



Denture sore mouth

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There are few dental rehabilitative options for edentulous patients, of which the soft tissue-supported complete denture is the most common. In general, patients accept the fact that dentures are a poor substitute for natural teeth; consequently, they tend to tolerate discomfort and inefficient chewing. Quite often additional alveolar ridge resorption results from years of denture wearing, and unless the patient is willing to follow up with a dentist in a consistent and timely manner, ridge resorption can continue and mucosal problems can exacerbate. This article discusses the causes of common inflammatory disorders associated with denture wearing, namely denture sore mouth (DSM) and other related mucosal problems associated with the long-term denture patient.

There are additional circumstances that contribute to problems associated with the fabrication and wearing of complete dentures. Denture patients are generally in their fourth through sixth decades of life and many have significant health problems. The side effects of many medications can contribute to decreased saliva production, which complicates denture wearing. Strokes can prevent normal jaw movement and mastication, and other debilitating diseases can decrease the patient's oral function and ability to tolerate dentures. The patient's demands and attitudes can also be responsible for denture problems; for example, some patients tend to have unrealistic expectations of what dentures can do.

For many patients, the process of becoming edentulous and obtaining complete dentures is a troubling experience. These patients quite often have had lifelong dental problems and many of their experiences have been unpleasant. Even with the limitations

of complete dentures, it is still possible to deliver excellent denture services for edentulous patients. If the patient is compliant with professional treatment suggestions and the long-term commitment of daily denture maintenance, problems related to denture sores can be minimized. One of the main reasons for ill-fitting dentures and the subsequent problems—especially for those patients that do not have regular dental visits—is the continuing resorption of the edentulous alveolar ridge. Therefore, a short discussion of ridge resorption may help clarify the nature of the denture-related problems outlined in this article.

Ridge resorption

Progressive ridge resorption is one of the main causes of the loss of stability and retention of complete dentures. Ridge resorption is reported to be very rapid during the first year after extraction of teeth and continues progressively throughout the patient's life. There is a large interindividual difference in the rate of resorption, which may be influenced by several nutritional and physiologic factors. Nahri et al [1] recently found that the amount of residual ridge resorption was significantly correlated with the number of years females were edentulous; however, this was not true in males. Ridge resorption was also found to increase after menopause; therefore, denture stability problems are more often associated with female patients. DSM complaints generally begin between the ages of 40 and 60 years (mean: 49 years). In most patients, complaints begin with the first prosthesis, and DSM appears to occur mainly in women. It is clear that factors such as osteoporosis may predispose female patients to increased alveolar bone loss and denture-related problems.

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In the same study [1], the authors noted that 34% of edentulous patients needed additional dental treatment. The most common complaints were soreness in the denture-bearing mucosa (one third of the subjects) and fair or poor chewing ability (another third). Those patients who had lost more than 50% of supporting bone reported a need for dental treatment more often than those whose bone loss was less than 50%. Painful denture-bearing tissues and poor chewing ability was also more often reported by subjects with more extensive bone loss. In general, denture complaints increased with increased residual ridge resorption.

Some patients resort to the use of commercial denture adhesives or self-reline materials to hold their dentures more securely in position; however, these products may actually increase the amount of soreness and inflammation of the oral tissues. Patients should have their dentures professionally relined or rebased to fit the changing denture-bearing area.

The retention and stability of complete dentures is significantly improved if the denture-supporting area can be increased. Over the years there have been several surgical procedures to augment residual ridges using various osseous graft materials. The use of synthetic particulate hydroxyapatite to increase the denture-bearing area, especially in the mandibular arch, has been attempted. Generally, the results have not been encouraging, and the use of particulate graft materials is no longer advocated. More recently, manufacturers have encapsulated hydroxyapatite particles in a biologically inert mesh that prevents the particles from migrating. This mesh has been used to augment vertical height to resorbed ridges.

Other surgical techniques using the patient's ribs or other extra-oral bony sites have been used to augment and rebuild resorbed jaws. Quite often there is significant resorption of the grafted tissues, but the ideal graft material to achieve vertical ridge height is still not available.

