

Denture Stomatitis - A Review

Koteswara Rao Pachava¹, Kamalakanth Shenoy K²,
Lakshmi Kavitha Nadendla³, Mereddy Ramu Reddy⁴

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¹Senior lecturer

⁴Reader

³Senior lecturer

Department of Oral Medicine and Radiology,
Kamineni Institute of Dental Sciences,
Marketpally, India

²Professor and HOD

Department of Prosthodontics, Yenepoya Dental
College, Mangalore, Karnataka India

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Email for correspondence:

koteswar_pachava@rediffmail.com

ABSTRACT:

Despite therapeutic progress, opportunistic fungal infectious diseases have increased in prevalence and becoming a universal and unresolved problem. Denture stomatitis is the most prevalent and long standing problem in denture wearers. The etiopathogenesis of denture stomatitis is multifactorial and complex to understand. The placement of denture produces significant changes in the oral environment and adversely affects the integrity of oral tissues. The combination of entrapment of yeast cells in irregularities in denture-base and denture-relining materials, poor oral hygiene and several systemic factors is the most probable cause for the onset of this infectious disease. Hence colonization and growth on prostheses by *Candida* species are of clinical importance. This article gives a comprehensive review of etiopathogenesis and management and current trends in management of denture stomatitis.

Key words: Denture stomatitis, *Candida albicans*, denture hygiene, antifungal drugs, photodynamic therapy, denture lining materials.

INTRODUCTION

Denture stomatitis (DS) also known as denture sore mouth and prosthetic stomatitis implies inflammation of the oral mucosa, especially palatal and gingival mucosa which is in direct contact with the denture base.¹ The prevalence of DS in edentulous patients has been reported as 62%, 39% and 23% respectively by different researchers.² No racial or sex predilection exists, although some authors have described a higher prevalence among women.³ Clinically the inflammation is of varying degrees and classifications, Newton's classification being most commonly accepted.¹ The condition is frequently symptomless, but when signs and symptoms are present they may display mucosal bleeding, swelling, burning or other painful sensations, halitosis, unpleasant taste and dryness in the mouth.⁴

CLASSIFICATION⁵

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

Type I: A localized simple inflammation or pinpoint hyperemia.

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

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

- 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.⁵

ETIOPATHOGENESIS

Candida albicans has been shown to be the principal *Candida* strain responsible for inflammatory pathology, though various species of *Candida* like *C. dubliniensis*, *C. Parapsilosis*, *C. Krusei*; *C. Tropicalis* and above all *C. glabrata* have been isolated from the inflammatory lesion.⁶ The pathogenesis of *Candida* - associated DS is elaborate and multifactorial. *C. albicans* is a normal oral microorganism, and upto 67% of people carry this organism without clinical evidence of infection. Local and systemic factors can determine the transformation of *C. albicans* from a commensal to a pathogenic organism.⁷ The line between its status as yeast and hyphae is very thin and as the host cell becomes immunocompromised, it becomes active and starts secreting several hydrolytic enzymes such as proteinases and phospholipases which help in their adherence to host cells and digesting their cell walls for nutrient supply to assist further invasion.⁷

PREDISPOSING FACTORS

The predisposing factors of denture induced stomatitis included systemic and local factors such as microbial factors, denture cleaning methods, wearing dentures through the night, ill fitting denture, denture integrity (fracture, crack, hole...), poor oral hygiene and denture hygiene, xerostomia,

smoking, quality and quantity of saliva, occlusion, parafunctional habits and carbohydrate rich diets, denture age and possibly a defect in host's defense mechanism.¹

LOCAL FACTORS

Micro organisms

It has been recently shown that the presence of *Candida albicans* in denture stomatitis is probably related to an extensive degree of inflammation⁸ and that denture stomatitis is usually associated with the detection of *Candida species* while other factors such as denture hygiene habits⁹ and trauma⁴ 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.⁵ Dentures can produce a number of ecological changes that facilitate the accumulation of bacteria and yeasts. Bacterial proliferate: Certain bacterial species, like *Staphylococcus species*, *Streptococcus species*, species, *Fusobacterium species* or *Bacteroides species* has been identified in patients with denture stomatitis. *Candida species*, particularly *Candida albicans*, have been identified in most patients.³

