Contact Allergy to Cinnamon: Case Report

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ABSTRACT

Allergic contact stomatitis is a rare disorder that is unfamiliar to most clinicians. The vast majority of cases are associated with consumption of products containing cinnamaldehyde or cinnamon essential oil, which are used as flavourings because of their pleasant taste and sensation of freshness. We report here the case of a patient who was diagnosed with alllergic contact stomatitis due to cinnamon-flavoured chewing gum. The clinical features of allergic contact stomatitis, which may occur indiscriminately on any of the oral mucosa, include edema and erythroplakic, ulcerous or hyperkeratotic changes, generally accompanied by a burning sensation. The histopathologic aspect of allergic contact stomatitis is nonspecific but tends to support the clinical diagnosis. Treatment generally consists of eliminating the causal agent. To avoid unnecessary diagnostic procedures and treatments, it is important for clinicians to recognize this disorder to be able to diagnose it quickly and accurately.

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Allergic contact stomatitis accounts for only a small proportion of oral disorders and is therefore little known among dentists.[1] Contact dermatitis, the most frequent form of immunotoxicity among humans, is much more common than contact stomatitis.[2] Moreover, only the allergic form of contact stomatitis develops in the mouth, whereas the skin may be subject to a form of irritant contact dermatitis as well as dermatitis secondary to exposure to ultraviolet rays.[3,4] Allergic contact stomatitis may be caused by a wide range of substances, including the aromatic compounds found in chewing gum and toothpaste, the most common being carvone, spearmint essential oil, menthol essential oil, cinnamaldehyde and cinnamon essential oil.[5] These substances are also used in ice cream, soft drinks, candies and mouthwash.[6] In addition to their use as a flavouring for certain products, these compounds are used at higher concentrations in antitartar toothpastes to mask the bitter taste of pyrophosphates.[7] Other products, such as formaldehyde,[5] the acrylates used in making dentures[8] and several metals including nickel, palladium, gold and mercury used in dental amalgam[9–11] may also cause contact stomatitis. Amalgam may cause clinical signs and symptoms resembling oral lichen planus, but where there is this form of contact allergy, a lichenoid reaction to amalgam should be diagnosed.[12]

Mechanism of Action

Allergic contact stomatitis is a hypersensitivity reaction (type IV) that affects only individuals who have previously been sensitized to the allergen. Because of the cascade of cellular events involved, contact stomatitis does not become evident until several hours or even days after exposure to the antigen; hence the term "delayed hypersensitivity reaction." The

allergic process develops in 2 phases: the induction phase, which sensitizes the immune system to the allergen, and the effector phase, during which the immune response is triggered.[2]

Allergens are molecules with the ability to infiltrate the mucosal epithelium and bind to epithelial proteins. The newly formed complexes have certain immunogenic properties.[13] In the induction phase, on first contact with the antigen, these complexes are phagocytized by specialized cells (macrophages) that present the complexes on their surface and migrate toward the regional ganglia. The complexes are then recognized by a specific group of lymphocytes, the helper T cells, which subsequently enter the stimulation and division phase, leading in turn to the production of 2 other types of T lymphocytes: memory and cytotoxic T lymphocytes. The memory T lymphocytes are then stimulated by contact with the antigens, and the cycle begins anew. Because these lymphocytes remain in the body for life, a more aggressive, more rapid immune response will be triggered whenever the antigen is encountered again. This cycle is controlled by several cytokines, which reinforce the T lymphocytes, support their proliferation and activate the macrophages.[2]

The effector phase of the process begins when the cytotoxic T lymphocytes ($CD8^+$ cells) produced in the first phase release cytokines to recruit and activate helper T lymphocytes ($CD4^+$ cells) from the peripheral circulation. The cytotoxic T lymphocytes bind to the epithelial cells and cause the death of cells that present the complexes.[14]