Currently, the most predictable way to provide support or retention for complete dentures in patients with severely resorbed jaws is to use dental implants. Titanium dental implants have been used successfully to support complete dentures and can be used to hold the dentures in place with a variety of retentive measures. The patient may also be able to have three to six implants placed in an arch and thereby have the complete denture screwed into the implant as a rigidly fixed prosthesis. Patients with severely resorbed alveolar ridges have found this to be very well tolerated, and function is increased significantly over a nonsupported denture prosthesis.

The use of dental implants enables patients who were wearing removable, soft tissue-born prostheses to have a fixed or markedly improved removable prosthetic replacement supported by implants. This treatment restores function to the extent that it resembles that of natural teeth, though there may be continuing soft tissue problems in a noncompliant patient.

DSM (denture stomatitis)

DSM is the most frequent diagnosis associated with denture wearers and is used for those patients whose subjective symptoms continue to exist after a period of 6 to 8 weeks. The term *DSM* is used to describe the pathologic changes that occur in the mucosa of the denture-bearing surfaces. Patients may complain of burning sensations, soreness, rawness, and dryness where the oral mucosa comes in contact with the dentures. Objective symptoms may also exist. The region covered by the denture is usually velvety red and swollen (Fig. 1). The tongue may also become erythematous and swollen. Salivation may be disturbed and blisters may develop. Studies have reported an 11% to 67% incidence of DSM in denture-wearing patients, whether wearing complete or removable partial dentures [2–4].

A major cause of DSM is tissue trauma from ill-fitting dentures, which predisposes the patient to oral fungal infection by *Candida albicans*. Another source of inflammation is an allergic response to some component to the denture base material. Although allergic responses to denture acrylics is uncommon, there is a female predilection. In a report by Fisher [5], 19 of 24 patients with allergic reactions to denture materials were female.

Treatment consists of a good oral and denture hygiene regimen accompanied by a period of rest for the tissues that support the denture daily. Tissue rest is simply achieved by removing the denture for a period of time, or with the application of tissue conditioners to the denture base. Generally, DSM is complicated by a fungal infection of *C. albicans*.

Russotto [6] found that most denture patients (93.3%) presented with local or systemic factors that predisposed the oral cavity to proliferation of *C. albicans*. In their study, there was a strong correlation between DSM and angular cheilosis. Approximately 83% of the experimental group wore either removable partial or complete dentures and complained of soreness in the tissues contacting the denture base. Examination of the patients in this study revealed findings compatible with DSM or

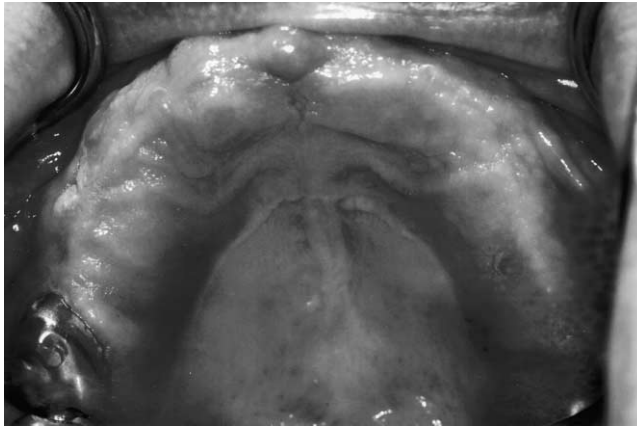


Fig. 1. Typical presentation of denture sore mouth. The patient wears a removable partial denture in the maxillary arch and presents with red, swollen tissues that relate directly to the denture contact area.

chronic candidiasis. The conclusion was that the incidence of chronic *C albicans* infection is greater than previously believed. Angular cheilosis and DSM are often found together; the cause of both lesions is *C albicans*.

