ว ทันต จุฬาฯ 2555;35:189-200
CU Dent J. 2012;35:189-200

Original Article
บทวิทยาการ

Prevalence and risk factors associated with denture stomatitis

Siripen Pesee D.D.S., Ph.D. (Dentistry)[1]
Boonsong Pratipsawangwong D.D.S., M.Sc. (Prosthodontics)[1]
Chatchai Pesee B.Sc. (Mathematics), M.S. (Statistics), Ph.D. (Fanancial Mathematics)[2]

[1]Faculty of Dentistry, Thammasat University, Pathumtani, Thailand
[2]Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand

Abstract

Objective To investigate the prevalence and risk factors, both prosthesis and microbiological, associated with different types of denture stomatitis in Thai patients.

Materials and methods Thai patients with upper removable denture (n = 137) were evaluated for the prevalence of and risk factors associated with denture stomatitis by questionnaire, oral and dental prosthesis examination. Palatal mucosa and denture fitting surfaces were swabbed for yeast carriage investigation. *Candida* species were primarily identified by colony color on chromogenic *Candida* agar, and their identity confirmed by colony, microscopic cell morphology, and biochemistry tests.

Results The prevalence of denture stomatitis was 52.56%, sub-classified as erythematous type (38.69%), and papillary hyperplasia (13.87%). Poor denture quality was strongly associated with the presence of denture stomatitis, while a noctural denture wear was more weakly related to the prevalence of this disease. In about 61% and 80% of denture stomatitis subjects, *Candida* were detected on palatal mucosa and on denture bases, respectively. Larger numbers of *Candida* colonies were isolated from denture stomatitis patients than from healthy subjects. However, the distribution of yeast species was not associated with the presence of denture stomatitis. No correlation between types of denture stomatitis and either prosthesis factors or *Candida* infection was found.

Conclusion Results confirmed significant associations between denture stomatitis, denture quality and quantity of yeast infection. However, neither prosthesis factors nor *Candida* infection were associated with the different types of denture stomatitis.

(CU Dent J. 2012;35:189-200)

Key words: *Candida albicans, denture stomatitis, removable dental prosthesis, risk factors*

Introduction

Denture stomatitis (DS) is an inflammatory process that mainly involves the palatal mucosa underneath removable prostheses. Denture stomatitis is frequent in older patients who wear removable denture. The prevalence of disease ranges from 10% to 67% based on the investigated population.[1-6] Denture stomatitis presents different degrees of severity ranging from petechiae to generalized inflammation with or without papillary hyperplasia. Inflammation of mucosa may result in soreness or lead to the development of papillary hyperplasia. Papillary hyperplasia will cause the dentures to become ill-fitting, thus increasing the degree of inflammation.

Risk factors in healthy denture stomatitis may be divided in two major groups-those related to the prosthesis and those that are infective. Prosthesis factors include the trauma caused by an ill-fitting denture, lack of oral and prosthesis hygiene, the age of the denture, continuous or noctural denture wearing.[5,7-9] The most frequent infective causative agent associated with denture stomatitis is *Candida spp.,* mainly *Candida albicans.*[10-12]

Several studies have reported the existence of *Candida* infection in the oral cavity of denture stomatitis patients.[13-17] The prevalence rate of *Candida* infection in the oral cavity of patients with denture stomatitis ranged from 28% to 100%, compared with 9% to 40% in subjects with healthy mucosa.[16,17] Fifty percent of the immunocompetent individuals with denture stomatitis showed positive yeast culture on oral mucosa.[13] Although *C. albicans* was found to be the predominant species in the oral cavity of denture stomatitis subjects, non-albicans species such as *C. tropicalis, C. glabrata, or C. dubliniensis* have been recently detected.[14,15] Several studies have reported the presence of *Candida* infection in Thai denture stomatitis subjects.[4,18,19] The frequency of *Candida* isolated from palatal mucosa of maxillary complete denture wearer with denture stomatitis (90%) was at the similar levels to that of denture wearer with healthy mucosa (81%).[4] However, a study by Pipatanagovit, *et al.* reported that the distribution of yeast in generalized erythematous denture stomatitis subjects was significantly higher than that in both denture wearers with healthy mucosa and in healthy dentate subjects.[19] Another study of 64 Thai denture stomatitis patients also suggested that not all cases of denture stomatitis could be associated with candidal infection, since *Candida* were significantly isolated in only 50% of cases in this study.[18]

There is scant information regarding the prevalence and risk factors related to denture stomatitis in the Thai population. The aim of this study was to investigate the prevalence of denture stomatitis in a group of healthy Thai subjects wearing upper removable dentures, and to identify risk factors associated with different types of denture stomatitis.

