

Influence of candida infection on denture stomatitis

Sanja Hadžić¹, Amira Dedić¹, Mirjana Gojkov-Vukelić¹, Enes Pašić¹,
Ladislav Ožegović², Edina Bešliagić³

¹ Chair of Periodontology and Oral Medicine
Faculty of Dentistry, Sarajevo,
Bosnia and Herzegovina

² Institut for Microbiology, Parasitology
and Immunology, University of Sarajevo,
Clinical Centre, Bosnia and Herzegovina

³ Chair of Microbiology, Faculty of Medicine,
Sarajevo, Bosnia and Herzegovina

Corresponding author:

Sanja Hadžić

Chair of Periodontology and Oral Medicine
Faculty of Dentistry, Bolnička 4a

71000 Sarajevo, Bosnia and Herzegovina

shadzic@sf.unsa.ba

Received: 26 June 2008

Accepted: 18 December 2008

Objective. The aim of this study was to evaluate the influence of candida infection on denture stomatitis. **Patients and Methods.** Our study included 90 examinees of both sexes and all of them were wearers of mobile prosthetic devices for at least a year. On the basis of the anamnesis data and clinical check-up, the examinees were divided into 6 groups. In the methodology framework palate and denture plate scrapings were taken. For identification of *Candida albicans* and non-*albicans Candida* species the blastesis (germ) test, cultivation on the chromo-phyll base (Chrom agar) and the *Candida* assimilation test (API test) were used. **Results.** The results showed that denture stomatitis was detected in 50% of the cases. The proof of the interrelation between *Candida albicans* and denture stomatitis is the highly significant positive palate culture finding to *Candida albicans* and the denture plate culture finding. **Conclusion.** Denture stomatitis is a local determinant for stronger adherence of *Candida albicans* with consequent pathologic implications for the oral mucous membranes.

Key words: Candidiasis, Denture stomatitis.

Introduction

Candidiasis of oral mucosa is an opportunistic infective state caused by fungi of *Candida* species that contains at least 8 kinds of fungi. They are: *Candida albicans*, *Candida glabrata*, *Candida tropicalis*, *Candida guilliermondi*, *Candida crusei*, *Candida parapsilosis*, *Candida stelatoidea*, *Candida kefyr* (1).

Factors of virulence that enable fungi to become pathogen are: ability of a fungus to adhere to the host tissue, production of pro-

teolytic enzymes which help penetration into tissues, fungus hiphae - morphogenetic transformation which enables penetration and various immune-modular effects of fungal determinants which can contribute to reduction of immune system activity (2). The most common fungus causing the fungal disease is *Candida albicans*. It lives as a saprophyte on the skin and mucous membrane of the mouth, vagina and in the digestive tract.

Nevill BW et al. (3) divided the preconditions for *Candida* infection appearance into

two groups: 1. Factors which bring the host's immune status into disorder: blood dyscrasias, old age, radio and chemo therapy, diabetes mellitus, hypothyroidism, hypoadrenalism, hypoparathyroidism, HIV infections and so on; 2. Factors which bring oral flora and stability of oral cavity surroundings into disorder: xerostomia, antibiotic therapy, poor hygiene, malnutrition, iron and folic acid deficiency, smoking, etc. Denture stomatitis is a multi causal disease of the palate mucous membrane which is diagnosed on the basis of the following parameters: clinical observation, microbiological analysis and risk factor analysis (4). According to modified Newton's classification it is divided into 3 groups:

1. Denture stomatitis type I – localized inflammation,
2. Denture stomatitis type II – diffuse erythema without hyperplasia,
3. Denture stomatitis type III – papillary hyperplasia (5).

The etiology of denture stomatitis appearance is multi causal: ill-fitting dentures, old age, immune system disorder, smoking, wearing dentures at night, poor oral hygiene which results in denture plate plaque accumulation. It is generally confirmed that one of etiological factors is microbiological and *Candida albicans* presence is one of the most important factors for denture stomatitis appearance (6). The disease is manifested in palate mucous membrane changes which are the result of *Candida* species influence and a patient's immune reaction (7, 8).

