Microflora in denture stomatitis - A review

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Abstract
Denture stomatitis is an inflammation that typically occurs in individuals that have a complete or partial denture. Denture stomatitis is commonly defined as persistent inflammatory changes in the mucosa-bearing denture surface, often characterized by palatal erythema and alveolar ridges on which the denture is mounted. All relevant search engines were searched for the literature pertaining to denture stomatitis, various microflora associated, prevention and treatment were searched. The required data was collected and quality analysis of the thus collected data was done. The knowledge in the current point of time-analyzed and thus the consensus was established. Denture stomatitis is induced by a variety of internal and external causes. The most pervasive causative factor for denture stomatitis is the concentration of microbial plaque on palate-covered removable dentures that cause denture stomatitis in close to 69% of denture wearers. The various microflora includes Candida, Streptococci, Staphylococci, Lactobacillus, Actinomyces, etc. Denture stomatitis has been shown to be a major oral disease seen on the denture wearers and is still prevalent in the majority of cases. Candida-associated denture stomatitis must be treated as it may serve as a repository for other infections and facilitate atrophy of the alveolar bone resulting in serious infections.

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INTRODUCTION
Denture stomatitis is an infection that usually occurs among individuals who wear a complete or a partial denture. Prosthetics, when introduced into the oral cavity in most cases results in severe alterations of the environmental conditions as the prosthesis leads to the development of colonization of microorganisms on the underlying mucosa resulting in distress of the denture wearer by causing denture stomatitis (Budtz-jørgensen, 2000). Denture stomatitis is generally described as the chronic inflammatory changes of the denture bearing mucosa, which is often characterized by erythema of the palate and the alveolar ridges on which the denture is placed (Budtz-Jørgensen, 1974). According to Arendorf and Walker (1987), Denture stomatitis has been reported in 11-67% of the complete denture wearers. It has also been mentioned that it is more prevalent in women than in men (Arendorf and Walker, 1987). Denture stomatitis is expressed in various other terms such as denture-induced stom-
atitis, denture sore mouth, inflammatory papillary hyperplasia next chronic atrophic candidiasis (Pattanaik et al., 2010). The various microflora associated with denture stomatitis are C. albicans, C. tropicalis, C. krusei, C. guilliermondii, C. lusitaniae, C. freysschusii (Arendorf and Walker, 1987). In the Streptococci variety, S. mitior, S. milleri, S. mutans, S. salivarius, and S. sanguis, Staphylococci variety contained mainly S. aureus, Lactobacillus spp, Actinomyces spp (Theilade and Budtz-Jørgensen, 1988). However, According to Jeganathan and Lin (1992) Candida albicans has been implicated as the major causative organism in denture-induced stomatitis (Jeganathan and Lin, 1992).

There have been numerous different types of research being done all over the world such as advances studies (Vijayalakshmi and Ganapathy, 2016; Venugopalan et al., 2014), practical research studies (Jyothi et al., 2017; Duraisamy, 2019; Ashok, 2014), analysis based study (Jain et al., 2017; Basha et al., 2018), study of effects of various products (Ganapathy, 2016; Subasree et al., 2016), review based studies (Ariga et al., 2018; Selvan and Ganapathy, 2016), survey based awareness studies (Ashok and Suvitha, 2016; Kannan and Venugopalan, 2018) in the field of prosthodontics. The aim of this review is to analyze the various factors causing denture stomatitis, microflora associated, it’s prevention, and treatment (Ampil, 1966; Radford and Radford, 1993).

**MATERIALS AND METHODS**

All relevant search engines (Google Scholar, PubMed) were searched for the literature pertaining to denture stomatitis, various microflora associated, prevention and treatment were searched. The required data was collected and quality analysis of the thus collected data was done. The knowledge in the current point of time analyzed and thus, the consensus was established.

**Quality Analysis of The Articles**

**Denture stomatitis**

Denture stomatitis is linked to as a prevalent recurrent problem seen in denture wearers. It is known to be an erythematous tissue-bearing denture disease (Pattanaik et al., 2010). It is a non-specific inflammatory reaction due to action against microbial antigens. The key causes of denture stomatitis include inflammation, trauma or possibly a defect in the individual’s host defense system (Jeganathan and Lin, 1992). Denture stomatitis has been identified in approximately 11–67% of full denture wearers (Arendorf and Walker, 1987).

**Causes of denture stomatitis**

Denture stomatitis is influenced by a number of internal and external factors (Gonzalez and Laney, 1966). The most common cause of denture stomatitis is the deposition of microbial plaque on removable dentures that cover the palate inducing denture stomatitis in close to 69% of denture wearers (Budtz-Jørgensen, 1974). Other potential causes of denture stomatitis includes diabetes mellitus, neoplastic diseases, chemotherapy, radiotherapy, broad-spectrum antibiotic treatment, etc (Dorko et al., 2001). Aging, malnutrition and immunosuppression could be other possible causes for acquiring denture stomatitis (Budtz-Jørgensen, 2000).

