Burning Mouth Disorder in the Background of Periodontal Disease

Srividya Iyer · Ramesh Balasubramaniam

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Abstract

Purpose of Review This review aims to discuss burning mouth disorder (BMD) and its management and offers a guide to general dental practitioners to manage periodontal health in patients with BMD.

Recent Findings Dental practitioners are well trained in diagnosing and treating periodontal disease; however, when periodontal disease coexists with BMD, diagnosis and management of these conditions become more complex. Personalised treatment for individual patients is prudent for long-term treatment compliance and effectiveness.

Summary BMD is a chronic pain disorder characterised by the absence of visible mucosal lesions. It is often associated with the symptoms of burning, altered taste, and dry mouth with no obvious medical or dental cause. Diagnosis and treatment of BMD are complex and are influenced by multiple factors, which may complicate the diagnosis and treatment of especially painful periodontal disease.

Keywords Burning mouth disorder · Xerostomia · Dysgeusia · Periodontal disease · Neuropathic · Dysesthesia

Introduction

A number of terms have been used previously in the literature to describe oral burning including orodynia, oral dysesthesia, glossodynia, stomatodynia, and burning mouth syndrome. The International Association of Study of Pain describes burning mouth syndrome as a chronic condition characterised by a burning sensation of the oral mucosa for which no cause can be found [1]. The International Headache Society defines it as “an intraoral burning sensation for which no medical or dental cause can be found”, and hence, it falls in the category of neuropathic pain, which is described as constant without any triggers. It is a disease diagnosed by exclusion as there are a number of local and systemic conditions that can cause oral burning or mimic symptoms of burning mouth syndrome. However, nomenclature for burning mouth syndrome has recently been challenged by the term BMD as this condition is strictly speaking not a syndrome as oral burning or dysesthesia is the only symptom that is consistently present. All other symptoms associated with this condition may occur, however, varies in their clinical presentation. Hence the experts in the field by consensus consider BMD (previously known as primary or idiopathic burning mouth syndrome) the correct terminology for this condition [2]. Another novel term to describe oral burning is complex oral sensitivity disorder (COSD) has been adopted by some experts given its varied dyesthetic oral presentation [3]. For the purposes of this review, this condition will be addressed by the general consensus terminology of BMD.

Epidemiology

Information on the prevalence and epidemiology of BMD is inadequate worldwide due to vague diagnostic criteria and complicated by the poor exclusion of other causes of oral burning. A substantial portion of adults is affected by BMD with prevalence estimated between 0.7 and 15% in various races, with postmenopausal women being most frequently affected [4•]. There is a significant female predilection with a reported ratio of approximately 5:1 to 7:1 [5, 6]. The mean age of BMD patients is between 55 and 60 years, with...
the onset under 30 years being rare [7]. In a meta-analysis involving the general population, the prevalence of BMD was higher in Europe (5.58%) and North America (1.1%) and lower in Asia (1.05%) [8].

Clinical Presentation

Typically, the pain associated with BMD is described as a spontaneous, poorly localised burning and scalding sensation, often without any precipitating factors [9, 10]. The most prevalent site of involvement is the tongue; however, it may affect the lips, palate, gingivae, buccal mucosa, or the entire oral cavity [11]. In a cross-sectional study involving 236 BMD participants, it was found that the most commonly involved site was the tongue (63.6%) followed by gingiva (61.9%) and palate (45.3%) [12]. Bilateral pain presentation is usually reported, with variation in clinical manifestation in a specified location like the tip of the tongue. Description of pain quality is of burning and hot sensation, with mild to severe intensity or in the visual analogue scale range of 3 to 7. Altered taste (dysgeusia) especially in the form of metallic taste is accompanied in more than two-thirds of patients with BMD. Other symptoms such as paraesthesia, hyperpathia, allodynia, shooting pain, or sensation of a dry mouth can also be present [9, 11] (Table 1).

