Case Report

"My taste has changed"……is it because of the dental procedure I underwent????

A Case Report and Review of Literature

V Mehrotra

Abstract

Taste is an important sensation that serves to evaluate the nutritious content of food, support oral intake and prevent ingestion of potentially toxic substances. Taste dysfunction may impact quality of life and impair the oral intake. It is a rare phenomenon that may be idiopathic or may be caused due to head trauma, post infections, or due to metabolic/systemic conditions, medication use, aging or iatrogenic/post surgical including various invasive dental procedures resulting in nerve damage. We present an unusual case of generalized taste change following an oral surgical procedure. The case is presented to enhance understanding of taste disorders and their relation to a localized traumatic event. We also review and enlighten various etiologic factors which result in taste disorders.

Key words: *Gustatory, Iatrogenic, Hyposalivation, Local anesthetic.*

Introduction

Taste is an important sensation that serves to evaluate the nutritious content of food, support oral intake and prevent ingestion of potentially toxic substances. It is commonly used to describe pleasure associated with food consumption and is related to several sensations including tactile (texture), temperature, and smell that are perceived when placing a substance in the mouth.[1]

Taste change, encompassing the quantitative and qualitative gustatory dysfunction[2] is a rare phenomenon. These may be idiopathic or may result from head trauma, systemic conditions affecting the endocrine, metabolic, neurologic, autoimmune systems; sinus and salivary gland disorders; medication use; cancer treatment (radiation or chemotherapy); viral, bacterial and fungal infections; certain oral conditions; iatrogenic or peripheral nerve damage due to invasive procedures including ethmoidectomy, rhinoplasty, tonsillectomy, middle ear surgeries, dental interventions. [3,4,5]

1. Dr. Vishal Mehrotra , Reader in Charge, Department of Oral Medicine and Radiology, Rama Dental College and Hospital, India.

Address of Correspondence:
Dr. Vishal Mehrotra , Reader in Charge, Department of Oral Medicine and Radiology, Rama Dental College and Hospital, India.
E-mail- vishal4march@rediffmail.com

Some factors thought to be responsible for nerve injuries associated with dental procedures are proximity of the chorda tympani nerve to the surgical site, retraction of the lingual flap, extraction of unerupted teeth, especially third mandibular molars, and experience of the operator predisposes the chances of nerve injuries associated with dental surgical treatments.[6,7,8,9,10] Nerve damage may also be a result of local anesthetic injection due to direct needle trauma causing hemorrhage within the epineurium or a neurotoxic effect of the anesthetic.[11,12]

Taste from the anterior 2/3 of the tongue is transmitted by the chorda tympani nerve (cranial nerve VII), and the lingual branch of the trigeminal nerve. The posterior third of the tongue, oropharynx, and esophagus are innervated by the glossopharyngeal (IX) and vagus(X) nerves.[13] The trigeminal nerve (V) provides general sensory innervation to a region that overlaps the areas served by these other cranial nerves. Because of their anatomic proximity, the possibility exists for iatrogenic injury to the chorda tympani, lingual nerve or both during surgical procedures in the posterior mandible resulting in irreversible gustatory deficits and somatosensory dysfunction.[14, 15]

This article describes an unusual case of generalized taste change following a periodontal and oral surgical procedure and also enlightens knowledge with the various etiologic factors associated with taste change with special emphasis on its possible relation to the localized traumatic event.

Case report

A 65-year-old male patient reported to the Oral Medicine department in June 2013 with the chief complaint of taste change. He also reported complain of oral dryness despite frequent intake of water.

He stated that his taste loss occurred several weeks after a combined periodontal and oral surgery procedure as recommended by his family dentist due to advanced periodontal bone loss and associated tooth mobility. The procedure involved the extraction of his maxillary and mandibular third molars, surgical incisions involving the sulcular, buccal, lingual and palatal tissues in both the maxillary and mandibular posterior regions thereby allowing access for thorough debridement and recontouring of the residual osseous defects in these areas. The patient was prescribed analgesics that are used routinely during postsurgical recovery.

The patient returned several times between September 2012 and January 2013, to his dentist to report his symptoms, but the dentist did not provide any treatment, although he conducted provocation taste tests, placing sugar, salt and mustard on the patient's tongue. The patient did not detect salt or mustard, resulting in a diagnosis of dysgeusia. The dentist consulted a neurologist and advised the patient for magnetic resonance imaging (MRI), but no central nervous system lesions or extra-axial abnormalities were detected. The dentist prescribed him zinc supplements (200mg/day in divided doses) and recalled the patient for follow-up after 1month.The patient instead reported to the oral medicine department after few months.