The aim of this study was to evaluate the influence of candida infection on denture stomatitis.

Materials and Methods

Our study included 90 examinees of both sexes and different age (the average age was 59). All of them were wearers of mobile prosthetic devices for at least a year. On

the basis of the anamnesis data and clinical check-up, the examinees were divided into 6 groups. Each group consisted of 15 patients: G1. Healthy patients, without denture stomatitis, G2. Healthy patients, with denture stomatitis, G3. Chronic patients, without denture stomatitis, G4. Chronic patients, with denture stomatitis, G5. Patients undergoing immunosuppressive therapy without denture stomatitis, G6. Patients undergoing immunosuppressive therapy, with denture stomatitis.

In the framework methodology palate and denture plate scrapings were taken. Native and culture findings were performed. The cultivation was on Sabouraud's dextrose agar and for identification of *Candida albicans* and nonalbicans *Candida* species, the blastesis (germ) test, cultivation on the chromo-phyll base (Chrom agar) and the *Candida* assimilation test (API test) were used.

Statistical analysis comprised basic statistical data: arithmetical means, standard arithmetical mean error and standard deviations, as well as the following statistical analysis tests: Levenes test, Hi-test quadrangle and T- tests for independent samples. Significance was defined as a $P < 0.05$.

Results

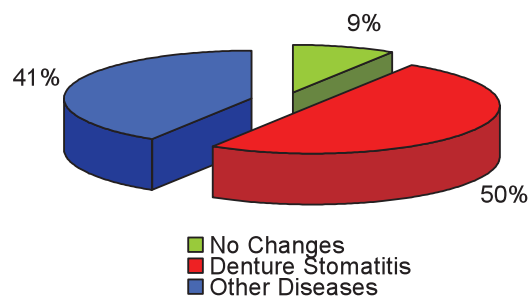


Figure 1 Percentual representation of oral finding according to categories

Denture stomatitis was detected in 50% of examinees and other diseases of oral mucous membranes in 41% of examinees.

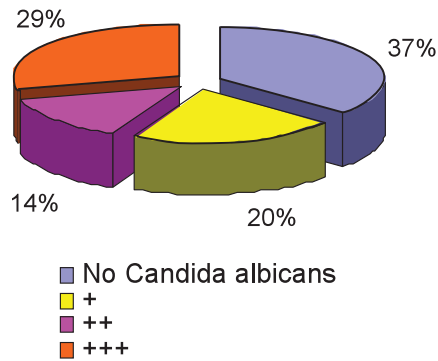


Figure 2 Native palate finding of Candida albicans

Thirty seven percent of patients did not have a positive native finding of Candida albicans and 63% of patients had a positive palate finding of Candida albicans of different intensity with domination +++ in 29% of cases.

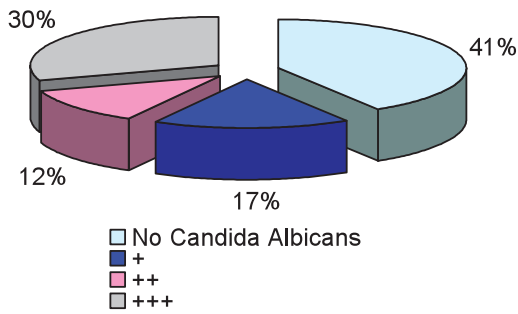


Figure 3 Native denture plate finding of Candida albicans

According to percentual presentation of native denture plate finding, 59% of patients have a positive finding of Candida albicans, of which 30% of patients have +++.

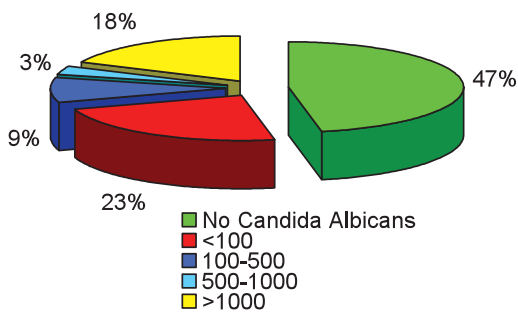


Figure 4 Palate culture finding of Candida albicans

Forty-seven percent of patients do not have positive culture finding of Candida albicans and 53% of patients have a positive culture finding. 23% of cases have less than 100 colonies and 18% have over 1000 colonies.