There are a number of factors that can cause oral burning, which must be excluded prior to establishing a diagnosis of BMD. A comprehensive clinical examination, diagnostic tests, and investigations along with psychological, local, and systemic factors such as parafunctional habits, dysgeusia, salivary changes, nutritional deficiency, diabetes mellitus, and menopause disorders should be factored in before making the diagnosis. Although the aetiology is poorly understood, BMD is thought to be a multifactorial disorder associated with complex interactions of biological and psychosocial factors (Fig. 1).

**Table 1** Signs and symptoms that may accompany burning mouth disorder—derived from Savage et al. [13••]

| Signs/symptoms                  | Subjective | Objective                                      |
|---------------------------------|------------|------------------------------------------------|
| Xerostomia                      | +          | +                                              |
| Sialorrhoea                     | +          | +                                              |
| Tongue ulcers                   | + (often fungiform papillae) | +                                               |
| Dysphagia                       |            | +                                              |
| Globus hystericus               | +          | +                                              |
| Dysgeusia (often metallic)      | +          | +                                              |
| Cervicofacial muscular hypertonicity | +          | +                                              |
| Parafunction (bruxing, tongue thrusting) | +          | +                                              |
| Cheek and tongue pressure against dentition (mucosal crenations) | +          | +                                              |
| Halitosis                       | +          | +                                              |

**Fig. 1** Pathophysiology of burning mouth disorder—extracted from Jääskeläinen et al. [14]
Neuropathic

A neuropathic origin of BMD is believed to be due to a decrease in the density of myelinated and unmyelinated thin fibres in the tongue epithelium. Additionally, the high density of fungiform papillae in BMD patients is an associated risk factor. The phantom taste or dysgeusia is a neuropathic symptom due to deafferentation of the chorda tympani. Recent data illustrates that thalamic atrophy with the features of a decrease in the grey matter volume (GVM) in the thalamus and a decrease in blood flow in the middle temporal gyrus and insula is a key factor in the pathogenesis of BMD. Nociceptive signalling to the cortex is mediated by this area and alteration in the thalamus is associated with chronic pain disorders [15•, 16, 17]. This explains the pain in BMD and reduced cerebral flow leading to the depressive symptomology in BMD.

Immunological

One of the key factors in disease onset and development is the dysregulation of inflammatory mechanisms [18]. Alteration in the proinflammatory cytokines and chemokines is seen in neuropathic and stress-related conditions. The upregulation of stress-related enzyme α amylase is also seen in patients with BMD [19]. The contribution of oxidative stress in the pathogenesis of BMD is supported by the altered level of reactive oxygen species found in patients with BMD [18].

Hormonal

Chronic stress and anxiety alter the adrenal steroid physiology and increased cortisol along with other salivary biomarkers in patients with BMD. This also has an effect on the level of gonadal steroids. Xerostomia and taste alterations as seen in patients with BMD are associated with hypoestrogenism as a result of menopause. This can have neurodegenerative effects on the peripheral nervous system in the form of small nerve fibres in the oral mucosa [20].

Psychological

A higher proportion of patients (80%) have preexisting depression, anxiety disorder, and chronic pain conditions prior to the onset of BMD [21]. However, the precise association between psychological factors and BMD is unclear. The role of stress and psychological factors in BMD is a topic under investigation and has varying degrees of contradictions in the literature. Personality disorders as seen in patients with BMD are associated with low dopaminergic tone in CNS [22]. As per the revised International Association for the Study of Pain [18], the definition of pain accounts for the fact that pain is a subjective experience that is influenced to varying degrees by biological, psychological, and social factors. There is also a consideration for whether BMD should be categorised as nociceptive pain.

Diagnosis

The diagnosis of BMD, having excluded secondary causes of oral burning, has evolved from basic intraoral disease exclusion to extensive clinical and laboratory investigations, which include the screening of comorbidities and other chronic pains and somatosensory testing (Table 2). It is essential to exclude the various causes of oral burning associated with underlying local and systemic factors (Table 3).