**Microflora associated with denture stomatitis**

**Candida**

The role of Candida in denture stomatitis is remarkable. Candida, due to its high infectivity and ability to adhere and biofilm on oral tissues (Gleiznys et al., 2015). A swab test was performed on 171 patients and seven different Candida species in oral mucosal lesions and adjacent denture surfaces. Calbicans has been seen in 95 cases, C. Tropicalis, 26 patients, C. Around 20 patients with parapsilosis, C. Krusei in approximately 14 patients, C. Guillermondii, 12 patients, C. Lusitaniae for 1 patient and C. Freyshot in 1 patient (Dorko et al., 2001). Another research used oral swabs and swish samples obtained from a patient group and observed the recovery of Calbicans isolates. The evident presence of implicating Candida albicans has led to colonization on the tissue surfaces of the prosthesis. It occurs as an inflammation of the oral mucosa seen in denture stomatitis caused by continuous dentures (Ramage, 2004).

**Cocci**

There was an inventory of predominant flora, where the findings showed that the dominant microflora in both groups comprised mostly of Gram-positive bacteria and, in the control group, about 69% of the denture flora comprised of cocci. It should be noted that neither group of palates had any variations in the proportions of cocci. The most common species of cocci is Streptococcus bacteria (Cawson, 1965; Lytle, 1957). It has also been asserted that S. Salivarius was mostly present in the palate of both groups (Koopmans et al., 1988).

**Torulopsisglabrata**

An experiment was performed in which yeast samples from 100 different patients were segregated with a generalized simple or granular form of denture stomatitis. Candida albicans and Torulopsisglabrata have been identified to be the most com-
Table 1: Quality Analysis

| Author                  | Year of Publication | Quality Analysis |
|-------------------------|--------------------|------------------|
| Budtz Jørgensen E       | 1974, 1992         | Strong           |
| Allendorf TM            | 1987               | Moderate         |
| Seema Pattanaik         | 2010               | Moderate         |
| Else Theilde            | 1988               | Strong           |
| Jeganathan S            | 1992               | Moderate         |
| Dorko E                 | 2001               | Strong           |
| Alyvdas Gleizyns        | 2015               | Moderate         |
| Gordon Ramage           | 2004               | Strong           |
| ASF Koopmans            | 1988               | Strong           |
| Ingar Olsen             | 1974               | Strong           |
| Lytle RB                | 1957               | Moderate         |
| Ampil JP                | 1966               | Moderate         |
| Gonzalez                | 1966               | Moderate         |
| Cahn LR                 | 1936               | Moderate         |
| Cawson RA               | 1965               | Moderate         |
| Doughlas WH             | 1973               | Moderate         |
| Vijayalakshmi B         | 2016               | Strong           |
| Venugopalan S           | 2014               | Strong           |
| Jyoti S                 | 2017               | Moderate         |
| Duraiswamy R            | 2019               | Moderate         |
| Ashok V                 | 2014               | Moderate         |
| Ranganathan H           | 2017               | Strong           |
| Basha FYS               | 2018               | Moderate         |
| Ganapathy D             | 2016               | Moderate         |
| Ajay P                  | 2017               | Moderate         |
| Ariga P                 | 2018               | Strong           |
| Selvam SR               | 2016               | Moderate         |
| Kannan A                | 2018               | Moderate         |
| Ashok V                 | 2016               | Moderate         |

mon microflora present (Olsen, 1974).

Other

Other kinds of microbiota that are known to cause denture stomatitis are Veillonellaparvula, certain Lactobacillus, Bacteroides and Actinomyces species (Theilade and Budtz-Jørgensen, 1988).

Treatment for denture stomatitis

Research by (Lytle, 1957), (Ampil, 1966), (Gonzalez and Laney, 1966), Cahn 1936 ('SEM analysis of denture plaque and oral mucosa of denture-related stomatitis,' 1993) and (Cawson, 1965) found that antifungal therapy is the most effective treatment choice for denture stomatitis. Recent work has proposed the use of denture liner products containing antifungal, antiseptic and microwave irradiation to treat Candida-associated denture stomatitis (Douglas and Walker, 1973).

Immunity to Candida

Immunity in Candida-associated denture stomatitis is given by IgA antibodies. It follows the concept of cell-mediated immunity, wherein the high serum antibodies work against C. albicans or other microorganisms, and continues to suggest a serious infection, much of which tends to be inflammation of the mucosa supporting the denture (Ganapathy et al., 2017; Ajay et al., 2017). Vitro cell-mediated immune response of circulating lymphocytes. Albicans-no signs of compromised clinically significant immune response (Dorko et al., 2001).

Prevention for denture stomatitis

Mitigation of denture stomatitis requires good oral and denture care and adequate denture construction (Budtz-Jørgensen, 2000). The study noted that increased levels of anti-Candida antibody present in infected individuals and clinical improvement of
mucosa due to the eradication of yeast flora typically serve as a preventive measure for potential denture stomatitis attacks. It also mentions the regular use of antiseptic or antimycotic drugs seems excessive (Arendorf and Walker, 1987).

CONCLUSION

From this study, denture stomatitis can be considered to be a significant oral disease seen in denture wearers and is still prevalent in the majority of cases. Candida-associated denture stomatitis should be treated as a reservoir for other infections that are more severe and encourage alveolar bone resorption leading to serious infections. The eradication and management of the microbial plaque is known to be the most effective treatment in both therapy and prevention.

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Conflict of Interest

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