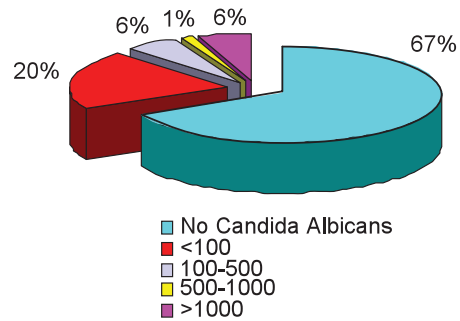


Figure 5 Denture plate culture finding of Candida albicans

Sixty eight percent of patients do not have positive denture plate culture findings of Candida albicans and 32% of patients have positive culture findings of Candida albicans. Groups 1, 2, 3 have a lower number of colonies in the culture finding <100 and groups 3, 4, 5 and 6 have >1000 colonies in the culture finding.

Table 1 Presence of denture stomatitis and Candida albicans culture finding from palate

Groups	Palate Culture Finding	
	n	$\bar{x} \pm SD$
Patients without denture stomatitis	45	0.33±0.769*
Patients with denture stomatitis	45	0.80±1.236

*The levens test of variance equality: F (1.88) = 7.65, p = 0.007.

The average value of the palate culture finding to Candida albicans is statistically higher (t=2.15; df = 73.6; p = 0.04) in patients with denture stomatitis ($\bar{x} = 0.80$) compared to the finding of patients without denture stomatitis ($\bar{x} = 0.33$) with average difference of 0.467 (%95 CI = 0.03-0.90).

Discussion

Candidiasis of the oral mucosa is an opportunistic infection caused by fungi of the *Candida* species, of which the most pathogenic is *Candida albicans*, which selectively pathologically adheres to oral mucous membranes and causes oral diseases (7). In 50–70% of the population *Candida* is present as an oral commensally. (8). The results of our research showed that in the group of 90 examinees, native finding to *Candida albicans* was positive in 63% of patients. Denture stomatitis is an inflammatory process of the palate tegument mucous membrane caused by mobile prosthetic devices. The described prevalence is ranked from 10–75% (9). According to frequency, the microbiological aspect of *Candida albicans* is the most significant factor for the occurrence of denture stomatitis. The unpolished denture plate surface is several hundred times larger in micro sizes resulting in much stronger adhesion. The unpolished surface is ideal for plaque adherence and growth of micro-organisms, especially *Candida albicans* (10, 11).

Our results match the research results of Dorkoo et al. who isolated *Candida albicans* in 95 patients out of 240 who were total or partial denture plate wearers (12) and the research results of Daries et al. and associates who identified *Candida albicans* in 66 out of 120 patients with malignoms who also were mobile prosthetic device wearers (13). Old age is one of the risk factors connected to decreased response of cellular immunity and increased adherence of *Candida albicans* (14).

Our examinees, with an average age of 59, had high values of *Candida albicans* culture findings in patients with denture stomatitis (G4, G6). Our results match the research results of Cumming et al. who examined yeasts presence and denture stomatitis in 121 examinees in a retirement home (15). Sixty four examinees had denture stomati-

tis and yeasts were detected in 51 patients (78%). Poor hygiene, wearing denture plates at night, mouth breathing and smoking are local factors which led to candidiasis in patients with denture stomatitis (16, 17). Rostok et al. confirmed that *Candida albicans* on the denture plate surface was one of the basic causes of **chronic atrophic candidiasis** (11, 18).

