Is There a Relationship Between Dysphagia and Oral Candida Colonization in Stroke Patients?

İnme Hastalarında Disfaji ve Oral Candida Kolonizasyonu Arasında İlişki Var mı?

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ABSTRACT

Objective: Dysphagia is a frequent problem in cerebrovascular events. Swallowing problems can increase the risk of oral infections caused by opportunistic yeasts. Detecting patients with increased risk for candida colonization is important regarding prevention of systemic dissemination. The aim of this study was to evaluate oral candida colonization in hemiplegic stroke patients and investigate its relationship with dysphagia.

Methods: Thirty-six hemiplegic stroke patients hospitalized at our rehabilitation unit enrolled in the study. Fourteen non-dysphagic patients who were hospitalized for rehabilitation other than stroke were also recruited as control group. A bedside examination to detect dysphagia was performed. After oral and laryngeal examinations, patients who have impaired examination were accepted as dysphagic. Microbiological samples were taken from oral mucosa with a cotton swab at admission and on discharge. Candida colonization in the cultures was analysed and compared.

Results: Fourteen of 36 (38.9%) hemiplegic patients have dysphagia. There was no significant difference in candida colonization between admission and discharge in all groups($p>0.05$). Furthermore, candida colonization between the groups were not different both at admission and on discharge ($p>0.05$).

Conclusion: Our findings show that dysphagia in stroke patients does not increase candida colonization on oral mucosa. Further studies with larger patient samples are needed to determine the relationship between dysphagia and oral candidiasis in stroke patients.

Keywords: Stroke, dysphagia, candida, oral colonization

ÖZET

Amaç: Bu çalışmanın amacı hemiplejik inme hastalarında oral candida kolonizasyonunu değerlendirmek ve disfaji ile ilişkisini araştırmaktı.

Yöntemler: Bu çalışmaya rehabilitasyon ünitemizde yatan 36 hemiplejik inme hastası katıldı. Kontrol grubu olarak inme dışı nedenler için hastaneye yatırılmış 14 disfajik olmayan hasta katıldı. Disfajiyi belirlemek için yatak başı muayene yapıldı. Oral ve laringeal muayenelerden sonra anormal muayenesi olan hastalar disfajik olarak kabul edildi. Hastaneye yatış ve çıkışta oral mukozadan pamuk çubukla mikrobiyolojik örnekler alınarak kültüre ekildi. Kültürlerdeki candida kolonizasyonu analiz edildi ve karşılaştırıldı.

Bulgular: Otuzaltı inme hastasının 14'ünün (%38,9) disfajisi vardı. Tüm gruplar içinde hastaneye yatışlar ve çıkışlar arasında candida kolonizasyonu açısından anlamlı fark yoktu ($p>0,05$). Ayrıca, yatış ve çıkışlarda gruplar arasında kolonizasyonda fark yoktu ($p>0,05$).

Sonuçlar: Bulgularımız inme hastalarında disfajinin oral mukozadaki candida kolonizasyonu arttırmadığını göstermektedir. İnme hastalarında, disfaji ve oral candida kolonizasyonu arasındaki ilişkiyi belirlemek için daha fazla hastayı kapsayan ileri çalışmalara ihtiyaç bulunmaktadır.

Anahtar sözcükler: Disfaji, inme, candida, oral kolonizasyon

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Introduction

Dysphagia is a frequent problem in cerebrovascular events (1, 2). The incidence of swallowing disorders in stroke patients has been estimated to be between 29% and 50%. Location of the cerebral pathology, diagnostic method of dysphagia and time interval between stroke and evaluation affect these rates. In stroke patients, dysphagia may lead to dehydration, aspiration pneumonia, and even sudden death associated with aspiration (3, 4, 5). Furthermore, it is associated with poor outcome following stroke (5).