Several histological studies have evaluated differences in the palatal soft tissues associated with denture wearing. In a study comparing palatal biopsies obtained from denture-wearing patients without DSM and nondenture wearers, the investigators found a mitotic index that was three times higher in denture wearers than in nondenture wearers [7]. Therefore, normal denture wearing is related to higher cellular activity and turnover. In addition, there is also reduced keratin density in the stratum granulosum and a flattening of the epithelial connective tissue interface after a considerable period of denture wearing.

Van Mens et al [8] studied the histologic features of the palatal mucosa in DSM patients. All patients had worn their dentures for approximately 4 years. Palatal biopsies were obtained from DSM and healthy denture-wearing patients. The authors noted that the mean thickness of the epithelium did not change between the DSM and control group. The mitotic index in denture-bearing epithelium from patients suffering with DSM was three times lower than in the epithelium of the normal denture wearers. The patients suffering from DSM showed a lower mitotic index but displayed a relatively high number of Langerhans cells. Therefore, epithelial cell proliferation appears to be diminished at the same time an active immune response is occurring, as indicated by the presence of the Langerhans antigen-presenting cells.

Traumatic ulcers

Traumatic ulcers are sore spots on the oral mucosa that occur when the denture base does not accurately conform to the anatomy of the residual ridge. Other causes include residual spicules of bone, root fragments, a rough inner surface of the denture, and uneven distribution of the forces exerted during the chewing cycle over the mucosal tissues.

Clinically, ulcers appear as small, painful, irregularly shaped lesions occasionally covered by necrotic epithelium and are usually surrounded by an inflammatory, erythematous halo. Differential diagnosis for traumatic ulcer must include recurrent herpetic stomatitis and aphthous ulcers. The treatment consists of recontouring the denture base or the ridge anatomy. Sore spots associated with entrapment of food particles will disappear within several days, but soreness related to denture or ridge problems or excessive function will persist despite good oral hygiene efforts by the patient and requires professional dental evaluation.

Candidiasis

Candidiasis is the most common fungal infection of the oral cavity, and it may manifest itself in several ways. The typical lesions (subacute form) appear as grayish-white patches that vary in size, shape, and distribution. The plaque-like area is composed of necrotic epithelial cells and *C albicans* organisms that can be wiped away with a cotton sponge. This form of the disease is easily recognized, diagnosed, and treated with antifungal agents. The chronic form of *Candida* infection is much more difficult to

recognize or diagnose clinically because it resembles other soft tissue diseases, especially the oral lesions seen in individuals with malnutrition or allergic responses. In the past, oral candidiasis was considered to be the result of a serious systemic abnormality, except in pregnancy or early infancy. Often, an infection of the oral cavity by *C albicans* is the first sign of an underlying systemic disorder, therefore an accurate medical history is important. Candidiasis can also result from antibiotic treatment, or treatment with immunosuppressant drugs. In cases in which no history of debilitating disease can be elicited and the patient denies any history of prolonged use of antibiotics or immunosuppressant drugs, local factors such as ill-fitting dentures should be considered as the possible cause of oral candidiasis.

Denture-related chronic candidiasis is often treated with nystatin oral (Mycostatin) suspension or creams. Clotrimazole troches (Mycelex troches) have been used with good success. Systemic medications such as fluconazole (Diflucan) are also very effective.

Angular cheilosis

Angular cheilosis is a nonspecific term that applies to all inflammatory reactions, erosions, ulcerations, and lesions at the corners or angles of the mouth. The lesions generally begin at the corners of the lips and extend onto the skin, following the skin folds (Fig. 2). Most angular cheilosis lesions reveal their inflammatory nature by being intensely red, fissured, or ulcerated. Others are crusted in the varying colors from pale yellow to dark brown. Generally, the lesions are accompanied by subjective symptoms of burning, tenderness, soreness, or pain.



Fig. 2. Angular cheilosis seen at both corners of the lips of a patient wearing a maxillary complete denture.