Trauma

Nyquist¹⁰ considered that trauma caused by dentures was the dominant factor in the occurrence of denture stomatitis ('sore mouth'), and he found no association between denture stomatitis and the bacterial microbiota under complete upper dentures.⁴ Cawson, concluded that the trauma and candidal infection are significant causes of denture stomatitis.¹¹ The latest study pointed out that trauma alone does not induce pictures of generalized denture stomatitis but, rather, it could be the cause of localized forms. Instead, in the generalized forms the principal pathogenetic role is played by *Candida albicans*. In this case, trauma could act as co-factor that favours the adhesion and the penetration of the yeast, sustains *phlogosis* of the palate and increases the permeability of the epithelium to toxins and soluble agents produced by *Candida* yeast.⁶ According to some recent evidence, nocturnal wear of dentures and smoking are suggested as other significant risk factors for denture stomatitis.⁵

Denture lining materials

Denture lining materials, which include tissue conditioners and soft denture liners, are widely used

as adjuncts in the prosthodontic treatment and management of traumatized oral mucosa, and are most commonly used in association with the mandibular denture.⁴ Recently materials which are available are either silicone elastomers, plasticized higher methacrylate polymers, hydrophilic polymethacrylates or fluoropolymers.⁵ Even though these materials exhibit excellent tissue tolerance, one of the problems is the colonization of *Candida* species on and within the material. Fungal growth is known to destroy the surface properties of the liner and this may lead to irritation of the oral tissues. This is due to a combination of increased surface roughness and high concentrations of exotoxins and metabolic products produced by the fungal colonies.¹²

Denture hygiene/denture plaque

Lack of denture cleanliness is considered to be one of the factors involved in the aetiology of denture stomatitis.² 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.¹³ The need to remove denture plaque at regular intervals, especially on the tissue fitting surfaces of dentures was emphasized.

Surface Texture and Permeability of Denture Base

The tissue surface of the dentures usually shows micropits and microporosities. Such irregularities of surface make possible the yeasts to nest and make difficult to eliminate bacteria by mechanics and chemical hygiene manoeuvres; therefore, in presence of poor oral hygiene, *Candida* can penetrate, stick and aggregate with the bacterial communities.⁴ Substrate surface properties, as surface charge, surface free energy, hydrophobicity, and roughness have all been reported to influence the initial adhesion of microorganism.¹⁴ Penetration of the unpolished surface of the denture base, which is in contact with the mucosa, was greater than that of the polished surface. It was suggested that the unpolished surface of the denture was a suitable site for *Candida* proliferation and sealing of the surface was recommended.⁴

The saliva

The role of the saliva in the colonization of *C. Albicans* is still controversial. Some studies have shown that it reduces the adhesion of *C. albicans*. In fact, the saliva possesses defensive molecules as lysozyme, lactoferrine, calprotectin, IgA that decrease the adhesion of *Candida* to the oral surfaces.¹⁵ The decrease or the complete absence of saliva in individuals with xerostomy induces the change and the imbalance of the normal microbial communities favouring the proliferation of bacteria as *Staphylococcus aureus* that inhibits the normal adaptation of the commensals.⁶

Systemic factors

Certain systemic conditions such as diabetes mellitus, nutritional deficiencies (iron, folate, or vitamin B12), hypothyroidism, immunocompromised conditions (HIV infection), malignancies (acute leukemia, agranulocytosis), iatrogenic immune suppressive drugs, e.g. Corticosteroids, may also predispose the host to *Candida*-associated denture stomatitis.⁵

MANAGEMENT AND PREVENTIVE MEASURES OF DENTURE STOMATITIS

The treatment of *Candida*-associated denture stomatitis is complex because of its multi factorial etiology and depends upon a comprehensive plan. Elimination of predisposing factors is considered the first and most crucial step.¹⁶ The therapeutic strategy still adopted includes the use of topical and systemic antifungal drugs, the use of preservatives and disinfectants, the irradiation with microwaves and the scrupulous removal and control of the plaque present on the denture and on the oral mucosa.⁶ Recent research has suggested the use of denture lining materials containing antifungals⁵ and the use of photodynamic therapy (PDT).¹⁷

Correction of Ill-fitting Denture

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.⁵ Correction of ill-fitting denture is considered important for the treatment of denture stomatitis.¹⁸ Discontinuous denture wearing are also considered important for the treatment of denture stomatitis.

Antifungal Agents

Antifungal agents are either polyenes (nystatin and amphotericin B) or azoles which are classified into: imidazoles (clotrimazole, econazole, fenticonazole, isoconazole, ketoconazole, miconazole, sulconazole, tioconazole); and triazoles (fluconazole, itraconazole).¹⁹ 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.²⁰ Some of these drugs are used topically, while others are used in systemic form.

