Burning mouth disorder (bmd) and taste: A hypothesis

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Received: 27/10/2007
Accepted: 06/01/2008

Indexed in:
-Index Medicus / MEDLINE / PubMed
-EMBASE, Excerpta Medica
-SCOPUS
-Indice Médico Español
-IBECS

Femiano F, Lanza A, Buonaiuto C, Gombos F, Cirillo N. Burning mouth disorder (bmd) and taste: A hypothesis. Med Oral Patol Oral Cir Bucal. 2008 Aug 1;13(8):E470-4.

http://www.medicinaoral.com/medoralfree01/v13i8/medoralv13i8p470.pdf

Abstract

Background: Burning mouth disorder (BMD) is a burning or stinging sensation affecting the oral mucosa, lips, and/or tongue, in the absence of clinically visible mucosal lesions. There is a strong female predilection, with the age of onset being approximately 50 years.

The causes of BMD are multifactorial and remain poorly understood.

Often BMD patients report, in association, change in taste.

In this regards, it is relevant that in central nervous system connections exist between taste and oral pain and that taste normally inhibits oral pain.

Aim: The working hypothesis of this study considers a possible relationship between burning mouth disorders and alterations of taste. Several conditions or pathologies can be responsible of taste disturbances that might be the cause of oral pain in BMD patients.

Subjects and methods: We have analyzed, retrospectively, 142 cases of BMD with associated taste disturbance. Possible causes that could be responsible for alterations of taste were investigated.

Results and conclusions: Sixty-one subjects revealed the habitual use of drugs having a documented interference with taste perception. Thirty-five subjects, among the 81 patients who had no associated pathology or habitual use of drugs, noticed in their clinical history conditions, pathologies or use of drugs that are known to affect the gustatory system. Therefore, we propose that BMD may represent an oral phantom pain induced in susceptible individuals by alteration of taste.

Key words: *Burning mouth, glossodynia, hypogeusie, dysgeusie, taste, oral pain.*

Introduction

Burning mouth disorder (BMD) is a chronic, intraoral burning sensation occurring in the absence of identifiable oral lesions or laboratory abnormalities (1). The most common intraoral site involved is the anterior tongue, but other sites can be affected including the hard palate, lips and less frequently the cheek. The patients usually describe the sensation as a burning, tingling, or numbness of some part of the oral cavity, and often describe it as a feeling that the mouth has been burnt by hot tea or coffee (2).

A multitude of studies have demonstrated psychological changes in BMD subjects including anxiety and depression. The presence of such psychological symptoms in combination with the absence of clinical findings has caused BMD to be viewed as a primarily psychological disorder, a belief fueled by the lack of responsiveness of BMD to different treatments (3-7).

In contrast to the above, there is a growing body of evidence that BMD may not always be psychological at origin, and may prove to be a model for other pain disorders both in the orofacial area and elsewhere (8-12). Burning and pain, the main features in BMD, are also characteristic features of some post-traumatic nerve injuries. In the latter, however, additional sensory abnormalities are often present which manifest as changes in perception of touch, temperature, two-point discrimination and pain (13, 14). No definite neurological causes of BMD have yet been identified but we have provided some evidence that it may be an intraoral form of neuropathic pain (15).
Patients with oral burning often report taste illness with dysgeusie or hypogeusie.
Thus, we have hypothesized that BMD may associated with or depend on taste disorders.

Subjects and Procedures

Obiectives
Aim of this study is to evaluate a possible relationship between BMD and taste disorders.
Inclusion criteria
We have analyzed 142 Italian patients affected by BMD (85 females and 57 males; median age 53 years).
All patients came to our clinical observation in a period referred to 2004-2005 complaining of oral burning associated to taste disorders (disgeusie or hypogeusie or normal taste but no flavor) in absence of any oral pathological evidence which could justify the oral pain. In particular, the majority of patients reported a reduction of bitter taste (hypogeusia) and metallic taste (dysgeusia).
BMD diagnosis was performed after using of a blood and instrumental protocol as listed in Table 1 and excluding whatever haematic and instrumental alteration.
Exclusion criteria
Patients having history of contact allergy and parafunctional habit were excluded from our study. Patients with associated pathologies that could be responsible for oral burning were excluded: oral candidiasis, gastroesophageal reflux disease, diabetes, anemia, Sjögren's syndrome, nutritional deficiencies (vitamin B-12, niacin, iron, or folic acid), and HIV.
Every patient was informed of the purpose of our study and informed consent was obtained.
Study design
Medical history of every patient was considered. Particular attention was paid on the presence of concomitant pathologies and/or use of drugs.
Data were analyzed by Wilcoxon signed rank test.

