

## Denture Stomatitis: A Literature Review

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### ABSTRACT

Denture stomatitis is a prevalent and longstanding problem in complete denture wearers. Post denture placement produces significant changes in the oral environment that may have an adverse effect on the integrity of the oral tissues. Mucosal changes could result from a mechanical irritation by the dentures, traumatic occlusion, an accumulation of microbial plaque, fungal infection or, a toxic or allergic reaction to components of the denture material. In the present article, various etiological factors contributing to the denture stomatitis and its treatment are reviewed.

Keywords: Denture stomatitis, chronic atrophic candidiasis, inflammatory papillary hyperplasia, Tissue conditioners.

### INTRODUCTION

The word stomatitis means inflammation of oral mucosa. Denture stomatitis is a term used in the literature to indicate an inflammatory state of the denture bearing mucosa. Denture stomatitis is also known as denture-induced stomatitis, denture sore mouth, inflammatory papillary hyperplasia and chronic atrophic candidiasis. It is one of the common problems in elders wearing complete or partial dentures. Incidence of occurrence is 11-67% of complete denture wearers and is more common in women than men.<sup>1</sup> Palatal mucosa is the most common site for the fungi to grow where it is covered by the denture base.<sup>1</sup> There are many literatures relating to the classification, causes of denture stomatitis and treatment, which are discussed in the following sections.

### CLASSIFICATION

It was first classified by Newton (1962) according to its clinical appearance as:

Type 1: A localized simple inflammation or pinpoint hyperemia (Fig. 1).

Type 2: An erythematous or generalized simple type seen as more diffuse erythema involving a part or the entire denture covered mucosa (Fig. 2).

Type 3: A granular type (inflammatory papillary hyperplasia) commonly involving the central part of the hard palate and the alveolar ridges (Fig. 3).

- Type III often is seen in association with type I or type II.
- Type III denture stomatitis involves the epithelial response to chronic inflammatory stimulation secondary to yeast colonization and, possibly, low-grade local trauma resulting from an ill-fitting denture. Candida-associated denture stomatitis with angular cheilitis (Fig. 4) or glossitis often indicates the spread of the infection from the denture-covered mucosa to the angle of the mouth or the tongue, respectively.<sup>2</sup>



Fig. 1: Pinpoint hyperemia or localized simple inflammation (type I)



Fig. 2: Diffuse erythema associated with scattered petechiae is distributed over the mucosa covered by the base of the denture (type II)



Fig. 3: Granular surface or inflammatory papillary hyperplasia of the palate (type III)



Fig. 4: Candida-associated denture stomatitis with angular cheilitis

According to the type of inflammation observed on the mucous membrane of the palate under a maxillary denture, Budtz Jorgensen and Bertram<sup>3</sup> classified denture stomatitis into three types as simple localized inflammation (involving a limited area), simple diffuse inflammation (involving the whole area covered by the denture) and granular inflammation (often localized to the central part of the hard palate). According to Bergendal and Isacson<sup>4</sup> it is classified as Type 1—Local inflammation which appear as red erythematous found usually around the minor palatal salivary glands. It was thought to be associated with trauma from the dentures. Type 2—Diffuse reddening referred to a diffuse hyperemic, smooth and atrophic mucosa extending over the entire denture area and was associated with increased growth of yeasts. Type 3—Granulated and was characterized by hyperemic mucosa with a nodular appearance in the central part of the palate and it was thought to be associated with both trauma and Candida infection.