Topical antifungals

Topical antifungal therapy remains the corner stone of treatment in mild localized cases of candidoses in healthy patients. They are available in many forms like pastilles, troches, creams, ointments and oral suspensions.²¹ The antifungal treatments more used are antifungal suspensions based on nystatin²⁰ amphotericin-B,²²⁻²³ miconazole²⁴⁻²⁵ and fluconazole.²⁰ On the other hand, Clotrimazole²⁶ is usually presented in a cream or solution form; the cream form also has an antistaphylococcal activity. Almost all drugs generally produce a complete remission of symptoms within 12-14 days.⁶ A nystatin suspension 100,000 unit per ml is prescribed. Clotrimazole (1% cream) is only used topically, because of gastrointestinal and neurological toxicity; Econazole exists in topical form only; miconazole (2-4% cream) can be used topically.⁵

Amorolfine belongs to a new class of chemical antifungal. Its fungistatic and fungicide effect is based on the alteration of the fungal cell membranes, in particular at the level of the sterols biosynthesis. In this way, the content of ergosterol is reduced, and at the same time not usual planar sterols accumulate.²⁷

Systemic antifungals

Systemic antifungal agents have been recommended for patients with poor compliance such as patients with special needs. They are also recommended for immunocompromised patients.²⁸ Among systemic antifungal drugs, fluconazole and

itraconazole have been the most extensively studied and proven as efficient antifungal drugs.¹⁶ Fluconazole is usually used in the form of 50 - 100 mg capsules, and itraconazole in the form of 100mg capsules. ketoconazole is given 200-400 mg, orally once daily.¹⁶

Preservative and disinfectant agents

More encouraging results are obtained when the dentures are immersing into 2% chlorhexidine as aid to topical therapy. Another antiseptic substance used is sodium hypochlorite.⁶ It is proven that by diving the denture in a solution of 0.02% sodium hypochlorite, the number of Candida and bacteria amount on the denture surface effectively decrease. Unfortunately, sodium hypochlorite may not be used for an indeterminate period of time according to its ability to damage the prosthetic handiwork.⁶

Microwave irradiation

Irradiation with microwave has been proposed as a quick effective and cheap method for the denture disinfection. In vitro the exposure to the microwaves was able to cause the cell death of Candida albicans.⁶ 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.⁴ Thomas and Webb²⁹ 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.

Scrupulous removal of denture plaque

The poor oral and denture hygiene are fundamental in the onset of disease, demonstrating the importance of the cleanliness of the denture through mechanical and chemical methods (20).

A good oral hygiene can be alone effective in treating denture stomatitis as well as when it is adopted in association with systemic and topical antifungal drugs. Both the prosthesis that oral mucosa in contact with it must be involved in procedures for oral hygiene through brushing them after each meal with water or chemical agents. The patients should also be instructed to remove the denture during night and to leave it dry; in addition, during therapy for stomatitis, the prosthesis should be removed for at least two weeks.⁶

Surgical Treatment

In mild cases of inflammatory papillary hyperplasia antifungal treatment without surgery might be an alternative before the dentures are relined or replaced. In severe papillary hyperplasia of palate, cryosurgery or excision can be considered.⁵

RECENT STUDIES IN MANAGEMENT OF DENTURE STOMATITIS

A number of in vitro and in vivo studies have been carried out by incorporating antifungal agents into denture lining materials and were shown to be more effective and preventive against denture stomatitis. Several attempts have been made to incorporate antifungal agents such as propolis,³⁰ zeolite,³¹⁻³² chlorhexidine,³³ punica granatum,³⁴ Nystatin,³⁵⁻³⁶ Fluconazole,³³ Itraconazole,³⁶ Miconazole,³⁷ Ketoconazole,³⁷ Clotrimazole³⁸ in the resilient liners with varying degree of success.

Photodynamic therapy (PDT) appears to be a promising method of treatment compared with antifungal agents. A study conducted by using PDT was shown to be an alternative method of treatment for DS.¹⁷

Recent study showed that the prevalence of denture stomatitis is reduced when mandibular dentures are stabilized by implants and concluded that implant over dentures 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 minimum of two implants.³⁹

CONCLUSION

This article reviews the etiopathogenesis and various approaches of preventive and management aspects of denture stomatitis. Though candida albicans was thought to be the principal cause in the etiology of DS, it may not be present in all cases. Hence it is important not to prescribe antifungal drugs without mycological investigations. As DS is generally asymptomatic; patients wearing dentures should be examined periodically.

