

Distribution Profile of *Candida* Species Involved in Angular Cheilitis Lesions Before and After Denture Replacement

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Background: Angular cheilitis known as an oral candidiasis manifestation is deep fissures with ulcerated appearance, which affects angles of the mouth. Decreasing the vertical dimension (VD) of face in the elderly denture users is one of the predisposing factors for heavy colonization of *Candida* spp. in the cheek angles resulting angular cheilitis. Correcting vertical dimension by a new denture replacement can decrease *Candida* spp. colonization to prevent or improve the angular cheilitis lesions.

Objectives: The current study aimed to determine the distribution profile of *Candida* species isolated from cheek angles of patients with old denture before and after replacing with new ones.

Materials and Methods: Twenty eight complete denture users with decreased ridge, and outwear complete dentures, who referred for denture replacement, were randomly selected and their lip angles were cultured before and 3 months after using new dentures. Frequency and the species of isolated *Candida* spp. colonies before denture replacement and 3 months after using new dentures and correction of their vertical dimension were compared using Mann-Whitney statistical tests by SPSS software.

Results: All samples were colonized before denture replacement, though 3 months after using new dentures, only few cultures were positive. A significant statistical difference was observed between *Candida* colonization before and 3 months after denture replacement ($P = 0.0001$). *Candida albicans*, *C. tropicalis*, *C. krusei*, *C. parapsilosis* and *C. glabrata* were isolated from lesions.

Conclusions: The results of the current study suggest that long term use of dentures can cause a wide range of *Candida* species colonization, resulting angular cheilitis. There was a need for an oral manifestation management-based strategy focusing on clinical and preventative treatment. Angular cheilitis can be prevented by changing and replacing a new denture to modify the face vertical dimension, and improve the angular cheilitis lesions.

Keywords: *Candida* Colonization; Angular Cheilitis; Denture; *C. albicans*

1. Background

Candida species, which are a part of the human oral microbial flora, in particular *Candida albicans*, are the main etiologic agents responsible for the development of oral candidiasis. These fungi are known as the commensally intra-oral microorganism, which varies from 20% to 50% in a healthy edentulous population and up to 75% in denture-wearers (1). The manifestation of oral candidiasis can occur in many different forms including median rhomboid glossitis, atrophic glossitis, denture stomatitis, and angular cheilitis (2-4). Risk factors for the development of oral candidiasis include immunosuppression, wearing dentures, pharmacotherapeutics, smoking, infancy and old age, endocrine dysfunction, and decreased salivation. The rapid development and spread of antifungal resistance, especially for treatment of candidiasis caused by non-*albicans* *Candida* species, have become an increasingly serious public health problem in a wide

range of infectious diseases (5).

Angular cheilitis, one of the mucocutaneous lesions with deep fissures, affecting the angles of the elderly's mouths with an ulcerated appearance, is associated with a variety of nutritional, systemic, and drug-related factors that may act exclusively or in combination with local factors. This endogenous infection is relatively common in edentulous or very old denture users in the elderly and immunocompromised, such as HIV-infected patients, diabetes mellitus, internal malignancy, and anemia (6). However angular cheilitis is infectious in origin and the patients may complain of burning of their lip angles, and several predisposing factors such as dentures, which altered vertical dimension of occlusion and lip support, avitaminosis, particularly deficiencies of Riboflavin and anemia may interact (7).

Different reports showed an increase in the frequency of angular cheilitis with increase in length of denture use.

Implication for health policy/practice/research/medical education

Results of the current survey could be useful for prosthodontics to maintain, control, and treat angular cheilitis lesions in the elderly.

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age, suggesting that the loss of vertical height could be an important cause, as it is assumed that the over-closure of the jaws will produce occlusive folds at the angles of the mouth in which saliva tends to collect and the skin subsequently becomes macerated, fissured and secondarily infected and colonized mainly with *Candida* and few bacterial species such as *Staphylococcus aureus* (6, 8). Poor oral hygiene, severe desorbed ridge and decrease in the face vertical height of occlusion can cause active colonization of *Candida*, which results in angular cheilitis among the elderly and institutionalized people leading to nutritional deficiency and impaired quality of life. (9-11). Management of the elderly mucosal Candidiasis especially angular cheilitis is a major dentists' concern, especially in case of non-albicans species, which are less susceptible to common antifungal therapy than *C. albicans*.

