SUMMARY

The aim of this study was to investigate the presence and numbers of Candida species, as well as denture related stomatitis (DRS), in an elderly population of a rest home. Additionally, the relation between presence of DRS and Candida species was controlled. A total of 80 patients wearing upper complete removable dentures were included in our study group. All patients were examined and interviewed for predetermined parameters and for DRS if any existed.

The results of this pilot study showed clearly that patients with symptoms of DRS had a pronounced number of Candida albicans in the saliva samples. Other candida species seem not to play a key role in the infection of the palatal mucosa. 31.25% of all examined patients showed DRS. Another important result of this study was that there was a statistically significant relationship between denture cleanliness, denture age and Candida albicans numbers.

Keywords: Denture Related Stomatitis; Candida albicans; Removable Dentures

Introduction

Since elderly patients suffer more often from health problems, thus use generally more medication than younger individuals and have a reduced velocity of metabolism, salivary flow rate is often lower. These facts inhibit the protection mechanisms of the mucosa seriously and pathologies can easier affect these persons.

Denture related stomatitis (DRS) is the most frequently encountered lesion associated with denture wearing and is most often seen under full upper dentures. It was reported that the incidence of oral mucosal lesions in elderly people is in average 27%, and the inflammation of denture bearing tissues is the most often encountered lesion type. The incidence rate of candida induced denture stomatitis was reported to be in average 19%.

Several studies have demonstrated an association between the opportunist pathogen C. albicans and DRS. Candida species are found in the oral cavity of 25-50% of healthy individuals. When only denture wearers are considered, the values increase to 60 up to 100%. In comparison with other species of Candida, such as C. tropicalis, C. glabrata, C. parapsilosis and C. krusei, Candida albicans was shown to have a very high occurrence in the oral cavity, thus the majority of candidiasis still seems to be caused by Candida albicans. This study is focused more on epidemiologic parameters and denture wearing habits, such as denture age, denture hygiene and continuous use of dentures by assessing Candida counts in patients with removable complete upper dentures, with or without presence of DRS, and has the aim to evaluate the importance of denture wearing habits as predisposing factors in the development of DRS in the Turkish geriatric population.

Material and Methods

A total of 80 upper edentulous and lower partially dentate or edentulous patients with an average age of 63.4 ± 8.2 (60 females and 20 males) were examined and interviewed.
The patients’ (1) age, (2) gender, (3) existence of a denture actually being used, (4) denture age, (5) frequency and (6) method of denture cleaning and (7) dental history were recorded. Clinical examination performed the same investigator for standardization reasons. The type of dentures, presence and localization of denture induced lesions, such as stomatitis, inflammatory papillary hyperplasia, and the cleanliness of the dentures was noted. Only individuals who were not undergoing antibiotic or antifungal therapy for at least 6 months before sampling were selected for this study.

In the case of DRS, the erythema was scored by using Newton’s classification index:
1. Slight inflammation (localized slight hyperaemia);
2. Moderate inflammation (generalized erythema);
3. Severe inflammation (diffuse and papillary hyperplasia).

A subjective denture hygiene index was used to score the plaque at the intaglio surface in 3 groups.
1. Excellent - no or very little plaque;
2. Fair - less than half of the denture base covered by plaque;
3. Poor - more than half of the denture base covered by plaque.

In all cases, a mycological test for Candida species was made. In order to provide standardization for collected samples, the overall investigation was carried out at midmorning and at least 2 hours after eating, drinking or any hygiene procedure. Smear samples from a triangular area of the palate and saliva samples were taken from the patients. 1ml of saliva as well as the smear samples were cultured in Chromagar medium, incubated at 37°C for 48 hours, and subsequently the count of Candida colony-forming units of all different morphologies was recorded. For identification of the yeasts, the morphologies were examined in cornmeal agar with Tween 80 and the carbohydrate assimilation was investigated with API ID 32 C (Biomerieux® - France). For differentiation of Candida albicans and C. dubliniensis, the colony morphology and chlamydospore development in Staib agar, chlamydospore development in Casein agar and the capability to grow in 45°C was investigated.