Although there are many allergenic substances and many people who have been exposed to them, it is believed that the specific environment of the oral cavity inhibits hypersensitivity reactions, which explains why this phenomenon is not more commonly seen. Two particular mechanisms might explain this observation. First, the saliva ensures constant cleaning of the mucosa and reduces contact time with allergenic substances. Second, the high degree of vascularization of the mucosa causes rapid absorption of antigens, which further reduces prolonged contact with these substances.[8]

Clinical Features

The clinical features of allergic contact stomatitis vary widely and include tissular edema, erythema, cracking, ulcerative areas, hyperkeratosis in the form of plaques or striations, desquamation and vesicles. Any of these features, which may occur concurrently, may be accompanied by pain, with or without a burning sensation.[15–19] They typically appear at sites that are in direct contact with the causal agent. The clinical appearance depends on the exposure time, the concentration of the causal agent and the type of exposure. For example, in a hypersensitive patient, wearing a removable dental prosthesis will affect the palatine mucosa or the alveolar ridge, the use of chewing gum could have a greater effect on the lateral surfaces of the tongue or the buccal mucosa, and use of a mouthwash or toothpaste may affect more areas of the oral cavity.

Microscopic Observations

Allergic contact stomatitis manifests primarily through hyperorthokeratosis, acanthosis or atrophy, all of which may be accompanied by liquefaction degeneration of the basal layer of the affected epithelium. Neutrophilic exocytosis and spongiosis are sometimes observed. Ulcerated areas characterized by fibrinopurulent exudate and acute inflammatory infiltrate may appear. The superficial area of the connective tissue presents a chronic inflammatory infiltrate composed principally of lymphocytes and plasmocytes and sometimes organized in a band resembling oral lichen planus but extending more deeply into the tissues. A perivascular lymphocytic infiltrate may also be present, accompanied by plasmocytes and eosinophils. The latter may also be observed in the superficial connective tissue.[1,15]

Case Report

A 42-year-old patient was referred to the faculty of dentistry at Laval University by her dentist for diagnosis of a nondetachable localized white lesion of the left buccal mucosa. This lesion had been found by the patient and appeared to come and go cyclically. The patient did not report any sensitivity when eating spicy or acidic foods or using toothpaste. However, she had noticed some sensitivity to the cinnamon-flavoured gum that she chewed a few times a week. The patient did not exhibit any parafunctional behaviour such as chronic cheek biting. She reported no cutaneous or ocular lesions or vaginal itching. Her medical history was noncontributory, and she was not taking any medications regularly. She smoked 1 or 2 small cigars per week.

The intraoral examination revealed full dentition of the maxilla and mandible. The restorations were made of amalgam and composite materials and included porcelain-fused-to-metal crowns. In the left buccal mucosa (**Fig. 1**), a white and red partially erosive lesion with a traumatic appearance was observed beginning in the retrocommissural area and extending to the pterygomaxillary raphe. This band-like lesion measured approximately 1 cm in height and was localized in the area of the buccal linea alba. An examination of the right buccal mucosa revealed similar lesions, but they were confined to the retrocommissural area. The other mucosa appeared unaffected.

The differential diagnosis of the lesions included an allergy to chewing gum, chronic cheek biting, erosive oral lichen planus, leukoplakia (precancerous lesion) and hyperplasic candidiasis. It was recommended that the

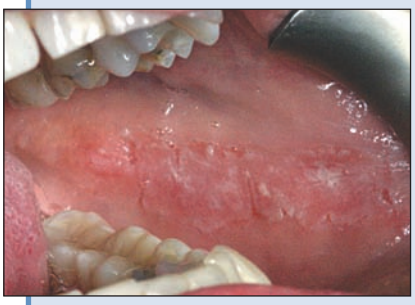

Figure 1: Appearance of the left buccal mucosa at the first consultation. Several white nondetachable plaques are visible on an erythematous background.