## **ETIOLOGY**

### **Multifactorial Findings**

The etiology of denture stomatitis remains controversial as it is of multifactorial nature. Denture trauma, night time denture wearing, denture cleanliness, dietary factors, Candida infections and predisposing systemic conditions have been proposed as associated factors in denture stomatitis.<sup>1,3,5</sup>

Trauma Denture trauma due to ill-fitting dentures is believed as one of the etiological factors of denture stomatitis. According to Nyquist;<sup>6</sup> trauma caused by dentures was the dominant factor in denture stomatitis. Cawson;<sup>7</sup> concluded that the trauma and candidal infection are significant causes of denture stomatitis. Immunohistochemical analysis of the mucosal tissue also has demonstrated a possible role of trauma in denture stomatitis.<sup>8</sup>

Incorrect vertical dimension of occlusion has also been suggested as a contributing factor in the occurrence of denture stomatitis.<sup>3,5,6</sup> The results of the studies by Emami E et al.<sup>9</sup> research suggest traumatic occlusion results in an inflammatory reaction which may create an environment favourable to micro organisms found in denture stomatitis. According to some recent evidence, nocturnal wear of dentures and smoking are suggested as other significant risk factors for denture stomatitis.<sup>10,11</sup>

### **Micro-organisms**

Although some earlier investigators linked denture stomatitis with trauma or bacterial infection, others had isolated the strains of the genus Candida, in particular Candida albicans from the mouths of patients with this condition.<sup>12-19</sup>

It has been recently shown that the presence of Candida albicans in denture stomatitis is probably related to an extensive degree of inflammation<sup>10</sup> and that denture stomatitis is usually associated with the detection of Candida species while other factors such as denture hygiene habits,<sup>14-20</sup> and trauma<sup>13</sup> are important to the development of the disease. The severity of the denture stomatitis has been correlated with the presence of yeast colonizing the denture surface.<sup>10,21</sup> Denture induced stomatitis or chronic atrophic Candidiasis is the commonest form of oral Candidiasis and is present in <sup>24</sup>60 percent of denture wearers. Denture stomatitis has been associated with angular cheilitis, atrophic glossitis, acute pseudomembranous Candidiasis and chronic hyperplastic Candidiasis, and has been found to be more common in females than males.<sup>1</sup>

### **Denture Lining Materials**

For the prosthodontic treatment and management of traumatized oral mucosa, denture lining materials, which include tissue conditioners and soft denture liners, are widely used. Denture lining materials are most commonly used in association with the mandibular denture. Recently materials which are available are either silicone elastomers, plasticized higher methacrylate polymers, hydrophilic polymethacrylates or fluoropolymers. Candidal growth has been associated with mandibular dentures relined with soft liner. The most commonly detected yeasts were strains of the genus *Candida*, in particular *C. albicans*, *C. glabrata* and *C. tropicalis*.<sup>22</sup>

### **Denture Plaque**

Poor denture hygiene is considered to be one of the etiologic factors for denture stomatitis. Various factors stimulating yeast proliferation, such as poor oral hygiene, high carbohydrate intake, reduced salivary flow, composition of saliva, design of the prosthesis and continuous denture wearing can also enhance the pathogenicity of denture plaque.<sup>2,20</sup>

### **Surface Texture and Permeability of Denture Base**

The tissue surface of the dentures usually shows micropits and microporosities. Microorganisms harboring in these areas are difficult to remove mechanically or by chemical cleansing. According to several in vitro studies, the microbial contamination of denture acrylic resin occurs very quickly, and yeasts seem to adhere well to denture base materials.<sup>2,23</sup> Surface roughness may facilitate microbial retention and infection.<sup>24</sup> The porosity and surface texture of acrylic resin were investigated,<sup>17</sup> and it was found that the denture surface with a fine texture with an absence of porosity did not allow attachment of plaque by penetration of surface defects or by mechanical fixation to surface irregularities. In vitro study, Van Reenen<sup>23</sup> showed that *C. albicans* penetrated the commonly used acrylic resin; penetration of the unpolished surface that is in contact with the mucosa was greater than that of the polished surface. It was further confirmed with the use of a fluorescent dye.