At his initial examination at the Oral Medicine department in June 2013, the patient reported that he was able to discern different tastes, although at reduced intensities (hypogeusia), and intermittently he often experienced loss of taste during mastication. A thorough medical history was taken which included the history of head trauma, any surgical procedure involving head and neck specially middle ear, tonsils, salivary glands and brain, any history of use of drugs before or after the oral surgical procedure, and also of any systemic disease which the patient may be suffering of, but there was no significant history revealed by the patient.

Extraoral examination revealed intact cranial nerves, facial symmetry, no lymphadenopathy, normal range of mandibular movements and no tenderness or pain on palpation of the masticatory musculature and lateral aspect of the temporomandibular joints.

Intraoral examination revealed intact dentition with well-healed mucosa and gingiva at the surgical sites and no clinical signs of infection or inflammation. The tongue was normally papillated.

Salivary flow rates were determined measuring total saliva (unstimulated and stimulated) expectorated for 3 minutes. The results indicated a slightly reduced unstimulated flow rate (0.2g/min) and a normal stimulated whole salivary flow rate.

Routine blood haemogram, thyroid profile, random/fasting blood sugar levels were checked and all the values were within the normal limits.

A working diagnosis of taste change as a result of injury to chorda tympani nerves at the time of the surgery, probably caused by inflammatory, infectious or fibrotic changes within the nerves was given. There was also the possibility of an underlying pathosis, leading to taste hypogeusia and mild hyposalivation at rest. Zinc dosage was increased from 200 mg/day to 450 mg/day and the patient was prescribed 30 mg cevimeline 3 times a day to increase saliva production. This medication produced subjective improvement and comfort with eating. Objective salivary flow rates (0.5 g/min unstimulated and 1.9 g/min stimulated) indicated an increase in salivary flow.

Although the patient was satisfied with the increase in intraoral moisture and continues to use sialogogues, normal taste sensation has not returned. He was advised to discontinue zinc supplements and to modify his diet by increasing the texture of foods and using stronger seasonings. At this point, he is satisfied with the recommendations and will be recalled periodically for follow-up.

Discussion

Taste is one of the five basic senses in the human body [16]. Together with olfaction and oral trigeminal sensitivity, the sense of taste contributes considerably to flavor perception during eating and drinking and thus plays a major role in the enjoyment of foods and beverages.[17] Other important physiological properties of gustation include the regulation of salt and energy intake and the detection of potential toxins during mastication. Consequently, damage to the gustatory system might lead to considerable dietary changes[18]. A similar history of poor appetite which may have been associated with gustatory change was reported by the patient in the present case.

Quantitatively, a total loss of gustatory function is termed ageusia, while hypogeusia describes a partial loss.[19] The two main qualitative gustatory disorders are mainly parageusia and phantogeusia. Parageusia is a bad taste elicited by the nutritional intake, which is otherwise absent. Phantogeusia describes the presence of a permanent intraoral bad taste.[20]

In the present case the patient reported that he was able to discern different tastes, although at reduced intensities suggestive of hypogeusia.

Many reported cases of taste change are idiopathic.4 Since gustatory disorders are often associated with a concomitant illness that can be diagnosed and treated, initial identification of the illness by means of detail medical history and clinical examination of all systems is of primary importance.[21]

Various infections and diseases affecting the systems of the body are described as important co factor in gustatory disorders. These include, oral viral, bacterial and fungal infections affecting oral cavity/ upper respiratory tract/middle ear/salivary glands, and various neurologic, psychiatric, endocrine/metabolic, gastrointestinal/liver diseases (Table I).[5]

Table: I
Various etiological factors associated with gustatory dysfunction:

S.no	Etiological factors:
1	**Head trauma**
2	**Neurological:** Peripheral neurological causes: Bell's palsy and Ramsay Hunt syndrome Neuritis due to neuroborreliosis or Herpes Zoster Neuralgia Polyneuropathies e.g diphtheria, porphyria, lupus erythematosus, amyloidosis Central neurological causes: Brainstem: Lesions of bulbar tegmentum at level of solitary tract or due to pontinc lesions (demyelinating processes or ischemia and hemorrhage; vascular and traumatic lesions) Lesions in mesencephalon Thalamic: Glioblastoma Cortical: Epilepsy, migraine, schizophrenia, major depression, dementia, eating disorders Other neurological causes with undetermined location: Familial dysautonomia Hereditary ataxia Machado-Joseph disease Gullain-Barre syndrome Taste disorders due to high altitude sickness Creutzfeldt-Jakob disease Early rabies Stroke Myasthenia gravis Neurodegenerative diseases: Parkinson's disease, Alzheimer's dementia, amylotrophic lateral sclerosis, multiple sclerosis
3	**Post-Infectious:** Upper respiratory tract infections Chronic middle ear infections and inflammation, otitis media Oral bacterial and fungal infections Viral infections: Herpes zoster, Herpes simplex virus infections affecting upper respiratory tract/middle ear
4	**Iatrogenic/Post surgical:** Tonsillectomy, stapedectomy, acoustic tumor removal, tympanoplasty, mastoidectomy Middle ear surgery/ mastoid surgery especially during eleveation of the tympanomeatal flap, removal of disease process and drilling of posterior canal wall Rigid Upper airway endoscopy/laryngoscopy Maxillofacial and cranial surgery: including partial or total glossectomy, surgical interventions involving palate or other oral structures(eg during cancer surgery or a velopharyngeal procedure), surgery involving base of skull. Dental surgery especially in proximity to lingual nerve Local anesthetic solutions and the technique followed e.g articaine, procaine, tetracaine, bupivacaine, lidocaine.
5	**Metabolic/systemic conditions:** Diabetes mellitus, hepatitis, liver failure, renal diseases, hypothyroidism, nasal polyps, Systemic lupus erythematosus Inflammatory mediated salivary gland diseases e.g. Sjogren's syndrome; Burning mouth syndrome. Glossitis Xerostomia
6	**Toxin or drug induced:** Onclogical radiotherapy, Systemic chemotherapy for head and neck cancers Various medications, including ACE inhibitors, calcium antagonist, diuretics, antiarrythmics, antibiotics, antivirals, antiprotozoals, antirheumatics, antihthyroid, antidiabetics, antihistamines, antidepressants, antipsychotics, local anesthetics, antineoplastic treatment, chelating agents.
7	**Neoplastic:** Paraneoplastic syndrome Neoplastic processes affecting submandibular region, skull base or middle ear e.g. cholesteatoma, Lung cancer Space occupying processes/tumors in cerebellopontine angle such as meningioma, neuroma
8	**Aging**
9	**Nutritional deficiencies:** Iron deficiency Vitamin B12 deficiency Zinc deficiency
10	**Other oral conditions:** Periodontal inflammation Dental and dento-alveolar infections Oral trauma, burns, soft tissue lesions, Candidiasis Postnasal drip, tongue plaque, and halitosis

Many medications affect taste, smell or salivation and lead patients to change their patterns of food and fluid intake. Identifying patients with drug related changes in taste is clinically important because such changes can lead to poor compliance with medications and negatively affect chronic disease management. In this case at the onset of the chief complain there was no history of any medication use. [22]

Taste disorders occasionally represent signs of potentially life threatening conditions including central nervous system (CNS) tumors at ponto-cerebellar angle, tumors involving middle ear such as cholesteatoma[23] Paraneoplastic syndromes, lung cancer, severe anemia[24] and HIV (Table I). [5]

In the case presented, the lack of any previous history of these conditions and the unremarkable clinical examination, routine blood haemogram, HIV, thyroid profile, random/fasting blood sugar levels, magnetic resonance imaging (MRI) enabled us to rule out potential underlying CNS/middle ear tumors, anemia, or other systemic disease entities.

Taste dysfunction often accompanies, as an iatrogenic complication, surgical procedures such as stapedectomy, acoustic tumor removal, tympanoplasty, mastoidectomy, or tonsillectomy.[25,26]

Of particular importance to oral health care providers is damage to the chorda tympani/lingual nerve following dental anesthesia (mandibular block), third molar extraction, implants, transplants, or mandibular osteotomy. Indeed, it is well-established that damage to the chorda tympani nerve can lead to atrophy of the taste buds in the affected area and impaired discrimination of certain taste qualities.[27, 28]

However, several articles report unilateral taste change, sensory (anesthesia, dysesthesia or paresthesia) changes and nerve damage after surgical procedures involving the removal of third molars have also been reported. [29,30]

Shafer and others showed that perceived taste intensity on discrete areas of the tongue significantly reduced after third molar surgery, and patients with the most severely impacted molars gave the lowest taste intensity ratings to whole-mouth test solutions. They also found that removal of severely impacted molars could cause partial or complete transection of nerves resulting in gustatory deficits. [31] Surgical procedures requiring lingual flaps, tooth sectioning or the insertion of a periosteal elevator can all be linked to taste dysfunction following third molar extraction.[32, 33] In our case, surgical removal of the third molars, and surgical manipulation of the underlying tissues was performed for periodontal reasons which may have resulted in neural injury and led to the patient's complaints.

Recovery of sensory functions is dependent on the degree of the trauma. If the nerve was stretched or crushed, but not sectioned, taste usually recovers. However, prognosis of taste recovery is poorer following complete section of the nerve. [34, 35]

Nerve damage has also been linked to the experience of the operator and procedures performed under various forms of sedation. Complications, including a higher frequency of nerve damage, are more likely with less experienced oral surgeons than with more experienced oral surgeons.[3]

In addition, the degree of force used to remove impacted teeth is greater when the patient is under sedation than in a conscious patient and this additional aggressiveness is a risk for nerve damage.[36] Although in our case it seems unlikely that a high degree of force would be needed to remove his erupted and periodontally compromised teeth, it is possible that nerve injury may have been caused during the procedure.