Table 1. Blood and instrumental protocol for BMD diagnosis.

Full blood count
Random blood glucose
Alanine and aspartate transaminase
Serum ferritin
Serum total IgE (paper radio-immunoadsorbent test = PRIST)
Serum vitamin Vit. B12
Serum antinuclear (ANA) and extractable nuclear antibodies (ENA)
Serum antibodies to Helicobacter Pylori
Scintigraphy glands salivar
Oral tampon for candida research

Results

The results obtained by clinical and anamnestic examination of the 142 BMD patients with taste disorder and the list of drugs taken are shown in Table 2. Sixty-one patients revealed concomitant pathologies along with use of various drugs (BMD-A). The list of substances that are documented to interfere with taste is shown in Table 3 (16-22); On the basis of such data which are reported from the data bank of drug –vigilance "Banque Nationale Française de Pharmacovigilance", it appeared that most drugs taken by BMD patients have been shown to cause taste disturbance (23).
In the majority of these cases, whenever possible, the substitution of the indicted drug allowed a spontaneous resolution of taste disturbance and a contemporary reduction or resolution of oral burning.
For the 81 patients (BMD-B), who had reported no associated pathologies or habitual use of drugs, the diagnosis of BMS (burning mouth syndrome) was performed. The clinical history of these subjects, retrospectively, was considered.
Therefore we analysed conditions, minor pathologies or occasional use of drugs happened 30 -60 days before the onset of oral burning along with taste disorder. For 46 patients, we didn't discover any pathological conditions that were supposed to be able to trigger oral burning or taste change. For 14 patients, herpes simplex, herpes zoster, mastoiditis and purulent otitis media were detected. Five patients revealed a transitory hypoaesthesia to the lower lip, the anterior hard palate or one side of the tongue after influenzal episodes or a local anaesthesia for dental treatment in the lower dental arch before the onset of BMD. Head trauma was found in recent medical history for two subjects. All the above conditions or pathologies have been demonstrated to be responsible for damage of nervous tract of taste. Other 14 subjects reported previous use of antibiotics which are known to interfere with taste receptors (Table 4). For these subjects, there was spontaneous complete or partial resolution of oral subjective symptomatology following the resolution of transitory pathology or condition in about 1-3 months and in absence of drugs therapy (24-28).

Table 2. Concomitant pathologies and drugs used in BMD patients.

Concomitant pathologies	Number of patients affected X (n females)	(%) of patients affected	Drugs taken
Several kind of pathologies in single form or associated (BMD-A)	61 (32 F)	43	
None (BMD-B)	81 (53 F)	57	
For 61 patients (BMD-A)			
Kind of pathologies	**Total number for pathology**		
Hypothyroidism	17* (11 F)		Thyroxine
Depression	14* (9 F)		Zopiclone, Benzodiazepine, Carbamezapine
Hyperthyroidism	3* (2 F)		Carbimazole, propyluracil
Hypertension	13* (6 F)		ACE-inhibitor
Hypercholesterolemia	16* (10 F)		Statin
Colitis	2* (1 F)		Sulphasalazine
Ischaemic heart disease	11* (5 F)		Calcium-antagonist, beta-blockers, nitrates, heparin
Obstructive pulmonary disease	5* (2 F)		Beta2-agonist

* Wilcoxon signed rank test P value is 0,0039

Table 3. Drugs interfering with taste (15-21).

Cardiovascular	ACE inibitors
	Calcium antagonists
	Beta blockers
Antimicrobials	Terbinafine
	Imidazole
	Mefloquine
	Macrolides
	Quinolines
Antiinflammatory	D-penicillamine
	Hydroxychloroquine
	Sodium aurothiomalate
	NSAIDs
	Aspirin
	Cortisone
Central nervous system	Zopiclone
	Zolpidem
	Carbamazepine
Endocrine and metabolic	Carbimazole
	Propylthiouracil
	Statin
	Fibrate
Antineoplastic	Methotrexate
	Cyclophosphamide
	Epirubicin
	Ciclosporin
Gastrointestinal	Sulphasalazine
	Domperidone
	Beta2-agonists

Table 4. Pathologies and condition or drug use found in previous clinical history for 81 BMD-B patients with no current medical history.