Materials and methods

All subjects were patients who attended the Oral Health Care Clinic in Thammasat Chalermprakiert Hospital, Thailand during the period of March 2007 to December 2008. The sample was limited to individuals with maxillary removable denture. Subjects with additional risk factors for candidiasis such as diabetes mellitus, HIV-infection, long term antibiotic administration, head and neck cancer treatment/radiation, or immunosuppressive medication were excluded. All subjects were informed about the nature of the research and signed consent forms approved by the Ethics Committee of Thammasat University prior to participation. The study group comprised 137 upper removable denture wearers. Eighty-one dentate subjects who had not had prostheses and did not show any sign of candidal infection were also included as a control group. Comprehensive oral examinations were carried out, and medical histories were collected, by

one investigator (Pesee, S). Data were obtained as follows:

(1) Medical history, demographic and behavioral data were collected by questionnaire. The recorded data included: gender, age, occupation, underlying diseases, medications taken during the last 6 months, tobacco and alcohol consumption, oral and prosthesis hygiene, and prosthesis wearing frequency.

(2) Evidence of denture stomatitis (DS) was assessed by clinical examination. Denture stomatitis, if present, was classified according to Newton's classification[20] as Newton type I (localized hyperemia), type II (diffused erythematous), and type III (papillary hyperplasia). All patients received standard dental hygiene advice during their assessment.

(3) Dentures were evaluated by direct examination. The data analysed included: duration of denture wear; type of denture (complete or partial); type of denture base (metal or acrylic resin); and quality of denture. Acceptable quality of denture was recorded if an undamaged denture was shown good hygiene, adequate retention and stability, and no ill fitting areas.

Denture stomatitis patients with positive candidal infection were treated with 10 mg of clotrimazole troches for 2 weeks and followed up for treatment response. Denture replacement was later provided if required.

Specimen collection

Samples for mycological examination were collected from subjects who refrained from eating, drinking, oral and denture cleaning for at least 1 to 1.5 hours prior to the evaluation. The whole surface of palatal mucosa and the entire fitting surface were swabbed, inoculated onto separated transport medium and delivered to research laboratory for yeast culturing.

Mycological processing and identification

The swabs were inoculated onto chromogenic *Candida* agar (Oxoid, England) and incubated at 37°C for 48 hours. *Candida spp.* was identified by the color of colonies appearing on chromogenic *Candida* agar. *Candida* species were definitely identified by colony and microscopic examination of cell morphology, carbon assimilation, germ tube tests, urease and phenoloxidase tests carried out at the Department of Medical Sciences, Ministry of Public Health. The number of colony-forming units (c.f.u.) on chromogenic *Candida* agar was assessed and scored at level 1 (1-10 colonies), 2 (11-100 colonies), or 3 (> 100 colonies).

Statistical analysis

The analyses were performed using GraphPad Prism and SPSS v11.5. The association between variables were analysed using the chi-square test (with odds ratio) for univariate and multiple logistic regression for multivariate analysis. Numbers of yeast colonies isolated from each group were compared using a Student's t-test or one-way analysis of variance (ANOVA) with Tukey's multiple comparison post test. A value of $p < 0.05$ was considered significant.

Results

A total of 137 Thai upper denture wearers attended the study consisting of 46 (33.58%) men and 91 (66.42%) women with an average age of 57.32 years (range 22-92 years). The control sample of 81 Thai dentate subjects comprised 25 (30.86%) men and 56 (69.14%) women with the average age of 40.18 years (range 20-71 years). Among the 137 prosthesis wearers, there were 72 subjects (52.56%) who suffered from different types of denture stomatitis (DS) on palatal mucosa: Newton type I (47 cases), type II (6 cases) and type III (19 cases). Since there were only 6

subjects in Newton type II group, the types of denture stomatitis in this study were assessed as erythematous DS (53 subjects, 38.69%), and papillary hyperplasia DS (19 subjects, 13.87%).

Table 1 The distribution of variables in denture wearer groups with and without denture stomatitis

	With DS (n=72)	Without DS (n=65)	Multiple logistic regression analysis
1. Gender (male/female)	24/41	22/50	$p > 0.05$, OR = 0.809, 95% CI = 0.327-2.004
2. Age (mean ± SD)	53.14 ± 0.27	61.81 ± 13.11	$p < 0.001$, OR = 0.926, 95% CI = 0.887-0.967
3. Type of denture: number (%)			
Partial	65 (90.28%)	51 (78.46%)	$p > 0.05$, OR = 0.522, 95% CI = 0.121-2.242
Complete	7 (9.72%)	14 (21.54%)	
4. Type of denture base: number (%)			
Acrylic resin	58 (80.56%)	51 (78.46%)	$p > 0.05$, OR = 0.718, 95% CI = 0.248-2.083
Metal	14 (19.44%)	14 (21.54%)	
5. Age of denture: number (%)			
More than 5 years	36 (50.00%)	21 (32.31%)	$p > 0.05$, OR = 1.128, 95% CI = 0.426-2.991
Less than 5 years	36 (50.00%)	44 (67.69%)	
6. Quality of denture: number (%)			
Not acceptable	68 (94.44%)	43 (66.15%)	$p < 0.001$, OR = 11.653, 95% CI = 2.928-46.375
Acceptable	4 (5.56%)	22 (33.85%)	
7. Noctural denture wear: number (%)			
Yes	29 (40.28%)	13 (20.00%)	$p > 0.05$, OR = 1.999, 95% CI = 0.732-5.460
No	43 (59.72%)	52 (80.00%)	
8. *Candida* isolated on palatal mucosa: number (%)			
Yes	44 (61.11%)	24 (39.92%)	$p < 0.05$, OR = 2.820, 95% CI = 1.087-7.316
No	28 (38.89%)	41 (63.08%)	
9. *Candida* isolated on denture fitting surface: number (%)			
Yes	58 (80.56%)	40 (61.54%)	$p > 0.05$, OR = 1.775, 95% CI = 0.620-5.083
No	14 (19.44%)	25 (38.46%)	

