

# Stimulating Local Factors in the Development of Denture Stomatitis

Marinka Mravak-Stipetić<sup>1</sup>  
Lada Hemerich<sup>2</sup>  
Ivana Jurčić<sup>3</sup>  
Vjekoslav Jerolimov<sup>4</sup>

<sup>1</sup>Department of Oral Pathology  
School of Dental Medicine  
University of Zagreb  
<sup>2,3</sup>Private dentist's office Zagreb  
<sup>4</sup>Department of Prosthetic  
Dentistry  
School of Dental Medicine  
University of Zagreb

---

## Summary

*A study was carried out of 70 denture wearers to determine the influence of local predisposing factors: the presence of saliva, oral and denture hygiene habits, age of present dentures and the degree of Candida colonisation on the fitting denture surface in the development of denture stomatitis. 49 patients with clinical evidence of various severity of denture stomatitis and 21 controls were investigated clinically and mycologically. Clinical tests included salivary measurement, oral and denture hygiene assessment, age of dentures and denture swabs for Candida culture on Sabouraud growth medium. Results have shown no significant differences between the two groups in quantity of saliva, oral and denture hygiene habits and denture age. However, in denture stomatitis group dentures were less older (6-10 years) than in controls (>10 years) but tended to be dirtier and related to the higher degree of denture stomatitis. The age of dentures was not related to the degree of inflammation but was with the degree of Candida colonization. Significant difference was obtained in the degree of Candida colonization on the fitting denture surface between denture stomatitis and control group. Poor denture hygiene favour colonization of Candida which interact as initiative local factors in the development of denture stomatitis.*

Key words: *denture stomatitis, local factors.*

---

Acta Stomatol Croat  
2000; 133-136

ORIGINAL SCIENTIFIC  
PAPERS  
Received: February 2, 2000

Address for correspondence:

Asst. prof. Marinka Mravak-  
Stipetić, DDS, PhD  
Department of Oral Pathology  
School of Dental Medicine  
University of Zagreb  
Gundulićeva 5, 10000 Zagreb  
Croatia

---

## Introduction

The term prosthetic stomatitis also named stomatitis prothetica, palatitis prothetica and in English denture sore mouth and denture stomatitis designates inflammation of oral mucosa, most frequently mucosa of the palate and gingiva, being in direct contact with the base of the removable denture. It develops with 25-67% frequency (1-4), more often in women, and its prevalence increases with age (5). The clinical picture changes depending

on the course and development of inflammatory changes, so various ways of classification of prosthetic stomatitis have been proposed, although the classification according to Newton has been generally accepted (6).

Although numerous factors for the development of denture stomatitis have been considered (1-23), the opinions on its main cause have not been agreed upon and are often contradictory. The most frequently mentioned causes are associated with

traumatic occlusion (5,9), microbial factors (10-14), poor hygiene of the oral cavity and the denture (11,14,16-19), continuous wearing of the denture (14), age of the denture (4,16), allergy to the basic material of the denture or hypersensitivity to residual monomer, thermal stoppage below the denture (1-3), smoking, various types of irradiation and dryness of the mouth (1,2,20). An important role is also played by predisposing factors of endogenic origin, such as various systemic diseases, conditions of immunodeficiency, diabetes mellitus (21), nutrition disorders (22) and numerous medications (20,23).

Inadequate hygiene of the denture resulting in accumulation of plaque on microretention areas on the denture surface is of particular importance as they represent ideal feeding ground for fungi and other micro-organisms, bringing about the development of infections and inflammation of the mucosa (2,3,17-19).

The aim of the study was to examine the influence of clinical indicators upon the development and intensity of denture stomatitis: saliva quantity, oral hygiene habits, hygiene and age of the denture, denture surface infected by *Candida albicans*.

### Subjects and methods

The study included 70 subjects aged 31-96 years (mean age 66 years) wearing removable dentures. Out of this number there were 55 women and 15 men. Subjects were divided into two groups: the tested group, consisting of 49 subjects with inflammatory changes of the mucosa below the base of the denture. Thirty seven subjects in the tested group were out-patients in the Department of Oral Medicine and 12 were from a nursing home and a control group represented by 21 subjects without inflammatory changes on the mucosa below the base of the denture.