Number	%	Pathology or drug use	
46*	57	None detectable	
5*	6	Oral hypoaesthesia	
3 *	4	Oral herpes simplex	
4 *	5	Facial herpes zoster	
4*	5	Purulent otitis media	
3*	4	Mastoiditis	
2*	2	Head trauma	
14*	17	Antibiotics	Imidazole
			Macrolides
			Quinolones
			Peniciline

*Wilcoxon signed rank test P value is 0,0156

Discussion and Conclusion

In this retrospective study, we have attempted to evaluate whether changes in taste perception might be responsible for some BMD cases. We have found that 61 BMD patients revealed associated pathologies for which they took drugs known to interfere with taste (BMD-A), as it is quoted in the literature (16-22). Furthermore, 35 out of 81 patients with BMD without associated systemic diseases (considered as BMS patients: BMD-B) reported in their clinical history some pathologies, conditions or use of drugs that are recognized to potentially interfere with taste. For all these patients (61 BMD-A + 35 BMD-B) we propose that taste disturbance may be responsible for oral burning and pain, especially in supertaster (persons with higher number of papillae).

Anatomical associations between perception of taste and oral pain support the idea that damage to gustatory system might be associated with oral burning phantoms as well as taste phantoms (perception of taste in absence of stimuli) (29). Thus, BMD could represent an oral pain phantom induced, in predisposed individuals, by damage to gustatory system. Normally, taste input inhibits the area of the brain receiving input from the trigeminal nerve (30). Damage to the chorda tympani or disorder to the gustatory system release that inhibition leading to intensification of normal trigeminal sensations as well as phantom trigeminal sensations (31). Trigeminal sensations include oral pain as well as sensations of touch (swelling) and oral dryness.

The taste buds are largely diffused in the epithelium of dorsal surface of tongue, whereas less represented they are within mucosa of the palate, pharynx, epiglottis and third superior of esophagus. In the tongue, the taste buds are located in papillae circumvallate, foliate and more in fungiform papillae (32, 33). The number of fungiform papillae is related to genetic variation in the ability to taste, a variation discovered in 1931 when Fox found that some individuals could taste the bitter compound phenylthiocarbamide (PTC) while others could not (34). Subsequent study has shown that individuals unable to taste PTC and related chemicals have the smallest number of fungiform papillae (35).

Individuals who can taste PTC can be divided into medium and supertasters. The supertasters have the largest number of fungiform papillae. It may be that women are like men supertasters and this would explain explain the greater prevalene of BMD in woman than in men. Each fungiform papillae contains, on average, six taste buds and each taste bud is surrounded by a basket-like collection of pain neurons. Thus, a supertaster appears to be a superperceiver of oral pain (36, 37). There are several lines of evidence supporting this hypothesis that could explain why the BMD is found predominantly in postmenopausal women. Indeed, the ability to taste bitter substances is reduced following menopause due to decrease in estrogenic rate (38). Furthermore, there is evidence that taste normally inhibits oral pain. This was demonstrated by anaesthetizing the chorda tympani just on one side. In this study the intensity of oral pain produced by capsaicin (the compound that makes chilis burn) intensified on the side of the tongue contralateral to the anaesthesia; however, this occurred in supertasters, not in nontaster ones (6, 38-40). Similarly, the reduction of taste perception for disturbance to gustatory system, by releasing the inhibition on oral pain, may cause increase in the perceived intensity of oral burning and this is proportional to the density of fungiform papillae (supertaster subjects). Consistently, topical anaesthesia of the mouth intensifies oral burning sensation in many BMD patients. Just as with the anaesthetic effects on taste phantoms, the intensification of a phantom with anaesthesia suggests that the phantom arises from release of inhibition (38-42).

The several drugs utilized by 61 patients of the BMD-A group, previous conditions and pathologies for 21 subjects and previous use of antibiotics for 14 subjects (among 81 BMD-B patients) might be responsible for taste disorder for chemical interference on development and maturity of taste receptors, with subsequent onset of oral pain. This suggests that BMS is a sensory phantom that can arise when tonic inhibition processes in the central nervous system are disrupted (42).

Damage of the gustatory system, therefore, by releasing pain inhibition by taste, might cause to patients to experience of oral pain in absence of visible oral lesions (43). Furthermore, we have recently reported that patients with hypothyroidism often suffer from oral burning and/or dysgeusia. This finding is worth of note given the well known effect of thyroid hormones in the maturation of fungiform papillae. Thus, hypothyroidism could act as a negative factor for the development of papillae, with subsequent reduction in taste perception and eventual release of inhibition on the trigeminal somatic-sensorial sensitivity (44). Pathology such as head trauma and upper respiratory infections, otitis media, and herpetic infections are known to damage taste and to reduce the perceived bitterness of PROP (6-n-propylthiouracil (28,45,46).

We propose for BMD patients to valuate every condition and use of drugs that could interfere with gustatory system and be responsible for BMD. For these cases, sometimes, the substitution of this drugs could resolve the oral burning.

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Acknowledgement

We would like to thank Chilton Cruz and Shadi Boutros, University of California at San Francisco, San Francisco, CA, for reviewing this manuscript.