Early studies concluded that angular cheilosis was associated with nutritional deficiencies or reduction of the normal intermaxillary distance. These studies indicated that certain nutritional deficiencies or the loss of vertical dimension of occlusion were the primary causes of angular cheilosis, and only a few studies implicated microorganisms. Later studies demonstrated an association between angular cheilosis and *C albicans*; however, *C albicans* was still believed to be of secondary importance. Bacterial infection with staphylococcal organisms can also be a cause of angular cheilosis. Indeed, angular cheilosis is often multifactorial.

More recently, Russotto [6] found a 100% correlation between angular cheilosis and the detection of *C albicans*. Many authors have reported angular cheilosis resulting from intraoral *C albicans* infection associated with DSM. Cawson [9] and Bodtz-Jorgensen [10] also reported that *C albicans* infection of the tongue was commonly associated with DSM.

Fibrous inflammatory hyperplasia (epulis fissuratum)

Denture-induced fibrous inflammatory hyperplasia occurs around the borders or flanges of an ill-fitting complete denture. Initially, there may be a small ulcer, but as the flange continues to irritate the tissue, an inflammatory lesion develops. It is often described as being a raised, sessile lesion that may be single or multiple, and is composed of an altered epithelium overlying hypertrophic connective tissue resulting from the trauma and inflammation caused by the presence of the flange (Figs. 3, 4). It is often asymptomatic and may be limited to tissues around

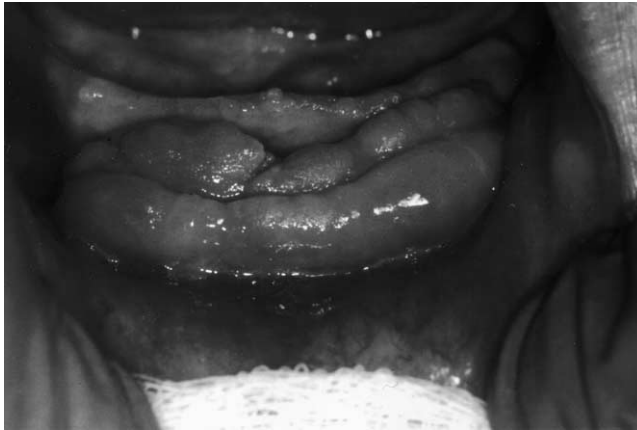


Fig. 3. Fibrous inflammatory hyperplasia in a patient a complete mandibular denture. There are two large hyperplastic tissue folds in front of the thin residual mandibular alveolar ridge.

the borders of the dentures. The light microscopic appearance of biopsies from the lesion has been discussed by Cutright [11]. In most lesions, hyperkeratotic epithelium alternates with parakeratosis or orthokeratosis. The spinous layer of viable cells is usually acanthotic but can be normal or atrophic in places. The basal layer of proliferative cells may be hyperplastic (up to four cell layers thick) or may display the complex rete ridge pattern known as pseudoepitheliomatous hyperplasia. The connective tissue of the lamina propria is usually grossly thickened and displays many areas of chronic inflammation, coexisting with dense fibrosis.

Fibrous inflammatory hyperplasia predominantly affects females at a proportion of 5:1 [12]. The explanation for the frequency of fibrous inflammatory hyperplasia among females is not well understood

and is possibly a result of the fact that female patients wear their dentures for longer periods each day. Another possible mechanism may be related to hormonal influences. During or after menopause, there is atrophy of the mucosa of the oral cavity, concomitant with decreased ovarian secretion. The thin, atrophic oral epithelium offers less protection against irritation, and may be more prone to develop an inflammatory reaction as a result of chronic trauma. Usually, the greatest proportion of patients with fibrous inflammatory hyperplasia is in their fifth and sixth decades of life.

Some studies have reported the frequency of all denture-related lesions increasing with patient age, length of denture use, and have found the mean length of denture use was 8.7 years in patients with fibrous inflammatory hyperplasia. The useful life of a



Fig. 4. Patient in Fig. 3 with the mandibular complete denture in place. Notice how the denture flange rests between the two folds of fibrous tissue and does not contact the bony (alveolar) ridge.