Data on the patients were filled in the questionnaires which, along with case history data, comprised data on clinical findings of the mucosa and degree of inflammation. The quantity of the saliva (24) was measured by the quantum test (Q sal) and the measured quantities were marked by

degrees: degree 0 = normal salivation (>0.4 ml/min), degree 1 = oligosialia (<0.4 ml/min), degree 2 = xerostomia (<0.2 ml/min). Oral and denture hygiene evaluation was done visually on the basis of plaque, dental calculus and pigmentation quantity, after the use of the plaque indicator. Oral hygiene was evaluated by degrees: degree 0 = poor; degree 1 = satisfactory; degree 2 = good. Degree of hygiene of the denture was estimated as: degree 0 = poor hygiene of the denture (over 1/3 denture covered with plaque and calculus); degree 1 = satisfactory (less than 1/3 denture covered with plaque and calculus) and degree 3 = good hygiene (without plaque and calculus). The removable denture wearing time data are shown on Table 1.

In all the subjects swabs were taken from the base of the denture for *Candida albicans* fungus mycopathological culture. The acrylate base was lightly cut on the surface and the remaining scraps soaked in the physiological salt solution were smeared by means of a sterile cotton stick onto nutritional Sabouraud dextrose agar substratum (Becton-Dickinson & Co., Cockeysville, USA, 25). After 48-hour incubation in the thermostat at 37° C temperature, colonies of *Candida albicans* fungus appeared. Their number was expressed in degrees according to Olsen (26,27).

Intensity of palatine inflammation below the base of the denture was estimated in degrees by a modified classification according to Newton (6). Degree 1 marked the poor intensity focal inflammation with individual focal erythematous areas on the palatine mucosa, degree 2 marked inflammation of the entire palate, erythema affecting the palatine mucosa, gingival and vestibular mucosa (below the base of the denture), and degree 3 marked inflammatory changes accompanied by hyperplasia of the mucosa with the development of the so-called papillary hyperplasia.

All examined variables in the tested groups were compared with the findings in the control and the data were statistically processed on the computer by using the PSS/PC + V.20 program. The significance of differences between the examined variables was estimated by the Chi-square test.

## Results

The finding of unstimulated saliva measured in both groups of subjects showed normal salivation in 53.1% subjects with denture stomatitis and in 38.1% subjects of the control. There were more subjects with xerostomia (5.7%) in the control group than in the tested group (4.3%). Salivation quantum (Q sal) was not statistically different between the tested and the control group ( $p = 0,2438$ ).

The results of the findings of the degree oral hygiene showed that more than half of the subjects in both groups had satisfactory oral hygiene ( $X^2 = 0.6347$ ) unlike denture hygiene which was less satisfactory in both groups. However, the subjects with denture stomatitis had poorer denture hygiene (70.4%), but without significant difference in relation to the control ( $X^2 = 0.839$ ).

Comparison of inflammation intensity and denture hygiene showed that the subjects with poorer hygiene had a higher degree of inflammation. The greatest number of subjects had degree 2 inflammation according to Newton (83.8%), while only a smaller number of subjects with poorer denture hygiene (8.2%) ( $X^2 = 0.1073$ ) had high intensity inflammation (Newton III).

Denture age examination showed that most of the subjects with denture stomatitis had 6-10-year old denture, while the control subjects had dentures older than 10 years. The difference in denture wearing time was not statistically significant ( $X^2 = 0.3140$ ).

Figure 1 shows the relation between inflammation intensity and denture age. The results showed that denture age did not significantly influence either the inflammation intensity ( $X^2 = 0.1720$ ) or the denture infection degree ( $X^2 = 0.9042$ ), although older dentures were more infected by *Candida albicans* in subjects with denture stomatitis.

Comparison of the degree of denture infection shown in Figure 2 revealed a high degree of denture infection (53.5%) in most subjects with denture stomatitis, while *Candida albicans* was not found on the denture in the majority of the control subjects (38.9%). These results were statistically significant ( $X^2 = 0.037$ ).