2. Objectives

The main purpose of the present study was to compare the distribution profile of *Candida* species isolated from cheek angles before and 3 months after replacing of new denture in the elderly with angular cheilitis.

3. Materials and Methods

Totally, twenty eight patients including 18 men and 10 women, with the mean age 73.5 ± 7.8 years, using complete denture admitted to dental clinic of Shahid Sadoughi University of Medical sciences (Yazd, Iran) took part in this study. All cases suffered from angular cheilitis confirmed by dentist. The patients with the history of diabetes mellitus, internal malignancy, immunosuppression, and anemia, were all excluded from this study. A questionnaire including demographic and oral-dental questions was completed for each subject in the beginning. Their age, gender, history of the denture using, denture cleaning method, and prior treatment or medications for the symptom were interviewed.

For mycological examination, separate samples from their left and right side of lip lesions were collected using sterile swabs and direct smear were prepared. Specimens were also cultured on Sabouraud agar (Merck, Germany) plates, incubated at 35°C for 3 days. The density of isolated yeasts colonies were counted and determined as colony forming units (CFU) for each sample, signifying the number of *Candida* cells in each sample (12). The isolated *Candida* species were also identified by sub-culturing on CHROMagar medium (CHROMagar, France) and performing the germ tube production test, hyphae/pseudohyphae and chlamidospores growth, carbohydrate fermentation and assimilation methods as described by

Sandven (12). Three months after the denture replacement and using new complete dental prostheses, their lip angles' swab samples were again cultured for another mycological examination as described before (Figure 1). The density (mean of isolated colony forming units per each sample) and the species of isolated *Candida* colonies before and three months after using new dentures were compared with the Mann-Whitney test using SPSS15 software. Differences were considered statistically significant when $P < 0.05$.



Figure 1. Appearance of Patients Before (Right), and After (Left) Denture Replacement

4. Results

All subjects had complete denture with mean 10.2 ± 9.8 years (ranging from 8.5 to 21.2 years) (Figure 2). Heavy colonization (more than 30 colonies) of *Candida* species was observed in most patients in the first mycological examination, whereas their Candidal load was significantly declined ($P = 0.0001$) following 3 months after using new denture (Table 1). Elderly men showed more angular cheilitis lesions than women in the present study ($P = 0.001$). Only three cases showed slight colonization (less than 5 colonies) 3 months after denture replacement as a result of trauma and denture stomatitis. *C. albicans* was the major *Candida* species, isolated from 57.2% of cases, followed by *C. tropicalis* (17.9%), *C. krusei* (10.7%), *C. parapsilosis* and *C. glabrata* (7.1% each) (Table 2).

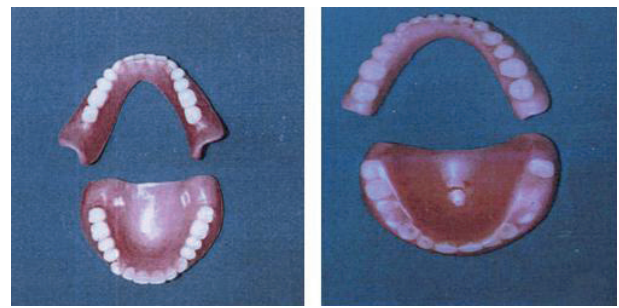


Figure 2. Old (Right) and new (Left) Complete Denture in the Present Study**Table 1.** Frequency of *Candida* Colonization (CFU/sample) From Right and Left Angles of lip Before and 3 Months After Denture Replacement. P = 0/0001, Mann-Whitney test

	Before		After	
	Mean ± SD ^a	(Min – Max)	Mean ± SD	(Min – Max)
Right	28.6 ± 11.3	8-36	3 ± 1.2	0-9
Left	17.2 ± 6.8	3-24	0	0

^a Abbreviation: SD, Standard deviation

Table 2. Distribution Profile of *Candida* Species in Angular Cheilitis Lesions Before and 3 Months After Using new Denture. P = 0.0001

