

"DENTURE STOMATITIS - A REVIEW"

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Abstract:

Denture stomatitis (DS) is an example of a biofilm-mediated condition. 'Biofilm' is a complex microbial structure which adheres to a surface and comprises of densely packed bacteria encased in a polysaccharide matrix. The common causes for onset of this condition are - colonisation and proliferation of yeast cells in denture surface irregularities, denture relining materials, continued poor denture hygiene and various systemic factors. The most crucial aspect of treatment is improvement in denture hygiene which involves denture removal at night followed by rigorous cleaning and overnight immersion in a disinfecting solution. This is essential to prevent re-infection if not removed properly since denture is commonly infected with *C. Albicans*. The pharmacological treatment comprises of use of topical or systemic antifungal drug therapy to halt the growth of yeast and resolve the mucosal infection. This review article provides an overview of multifactorial etiology and treatment modalities for denture-induced stomatitis

Key words: Denture Stomatitis (DS), *Candida albicans*, Etiology

Introduction

Denture Stomatitis is a recurring mucosal condition commonly observed in denture wearing individuals. It is defined as a 'chronic erythematous mucosal inflammation of oral tissues underneath a partial

or complete removable prosthesis'.¹ The other terms commonly used to refer to this condition are-Chronic atrophic candidiasis, chronic denture palatitis and denture sore mouth. Incidence of occurrence ranges between 11-67% of complete denture wearers with a higher prevalence seen in women.² Denture stomatitis has multifactorial etiology, predominant factors being- accumulation of microbial plaque, trauma due to poorly adapted prostheses, presence of microporosities on denture surfaces and poor oral hygiene.³

Clinical Features

Denture stomatitis has variable symptoms which differ depending on the severity from completely asymptomatic to pain and irritation.⁴ In few cases, *Candidial overgrowth* can become intense causing discomfort, alteration of taste, dysphagia and a scalding sensation in the mouth.⁵ According to the clinical aspects of the lesions, Newton in 1962 clinically graded denture stomatitis into three progressive stages:⁶

- Punctiform hyperemia (Type I): Pinpoint hyperemic areas which are localized, the chief etiological factor being trauma;
- Diffuse hyperemia (Type II): Diffuse erythematous areas which are generalized. This is most widely seen presentation extending usually over a part or the complete denture bearing region;⁷
- Granular hyperemia (Type III) : Hyperemic

mucosa with a nodular appearance which mostly involves the central part of the palate or alveolar ridges. (Figure 1)

Etiology

This condition is prevalent in denture patients since notable changes in oral environment occur after placement of dentures which disrupt the integrity of oral tissues. Denture stomatitis has multitude of causes for its initiation and progression, the chief etiological factors being as follows:

- Trauma

The inflammatory process in denture stomatitis differs and is dependent on involved tissue type and the manner in which transmitted forces are intensified and concentrated. The histopathological studies conducted on denture-supporting tissue revealed that changes were dependent on intensity of the occlusal pressure.⁸ Trauma can arise either from poorly adapted dentures or dentures that lack adequate vertical and horizontal arch relations.⁹ Incorrect vertical dimension distributes the load in an uneven manner and produces traumatic contacts which further increase the frequency of denture stomatitis. Cawson came to the conclusion that infection by *Candida albicans* and trauma are predominant causative agents for denture stomatitis.¹⁰ Histological and microbiological

analysis of mucosal tissue has proved that trauma has a substantial role for development of this condition.¹¹

- Nocturnal denture wearing

The combination of reduced salivary flow and highly acidic local environment under a denture surface facilitates increased microbiological aggression which predisposes the mucosa to inflammation.¹² The prevention of adequate oxygenation of the palatal mucosa due to prolonged wear of prostheses at night leads to local trauma to the mucosal tissues. This further makes denture wearers more conducive to mechanical and microbial trauma thereby increasing the likelihood of developing denture stomatitis.¹³