### **Allergic Condition/Reaction**

Toxicity is usually manifested by the release of several chemical constituents from the material, which can induce an allergic response in terms of localized or generalized stomatitis/ dermatitis, severe toxicological reactions or carcinogenic/ mutagenic effects. An allergic reaction to constituents of the denture material in the form of contact mucositis is also suggested. This reaction may be related to the presence of resin monomer, hydroquinone peroxide, dimethyl-p-toluidine, or methacrylate in the denture. Furthermore, contact sensitivities are more common to occur with cold or autopolymerized resins than with heat-cured denture-base materials. Several forms of allergies including type IV hypersensitivity, urticaria, allergic stomatitis, dermatitis and psoriasis have been reported in literature from different polymer components.<sup>25</sup>

### **Systemic Factors**

In cases that fail to respond to the usual treatments, consider the role of systemic disease and its impact on oral function. Certain systemic conditions such as diabetes mellitus, nutritional deficiencies (iron, folate, or vitamin B12), hypothyroidism, Immunocompromised conditions (HIV infection), malignancies (acute leukemia, agranulocytosis), iatrogenic immunosuppressive drugs, e.g. Corticosteroids, may also predispose the host to candida-associated denture stomatitis.<sup>2,14</sup>

### **Treatment of Denture Stomatitis and Preventive Measures**

Due to its multifactorial etiology, the management of Candida associated denture stomatitis is complex. Several treatment procedures can be used, including the use of antifungal therapy,<sup>13,26,27</sup> in addition to the removal of dentures at night and efficient plaque control.<sup>28</sup> Recent research has suggested the use of denture lining materials containing antifungals,<sup>29,30</sup> antiseptic mouth rinses<sup>31,32</sup> microwave irradiation,<sup>33</sup> as factors to be considered in the treatment of Candida-associated denture stomatitis. There have been several reviews concerning the treatment of denture stomatitis in the literature.<sup>20,26,34</sup> Their conclusions vary and cover findings about different treatment regimens.

#### **Correction of Ill-fitting Dentures**

Ill-fitting dentures were considered to be the main predisposing factor for the occurrence of denture stomatitis. Therefore, improving adaptation of the denture should be considered for the management of denture stomatitis.<sup>28</sup> Correction of ill-fitting denture is considered important for the treatment of denture stomatitis.<sup>1,26</sup> Discontinuous denture wearing are also considered important for the treatment of denture stomatitis.<sup>26</sup>

#### **Antifungal Agents**

These act by inhibiting pathways (enzymes, substrates, transport) necessary for cell membrane synthesis or altering the permeability of the cell membrane (polyenes) of the fungal cell. It may also alter RNA and DNA metabolism or an intracellular accumulation of peroxide that is toxic to the fungal cell. The effect of the antifungal agent depends on its concentration, susceptibility of the strain and the source of the mucosal surface.<sup>34</sup> Some advocate the use of antifungals<sup>13,26,35</sup> such as nystatin and amphotericin B for the treatment of denture stomatitis and consider it effective, While others believe that the use of antimycotic drugs seems unnecessary.<sup>1</sup> It is also observed commonly that the disease recurs if the appropriate therapy is stopped.<sup>13,35</sup>

An effective topical agent, amphotericin B is also a drug of choice for intravenous treatment of progressive and potentially fatal candidal infections. Amphotericin B Lotion 3% is applied topically twice daily. Nystatin, which is useful as a topical agent in oral and pharyngeal candidosis, most of the drug passes unchanged through the gastrointestinal tract as it is poorly absorbed when ingested. A nystatin suspension 100,000 unit per ml is prescribed. Both amphotericin B and nystatin have an unpleasant taste, and sometimes its oral use may lead to gastrointestinal side effects such as nausea, vomiting and diarrhoea.<sup>36</sup>

The imidazole compounds such as clotrimazole, miconazole, econazole and ketoconazole, are broad-spectrum antifungal agents which affect permeability of Candida membrane by interfering with the synthesis of ergosterol; they also bind more strongly to Candida enzymes than to mammalian enzymes. Clotrimazole (1% cream) is only used topically, because of gastrointestinal and neurological toxicity; Econazole exists in topical form only; miconazole (2-4% cream) and ketoconazole (200-400 mg, orally once daily) can be used both topically and systemically.<sup>36</sup>

To test the efficacy of denture lining materials containing antifungals in the treatment of denture stomatitis, a number of studies have been carried out. Douglas and Walker,<sup>37</sup> in their in vivo investigation confirmed the inhibitory effect of tissue conditioners incorporated with Nystatin. According to Thomas and Nut,<sup>38</sup> Tissue conditioner combined with Nystatin powder

was successful in inhibiting the growth of *Candida albicans*, *Candida tropicalis*, *Candida krusei*.