The growth of yeasts from saliva samples were determined as colony forming units (cfu). The growth of smear samples was determined as follows:
- In case of growth in the first region - low;
- In case of growth in the first and second region - dense;
- In case of growth in all three regions - very dense.

The relationship between DRS, denture age and patient age was analyzed by using Whitney-Mann U-test. The relationship between other denture related factors and DRS was investigated by the use of Chi-square test.

Results

60 isolates (75%) of Candida species were obtained from the oral cavity of the elderly subjects. Distribution of the different Candida species were shown in Table 1.

32.25% of all examined patients had symptoms of DRS.

Table 1. Distribution of Candida Species

<table>
<thead>
<tr>
<th>Candida Types</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. albicans</td>
<td>50</td>
<td>62.5</td>
</tr>
<tr>
<td>C. glabrata</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>C. tropicalis</td>
<td>9</td>
<td>11.25</td>
</tr>
<tr>
<td>C. parapsilosis</td>
<td>9</td>
<td>11.25</td>
</tr>
<tr>
<td>C. crusei</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>C. crevisiae</td>
<td>1</td>
<td>1.25</td>
</tr>
<tr>
<td>C. guilliermondii</td>
<td>1</td>
<td>1.25</td>
</tr>
<tr>
<td>C. dubliniensis</td>
<td>1</td>
<td>1.25</td>
</tr>
<tr>
<td>C. lusitaniae</td>
<td>1</td>
<td>1.25</td>
</tr>
<tr>
<td>C. kefyr</td>
<td>1</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Smear samples: The relationship between DRS symptoms, such as palatal erythema and Candida albicans growth, was not statistically significant. Additionally, other Candida species also had no effect on the DRS. Candidal growth showed clear differences within the 3 stomatitis types, although there was no statistical significance, thus patients with any type of inflammation regardless of the Newton classification, were considered as DRS cases.

Saliva samples: The numbers of Candida albicans in saliva samples had a statistically significant effect on the clinical symptoms (Tabs. 2 and 3). Other candida species had no effect on the DRS.

Table 2. The relationship between C. albicans count and Denture Related Stomatitis

<table>
<thead>
<tr>
<th>Candida Albicans Count</th>
<th>n mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denture Related Stomatitis</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>25 820.2 1290.4</td>
</tr>
<tr>
<td>-</td>
<td>55 434.6 996.4</td>
</tr>
</tbody>
</table>

Table 3. The relationship between Candida albicans and Denture Related Stomatitis

<table>
<thead>
<tr>
<th>Denture Related Stomatitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ n 21</td>
</tr>
<tr>
<td>% 84</td>
</tr>
<tr>
<td>- n 4</td>
</tr>
<tr>
<td>% 16</td>
</tr>
<tr>
<td>Total n 25</td>
</tr>
</tbody>
</table>

There was also a statistically significant association between Candida albicans numbers and denture cleanliness (Tab. 4). The relation between denture age and DRS was found to be statistically very significant (p = 0.008). There was no statistical relation between patient gender, denture
cleaning methods, denture cleaning frequency, continous
denture wearing and frequency of denture cleaning and DRS.

Table 4. The relationship between denture cleanliness and
C.albicans count

<table>
<thead>
<tr>
<th>Denture Cleanliness</th>
<th>Candida Albicans Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td>Excellent</td>
<td>15</td>
</tr>
<tr>
<td>Fair</td>
<td>32</td>
</tr>
<tr>
<td>Poor</td>
<td>33</td>
</tr>
</tbody>
</table>

Discussion

The patients in this study were drawn from a
population of people living in a rest home. Therefore, this
sample group may not be representative of the population
wearing removable dentures on a whole, but is a cross-
section.