DS = denture stomatitis, n = number, SD = standard deviation, OR = odds ratio, CI = confidence interval

Distribution of prosthesis variables in denture stomatitis

Using multiple logistic regression analysis, the younger age subjects were found in the DS group ($p < 0.001$) (odds ratio (OR) = 0.926, 95% confidence interval (CI) = 0.887-0.967), and the proportion of unacceptable denture quality in DS subjects was significantly greater than that in the healthy group ($p < 0.001$) (OR = 11.653, 95% CI = 2.928-46.375) (Table 1).

Frequency of *Candida spp.* infection on palatal mucosa of denture stomatitis subjects

Of the 81 dentate subjects, *Candida* was isolated from palatal mucosa of 10 subjects (12.35%) with an average cultured colony score of 0.21 ± 0.60 (mean ± SD). The prevalence of *Candida spp.* isolated from palatal mucosa of adults with dentures (49.64%) was significantly higher than that of dentate subjects (12.35%) ($p < 0.001$). The proportion of *Candida* infection on palatal mucosa of denture stomatitis patients (61.11%) was significantly greater than that of denture wearers with healthy mucosa (39.92%) ($p < 0.05$) (OR = 2.820, 95% CI = 1.087-7.316) (Table 1).

Analysis of swab samples taken from denture wearers with clinically healthy mucosa showed the presence of a strikingly higher number of *Candida* colonies than dentate individuals (mean score 0.63 ± 0.99 and 0.21 ± 0.60, respectively, $p < 0.05$). A significantly higher number of colonies was also demonstrated in patients with denture stomatitis (mean score 1.03 ± 1.0) compared to the control group ($p < 0.001$, Fig. 1A).

Four *Candida* species were isolated from palatal mucosa of subjects, *C. albicans, C. glabrata, C. tropicalis and C. parapsilosis. C. albicans* was the most frequently isolated species in monocultures, mixed species populations were observed in 1.25% of the control group, 10.77% of the healthy denture wearer group and 13.88% of the denture stomatitis group. However, the prevalence of single or combination species populations found in the denture stomatitis group was similar to that in the healthy denture wearer group (Table 2).

Frequency of *Candida* infection on denture fitting surface of denture stomatitis subjects

The prevalence of *Candida* infection on denture fitting surfaces of denture stomatitis subjects (80.56%) was not significantly different form that of healthy mucosa participants (61.54%) (Table 1). However, the CFU score was greater on denture fitting surfaces of denture stomatitis subjects than on those of healthy mucosa participants ($p < 0.01$) (mean ± SD = 1.99 ± 1.19 and 1.42 ± 1.26, respectively) (Fig. 1B).

Table 2 The characteristic of *Candida spp.* growth on palatal mucosa of subjects with and without denture stomatitis.

		Single *Candida spp.* (%)		Mixed *spp.* (%)	Statistics
	n	*C. albicans*	Non-albicans		(χ^2)
Clinically healthy mucosa	24	16 (66.67%)	1 (4.17%)	7 (29.17%)	$p > 0.05$
Denture Stomatitis	44	31 (68.89%)	3 (6.67%)	10 (22.22%)	