REFERENCES

1. Naik AV and Pai RC. A study of factors contributing to denture stomatitis in a North Indian community. *Int. Jour. Denst.* 2011; doi:10.1155/2011/589064
2. Sahebamee M, Basir Shabestari S, Asadi G, Neishabouri K. Predisposing Factors associated with Denture Induced Stomatitis in Complete Denture Wearers. *Shiraz Univ Dent J* 2011; **11**:35-39.
3. Maller U S, Karthik. K. S. Maller S V. Candidiasis In Denture Wearers- A Literature Review. *JIADS* 2010; **1**(1):27-30.
4. Webb BC, Thomas CJ, Willcox MDP, Harty DWS, Knox KW. Candida - associated denture stomatitis. Aetiology and management: A review. Part 2. Oral diseases caused by candida species. *Ausln. Dent. Jour.* 1998; **43**(3):160-166
5. Pattanaik S, Vikas BVJ, Pattanaik B, Sahu S, Lodam S. Denture Stomatitis: A Literature Review. *Journal of Indian Academy of Oral Medicine and Radiology*, 2010; **22**(3):136-140.
6. Salerno C, Pascale M, Contaldo M, Esposito V, Busciolano M, Milillo L, Guida A, Petrucci M, Serpico R. Candida-associated denture stomatitis. *Med Oral Patol Oral Cir Bucal.* 2011, **1**; **16**(2):e139-143.
7. BhatV, SharmaM, ShettyV, Shastry CS, Rao V. Extracellular Enzymes of Candida Albicans and Their Role in Development of Denture Stomatitis-a Review. *JIDAS*-2011; **2**(1):26-30.
8. Barbeau J, Séguin J, Goulet JP, de Koninck L, Avon SL, Lalonde B, et al. Reassessing the presence of Candida albicans in denture related stomatitis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003; **95**:51-59.
9. Pires FR, Santos EB, Bonan PR, de Almeida OP, Lopes MA. Denture stomatitis and salivary Candida in Brazilian edentulous patients. *J Oral Rehabil* 2002; **29**:1115-1119.
10. Nyquist G. The influence of denture hygiene and the bacterial flora on the condition of the oral mucosa in full denture cases. *Acta Odontol Scand* 1953; **11**: Supp **1**:24-60.
11. Cawson RA. Symposium on denture sore mouth. II. The role of Candida. *Dent Pract Dent Rec* 1965; **16**:138-142.
12. Masella RP, Dolan CT, Laney WR. The prevention of the growth of Candida on silastic 390 soft liner for dentures. *J Prosthet Dent.* 1975; **33**:250-257.
13. Lombardi T, Budtz-Jørgensen E. Treatment of denture-induced denture stomatitis: A review. *Eur J Prosthodont Restor Dent* 1993; **2**:17-22.
14. Cenci TP, Curya ADB, Crielaard W, Tencate JM. Development of Candida-Associated Denture Stomatitis: New Insights. *J Appl Oral Sci.* 2008; **16**(2):86-94S.
15. Baena-Monroy T, Moreno-Maldonado V, Franco-Martínez F, Aldape-Barrios B, Quindós G, Sanchez-Vargas LO. Candida albicans, Staphylococcus aureus and Streptococcus mutans colonization in patients wearing dental prosthesis. *Med Oral Patol Oral Cir Bucal.* 2005; **10**(1):E27-39.
16. Dar-Odeh NS, Al-Beyari M, Abu-Hammad OA. The role of antifungal drugs in the management of denture - associated stomatitis. *The International Journal of Antimicrobial Agents* 2012; **2**(1):1-5.