- Surface Texture of Denture Base

Various in vitro studies have shown that colonization of denture surface by microorganisms progresses rapidly and *Candida* species adhere well to the denture base.¹⁴ This occurs since irregularities in denture surface provide an increased opportunity for microorganisms to retain and protect them from shear forces even during denture cleaning. The denture surface thus acts as a reservoir with these irregularities allowing the entangled microbial cells to attach to the surface irreversibly.¹⁵

- Poor denture hygiene



Figure 1. Newton's Type scale for the classification of inflammation present in DS- A. Type 1 - Pinpoint hyperemia seen on palate B. Type 2 -Diffuse erythema distributed over palatal denture bearing area C. Type 3- Erythematous mucosa presents a papillary/ pebbly surface and involves the entire vault of the hard palate

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Wearing dentures predisposes an individual to infection since their usage results in a variation in the oral microflora. A polymicrobial plaque is formed on the denture fitting surface and underlying mucosa (Figure 2). In due course of time, *Candida* species invades this denture plaque if denture is not cleaned efficiently.¹⁶

- Denture lining materials

Tissue conditioners and soft denture liners commonly called denture lining materials are used in prosthodontics for the management of oral mucosal tissues which are traumatised. Tissue conditioners are composed of polyethylmethacrylate and a mixture of aromatic ester and ethyl alcohol. These are used to preserve the residual ridge and heal irritated hyperemic tissues prior to denture fabrication. Resilient or soft denture liners include silicone elastomers, plasticized methacrylate polymers, hydrophilic polymethacrylates and fluoropolymers. These are indicated if the patient has abused denture bearing mucosa, defects of palate or inelastic tissue. One of the major problems encountered with these products is that *Candida* species and other microorganisms grow and proliferate within these materials thereby compromising their surface properties. The fungal colonization arises due to exotoxins and metabolic products produced by the yeast along with increased surface roughness.¹⁷

- Saliva

Saliva has a dual role on *Candidal* adhesion

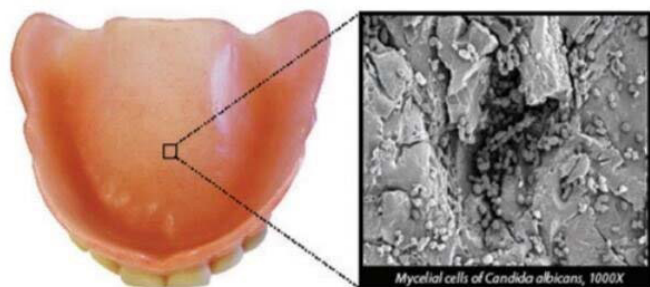


Figure 2. Microscopic representation of mycelial cells of *Candida Albicans* invading the denture surface.

to polymethyl metacrylate. Some studies have shown that saliva shows a physical cleansing effect and consist of antimicrobial components such as lysozyme, lactoferrin and peroxidase. These constituents interact with *Candida* species and reduce their adherence and colonization on oral mucosal surfaces.¹⁸ However few other studies have shown that salivary proteins such as mucines and statherins perform the role of receptors for mannoproteins present in *Candidal* cell wall and promote their adhesion.¹⁹

- Systemic conditions

It has been shown that smoking significantly increases the carriage rate of *C. Albicans* and results in a higher predisposition for development of Oral Candidiasis. Sugar consumption is another significant cause which leads to Denture Stomatitis.²⁰ Other systemic factors such as deficiency of iron, folate, ferritin, vitamin B6 and vitamin B12, HIV infection, prolonged use of corticosteroids, decreased saliva production and radiation therapy for head and neck region also contribute to the development of this condition.²¹

Management

The management of DS involves targeting the chief etiological factor involved, which may require one or a combination of treatment modalities enlisted below:

- Correction of ill-fitting dentures:

Increased length of denture use and using dentures which possess faulty design often lead to trauma. Focus should be on trimming, smoothing of overextensions or roughened areas on the denture fitting surface. In order to improve the overall retention of complete dentures and decrease mucosal pain, the use of tissue conditioners such as Viscogel and GC tissue conditioner can be employed. Nowadays, anti-fungal drugs have also been added to soft liners. Moreover, the elimination

of tissue inflammation should be accomplished prior to impression making in case a new denture is recommended for a patient.²² Furthermore, it has been shown that implant supported dentures are more stable dentures since they result in uniform stress distribution on denture-bearing mucosa and offer more consistent biting force vectors as compared to conventional dentures thereby decreasing trauma.²³

- Efficient Plaque Control

The practice of daily removal of the microbial plaque present on complete dentures is of prime significance in reducing the chances of developing denture stomatitis. Numerous denture hygiene methods have been proposed which include active and passive methods, former being more effective.²⁴ Active methods for denture cleaning involve mechanical brushing of the denture with a denture brush using a nonabrasive denture paste. This helps to remove food debris and prevent denture plaque. On other hand, passive methods include disinfection achieved through immersing the dentures overnight in a disinfecting solution or by the use of microwave irradiation. The practice of soaking dentures in 2% Chlorhexidine solution or 0.1% Hypochlorite solution or White vinegar (diluted 1:20) for 15–30 min twice on a weekly basis should be emphasized.²⁵ Also the patients should be educated about the significance of diligent denture maintenance and nocturnal denture wearing should be discouraged.

- Microwave irradiation

Microwave irradiation is a rapid, effective and economical method for disinfecting dentures. This methodology has been clinically shown to treat Candida-associated denture stomatitis and disinfect dentures by the exposing them to microwaves (350 Watt, 2450 MHz) for a duration of 6 minutes. However, the formation of waves induces the generation of energy which can result in distortion of the prosthesis.²⁶

- Antifungal therapy

The mode of action of these agents is inhibition of biofilm formation or alteration of cell membrane permeability or an alteration of RNA and DNA metabolism. These drugs prove more effective if used as adjuvants to improved denture hygiene. One of the following antifungal drugs is recommended for a treatment duration of 1-2 weeks:

1. Miconazole 24 mg/ml gel – Miconazole available in gel form to be applied on cleaned denture fitting surface four times daily

2. Ketoconazole 200 mg tablet – One tablet to be taken once a day

3. Nystatin Ointment 100,000IU/g – Local application on the denture tissue surface before insertion

4. Nystatin 500,000 IU/g lozenges – One lozenge to be taken 4 times a day is an alternative method of treatment.²⁷

- Photodynamic therapy (PDT)

This therapy is a potential alternative to antifungal agents for treatment of denture stomatitis. It incorporates the use of a photosensitizing agent, light of appropriate wavelength and oxygen which generate free radicals resulting in irreversible lysis of bacterial cell membrane and protein inactivation during illumination.²⁸

- Management of the underlying systemic disease

This includes advice on how to quit smoking for smokers, nutritional recommendations (especially regarding carbohydrate intake) for denture patients with high sugar consumption since glucose enhances Candidial growth and adherence to denture surface.²⁹ Moreover few patients benefit from the prescription of salivary substitutes to treat xerostomia.

- Recent developments

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Other suggested ideas to avoid recurrence of DS are as follows:

1. Use of protective coatings on denture surface to decrease Candida adhesion;
2. Incorporation of antibodies specific to Candida species into the prosthesis material; and
3. Use of antifungals in the denture material.[30]

Conclusion

It is essential to lessen the risk of developing denture stomatitis. Good dentures along with detailed verbal and written instructions should be given to denture wearers on the importance of careful denture maintenance. In addition, the practice of wearing dentures during night should be discouraged. Regular follow-up visits to determine if prosthesis is properly adapted and if users maintain denture hygiene are of utmost importance. Finally, the treatment should include replacement of worn out dentures as well as an appropriate antifungal treatment.

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Conflicts of interest

There are no conflicts of interest.

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