n = number

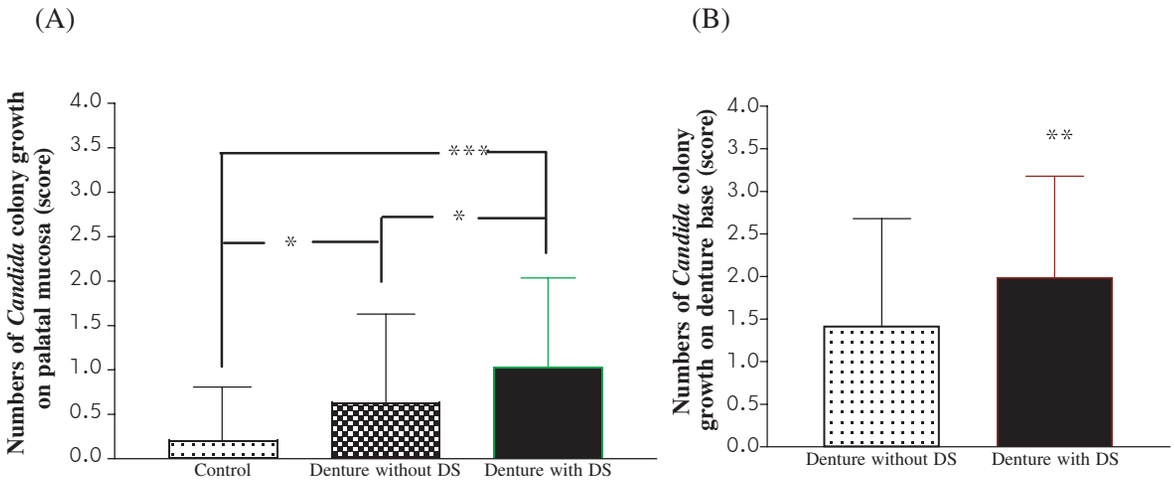

Fig. 1 Scores for *Candida* colonies collected from palatal mucosa (A), and denture fitting surface (B) of subjects. *Candida* scores were derived from numbers of colony-forming units on chromogenic *Candida* agar, scored as level 1 (1-10 colonies), level 2 (11-100 colonies), or level 3 (>100 colonies). Bars represent the mean score ± standard deviation from subjects within each group. Significant difference at $^{**}(p < 0.01)$ using Student's *t*-test, and at $^{*}(p < 0.05)$, $^{***}(p < 0.001)$ using one way ANOVA analysis and Tukey's multiple comparison post test. (DS abbreviated from denture stomatitis)

The frequency of *Candida* carriage on denture fitting surface was greater than that on palatal mucosa. Among 137 denture wearer subjects, *Candida* was isolated from denture fitting surface of 98 subjects (71.53%). Moreover, colony-forming units of *Candida* in sample taken from denture fitting surface of healthy mucosa subjects was significantly higher than those from palatal mucosa (mean score 1.42 ± 1.26 and 0.63 ± 0.99, respectively, $p < 0.001$). Similarly, the CFU score was also significantly greater on denture fitting surface than on palatal mucosa of denture stomatitis participants (mean score 1.99 ± 1.19 and 1.03 ± 1.0, respectively, $p < 0.001$). Only 62 denture wearers exhibited *Candida* carriage on both palatal mucosa and prosthesis fitting surface (45%) (Table 3). Statistical analysis suggested that the correlation between the presence of *Candida* on the mucosa and on the denture is significant ($p < 0.0001$, OR = 9.472, 95% CI = 3.619 to 24.79) (Table 3).

Analysis of yeast species cultured from denture fitting surface showed mixed species populations in 13.85% of the healthy group and 18.06% of the denture stomatitis group. However, *C. albicans* remained the most frequently isolated species. In addition, the proportion of single or combination yeast species appearing on denture fitting surface of denture stomatitis group was not significantly different from that of the healthy group. Of the 40 participants with clinically healthy mucosa, single *C. albicans,* single non-albicans and mixed species populations were detected on denture fitting surfaces in 28 cases (70.00%), 3 cases (7.50%) and 9 cases (22.5%), respectively. Among the 58 denture stomatitis patients, single *C. albicans,* single non-albicans and mixed species populations were detected on denture fitting surface in 43 cases (74.14%), 2 cases (3.45%) and 13 cases (22.41%), respectively.

Table 3 The distribution of *Candida spp.* isolated on palatal mucosa and/or denture fitting surface of denture wearer subjects.

	Positive culture on fitting surface (n)	Negative culture on fitting surface (n)	Statistics (χ^2)
Positive culture on palatal mucosa	62	6	$p < 0.0001$, OR = 9.472, 95% CI = 3.619 - 24.79
Negative culture on palatal mucosa	36	33	

n = number, OR = odds ratio, CI = confidence interval

Table 4 The distribution of variables in subjects with different types of denture stomatitis.

	Erythematous DS (n = 53)	Papillary hyperplasia DS (n = 19)	Multiple logistic regression analysis
1. Quality of denture: number (%)			
Not acceptable	51 (96.23%)	17 (89.47%)	$p > 0.05$, OR = 0.311,
Acceptable	2 (3.77%)	2 (10.53%)	95% CI = 0.040-2.437
2. *Candida* infection on palatal mucosa: number (%)			
Yes	31 (58.49%)	13 (68.42%)	$p > 0.05$, OR = 1.609,
No	22 (41.51%)	6 (31.58%)	95% CI = 0.521-4.972

n = number, OR = odds ratio, CI = confidence interval

Distribution of prosthesis and infective variables in groups exhibiting different types of denture stomatitis

When grouped by type of denture stomatitis relationships between DS types and either quality of denture, or yeast infection on palatal mucosa were not significant (Table 4). Moreover, the proportion of *Candida* species taken from palatal mucosa was not associated with the types of denture stomatitis. Of the 31 *Candida* infected erythematous DS subjects, single *C. albicans,* single non-albicans and mixed species populations were isolated from palatal mucosa of 23 cases (74.19%), 1 case (3.22%) and 7 cases (22.58%), respectively. Similarly, among the 13 yeast infected papillary hyperplasia DS subjects, single *C. albicans,* single non-albicans and mixed species populations were detected on palatal mucosa in 8 cases (61.54%), 2 cases (15.38%) and 3 cases (23.08%), respectively. Again, the relationships between the types of denture stomatitis and *Candida* species taken from denture surface were

not significant. Among the 46 participants exhibiting yeast infection on denture fitting surfaces of erythematous DS, there were 34 cases of single *C. albicans* (73.91%), 2 cases of single non-albicans (4.35%) and 10 cases of mixed species populations (21.74%). Of the 12 *Candida* infected papillary hyperplasia DS, single *C. albicans,* and mixed species populations were isolated on denture fitting surface in 9 cases (75.00%), and 3 cases (25.00%). No single non-albicans cases were discovered.