<i>Candida</i> species	Before Denture Replacement		After Denture Replacement	
	Positive No. (%)	Mean ± SD	Positive No. (%)	Mean ± SD
<i>C. albicans</i>	16 (57.2)	40.3±16.2	2 (8.3)	12±3.2
<i>C. tropicalis</i>	5 (17.9)	32±12.5	0	0
<i>C. krusei</i>	3 (10.7)	26±15	1 (4.2)	7
<i>C. parapsilosis</i>	2 (7.1)	18±9.8	0	0
<i>C. glabrata</i>	2 (7.1)	25±13.09	0	0
Total	28 (100)		3 (12.5)	

5. Discussion

Candida species are known as the most prevalent opportunistic fungi, producing a high prevalence disease, candidiasis in human body, with the extremely varied localization. Colonization of *Candida spp.* in human mouth can promote oral candidiasis, with different manifestations. Angular cheilitis, one of the mucosal manifestations of oral candidiasis, results from colonization of *Candida spp.* in commissural folds, and satellite lesions on lips; however impaired immunity, diabetes mellitus and AIDS can also provoke this lesion (13, 14). The present study was conducted in order to show the role of vertical dimension of occlusion modification in reduction of *Candida* species colonization in angular cheilitis lesions and improvement of this infection.

Angular cheilitis is usually seen in elderly and complete denture users, following the reduction in facial height caused by old age, bad-fitting dentures and over use of dentures (6, 7). Results of the present study showed that replacing the old dentures with the new ones usually reduces the angular cheilitis in denture wearers as reported by Mac Entee et al. (15). Pires et al. (16) reported denture stomatitis in 50% of subjects which decreased to 18.2% six months after using new denture. The present study revealed that 57.2% of cases were infected by *C. albicans* as the most prevalent species, which is supported by many similar studies (17-19). However, *C. albicans*, known as the most common isolated species in the present study, and heavy colonization of non-*albicans Candida* species

were also seen in the lip lesion before denture replacement. Unfortunately, these species are less susceptible to common antifungal drugs than *C. albicans*. This may highlight a more precaution concerning the possible increased risk of systemic Candidiasis in immunosuppressed elderly people and show the important role of VD correction in diminution of colonization and improving the angular cheilitis lesions (20).

In the current study angular cheilitis was seen more in men in comparison with women which was the same as that of the study, reported from Venezuela (17). A high prevalent colonization of *Candida* species is often documented in the elderly denture wearers. *Candida* species which adhere to acrylic surfaces of dentures play an important role in both the colonization and the pathogenesis of candidiasis (18, 19). For this reason, oral candidosis in the form of *Candida*-associated denture stomatitis and angular cheilitis are known as the most common diseases in the elderly denture wearers (5, 19, 21). However in the present study only *Candida* species were isolated from lip lesions, but Ohman et al. (22) also isolated *C. albicans* and *S. aurous*. A positive *Candida* culture in the absence of other diagnostic signs and symptoms does not necessarily mean the mucosal disease of angular cheilitis (23), because this fungus is normally encountered as part of normal flora in human oral cavity and can be usually isolated without pathologic changes. Isolation of *Candida* species in culture should be supported by determination of characteristic budding yeast, pseudohyphae, and hyphae in the direct smear of the lesions (13).

The results of the present study led to the conclusion that there was a need for an oral manifestation management-based strategy focusing on clinical and preventative treatment. Angular cheilitis, as oral manifestations are frequent in the edentulous elderly using old dentures, is caused by a wide range of *Candida* species colonization. This lesion can be controlled with changing and replacing a new denture to modify the face vertical dimension, and improve the angular cheilitis lesions.

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Authors' Contribution

Study concept and design: Mohammad Hosein Lotfi-Kamran. Analysis and interpretation of data: Abbas Falah-Tafti and Saeed Shirzadi. Draft of the manuscript and critical revision of the manuscript for important intellectual content: Abbas Ali Jafari. Statistical analysis: Mohammad Hosein Lotfi-Kamran and Saeed Shirzadi.

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