Treatment

There is no standardised curative treatment for BMD, and it is usually symptomatic relief. Holistic assessment and care, including an empathetic and supportive approach to patients’ complaints, are essential. Patients should be reassured that their symptoms are not imaginary (psychological) and not related to underlying cancer. Also, a realistic expectation of the outcome of BMD treatment is necessary [26]. This supportive approach will reduce the patient’s anxiety,

Table 2 Diagnostic criteria for burning mouth disorder—data from Currie et al. [23••]

| Criteria | Comments |
|----------|----------|
| A. Oral pain fulfilling criteria B and C | Usually bilateral and of fluctuating intensity |
| B. Recurring daily for more than 2 h per day for more than 3 months | There is a high menopausal female prevalence and also, psychosocial and psychiatric disorders association |
| C. Pain has the following characteristics (both): Burning quality and superficial presentation in the oral mucosa | Most common site of presentation is tongue. Dry mouth, dysesthesia and altered taste are present |
| D. Normal appearance of oral mucosa including normal sensory testing | Other secondary burning factors should be excluded |
| E. Not accounted for by another ICHD-3 diagnosis | Subjective dryness of mouth, dysesthesia and altered taste may be present. It is a matter of debate whether the secondary BMD is considered as an entity as current evidence does not justify inclusion even in the appendix |
depression, fear, and frustration from often multiple previously unsuccessful treatments [27]. It is important to distinguish BMD from secondary causes of oral burning as the elimination of underlying factors causing oral burning will result in the improvement or resolution of oral burning.

Therapeutic strategies (Table 4) include benzodiazepines (clonazepam), tricyclic antidepressants (amitriptyline), anticonvulsants (gabapentin), selective inhibitors of serotonin receptors (paroxetine and sertraline), capsaicin topical/systemic, and alpha-lipoic acid (antioxidant).

Nonpharmacological therapies such as photo biomodulation have limited scientific evidence and are postulated to decrease BMD, by the release of serotonin and endorphins, blocking the depolarization of C-fibres, and decreasing bradykinin secretion. Relaxation techniques such as progressive muscle relaxation and focused breathing are employed to alleviate discomfort, with concurrent use of cognitive restructuring detracts negative emotional and behavioural problems. Several studies demonstrated a positive response to cognitive behavioural therapy (CBT) for the management of BMD, particularly in combination with pharmacological management such as alpha-lipoic acid.

Salivary supplements are used routinely to relieve symptoms of burning and dry mouth. Lysozyme-lactoperoxidase is commonly used as a salivary supplement. Other topical agents have been investigated, including extra-virgin olive oil with lycopene, 10% urea, melatonin, chamomile, aloe vera, and benzydamine hydrochloride; however, none of these supplements have been reported as effective in various studies [28••].

Table 3 Local and systemic factors that can cause oral burning—extracted from Tan et al. and Balasubramaniam et al. [24••, 25•]

| Local factors                              | Systemic factors                                      |
|--------------------------------------------|-------------------------------------------------------|
| Oral mucosal diseases/lesions – fungal infection – Candidiosis | Nutritional deficiency – decreased level of Iron, Zinc, folate and vitamin B1, B2, B6 and B12 |
| Inflammatory conditions – lichen planus, pemphigus, pemphigoid, geographic tongue | Endocrine disorders-Diabetes mellitus, hypothyroidism, thyroid disorders, hormone deficiency |
| Trauma – Mechanical -ill-fitting dentures, sharp edges of teeth or restorations. Chemical – abrasive | Autoimmune or immunological disorder-Sjogren’s syndrome, systemic lupus erythematosus, lichenoid reaction |
| toothpaste, mouthwash containing ethyl alcohol, acidic drinks, aspirin, oral galvanism, food dyes, additives Thermal – hot/spicy food and beverage | Medications/drugs – Angiotensin converting enzyme inhibitor, antiretrovirals |
| Dry mouth – hyposalivation, xerostomia    |                                                        |
| Parafuction                                |                                                        |

