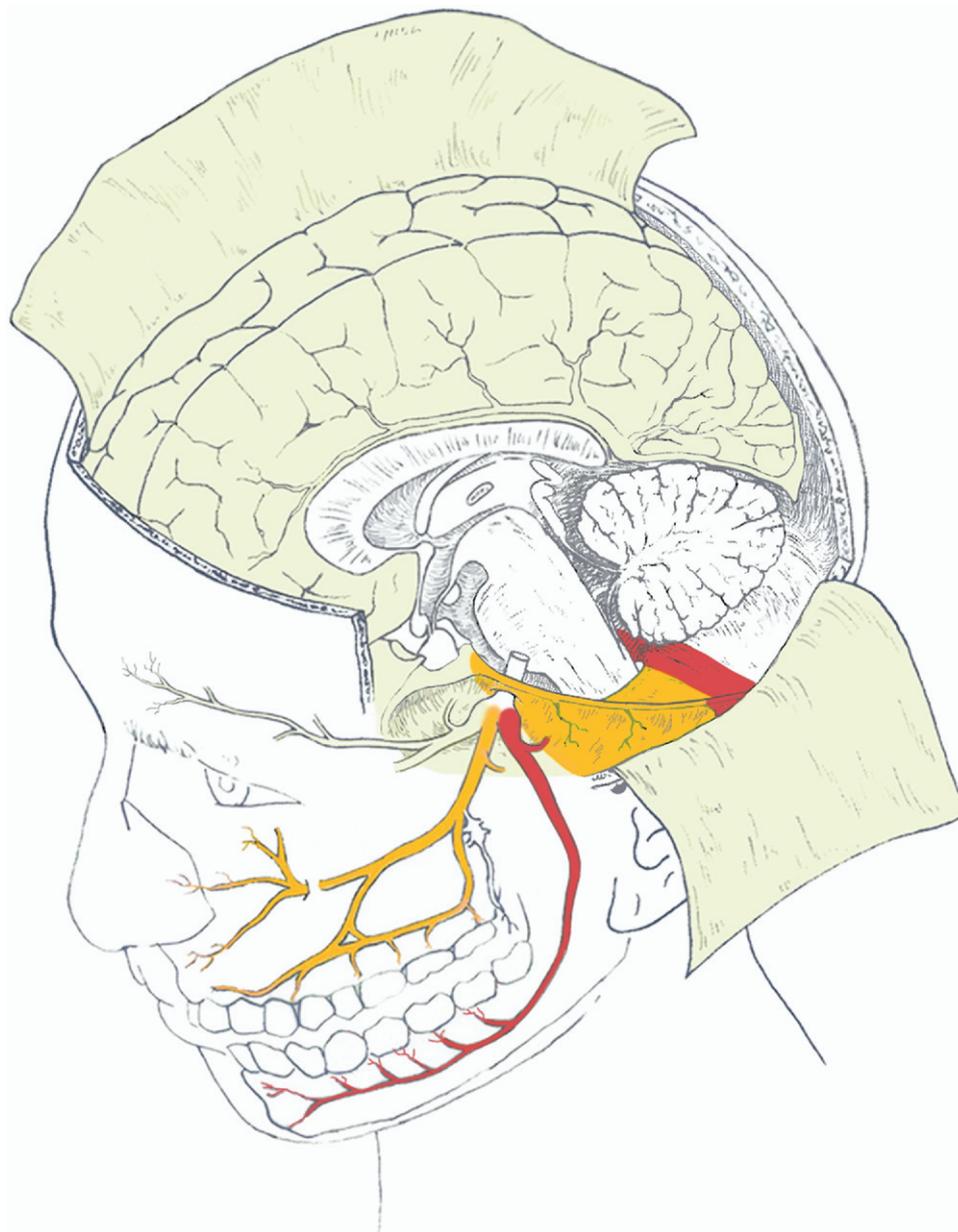


Figure 1. Trigeminal innervation of the brain. The vast majority of the brain and associated structures are innervated by branches of the ophthalmic branch of the trigeminal nerve (yellow). A small portions are innervated by the maxillary branch (orange) and mandibular branch (red). Stimulation of intracranial nociceptive fibers in the colored areas results in pain being perceived in the corresponding trigeminal branches of the orofacial region, including the teeth and alveolar bone.

associated with increased levels of CGRP measured from the jugular vein during headache pain. This sterile inflammation has been shown to result in an increase of unilateral intracranial blood flow related to facial flushing on the side of stimulation (14).