Fig. 5. Inflammatory papillary hyperplasia of the hard palate. The soft tissue of the hard palate is covered with hyperplastic epithelium with a nodular or pebbly appearance. Tissues are highly inflamed and bleed easily when palpated.

complete denture is about 5 years. The presence of fibrous inflammatory hyperplasia is due to the extended period of denture wearing without relining or modification resulting in an overextended denture periphery because of ridge resorption.

Fibrous inflammatory hyperplasia is considered to be benign in nature. However, sites of chronic irritation may be predisposed to the development of squamous cell carcinoma, and neoplastic changes have been reported. Hoback [13] studied the relationship of chronic irritation by an ill-fitting complete or partial denture in the development of cancer. He reported on 560 cases of oral cancer and verified that 204 patients were denture patients and in 86 of these patients there was a relationship between cancer and irritation caused by dentures. He suggested that the possibility of a direct transition to carcinoma from

fibrous inflammatory hyperplasia cannot be excluded. The irritant effect of the denture base materials and the tissue changes in these patients should be thoroughly evaluated.

Inflammatory papillary hyperplasia

Inflammatory papillary hyperplasia is a benign, persistent, and usually painless lesion of the oral mucosa that is the result of epithelial proliferation (Figs. 5–7). Inflammatory papillary hyperplasia is generally observed on the hard palate and is a non-neoplastic lesion characterized histologically by significant epithelial hyperplasia and an inflammatory infiltrate usually in response to trauma and *C albicans* infection.

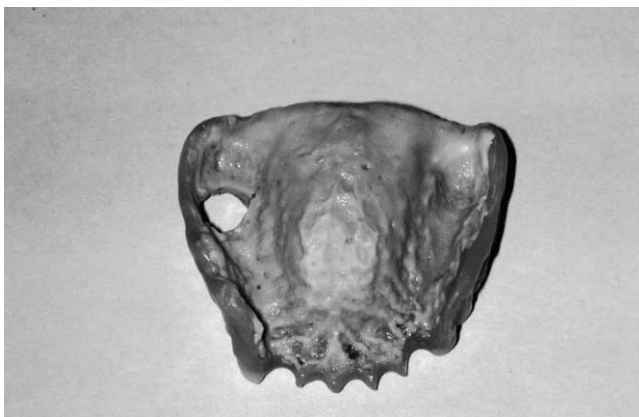


Fig. 6. The poorly fitting maxillary partial denture of the patient in Fig. 5. The partial denture is providing inadequate function for the patient and the patient requires a new denture.



Fig. 7. Inflammatory papillary hyperplasia of the maxillary alveolar ridge. Notice the extreme pebbly appearance of the tissues, which bleed profusely when manipulated.

Kaplan et al [14] examined the p53 antigen and the proliferative cell nuclear antigen (PCNA) in biopsies from denture wearers and controls. Both p53 and PCNA are cell-cycle regulators and may reflect malignant transformation. All cultures from both the palatal mucosa and dentures were positive for *C albicans*. The epithelial width and inflammatory infiltrate were significantly higher in inflammatory papillary hyperplasia than in controls. In addition, a threefold increase in positively stained cells for p53 and a twofold increase in positively stained cells for PCNA were seen in inflammatory papillary hyperplasia compared with controls. The authors concluded that a significant increase in the immunodetection of p53 and PCNA may indicate a malignant potential, but inflammatory papillary hyperplasia has never been reported to undergo malignant transformation, and there were no cytologic signs of dysplasia. Treatment of inflammatory papillary hyperplasia consists of surgical excision of the hyperplastic tissue followed by rebasing or remaking the denture.

Summary

The majority of the lesions associated with DSM are preventable and can be managed successfully by the dental professional. The hyperplastic tissue response seen in denture wearing patients generally requires surgical excision and follow-up. Health care providers should be encouraged to ask patients to remove their prostheses during a thorough examination of the oral tissues. In addition, patients should be

asked about the fit and comfort of their dentures, and referred to their dental health care team for appropriate follow-up when required.

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