Another possible mechanism for nerve damage is the use of local anesthetic (Table I). Direct contact with the needle used to inject anesthetic traumatizes the nerve and produces a prolonged change in sensation. However, paresis caused by shearing of the nerve as a result of direct trauma is unlikely because of the small diameter of the needle (0.45 mm in a 25-gauge needle) compared with the 2–3 mm diameter of the lingual and inferior alveolar nerves.[12, 37] Intraneural hematoma caused by the needle striking one of the smaller intraneural blood vessels is a possible cause of nerve damage. If the needle contacted one of the small blood vessels inside the nerve, the release of blood and blood products inside the epineurium could cause compression, fibrosis and scar formation. Compression of the nerve could result in damage and inhibit or alter the natural healing process.[11, 12]

Chemical damage to the nerve due to neurotoxicity of the local anesthetic is another possibility if the anesthetic is injected intrafascicularly or becomes deposited within the nerve as the needle is withdrawn.[37] Local anesthetics (articaine, procaine, tetracaine, bupivacaine or lidocaine) can all be neurotoxic when injected directly into the nerve.[38] Chemical trauma as a result of these has been shown to cause demyelinization, axonal degeneration and inflammation of the surrounding nerve fibers within fascicles, which results in a breakdown of the nerve–blood barrier and endoneurial edema.[37] Nerve damage due to local anesthesia or because of its neurotoxic effect as possible mechanisms for gustatory dysfunction cannot be considered in our case since the taste loss occurred several weeks after the oral surgical procedure.

Several additional oral conditions have been found to induce taste complaints. These are not disorders of taste per se, but rather result from conditions that produce a constant source of stimulants to a normally functioning gustatory system. Such conditions include periodontal inflammation, dental and dento-alveolar infections, oral trauma, burns, soft tissue lesions, candidiasis, removable dentures, postnasal drip, tongue plaque, and halitosis (Table I); thus, blood, gingival crevicular fluid, pus, or necrotic tissue in the oral cavity can furnish a steady reservoir of unpleasant-tasting stimulants.[39,40,41]

The amount of saliva in the oral cavity is an important factor in taste function (Table I). Saliva has been linked to taste sensitivity, as it is the principal component in the external environment of taste receptor cells.[42]

Thus hyposalivation may affect taste as saliva dissolves food particles allowing presentation of tastants to the receptors.[13]

Matsuo and Yamamoto demonstrated an association between saliva and taste; whole saliva affected taste response of the chorda tympani nerve to the 4 standard chemical stimuli (sucrose, NaCl, HCl, quinine hydrochloride). Thus, low saliva flow may alter taste, which would warrant the use of a sialogogue. In the present case there was slight reduction in unstimulated salivary flow rate which may have played some role in altered taste.[43]

The case presented above is unusual as it represents generalized taste change following an oral surgical procedure. There is no curative therapy for trauma-induced taste change, although studies have shown that zinc supplementation, sialogogues and surgical procedures have

been useful in treating taste disorders.[44,45,46,47,48] Several studies indicate that zinc (gluconate or sulfate) may be helpful in the treatment of idiopathic dysgeusia, as it is an important factor in gustation. Zinc has been shown to play a significant role in the regeneration of taste bud cells.[49] Surgical procedures to repair nerve damage are another means to manage taste disturbances. These injuries should be repaired within the first 90 days to increase the chances of improvement.[42] In the present case an increase in the dosage of zinc from 200 to 450mg/day along with cevimeline helped in subjective improvement and comfort while eating. In our case, because of the time that had elapsed since the initial taste disturbance, a surgical procedure was not recommended.

Conclusion:

The case presented here is unique in that the patient reported a generalized taste change shortly after an oral surgical procedure. The various reasons which can be linked to this delay are patient's altered diet following normal wound healing from the oral surgical procedure, inflammation as a result of the surgery, masking of tastes by medications taken after surgery, unmasking of a preexisting condition by the oral surgery, heightening the patient's perception of altered taste or revealing an underlying and possibly undiagnosed preexisting hypothyroid or other systemic condition. Unlike most other patients in this situation, normal taste has not returned and will most likely remain unchanged, making this a rather distressing situation.

This article enlightens us with the knowledge of various etiological factors playing key role in gustatory disorders and thereby helping the oral health and medical practitioners to be able to recognize this phenomenon and thereby initiate the treatment.

Hopefully, this will increase patients' chances of recovery through timely diagnosis and appropriate care.

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