In our research on the sample of 90 patients we also identified *Candida tropicalis* on the palate but only in 1.11% and on the denture plate 3.33%, while other fungi were not identified. Mosca et al. isolated *Candida albicans* on the palate of patients below the denture plate in 75% of cases and *Candida glabrata* in 16.6% of cases and also *Candida dubliniensis* in 8.3% of cases (19). Our results related to other species of *Candida* matched the mentioned research results.

Conclusion

Palate mucous membrane culture finding to *Candida albicans* is significantly higher in patients with denture stomatitis, and denture stomatitis is a local determinant for stronger adherence of *Candida albicans* with consequent pathologic implications for the oral mucous membranes.

References

1. Cawson RA. Color atlas of oral disease. In: Cawson RA, Binnie WH, Evson JW, editors. The deep mycoses, London: Wolfe.1995;9.3-9.5.
2. Odds FC. *Candida* and candidiasis. A review and bibliography. London: Balliere, Tindal 1996.
3. Nevill BW, Damm D.D. Allen CM, Bouquot JE, -Oral and Maxillofacial Pathology, Philadelphia WB, Saunders 1995;163-9.
4. Kulak Y, Arikan A, Kazazoglu E. Existence of *Candida albicans* and microorganisms in denture stomatitis patients. J Oral Rehabil. 1997;24(10):788-90.
5. Newton AV. Denture sore mouth as possible etiology. Brit dental J. 1962;112:357-60.

6. San Millan R, Elguezal N, Regulez P, Moragnis MD, Quindos G. **Effect of salivary secretory IgA on the adhesion of candida albicans to Polystyrene.** *Microbiology.* 2000;146:2105-12.
7. Topić B. Diferencijalna dijagnoza i terapija bolesti oralnih sluznica. Sarajevo- Zagreb: Medicinska naklada; 2004.
8. Ana Cekić-Arambašin, et al. Oralna medicina. Zagreb: Školska knjiga; 2005.
9. Barbeau J, Seguin J, Goulet JP. **Reassessing the presence of candida albicans in denture – related stomatitis.** *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2003;95(1):51-9.
10. Pires FR, Santos EB, Bonan PR, De Almeida OP. **Denture stomatitis and salivary candida in Brazilian edentulous patients.** *J Oral Rehabil.* 2002;29(19):1115-9.
11. Rostoka D, Kroichalu, Kuznetsova V, Reins A, Ttremiane R, Uiovskaia T, et al. **Candida albicans adhesion to plastics during correction of removable dentures.** *Stomatologija (Mosk).* 2004;83(5):14-6.
12. Dorko E, Jenca A, Pilipcinec E, Dano J, Svicky E, Tkacikova L. **Candida associated denture stomatitis.** *Folia Microbiol Praha.* 2001;46(5):443-6.
13. Daries AN, Braillford S, Broadley K, Beighton D. **Oral yeast carriage in patients with advanced cancer.** *Oral Microbiol Immunol.* 2002;17(2):79-84.
14. Webb BC, Thomas CJ, Wittle T. **A 2-year study of Candida associated denture stomatitis treatment in age care subjects.** *Gerodontology.* 2005;22(39):168-76.
15. Cumming CG, Wightc, Black Well CL, Wray D. **Denture stomatitis in the elderly.** *Oral microbiol immunol.* 1990;5(2):82-5.
16. Ožegović L, Arifhodžić F. **Infekcija kandidom, sistemski poremećaji i protezna stomatopatija.** *Stomatološki vjesnik.* 2002;1(1):33-5.
17. Dedić A. **Diabetes mellitus –oralni aspekti.** Sarajevo: Stomatološki fakultet; 2004.
18. Serrano-Granger C, Cerero-Lapiedra R, Campo-Trapero J, Del Rio- Highsmith J. **In vitro study of the adherence of Candida albicans to acrylic resins: relationship to surface energy.** *Int J Prosthodont.* 2005;18 (5):392-8.
19. Mosca CO, Moragues MD, Brena S, Rosa AC, Ponton J. **Candida dubliniensis in teenager with denture stomatitis.** *Med Oral Pathol Oral Cir Bucal.* 2005;10(1):28-31:25-8.