17. de Oliveira Mima EG, Pavarina AC, Silva MM, Ribeiro DG, Vergani CE, Kurachi C and Bagnato,VS. Denture stomatitis treated with photodynamic therapy: five cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011; **112**:602-608
18. Jeganathan S, Lin CC. Denture stomatitis: A review of the aetiology, diagnosis and management. *Aust Dent J* 1992; **37**:107-114.
19. Ghannoum MA and Rice LB. Antifungal agents: mode of action, mechanisms of resistance and correlation of these mechanisms with bacterial resistance. *Clin. Microbiol. Rev.* 1999, **12**(4):501.
20. Webb BC, Thomas CJ, Willcox MD, Harty DW, Knox KW. Candida associated denture stomatitis. Aetiology and management: A review. Part 3. Treatment of oral candidosis. *Aust Dent J* 1998; **43**: 244-249.
21. Sherman, RG, Prusinski, L, Ravenel, MC, Joralmon, RA. Oral candidosis. *Quintessence International* 2002; **33**(7):521-532.
22. Dorocka-Babkowska, B, Konopka, K, Dungunes, N. Influence of antifungal polyenes on the adhesion of *Candida albicans* and *Candida glabrata* to human epithelial cells in vitro. *Archives of Oral Biology* 2003; **48**(12):805-814.
23. Dar-Odeh, NS, Shehabi, AA. Oral candidosis in patients with removable dentures. *Mycoses* 2003; **46**(5-6):187-191.
24. Vasconcelos, LC, Sampaio, MC, Sampaio, FC, Higino, JS. Use of Punica granatum as an antifungal agent against candidosis associated with denture stomatitis. *Mycoses* 2003; **46**(5-6):192-196.
25. Dias AP, Samaranayake LP, Lee MT. Miconazole lacquer in the treatment of denture stomatitis: clinical and microbiological findings in Chinese patients. *Clinical Oral Investigations* 1997; **1**(1):47-52.
26. Samaranayake, LP, Cheung, LK, Samaranayake, YH. Candidiasis and other fungal diseases of the mouth. *Dermatologic Therapy* 2002; **15**: 251-269.
27. Cherian B and Sunil S. Use of Amorolfine in Candida - associated denture stomatitis. *Oral and Maxillofacial Pathology Journal* 2010; **1**(1)
28. McIntyre GT. Oral candidosis. *Dental Update* 2001; **28**(3):132-139
29. Thomas CJ, Webb BC. Microwaving of acrylic resin dentures. *Eur J Prosthodont Rest Dent* 1995; **3**:179-182.
30. Santos VR, Gomes RT, de Mesquita RA, de Moura MD, França EC, de Aguiar EG, Naves MD, Abreu JA, Abreu SR. Efficacy of Brazilian propolis gel for the management of denture stomatitis: a pilot study. *Phytother Res.* 2008 Nov; **22**(11):1544-1547
31. Nikawa H, Yamamoto T, Hamada T, Rahardjo MB, Murata H, Nakanoda S. Antifungal effect of zeolite incorporated tissue conditioner against *Candida albicans* growth and/or acid production. *J Oral Rehabil* 1997; **24**: 350-357.
32. Jang KS. Inhibitory effect of antifungal agents incorporated in denture lining materials against candida albicans. *J Korean Acad Prosthodont.* 1999; **37**(3):293-300.
33. Amin WM, Al-Ali MH, Salim NA, Al-Tarawneh SK. A New Form of Intraoral Delivery of Antifungal Drugs for the Treatment of Denture-Induced Oral Candidosis *Eur J Dent* 2009;**3**:257-266
34. Vasconcelos LC, Sampaio MC, Sampaio FC, Higino JS. Use of Punica granatum as an antifungal agent against candidosis associated with denture stomatitis. *Mycoses.* 2003; **46**(56):192-196.
35. Thomas CJ, Nutt GM. The in-vitro fungicidal properties of Visco-gel, alone and combined with nystatin and amphotericin B. *J Oral Rehabil* 1978; **5**: 167-172.
36. Chow CKW, Matear DW, Lawrence HP. Efficacy on antifungal agents in tissue conditioners in treating candidiasis. *Gerodontology* 1999; **16**(2):110-118.
37. Quinn DM. The effectiveness, in-vitro, of miconazole and ketoconazole combined with tissue conditioners in inhibiting the growth of *Candida albicans*. *J Oral Rehabil* 1985; **12**: 177-182.
38. Vojdani M, Zibaei M, Khaledi AAR, Zomorodian K, Ranjbar MA, Boshehri S. In- vitro Study of the Effect of Clotrimazole Incorporation into Silicone Soft Liner on Fungal Colonization Shiraz Univ Dent J 2009; Vol.9, Suppl. **1**:19-23.
39. Emami E, de Grandmont P, Rompré PH, Barbeau J, Pan S, Feine JS. Favoring trauma as an etiological factor in denture stomatitis. *J Dent Res* 2008;**87**:440-144.

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