Swallowing problems increase the risk of superficial or deep-seated oral infections caused by opportunistic yeasts and candidiasis has been found to be responsible for a third cause of nosocomial oral infections in elderly hospitalized patients. Risk factors for colonization other than dysphagia were found to be dental prosthesis, poor oral hygiene, endocrine diseases, antibiotic use, poor nutritional status and prolonged length of stay (6, 7). Furthermore, stroke itself may be an independent risk factor for the colonization. Zhu et al. found that the oral yeast carriage increased significantly during acute stroke period in their study (8). Further studies showed the occurrence of colonization in 64% of all hospitalized patients and a rate of nosocomial contamination of 40%, with oral infections predominating (6). In addition to oral candidiasis, dental plaques containing candida species can lead to pulmonary infections due to aspiration of the plaques, especially in elderly stroke patients and immunocompromised patients (4).

Early diagnosis of dysphagia is crucial because management strategies regarding dysphagia can decrease morbidity and mortality. Detecting those patients with increased risk for candida subspecies (spp.) colonization is also important for the prevention of systemic dissemination and fungemia (4, 7). Although more sensitive methods like videofluorcopy and fiberoptic endoscopic evaluation of swallowing (FEES) are more sensitive and detailed for determining dysphagia including information about etiology and severity, their cost, time consuming and difficulties of application limit their usage (9). Bedside examination remains the cornerstone in clinical practice regarding cost effectiveness, and ease of application (10). The aim of this study is to evaluate oral candida colonization in hospitalized hemiplegic stroke patients and to investigate its relation with dysphagia.

Materials and Methods

Patients

Thirty-six hemiplegic stroke patients hospitalized at our inpatient rehabilitation unit who can cooperate for query and oral examination enrolled in the study between August 2006 and January 2008. The exclusion criteria included; using corticosteroids and other immunosuppressive medicines, being immunosuppressed, having another neurologic disease affecting swallowing ability. Fourteen non-dysphagic patients who were long term hospitalized for a rehabilitation program other than stroke were also recruited as a control group. The study was approved by the local ethics committee and all the participants gave written, informed consent for the study.

Interventions

A bedside examination to detect dysphagia was performed. Bedside swallowing examination consisted of inquiry regarding dysphagia (choking, coughing after drinking or eating, pain during swallowing, throat clearing, feeling of food stuck in throat, nasal regurgitation, chewing difficulty, shortness of breath, changes in vocal quality, slow eating, difficulty in saliva management), investigation of structural abnormalities, gag reflex assessment, observation of palatal arc elevation, evaluating lingual strength and range of motion, palpating hyoid bone and larynx during swallowing, 50 ml water swallowing test and speech evaluation. Patients who have impaired orolaryngeal examination and 50 ml water swallowing test constituted the "dysphagic group" and the remaining patients "non-dysphagic".

In addion, Turkish version of Mini Mental State Examination (MMSE) and Functional Independence Measure cognitive (FIM-cog) scores were used to assess cognitive function of patients on admission. Mini Mental State Examination evaluates the cognitive status of the individual with a maximum score of 30. High scores are interpreted as better cognitive condition. Its Turkish version's reliability and validation was confirmed formerly (11). Functional independence measure (FIM) evaluates patient's activity of daily living. Calculated scores are correlated positively with independence state of patients. It has 2 subsections as motor and cognitive. Maximum score of cognitive section which was used in this study is 35. Reliability and validation of the Turkish version have been documented by Küçükdeveci et al. previously (12).

Microbiological Analysis

Microbiological samples were taken within 72 hours after the admission and before discharge after an inpatient follow up period of at least 1 month. Samples were taken from 1 cm^2 area of oropharyngeal and buccal mucosae of the patients with a cotton swab. They were labelled as oropharyngeal-admission, oropharyngeal-discharge, buccal-admission and buccal-discharge for each participant. The samples were immediately transferred to Department of Medical Microbiology and placed into Sabouraud Dextrose Agar (SDA). After 72

hours, isolated candida spp. colonies were counted in the cultures. Candida colonization was reported as 'absent' or 'present'. Values above 10 colonies for each 1 cm^2 sample were accepted as 'present', values 10 and below were accepted as 'absent'.

Statistical Analysis

Kolmogorov-Smirnov test was used for defining the groups' distribution pattern. If the groups' distribution was normal, ANOVA-test was used for comparing the dysphagic, non-dysphagic and control groups for continuous variables. Kruskal-Wallis H test was used if the distribution was not normal. Mann Whitney-U test was used for the comparison of two groups' continuous variables. In the calculations based on proportions, McNemar test was used for the dependent samples and Chi-square test for the independent samples. For all analyses, SPSS for Windows (version 11.5) software was used. Statistical significance was considered at a level of $p<0.05$.