Although the density of *Candida* infection, either taken from palatal mucosa or denture fitting surfaces, was not associated with denture stomatitis type (Fig. 2), a significantly higher number of colony growths were demonstrated on dentures than on palatal mucosa in the erythematous DS group ($p < 0.0001$) (mean ± SD = 2.09 ± 1.09 and 1.04 ± 1.04, respectively) (Fig. 2).

Discussion

The prevalence of denture stomatitis in our study fell within the range of the previous studies in Swedish and Jordanish populations,[1,2] but it was greater than in earlier studies in Thai populations and a study from a large USA sample.[3-5] Differences in experimental design may explain these discrepancies. First, Prachyabrued, *et al.*'s study focused on subjects with a less than 2 year denture age,[4] while about 65% of subjects in our study had worn dentures for more than two years. Second, the greater sample size and the evaluation of prevalence of stomatitis in both jaws may explain the lower frequency of denture stomatitis in the studies by Jainkittivong, *et al.* and by Shulman, *et al.*[3,5] However, an erythematous DS was still the most common clinical presentation of denture stomatitis in our report, which is in agreement with earlier reports.[21,22]

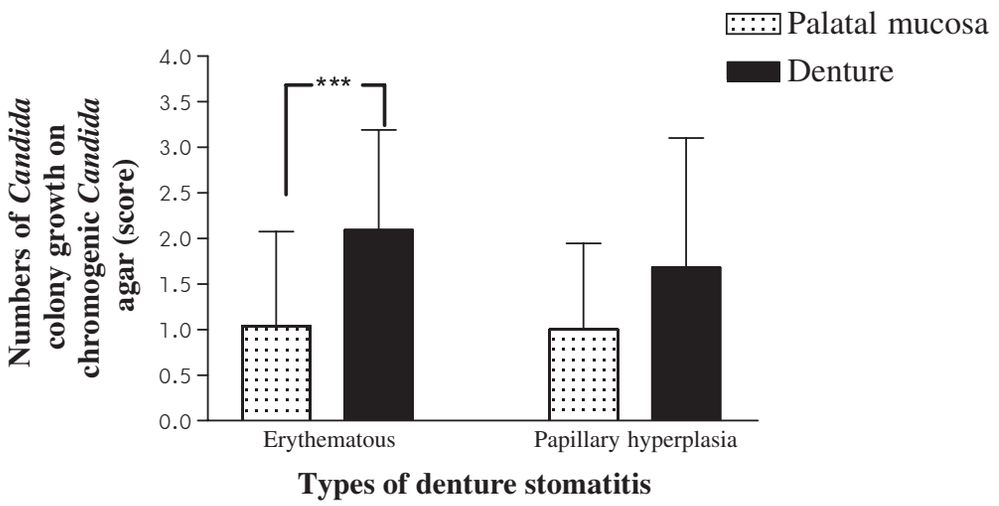

Fig. 2 Scores for *Candida* colonies collected from palatal mucosa and denture fitting surface of subjects with different types of denture stomatitis. *Candida* scores were derived from numbers of colony-forming units on chromogenic *Candida* agar, scored as level 1 (1-10 colonies), level 2 (11-100 colonies), or level 3 (> 100 colonies). Bars represent the mean score ± standard deviation from subjects within each group. Significant difference between numbers of colony taken from palatal mucosa and denture fitting surface at ***($p < 0.0001$) using Student's *t*-test.

Data presented here show that denture quality was strongly related to the prevalence of denture stomatitis, whereas *Candida* infection on palatal mucosa was more weakly associated with the presence of this disease. However, no correlation between denture stomatitis prevalence and age of denture was found here. These results were partly inconsistent with Figueiral, *et al.*'s study showing that denture stomatitis was significantly more prevalent in subjects with older prosthetic appliances, and the presence of yeast.[21] These data also differed from the report from a large USA survey conducted during 1988-1994, which indicated that denture stomatitis prevalence was mostly associated with continuous complete denture wear (odds ratio = 6.02), and more weakly associated with inadequate stablility of the complete denture (odds ratio = 1.08).[5] This survey also showed that gender, race ethnicity, diabetes, glycemic control, taking antibiotics or steroids, folate balance, vitamin C deficiency were not associated with denture stomatitis. The greater sample size and the different denture quality assessment performed in the study of Shulman, *et al.* may be responsible for these discrepancies.