## Discussion

Connection of denture stomatitis with individual local and systemic factors has been reported in many papers although the predominant opinion today is that there is interaction of several factors in the pathogenesis of the disease. Oral microflora changes with the beginning of wearing the denture, and new conditions of micro-environment favor the development of denture stomatitis in some persons. *Candida albicans* infection and bacterial interaction (7,8,10-13) are reported to be among the most important causes and the influence of trauma upon weaker resistance of the mucosa whose joint action is crucial in the pathogenesis of the disease. The supposition is that the cause determines the clinical picture so the Newton type I denture stomatitis is thought to be the result of a trauma, while generalized erythema (Newton type II) and development of hyperplasia of the mucosa are the results of the interaction of several causes (7-9).

Our results conform with the aforementioned views on the simultaneous influence of several local factors in the development of denture stomatitis. Namely, examined local factors, salivation quantity, hygiene of the mouth and denture and its age were not statistically different between the subjects with denture stomatitis and the control, indicating that neither of these studied local causes was the sole cause of inflammation.

Saliva quantity measurement was carried out to assess dryness of the mouth, which is considered to be the principal predisposing factor in the development of denture stomatitis, as was shown in earlier studies (2,5,20, 23,24). In his report on xerostomia Spielman (24) pointed out that dryness of the mouth engenders predisposition for inflammation. However, our investigation showed that dryness of the mouth was not an important factor in the development of denture stomatitis because most of the subjects with denture stomatitis had normal salivation and only a small number of subjects had xerostomia (4.3%). More subjects with xerostomia (5.7%) were in the control group with inflammatory changes. Unlike relatively good oral hygiene habits in all our subjects, their denture hygiene was not an satisfactory. Earlier studies (7,14,16-19) reported a connection between poor denture hygiene and

development of denture stomatitis. Our results show that hard palate inflammation intensity was higher in the subjects with poorer denture hygiene habits. However, control subjects did not have inflammatory changes, which clearly shows that the resistance of oral mucosa is particularly important in the development of inflammation (14,17,19,23).

Denture age is thought to be a predisposing factor for the development of denture stomatitis, mainly due to the poor possible fitting of the denture, roughness of its surface, impossibility of adequate cleaning and accumulation of plaque and microbial pathogens. Moscona et al (4) believe that denture stomatitis is only the result of denture age and not the quality of its maintenance. However, other authors, who like us demonstrated that denture age is not crucial in the incidence and development of inflammatory changes, do not agree (16-19). Namely, our subjects, both those with denture stomatitis and the control group, had equally old dentures. However, in the subjects with denture stomatitis, older dentures were more infected, which agrees with the reports of authors who point out that the quality of the denture is more important for the development of inflammation than its age (13,15,16,19). Compared to the control group, the subjects with denture stomatitis showed significantly more infected dentures with *Candida albicans*, which is indicative of the role played by the fungi in the development of inflammation. This is substantiated by the finding of inflammation in highly infected dentures.

The greatest number of subjects with denture stomatitis had medium high intensity inflammation (Newton, type II), which is in accordance with the observations of authors that type II denture stomatitis is the result of interaction of several factors of which *Candida albicans* is the most significant. On the basis of an investigation of some

of the local factors in the incidence of denture stomatitis, we believe that poor hygiene habits and colonization of *Candida* on the denture are local factors that stimulate the development of denture stomatitis. The integrity of the mucosa is not necessarily threatened by age but its changes may be accelerated by stress, trauma or disease as well as by drugs used in the treatment of disease. General disorders, particularly of a nutritional and metabolic nature (21,22) and side-effects caused by pharmacotherapy (20,23) weaken the resistance of the mucosa making it susceptible to the action of various microbial pathogens, bacteria and fungi and to infection. Therefore, denture stomatitis, which develops frequently in older people's mouths, is the result of interaction of several factors, although merely wearing a removable denture cannot be considered its cause if appropriate oral and general health conditions are present (3,9).

### Conclusion

On the basis of the present study the following conclusion can be drawn:

In relation to the development and intensity of denture stomatitis the comparison of clinical indicators of saliva quantity, oral hygiene habits, age and hygiene of the denture showed that there was no statistically significant difference between the subjects with denture stomatitis and the control group. The statistically significant difference in the degree of the dentures infected by *Candida albicans* between the control and the tested group, as well as the observed correlation between intensity of inflammation, degree of hygienic habits and infection of the denturee shows that poor hygienic habits and infection of the denture are initial local factors in the development of denture stomatitis.