Research shows that the inflammatory mediators also activate and sensitize primary afferent nociceptors, which results in a lowering of their activation threshold and a prolongation of neuronal firing upon stimulation (15–17). This sensitization of cerebral vascular nociceptors results in nonpainful stimuli being perceived as being painful, otherwise known as allodynia. This occurs first in the anatomic region where the headache pain is felt, usually the ophthalmic division, and spreads to the rest of the body (18). Clinically, this hypersensitivity to stimulation manifests as patients avoiding sensory input, such as bright lights, noise, physical activity, and restrictive clothing. However, within

the dental setting it may present as increased sensitivity to pulp testing, tooth percussion, and soft tissue manipulation.

Functional brain imaging clearly suggest that vascular changes are not the primary cause for head pain in migraine, but rather the end result of neuronal activity. Functional magnetic resonance imaging (fMRI) during visually triggered migraine suggests that brainstem structures, the red nucleus and substantia nigra, are part of the activation process during the migraine attack (19).

Headache Classification

The International Headache Society (IHS) has developed diagnostic criteria for headache disorders that have become the gold standard for headache research and clinical care (20). Listed below are the

corresponding IHS diagnostic criteria for each patient who presented to their dentist with presumed odontogenic pain.

Case Presentations

Case 1

A 43-year-old white male presented with a dull, aching, throbbing deep pain in the left maxillary molar region. This pain was intermittent, with an intensity of 7 to 8/10, lasted 2 hours to 5 days and caused him to miss work and go to bed. The pain had been present for 8 years. During that time he had undergone multiple general dental and medical evaluations, as well as seeing an Endodontist, TMD practitioner, Oral Surgeon, Chiropractor, Massage Therapist, and a Neurologist without palliation. Care provided included four root canals, three extractions, an occlusal splint, neck adjustments, massage and carbamazepine (Tegretol). No specific triggering factors for this pain could be identified by the patient, but the pain was associated with nausea and vomiting, light and sound sensitivity, and was made worse with activity. The patient had no major medical diagnoses, but felt that the tooth pain started 1 year after maxillary orthognathic surgery. This tooth pain was completely relieved with symptomatic triptan pharmacotherapy.

Diagnosis = *Migraine Headache*

Diagnostic Criteria

- A. At least five attacks fulfilling criteria B-D
- B. Headache attacks lasting 4 to 72 hours (untreated or unsuccessfully treated)
- C. Headache has at least two of the following characteristics:
 1. Unilateral location
 2. Pulsating quality
 3. Moderate to severe pain intensity
 4. Aggravation by or causing avoidance of routine physical activity
- D. During headache at least one of the following:
 1. Nausea and/or vomiting
 2. Photophobia and phonophobia
- E. Not attributed to another disorder

Migraine headaches affect about 12.5% of the United States population, and migraine is the most common reason for disability from headache (21). It occurs three times more often in females than in males, and it is characterized by patients wanting to withdraw from activity and go to sleep. Ten percent of migraine sufferers have a benign and reversible neurological symptom preceding their headache, which is known as aura. Visual aura is the most common symptom and may include scintillations and/or scotoma, black spots. More rarely, patients can experience focal anesthesia or paralysis as aura. Frequency of migraine is variable. Commonly, patients report 1 to 2 headaches per month, but it may range from 2+ per week to <1 per year (22, 23).

Case 2

A 48-year-old white male presented with the chief complaint of toothache. This aching pain radiated to the right orbital area, as well as to the temporal and infratemporal areas. It was an intermittent 8 to 9/10 pain, occurring 2 to 12 times per day and lasting from minutes to a couple hours. He experienced right eye tearing, facial swelling, and increased temperature during the pain episodes. When it occurred he was unable to focus, causing him to pull off the road and stop if he was driving. The pain was unaffected by ibuprofen or acetaminophen. Sleeping and increased physical activity had no impact on his pain. The patient had no major medical diagnoses. Pain was completely relieved by prophylactic pharmacotherapy with verapamil.

Diagnosis = *Cluster Headache*

Diagnostic Criteria

- A. At least five attacks fulfilling criteria B-D
- B. Severe or very severe unilateral orbital, supraorbital, and or temporal pain lasting 15 to 180 minutes if untreated
- C. Headache is accompanied by at least one of the following:
 1. Ipsilateral conjunctival injection and/or lacrimation
 2. Ipsilateral nasal congestion and/or rhinorrhoea
 3. Ipsilateral eyelid edema
 4. Ipsilateral forehead and facial sweating
 5. Ipsilateral miosis and/or ptosis
 6. Sense of restlessness or agitation
- D. Attacks have a frequency from one every other day to 8 per day
- E. Not attributed to another disorder

Cluster headache attacks usually occur in series, better known as cluster periods. These periods can last weeks or months, being separated by remission periods of months or years, and have therefore been termed episodic cluster headache. Patients without remission periods are said to have chronic cluster headache, representing about 10 to 15% of cluster headache sufferers.