Results

Fourteen of 36 (38.9%) hemiplegic patients have dysphagia. The mean ages of the patients were 65.9±9.4, 59.5±16.4 and 43.7±15.5 years in the dysphagic, non-dysphagic and control groups, respectively. The differences between hemiplegic (dysphagic and non-dysphagic) groups and control group were statistically significant (p=0.01 and p=0.03, respectively). The mean time intervals between stroke and the hospitalization for the rehabilitation were 72.5±66.4 (21-229) days in the dysphagic and 64.9±79.5 (8-353) days in non-dysphagic group (p=0.47). Dysphagic, non-dysphagic and control groups' mean length of stay were 62.4±40.8, 48.3±29.6 and 61.1±42.2 days, respectively (p=0.58). Denture usages were equal with the percentage of 57.1 in dysphagic and non-dysphagic hemiplegics. There was no significant difference between the dysphagic and non-dysphagic groups in respect to other demographic, clinical characteristics and cognitive status (p>0.05) (Table 1).

There was no statistically significant difference in candida spp. colonization between admission and discharge for all groups (p>0.05). Candida spp. colonization was not different between three groups both on admission and discharge (p>0.05) (Table 2).

Discussion

This study suggested that there is no relation between dysphagia and oral candida colonization in hemiplegic stroke patients. In our study, the frequency of dysphagia was 38.9% in hemiplegic patients, which is in accordance with the literature (13, 14, 15). In the previous studies, dysphagia was reported as affecting one-third to one half of stroke patients, depending on the diagnostic method and timing of the assessment (13, 14). Falsetti et al. assessed the relationship between dysphagia and the hemiplegic side in stroke patients and found an association between dysphagia and non-dominant cortical lesion (16). In contrast to this, we did not observe any relationship between dysphagia and the hemiplegic side.

Table 1. The demographic and clinical characteristics of the dysphagic, non-dysphagic and control groups.

	Dysphagic (n=14)	Non-dysphagic (n=22)	Control (n=14)	X^2	p
Gender (%) Male Female	 28.6 71.4	 36.4 63.6	 35.7 64.3	0.234	0.73
Age (mean±SD)	65.9±9.4	59.5±16.4	43.7±15.5		0.20# 0.01† 0.03*
Etiology (%) Thromboembolia Hemorrhagia	 71.4 28.6	 81.8 18.2		0.534	0.68
Hemiplegia (%) Left Right	 57.1 42.9	 59.1 40.9		0.013	0.91
DM (%)	14.3	40.9		2.858	0.14
MMSE (mean±SD)	19.8±7.7	18.7±7.6			0.72
FIM-cog (mean±SD)	26.2±9.0	29.1±8.3			0.34

SD: *Standard deviation,* ***#:*** *Dysphagic and non-dysphagic groups,* ***†:*** *Dysphagic and control groups,* ****:*** *Non-dysphagic and control groups,* ***DM:*** *Diabetes mellitus,* ***MMSE:*** *Mini-Mental State Examination,* ***FIM-cog:*** *Functional Independence Measure-cognitive score*

Table 2. Oropharyngeal and buccal Candida spp. colonization on admission and discharge.

	Dysphagic (n=14)	Non-dysphagic (n=22)	Control (n=14)	X^2	p
OF-1 (%)	28.5	27	14	1.014	0.60
OF-2 (%)	21	27	21	0.231	0.89
B-1 (%)	28.5	18	28.5	0.729	0.69
B-2 (%)	21	13.5	21	0.507	0.78

OF-1: *Oropharyngeal sample on admission;* ***OF-2:*** *Oropharyngeal sample at discharge;* ***B-1:*** *Buccal sample on admission;* ***B-2:*** *Buccal sample at discharge*

Oral infections can play an important role in the pathogenesis of systemic diseases, such as pulmonary infections and endocarditis, in elderly immunocompromised patients and even in healthy people (17). Because of the advanced age together with hemiplegia associated complications, stroke patients have an increased risk of oral candida infection and its complications. Although high counts of oral candida spp. are not synonymous with infection, such colonization can be a threat for potential oral, oesophageal and pulmonary infections due to aspiration of microorganisms in stroke patients (8, 17, 18).