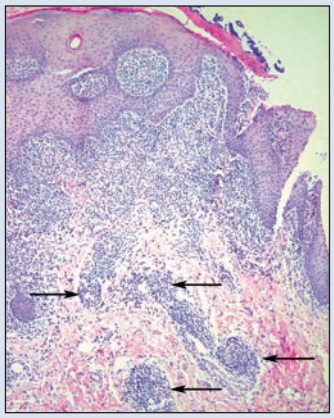

Figure 2: Photomicrograph showing a fragment of a predominantly lymphocytic band-like inflammatory infiltrate located directly under the epithelium and attached to the basal cell layer. Eosinophils and plasmocytes were observed at higher magnifications (not shown). Deeper in the connective tissue, a perivascular lymphocytic infiltrate can be observed (arrows). Hematoxylin and eosin ×20.

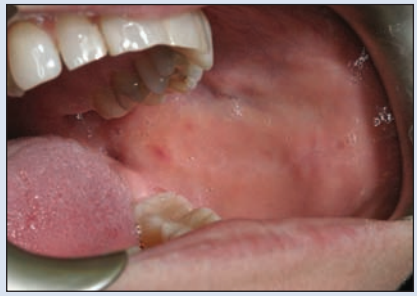

Figure 3: At the follow-up visit, after discontinuation of consumption of cinnamon-flavoured chewing gum, the appearance of the left buccal mucosa is normal, except for the presence of 2 petechiae.

patient stop using chewing gum for 2 weeks. At the patient's request, an incisional biopsy of the buccal mucosa was performed the day of the initial appointment. The microscopic examination revealed a fragment of tissue composed of keratinizing stratified squamous epithelium covering an inflamed connective tissue. A predominantly lymphocytic band-like inflammatory infiltrate that also contained eosinophils and plasmocytes was observed directly under the epithelium and adjacent to the basal cell layer (**Fig. 2**). Deeper in the connective tissue, there was a perivascular lymphocytic infiltrate. The histopathologic and clinical features were consistent with a hypersensitive reaction to chewing gum. After use of cinnamon-flavoured chewing gum was discontinued, the lesions of the buccal mucosa disappeared completely (**Fig. 3**).

Discussion

Given its numerous clinical features, allergic contact stomatitis can easily be confused with other more or less serious disorders. These include a variety of white lesions (e.g., hairy leukoplakia, leukoplakia, lesions associated with chronic biting, hyperplasic candidiasis, reticular oral lichen planus, epidermoid carcinoma) and red lesions (e.g., atrophic or erosive oral lichen planus, lupus erythematosus or discoid lupus, epidermoid carcinoma).[1,15]

No intraoral sites are spared from contact stomatitis. It may just as easily develop on keratinized as nonkeratinized mucosa. However, it mainly affects the lateral edges of the tongue, the attached gingiva, the buccal mucosa and the hard palate.[1,8,15]

Some practitioners use patch tests to confirm the diagnosis of allergic contact stomatitis. Although these tests may yield positive results for some patients, false-negative results often occur. Direct tests of the mucosa are difficult to perform and even more difficult to interpret, given the structural differences between the skin and the oral mucosa.[20]

The treatment of allergic contact stomatitis involves eliminating the allergenic agent, whose allergenic properties may be confirmed by the reappearance of inflammatory lesions on re-introduction of the agent. Complete disappearance of the lesions can take up to 2 weeks.[20] Patients experiencing more severe symptoms may need a topical corticosteroid in the form of a mouthwash, ointment or gel to accelerate healing.

Conclusion

In addition to information gathered by the standard health questionnaire, the main factor in diagnosing allergic contact stomatitis is the information obtained through the interview with the patient, which allows the clinician to associate consumption of the allergenic agent with development of symptoms. Although the histopathologic element is not pathognomonic for contact stomatitis, a biopsy will usually support the clinician's diagnosis and eliminate the other abnormalities in the differential diagnosis.

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