Intraoral Candida in Thai Diabetes Patients

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Abstract

The purpose of this study was to determine the oral candidal prevalence and identify the candidal species in fifty four diabetes and sixty two healthy, non smoking and non denture wearing subjects. The modified imprint culture technique was used for candidal isolation. It was found that the prevalence of oral candida was significantly higher in diabetics ($P<0.00001$) with the relative risk of positive culture at 3.674 (95% CI=1.998-6.757). The most frequent candidal species in diabetics were *C. albicans* (81.3%) followed by *C. glabrata* (9.4%), *C. tropicalis* (3.1%) and *C. rugosa* (3.1%). There were two species of *C. tropicalis* and *C. rugosa* in one subject (3.1%). The candidal species in healthy subjects was only *C. albicans* (100%).

Candida can be found as normal flora in the oral cavity without lesions or any symptoms. Statistically, it was reported that candidal occurrence in oral cavity of healthy people ranged from 2 per cent to 71 per cent[1] and one study showed that 23 per cent of healthy Thai people had oral candidal carriage[2]. The increased prevalence of intraoral candida is influenced by local and systemic factors. Local factors are denture wearing[3-6] and tobacco smoking[7,8]. Systemic factors are the following: altered nutritional states, hypovitaminosis and iron deficiency, altered immune mechanisms; particular medication like antibiotics, steroids and some specific diseases such as diabetes[9].

Diabetes mellitus is the most common endocrine disease. The epidemiologic studies showed that prevalence rate of diabetes in the Thai population was 2.5 per cent[10]. Diabetes tends to cause some systemic complications and is susceptible to infection. Intraoral candida, is the opportu-

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nistic pathogen of oral condidosis which initiates abnormal symptoms or signs[11-15] and is also manifested in some diabetes patients[16,17]. Moreover, intraoral candida may possibly spread to other parts of the body in some cases of malignancy, burns and paronychia. However, further study is required to support this hypothesis[18].

The objectives of this study were

(1) To study the prevalence rate of intraoral candida among diabetics, compared to healthy subjects.

(2) To identify the intraoral candidal species among diabetic patients and healthy subjects.

MATERIAL AND METHOD

Two groups of subjects were studied. The first group comprised of 54 diabetics, non denture wearing and non smoking patients of the diabetes clinic, Department of Internal Medicine, Rajavithi Hospital, aged between 20 to 60 years old. All patients were examined by the endocrinologist for evaluating the routine diabetes status and diabetes complications (ischemic heart disease, diabetic nephropathy, diabetic retinopathy and stroke). In the other group, 62 healthy samples were randomly selected from sixth year dental students, dental assistant students and outpatients in the oral diagnostic clinic, Faculty of Dentistry, Mahidol University, aged between 20 to 60 years old. According to the subject records, all 62 subjects had no underlying diseases, medications, denture wearing or smoking. All healthy individuals underwent the fasting blood sugar test and the results showed normal blood sugar level (<110 mg/dL).

Microbiological investigation : The imprint culture technique, modified from Arendorf and Walker[19], was used to detect the intraoral candida. A sterile tongue shape Whatmann paper No.1, size 13 cm^2 was used in this study instead of a foam pad. The paper was dipped in sabouraud's dextrose broth (Difco) and placed on the dorsum of the tongue for 60 seconds. The contacted paper was then pressed firmly on a saubouraud's dextrose agar (Difco) plate and left in place for the first 6-8 hours incubation at 37°C. The paper was removed and further incubated to achieve a total cumulative incubation time of 48 hours. The yeast colonies on the agar plate were counted and identified; *Candida albicans* was distinguished from other species of the genus, using serum germ-tube formation, chlamydospore formation on cornmeal agar and sugar fermentation[20]. The subject was regarded as positive if a single colony was obtained and represented as a candidal carrier. All samplings were collected from 7:30 a.m. to 9:00 a.m. after the subjects had brushed their teeth in the morning and undergone fasting for 8 hours.

Statistical analysis

The results were coded and a computerized database was set up to facilitate analysis using SPSS for window. The relationship between prevalence of intraoral candida and other factors was tested by chi-square test and relative risk.

RESULTS

Sixty two healthy subjects were forty females and twenty two males, with a mean age (yr±SD) of 40.10±12.03. The mean fasting blood sugar level was 83.16±5.23 mg/dL. Fifty four diabetic patients were thirty six females and eighteen males, with a mean age (yr±SD) of 48.35±10.06.

Thirty two diabetic subjects had positive candidal culture (59.3%) and twenty two diabetic subjects had negative candidal culture (40.7%). In healthy subjects, ten subjects had positive candidal culture (16.1%) and fifty two subjects had negative candidal culture (83.9%) (Table 1). There was a significantly increased prevalence of intraoral candidal carriage in the diabetics. The relative risk for positive culture in the diabetic group was 3.674 (95% CI=1.998-6.757).