Cluster headache occurs more often in men, which is why it has been nicknamed as the male version of migraine. It is the stereotypical headache that has prominent autonomic features. Often this headache is alerting, unlike migraine, driving patients to pace and do such things as pound their head. Cluster headaches often cause patients to wake at the same time during the middle of the night. Also, patients with cluster have been described as having a coarse, ruddy facial appearance (24). Also, cluster headache is often associated with smoking and can be induced by vasodilators, such as alcohol (24).

Case 3

A 64-year-old, white female presented with sharp-shooting pain in the left maxillary molars. When the pain occurred she was unable to talk. The pain intensity was rated as 9/10, occurring 5+ times per day and lasting 5 to 10 minutes. This pain would wake her from sleep and was associated with nasal congestion. Previous treatment included splint therapy and bite adjustments. The patient had no major medical diagnoses except for osteoarthritis. Pain was completely relieved with prophylactic indomethacin pharmacotherapy.

Diagnosis = *Paroxysmal Hemicrania*

Diagnostic criteria

- A. At least 20 attacks fulfilling criteria B-D
- B. Attacks of severe unilateral orbital, supraorbital, or temporal pain lasting 2 to 30 minutes
- C. Headache is accompanied by at least one of the following:
 1. Ipsilateral conjunctival injection and/or lacrimation
 2. Ipsilateral nasal congestion and/or rhinorrhoea
 3. Ipsilateral eyelid edema
 4. Ipsilateral forehead and facial sweating
 5. Ipsilateral miosis and or ptosis
- D. Attacks have a frequency >5 per day for more than half of the time, although periods with lower frequency may occur
- E. Attacks are prevented completely by therapeutic doses of indomethacin
- F. Not attributed to another disorder

Like cluster headache, paroxysmal hemicrania has been characterized as episodic or chronic. Paroxysmal hemicrania is consid-

ered chronic when it occurs for 1 year without a 1-month remission period. Compared to cluster, paroxysmal hemicrania are more common in females, shorter in duration, occur more frequently and have a treatment response rate of almost 100% to indomethacin pharmacotherapy (25).

Case 4

A 52-year-old white male presented with dull, soreness in the right maxillary premolars that radiates to the temple and vertex. This was a daily constant pain present for 6 months that ranging from 4 to 10/10 in pain intensity. He experienced pain exacerbation with physical activity and when worse, he had tearing of the right eye. Previous treatments included extraction of tooth #5 by his dentist, cervical adjustment by a chiropractor, multiple chronic pain medications given by his primary physician and Neurologist. None of the care he received relieved the pain. The patient had no major medical diagnoses. Pain was completely relieved with prophylactic pharmacotherapy using indomethacin.

Diagnosis = *Hemicrania Continua*

Diagnostic Criteria

- A. Headaches for >3 months fulfilling criteria B-D
- B. All of the following characteristics
 - 1. Unilateral pain without side-shift
 - 2. Daily and continuous, without pain free periods
 - 3. Moderate intensity, but with exacerbations of severe pain
- C. At least one of the following autonomic features occurs during exacerbations and ipsilateral to the side of pain:
 - 1. Conjunctival injection and/or lacrimation
 - 2. Nasal congestion and/or rhinorrhoea
 - 3. Ptosis and/or miosis
- D. Complete response to therapeutic doses of indomethacin
- E. Not attributed to another disorder

Hemicrania continua is the only headache that starts and persists as strictly unilateral or side-locked. It is characterized by the presence of autonomic features, which may be subtle and better reported by a spouse or significant other. This headache disorder is rare and is more common in females than males. This is the first report of hemicrania continua presenting as tooth pain. Fortunately, like paroxysmal hemicrania, hemicrania continua is responsive to indomethacin pharmacotherapy (26).

Conclusion

Headache disorders can present with pain in any region of the trigeminal neurosensory distribution, including the teeth and jaws. These patients may present to their dentist for evaluation and treatment of a suspected odontogenic reason for their toothache. Often, by the time they see an Orofacial Pain practitioner they have received multiple unsuccessful and irreversible dental treatments in hopes of alleviating their pain. It is important that dentists be able to identify headache pain masquerading as toothache before implementing traditional dental treatments.

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