The presence of yeast reported in denture stomatitis has varied greatly between studies and populations. The frequency of yeast infection on palatal mucosa of denture stomatitis subjects demonstrated here differs from previous studies of Thai patients.[4,18,19] The inconsistency might be due to the different sampling methods and the focus on different age groups. An increased frequency of oral yeast colonization in older subjects has been reported since 1996.[23] Decreasing salivary flow rate, alteration in epithelial defence against yeast, or alteration in the ecological environment can cause a greater yeast adherence in the oral cavity of elderly subject. Thus, the younger mean age of subjects may account for the lower prevalence of *Candida* carriage reported by Nittayananta and coworkers.[18] The different sampling method (imprint culture), and the site of sample collection (whole oral mucosa and denture base) may account for the higher prevalence rate of yeast carriage reported by Prachyabrued, *et al.* and by Pipatanagovit, *et al.*[4,19] Yeast extraction from the oral environment can be carried out by rinsing, swabbing or imprinting. Swabs and imprints are more suitable for accessing yeasts adherent to surface; swabbing is technically easier for studies on a larger scale. However, yeast counts after swab culture represented only a small part of the fungal cells present on the surface. This limitation of swabs could partly explain the lower prevalence rate of yeast extracted from palatal mucosa found in our study.

The greater frequency and quantity of *Candida* colonies isolated from palatal mucosa of denture wearers demonstrated here supports previous reports that *Candida* carriage in denture wearer groups is different from dentate groups.[24] However, Arirachakaran, *et al.* reported that the prevalence and distribution of *Candida* species in asymptomatic denture wearers did not differ from those in non-denture wearers.[25] Colonization is not indicative of candidiasis, but it is required for clinical infection. In order to be able to colonize and infect the oral environment, yeasts must first adhere to oral surfaces or coaggregate with oral bacteria. Initial attachment is followed by proliferation and biofilm formation which enhances yeast resistance to salivary host defences and antimicrobial agents. The significantly higher density of colonies in denture stomatitis patients demonstrated here supports the earlier studies indicating that density of yeast colonies is related to the development of candidiasis,[26] and that plaque quantity is important for the development of denture stomatitis.[11,27,28] These results suggest that quantification of yeast cells may be helpful in differentiating between colonization and infection.

Higher frequency of yeast colonization on denture fitting surface than that on palatal mucosa found here are in agreement with previous report.[22] Surface adherance is an important initial stage for the development of yeast colonization and biofilm formation on denture surfaces. *Candida* hydrophobicity and its ability to adhere on the rougher surface of denture base are likely important reasons for the greater frequency of yeast prevalence on denture bases.[12] In

the present study, about 80.6% of denture stomatitis consisted of *Candida* infection on the denture base which were lower than the report showing all 9 HIV negative subjects with denture stomatitis had yeast infection on denture fitting surfaces,[13] and higher than the previous study of the Thai population showing only 61% of denture stomatitis subjects exhibited yeast presence on denture fitting surfaces.[18] It was shown that the ability of yeast cells to adhere on metal denture base was significantly lower than on acrylic resin.[29] Thus, the higher percentage of acrylic denture bases (80%) in present study may explain the higher frequency of yeast colonization reported here than that reported by Nittayananta, *et al.*[18]

As in previous studies,[4,15,17,22] *C. albicans* was the predominant *Candida spp.* isolated from the oral cavity, both in healthy and denture stomatitis participants. In addition, non-albicans species *C. tropicalis, C. glabrata,* and *C. parapsilosis* were found singly or in combination with *C. albicans,* which was consistent with the previous studies.[14,22] However, an association between yeast species and denture stomatitis was absent here. This result supports previous reports that quantity, rather than composition, of yeast accounts for the development of denture stomatitis.[11,27,28]

Correlations between different types of denture stomatitis and risk factors (including prosthesis and infective variables) were not found in this study. The absence of an association between types of denture stomatitis and frequency, density and composition of yeast infection found here was inconsistent with previous reports.[14,22] Differences in subjects recruitment (complete denture wearers only), sample collection for yeast detection (oral rinse and denture sonication), and a modified classification of denture stomatitis may explain the inconsistency reported by Coco, *et al.* and by Barbeau, *et al.*[14,22] However, further studies with larger samples of maxillary and mandibular prosthesis wearers are required to confirm these findings.

Conclusion

Our study demonstrated that poor denture quality is a strong predictor of the development of denture stomatitis, while yeast infection on palatal mucosa is more weakly associated with the presence of this disease. Moreover, quantity, rather than composition, of yeast colonies may account for the presence of denture stomatitis. Neither prosthesis variables nor *Candida* infective variables correlate with the manifestation of different types of denture stomatitis.

Acknowledgements

This study was supported by National Research Grant of Thammasat University 2007-2008.