Dysphagia may contribute to the formation of a suitable environment for candida spp. colonization in oral cavity. Aizen et al. investigated the effect of dysphagia on candida colonization of dental and denture plaques in elderly patients and found dysphagia as a risk factor for candida colonization of dental plaque (4). In contrast to this study, we found no difference in candida colonization at the buccal and oropharyngeal mucosa between dysphagic and non-dysphagic hemiplegic patients. This discrepancy might suggest that dental plaques could be more liable to colonization as we did not attain samples from dental plaques.

Although denture usage is said to be a risk factor for the colonization, our results did not support this (6, 7, 19, 20). In our study 57% of both dysphagic and non-dysphagic hemiplegic patients have dental prosthesis and there was no association between oral colonization and dental prosthesis. However, we did not take into account denture usage in control group because of focusing on candida colonization in hemiplegic patients. Our results might have changed if these patients were sought for dental prosthesis usage and were included in the analysis.

Although high prevalence of candida colonization in elderly and hospitalized patients has been shown, the information about the oral colonization of candida spp. in stroke patients is limited (6, 8, 17). Zhu et al. found increased oral carriage of candida albicans in stroke patients during the acute stage and a progressive reduction during the recovery period. They stated that the difficulty in tooth brushing and impaired oral motor function in hemiplegia lead to poor oral hygiene in those patients (8). However, a possible impact of dysphagia might be overlooked, as swallowing function of the patients were not evaluated in this study. In our study, we did not find any significant difference in candida colonization at the buccal or oropharyngeal mucosae between hemiplegic and control patients on admission and also at discharge. This finding suggests that hemiplegia is not a risk factor for candida colonization. In addition, candida colonization did not exhibit any difference between dysphagic and non-dysphagic hemiplegic groups which implies that dysphagia is not a risk factor either. Millns et al. observed increased rates (34%) of oral colonization of gram-negative bacilli in acute stroke patients. In dysphagic patients, this rate increased to 50%. However, they investigated only gram-negative bacilli colonization in their study, not candida spp. as a difference from our study (21).

In our study, the mean MMSE and FIM-cog scores were not significantly different between dysphagic and non-dysphagic hemiplegic patients. In contrast to our study, Falsetti et al. reported that dysphagic hemiplegic patients had significantly lower functional independence and cognitive functioning level. In Falsetti's study, all enrolled patients had been transferred to the rehabilitation unit following the acute phase with the mean length of 13 days (16). Our patients had a longer time interval (67 days) between stroke and hospitalization dates and this may account for the discordance of our findings with others. The cognitive and functional abilities of our participants may have improved during this period until hospitalization.

In recent studies, diabetes mellitus has been reported to be a risk factor for oral candidiasis (21, 22). In our study, we did not find an increased risk for candida colonization inpatients with diabetes mellitus. On the other hand, hospitalization may be an independent risk factor for candida colonization on oral mucosa. But likewise

dysphagia and diabetes mellitus, candida colonization was found to be unrelated with length of stay.

A limitation of our study was the long-time interval between stroke and hospitalization date which might have led to different findings on candida colonization and cognitive functions. In our study we assessed MMSE and FIM-cog scores. To be able to provide a good oral hygiene is important in oral cavity health. A hemiplegic patient's motor deficiencies will be important in this concern. FIM-self-care sub-scores of motor section might have been different between colonized and non-colonized patients. Lack of this kind of data could be said as the second limitation of the study. Besides, we did not perform identification of subspecies for candida. We might have been able to find a difference between study groups, if we've had identified and performed our analysis according to subspecies.

Conclusion

Our findings show that dysphagia or stroke itself does not increase oral candida colonization in hospitalized patients. It seems like routine candida screening for hospitalized patients is not necessary. Nevertheless, further studies with larger patient samples are needed to determine the relationship between oral candidiasis and dysphagia in stroke.

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