Table 4 Treatment of burning mouth disorder

| Route | Treatment          | Class            | Mechanism of action                  | Dose            | Side effects                          |
|-------|--------------------|------------------|--------------------------------------|-----------------|---------------------------------------|
| Topical | Clonazepam | Benzodiazepine | GABA-A agonist | 0.5-3 mg/day | Minimal in topical form |
|       | Capsaicin | Chilli pepper extract | TRPV1 agonist on C fibres | 0.01% or 0.025% gel three times a day for 14 days | Minimal adverse effects in topical form |
|       | Bupivacaine lozenges | Amide | Local anaesthetic | Blocking voltage gated Na + channels | 25 mg | Minimal |
| Systemic | Alpha lipoic acid | Fatty acid | Antioxidant and neuropeptide | 600-800 mg/day | Higher doses can cause nausea, rashes and itching |
|       | Clonazepam | Benzodiazepine | GABA-A agonist | 0.5 – 2 mg/day | Drowsiness, dizziness, dryness, fatigue, dependence |
|       | Fluoxetine | Antidepressant | Selective serotonin reuptake inhibitor | 20-40 mg | Blurred vision, dizziness, dry mouth, urinary retention |
|       | Pregabalin | Antiepileptic | Structural analogue of GABA. Binds to voltage-dependent calcium channel | 50-150 mg/day | Somnolence, confusion, restlessness, agitation, depression |
|       | Gabapentin | Anticonvulsant | Structural analogue of GABA. Binds to voltage-dependent calcium channels | 300 mg/day | CNS and respiratory depression, hypersensitivity, restlessness |
Management and Periodontal Treatment Considerations

Periodontal disease is characterised by chronic inflammation, which mediates the interaction between the immune system and pain. Treatment of periodontal disease in patients with BMD may continue as planned; however, certain aspects such as low pain tolerance and depressive outlook can negatively impact both the affective function and quality of life in patients with BMD [29••].

Patients with BMD often neglect maintenance and routine dental treatment including scaling and root planing to avoid exacerbating or recurrence of their oral symptoms. This may deteriorate their periodontal and overall oral health.

In patients with BMD, pain may vary and fluctuate in intensity; therefore, an appreciation of the pain cycle is essential. If pain is episodic, periodontal care-related procedures should be carried out during periods of lowest pain intensity or remission [30••]. Furthermore, procedures like scaling and root planing requiring multiple visits should be performed when medication used in the management is at its peak level of effectiveness. Hence, dental practitioners should have knowledge of the pharmacokinetics and pharmacodynamics of their patients’ BMD medications to take advantage of these factors and provide maximum comfort with minimal risk of pain intensification [30••].

For soft tissue maintenance and removal of calcified deposits, dental practitioners should consider careful and gentle administration of local anaesthesia to the areas to be treated to produce anaesthetic camouflage and, thereby, decrease noxious stimuli to the CNS. Oral hygiene aids and techniques should be used to limit stimulation, thereby mitigating patients’ reluctance to perform daily dental hygiene procedures. Soft cleansing aids (a soft or extra soft toothbrush), interdental cleaning devices (various floss textures, dental tape, interdental cleaners), antibacterial/antiplaque alcohol-free mouth rinses, remineralising agents and fluoride supplementation in the form of custom trays or pastes may be recommended for achieving good periodontal and overall oral health in patients with BMD.

Conclusion

BMD is a complex chronic pain condition that proposes challenges in both diagnosis and management. This article reviewed the current literature on the recent advances in diagnosis and management. While a common-sense approach to the management of periodontal disease in patients with BMD has been adopted based on the available scientific literature, further research in this area is needed.

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Compliance with Ethical Standards

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