Budtz-Jorgensen and Bertram suggested that the
denture plaque on tissue surfaces of dentures must have an
irritating effect on mucosa. Catalan et al have reported
that denture plaque in patients with DRS mostly show a
considerable thickness. The toxic effects of plaque
masses in contact with oral mucosa, for extended period
of time, are predictable and similar as in the periodontal
patient. Candida albicans and other related species
are the most common type of bacteria found in oral
candidal infections. A significant number of DRS cases
were encountered especially among patients wearing
maxillary complete dentures: the palate is the most
frequently affected region and is more susceptible to yeast
colonization. This finding was usually reported in similar
investigative studies, which is also confirmed by our
results. This fact can be explained by the greater area
which is covered by the denture base and thus prevented
from contacting saliva and being subject to anaerobic
conditions.

Denture plaque is mainly composed of Candida albicans, which is the main cause of DRS. The importance of Candida species, especially Candida albicans, in provoking DRS was reported by several other investig
ators. In comparison with other species of Candida, such as C. tropicalis, C. glabrata, C. parapsilosis
and C. krusei, Candida albicans was shown to have a
very high occurrence in the oral cavity, thus the majority of candidiasis still seems to be caused by Candida albicans. These findings were confirmed by our results too, but no statistically significant differences in yeast colonization between the various stages of DRS could be shown; however, 75% of all patients had at least one kind of Candida species in their samples. The comparison of our findings with other studies about the distribution of Candida species showed generally similar
numbers and percentages. The only 2 differences were
that the percentage of C. tropicalis in our study group was
lower than other reports, and in contrast, the C. glabrata
percentage was much higher. This could indicate to a
difference for the Turkish geriatric patient as well as being a
coincidence due to the low number of cases.

The denture cleanliness, according to numerous stu-
dies, is an important factor in the development of DRS. Similarly, in Kulak and Arikani’s study the results
showed a significant association between DRS, denture
hygiene and candidal colonization. Our results indicated
a significant association between DRS and denture
cleanliness, and a tendencial relation to Candida albicans
growth, too.

Some studies have shown that denture hygiene
habits (frequency and method) are important factors in
the development of DRS; however, in accordance to our
findings, others found no relationship. The reason for
these controversial findings could be the fact that many
patients are not properly informed about the brushing and
cleaning methods and the frequency, and believe that their
habits are adequate.

According to the results of many studies showing a
high incidence of yeasts in the saliva or on palatal tissue
of DRS patients in comparison to the control groups, it has
been speculated that the presence of yeasts is an important
factor in the development of the disease. However, many
subjects with intraoral yeast presence can from time to
time be free of symptoms of DRS. On the other hand,
some cases with significant symptoms of DRS can have a
relatively low count of yeasts. There must be other factors,
besides the presence of yeasts, that are important in the
development of the disease. The filamentous growth in
the hyphae form of Candida albicans has been reported
to enhance the adherence to the tissues and consequently
contribute to the virulence of this pathogen. It
can be speculated due to our low yeast counts from the
palatal smears, that the hyphae form is resistant to smear
sampling due to the strong adherence, thus in spite of
heavy inflammation, no yeast colonization can be detected.
Understanding of the potential role of hyphae in the
pathogenicity of Candida albicans would be of significant
benefit in view of the increasing incidence of candidiasis.

In the light of these findings, for the future of this
project it is planned to increase the number of patients
and to take epithelial samples of a permitting group to
ascertain the role of hyphae in the development of DRS.

Conclusions

The results of this pilot study showed clearly that:
1) The relationship between DRS symptoms, such as
palatal erythema, and Candida albicans growth was
not statistically significant in palatal smear samples;
2) Patients with symptoms of DRS had a pronounced number of *Candida albicans* in the saliva;
3) Other Candida species seem not to play a key role in the infection of the palatal mucosa;
4) Poor denture hygiene seems to increase *Candida albicans* numbers;
5) Denture age influences DRS development, too.

**References**


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