References

1. Axell T. A prevalence study of oral mucosal lesions in an adult Swedish population. Odontol Revy. 1976;36:1-103.
2. Al-Dwairi ZN. Prevalence and risk factors associated with denture-related stomatitis in healthy subjects attending a dental teaching hospital in North Jordan. J Ir Dent Assoc. 2008;54:80-3.
3. Jainkittivong A, Aneksuk V, Langlais RP. Oral mucosal conditions in elderly dental patients. Oral Dis. 2002;8:218-23.
4. Prachyabrued W, Silapabanleng Y, Laovanitch R. Prevalence of *Candida* and denture stomatitis in complete denture wearer. J Dent Assoc Thai. 1988;38:101-10.
5. Shulman JD, Rivera-Hidalgo F, Beach MM. Risk factors associated with denture stomatitis in the United States. J Oral Pathol Med. 2005;34:340-6.
6. Arendorf TM, Walker DM. Denture stomatitis: a review. J Oral Rehabil. 1987;14:217-27.
7. Budtz-Jorgensen E. The significance of *Candida albicans* in denture stomatitis. Scand J Dent Res. 1974;82:151-90.
8. Sakki TK, Knuuttila ML. The association of

yeasts and denture stomatitis with behavioral and biologic factors. Oral Surg Oral Med Oral Pathol Oral Radiol Oral Endod. 1997;84:624-9.

9. Emami E, de Grandmont P, Rompre PH, Barbeau J, Pan S, Feine JS. Favoring trauma as an etiological factor in denture stomatitis. J Dent Res. 2008;87: 440-4.
10. Budtz-Jorgensen E, Bertram U. Denture stomatitis I. The etiology in relation to trauma and infection. Acta Odontol Scand. 1970;28:71-92.
11. Theilade E, Budtz-Jorgensen E. Predominant cultivable microflora of plaque on removable dentures in patients with denture induced stomatitis. Oral Microbiol Immunol. 1988;3:8-13.
12. Radford DR, Challacombe SJ, Walter JD. Denture plaque and adherence of *Candida albicans* to denture-base materials *in vivo* and *in vitro.* Crit Rev Oral Biol Med. 1999;10:99-116.
13. Leigh JE, Steele C, Wormley F, Fidel PL, Jr. Salivary cytokine profiles in the immunocompetent individual with *Candida*-associated denture stomatitis. Oral Microbiol Immunol. 2002;17:311-4.
14. Barbeau J, Seguin J, Goulet JP, de Koninck L, Avon SL, Lalonde B, et al. Reassessing the presence of *Candida albicans* in denture-related stomatits. Oral Surg Oral Med Oral Pathol Oral Radiol Oral Endod. 2003;95:51-9.
15. Marcos-Arias C, Vincente JL, Sahand IH, Eguia A, De-Juan A, Madariaga L, et al. Isolation of *Candida dubliniensis* in denture stomatitis. Arch Oral Biol 2009;54:127-31.
16. Kulak Y, Arikan A, Kazazoglu E, Existence of *Candida albicans* and microorganisms in denture stomatitis patients. J Oral Rehabil. 1997;24:788-90.
17. Dar-Odeh NS, Shehabi AA. Oral candidosis in patients with removable dentures. Mycoses. 2003; 46:187-91.
18. Nittayananta W, Teanpaisan R, Kitkumthorn N. *Candida*-associated denture stomatitis in a group of patients attending the dental hospital, Prince of Songkla University. J Dent Assoc Thai. 1996;46:78-80.
19. Pipatanagovit P, Itharatana K, Aneksuk V. The prevalence and intra oral distribution of *Candida* in denture stomatitis. J Dent Assoc Thai. 1995;45:108-24.
20. Newton AV. Denture sore mouth: a possible aetiology. Br Dent J. 1962;112:357-60.
21. Figueiral MH, Azul A, Pinto E, Fonseca PA, Branco FM, Scully C. Denture-related stomatitis: identification of aetiological and predisposing factors - a large cohort. J Oral Rehabil. 2007;34:448-55.
22. Coco BJ, Bagg J, Cross LJ, Jose A, Cross J, Ramage G. Mixed *Candida albicans* and *Candida glabrata* populations associated with the pathogenesis of denture stomatitis. Oral Microbiol Immunol. 2008;23:377-83.
23. Kleinegger CL, Lockhart SR, Vargas K. Frequency, intensity, species, and strains of oral *Candida* vary as a function of host age. J Clin Microbiol. 1996; 34:2246-54.
24. Zaremba ML, Daniluk T, Rozkiewicz D,Cylwik-Rokicka D, Kierklo A, Tokajuk G, et al. Incidence rate of *Candida* species in the oral cavity of middle-aged and elderly subjects. Adv Med Sci. 2006;51: 233-6.
25. Arirachakaran P, Piboonratanakit P, Kiatkroekkrai P, Sornmai M, Srimart N. Prevalence of oral *Candida* carriage in denture wearers. CU Dent J. 2009;32:101-12.
26. Oliveira MA, Carvalho LP, Gomes Mde S, Bacellar O, Barros TF, Carvalho EM. Microbiological and immunological features of oral candidiasis. Microbiol Immunol. 2007;51:713-9.
27. Budtz-Jorgensen E, Theilade E. Regional variations in viable bacterial and yeast counts of 1-week-old denture plaque in denture-induced stomatitis. Scan J Dent Res. 1983;91:288-95.
28. Jegananthan S, thean HPY, Thong KT, Chan YC, Singh M.A. Clinically viable index for quantifying denture plaque. Quintessence Int. 1996;27:569-73.
29. Perezous LF, Stevenson GC, Flaitz CM, Goldschmidt ME, Engelmeier RL, Mark Nichols C. The effect of complete dentures with a metal palate on *Candida* species growth in HIV-infected patients. J Prosthodont. 2006;15:306-15.