Table 1. The numbers and percentages of positive and negative intraoral candidal culture between diabetics and healthy group.

Group	Number of candidal culture(%)	
	Negative	Positive
Diabetics	22(40.7)	32(59.3)
Healthy	52(83.9)	10(16.1)

The most frequent candidal species, isolated from thirty two positive candidal culture in the diabetic group, was *C. albicans* which were found in twenty six cases (81.3%). *C. glabrata* was found in three subjects (9.4%). *C. tropicalis* was found in one subject (3.1%). *C. rugosa* found

in one subject (3.1%). Only one subject was found in both species of *C. tropicalis* and *C. rugosa* (3.1%). In the non-diabetic group, *C. albican* was the only species that was found in ten positive culture subjects. (100%) The numbers and percentages of candidal species in each group are shown in Table 2.

Table 2. The numbers and percentages of candidal species in diabetes group and healthy group.

Candidal species	Group	
	Diabetics	Healthy
C. albicans	26(81.3)	10(100)
C. glabrata	3(9.4)	-
C. tropicalis	1(3.1)	-
C. rugosa	1(3.1)	-
C. tropicalis & C. rugosa	1(3.1)	-

DISCUSSION

The results of this study confirmed previous reports that there was an increased prevalence rate of oral candida in diabetic patients (21-23). There were possible factors which indicated the increased susceptibility to candidal infestation. The high salivary glucose level in diabetics may initiate the growth of yeast but this hypothesis requires more further studies(24). Epithelial changes which promoted the yeast colonization was also suggested(25). There were reports that diabetic patients had immune defects and were susceptible to infections(26). Some studies showed that the candida cell killing ability of neutrophil was suppressed and was associated with oral candidosis in diabetic patients(27).

C. albicans was the most frequent candidal species isolated in the oral cavity of diabetics and the healthy group. These results confirmed many previous studies(28-32). The results of this study also found *C. glabrata, C. tropicalis* and *C. rugosa* only in mouths of diabetics. These candidal species were reported to be found in the oral cavity of healthy subjects(32,33) and they might be pathogenic species(34). The relationship between the adherence of candidal species to buccal epithelial cell is still unclear. It requires further studies to support the hypothesis of epithelial alterations which may be susceptible for candidal adherence with underlying causes like diabetes, denture wearing or smoking.

ACKNOWLEDGEMENT

The authors would like to thank all subjects in this study, without their cooperation this study would not have been possible. Vinai Leelaprute, for his technical support. Parichard Rojanaplakorn, for statistical analysis and Assoc. Prof. Anongporn Sirikulsathean, for her kind contribution.

(Received for publication on November 12, 1997)

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การศึกษาเชื้อราแคนดิดาในช่องปากผู้ป่วยเบาหวานไทย

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วัตถุประสงค์ของการศึกษานี้เพื่อเปรียบเทียบ ความชุกของการพบเชื้อแคนดิดาและจำแนกชนิดของเชื้อรา แคนดิดาในช่องปากผู้ป่วยเบาหวาน จำนวน 54 คน และคนสุขภาพปกติจำนวน 62 คน ที่ไม่มีประวัติสูบบุหรี่และไม่ใส่ฟันปลอม โดยใช้วิธีที่ดัดแปลงจากวิธีอิมพรินท์ ในการเพาะเลี้ยงเชื้อ ผลจากการศึกษาพบว่า ในช่องปากของกลุ่มผู้ป่วยเบาหวานมีอัตราความชุกของการพบเชื้อแคนดิดาสูงกว่าคนสุขภาพปกติอย่างมีนัยสำคัญทางสถิติ ($P<0.00001$) และมีความเสี่ยงในการพบเชื้อแคนดิดาสูงกว่าคนสุขภาพปกติ 3.674 เท่า (95% CI = 1.998–6.757) ชนิดของเชื้อแคนดิดาที่จำแนกได้สูงสุดคือ แคนดิดาแอลบิแคนส์ (81.3%) และสามารถจำแนกแคนดิดากลาบาตา (9.4%), แคนดิดาทร้อพบีคาลีส (3.1%) และแคนดิดารูโกซา (3.1%) และมีผู้ป่วยเบาหวาน 1 คน ที่จำแนกเชื้อได้ทั้งแคนดิดาทร้อพบีคาลีส และแคนดิดารูโกซา (3.1%) ชนิดของเชื้อราในช่องปากของคนปกติจำแนกพบเชื้อแคนดิดาแอลบิแคนส์ (100%)

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