### **Efficient Plaque Control**

Lacopino and Wathen<sup>39</sup> noted the presence of *C. albicans* in microbial denture plaque and emphasized the importance of oral hygiene. Therefore, it was recommended that by simple denture hygiene measures such as careful brushing and over night denture soak in 0.1% aqueous chlorhexidine is efficient to remove microbial plaque on the denture.<sup>17</sup>

### **Antiseptics and Disinfecting Agents**

The use of disinfecting agents, such as sodium hypochlorite<sup>13</sup> and chlorhexidine<sup>40</sup> aimed to eliminate denture plaque<sup>1,26</sup> and to control colonization of the fitting denture surface by candida.<sup>1,26</sup> Schwartz et al<sup>41</sup> compared antiseptic (Listerine), Nystatin Oral Suspension (100,000 units/mL) and control (5% hydroalcoholic) mouth rinses three times per day for 30 percent over a 28-day period. The authors also suggested that the denture may be a reservoir of infection and recommended that treatment should include antimicrobial therapy of the denture and removal of the denture for a period of time in every 24 hours.<sup>41</sup> In another study a 0.2% chlorhexidine gluconate mouth rinse used three times daily significantly reduced plaque, but there was no significant effect on the number of *Candida* organisms.<sup>40</sup>

However in one study, it was concluded that in the absence of other mechanical denture hygiene measures, the antiseptic rinses and relines were equally effective in reducing denture stomatitis.<sup>28</sup> Some studies showed that the sodium hypochlorite eliminate denture plaque effectively in vitro even after denture soaked for short period exposures.<sup>32,42</sup>

### **MICROWAVE IRRADIATION**

There are many evidences showing a new alternatives, such as the use of microwave irradiation at a specified setting and exposure time, are bactericidal and fungicidal.<sup>13,43-45</sup> But so far, there has been only few studies reported the use of microwave irradiation to sterilize microorganisms on denture surfaces.<sup>46,47</sup> Rohrer and Bulard<sup>46</sup> showed that microwaving at high setting for eight minutes would sterilize acrylic dentures contaminated with *C. albicans* suspension. Ribeiro D et al<sup>47</sup> in there study evaluated the clinical effectiveness of two exposure times(2 and 3 minutes) of microwave irradiation on the disinfection of complete dentures and concluded that microwave irradiation for 3 minutes may be a potential treatment to prevent cross contamination. Thomas and Webb<sup>48</sup> demonstrated that microwaving of dentures at medium setting (350 W, 2450 MHz) for six minutes caused minimal change which was considered to be harmless in the long-term.

### **Surgical Treatment**

In mild cases of IPEH, antifungal treatment without surgery might be an alternative before the dentures are relined or replaced. In severe e papillary hyperplasia of palate, cryosurgery or excision can be considered.<sup>2</sup>

### **Recent Study**

Recent study showed that the prevalence of denture stomatitis is reduced when mandibular dentures are stabilized by implants and concluded that implant overdentures could be an effective in controlling denture stomatitis by preventing trauma to the oral mucosa in edentulous elders. Better maxillary oral mucosal health may result when mandibular dentures are supported by a minimum of 2 implants.<sup>9</sup>

**CONCLUSION**

In this article, denture-stomatitis was reviewed. It has multifactorial etiology. Trauma, microorganism (*Candida albicans*), denture plaque, denture lining material, surface texture and permeability of denture base, allergic conditions and systemic factors are some of the proposed associated factors in the denture stomatitis. Treatment of denture induced stomatitis differs, depending on the causes of the disease. In most of the patient, the elimination of mechanical and traumatic factors, the consistent use of oral hygiene measures, and the administration of local antimycotic therapy usually enables the inflammatory lesions to heal rapidly.

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