ความชุกและปัจจัยเสี่ยงในผู้ป่วยปากอักเสบเหตุฟันเทียม

ศิริเพ็ญ เปสี ท.บ., Ph.D. (Dentistry)[1]
บุญส่ง ประทีปสว่างวงศ์ ท.บ., M. Sc. (Prosthodontics)[1]
ฉัตรชัย เปสี วท.บ. (คณิตศาสตร์), พม.บ. (สถิติประยุกต์), Ph.D. (Financial mathematics)[2]

[1]คณะทันตแพทยศาสตร์ มหาวิทยาลัยธรรมศาสตร์ ปทุมธานี
[2]ภาควิชาคณิตศาสตร์ คณะวิทยาศาสตร์ มหาวิทยาลัยเกษตรศาสตร์ กรุงเทพมหานคร

บทคัดย่อ

วัตถุประสงค์ เพื่อศึกษาความชุกและปัจจัยเสี่ยงด้านฟันเทียมและด้านจุลชีววิทยาที่สัมพันธ์กับการเกิดโรคปากอักเสบเหตุฟันเทียมที่มีระดับความรุนแรงต่าง ๆ ในคนไทย

วัสดุและวิธีการ ความชุกและปัจจัยเสี่ยงที่สัมพันธ์กับการเกิดโรคปากอักเสบเหตุฟันเทียมในผู้ป่วยไทยที่ใส่ฟันเทียมบนแบบถอดได้ (137 ตัวอย่าง) ถูกประเมินโดยใช้การตอบแบบสอบถาม การตรวจช่องปากและฟันเทียม การปรากฏของเชื้อราในช่องปากผู้ป่วยถูกทดสอบโดยใช้วิธีป้ายเชื้อจากบริเวณเยื่อเมือกเพดานปากและที่ด้านสัมผัสเนื้อเยื่อใต้ฐานฟันเทียม การจำแนกสายพันธุ์เชื้อราแคนดิดาเบื้องต้นใช้ความแตกต่างของสีของโคโลนีที่ปรากฏบนวุ้นอาหารเลี้ยงเชื้อโครโมจีนิกแคนดิดาอะการ์ และทำการยืนยันด้วยลักษณะของเซลล์และโคโลนีร่วมกับวิธีทดสอบทางชีวเคมี

ผลการทดลอง ความชุกของการเกิดโรคปากอักเสบเหตุฟันเทียม คือ ร้อยละ 52.56 โดยร้อยละ 38.69 เป็นชนิดอักเสบแดง ร้อยละ 13.84 เป็นชนิดปุ่มเนื้องอกเกิน ปัจจัยเสี่ยงที่สัมพันธ์กับการเกิดโรคปากอักเสบเหตุฟันเทียมมากที่สุด คือ สภาพฟันปลอมที่ไม่ดี รองลงมา คือ การติดเชื้อราแคนดิดาที่เยื่อเมือกเพดานปาก โดยร้อยละ 61 ของผู้ป่วยโรคปากอักเสบเหตุฟันเทียมมีการตรวจพบราแคนดิดาที่เยื่อเมือกเพดานปาก และร้อยละ 80.56 มีราแคนดิดาที่ด้านสัมผัสเนื้อเยื่อใต้ฐานฟันเทียม จำนวนโคโลนีเชื้อราที่ตรวจพบในผู้ป่วยโรคปากอักเสบเหตุฟันเทียมโดยเฉลี่ยมีค่าสูงกว่ากลุ่มควบคุมที่ไม่ได้ใส่ฟันเทียมอย่างมีนัยสำคัญ แต่การกระจายของสายพันธุ์ราแคนดิดาไม่มีความแตกต่างกัน ชนิดของโรคปากอักเสบเหตุฟันปลอมไม่มีความสัมพันธ์กับปัจจัยเสี่ยงทางด้านฟันเทียมและทางการติดเชื้อราแคนดิดา

สรุป ผลการศึกษายืนยันความสัมพันธ์ระหว่างโรคปากอักเสบเหตุฟันเทียมกับคุณภาพของฟันเทียม และกับปริมาณเชื้อราแคนดิดา อย่างไรก็ตามชนิดของโรคปากอักเสบเหตุฟันเทียมไม่มีความสัมพันธ์กับปัจจัยเสี่ยงใด ๆ

(ว ทันต จุฬาฯ 2555;35:189-200)

คำสำคัญ: *แคนดิดา อัลบิแคนส์; ปัจจัยเสี่ยง; ฟันเทียมแบบถอดได้; โรคปากอักเสบเหตุฟันเทียม*