Medication in elderly people: its influence on salivary pattern, signs and symptoms of dry mouth

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Objective: To compare stimulated and non-stimulated salivary flow, pH, buffering capacity and presence of signs and symptoms of hyposalivation and xerostomia in elderly patients, with senile dementia using medication and healthy elderly subjects not using medication.

Methods: Forty individuals (mean age: 68.5 years) were divided into two groups, according to the use (G1) or non-use (G2) of medication and the presence (G1) or absence (G2) of senile dementia. Data with reference to the general health condition, use of medication and the patient’s complaints were collected during anamnesis. Clinical examination identified signs associated with hyposalivation and xerostomia. Stimulated and non-stimulated saliva flow, pH and buffering capacity were verified.

Results: The stimulated saliva flow in both groups was below normal parameters. The drugs used by individuals in G1 showed xerostomic potential. Individuals with a higher consumption of xerostomic medication presented with dry and cracked lips. A significant negative relationship was found between drugs consumption and the buffering capacity ($p < 0.001$), and the resting saliva flow rate ($p = 0.002$).

Conclusion: The use of medication increases the chance that an elderly person may present signs related to xerostomia and alterations in stimulated saliva flow and buffering capacity.

Keywords: xerostomia, hyposalivation, saliva, medication.

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Introduction

Quantitative reduction in the salivary flow rate is defined as hyposalivation, while the complaint of dry mouth is classified as xerostomia. For a long time, it was believed that the salivary reduction was only associated with old age and loss of salivary gland capacity to produce saliva. The literature has shown that the use of some medications significantly contributes to a reduction in saliva production; whether by interference with the autonomic nervous system or through direct action on acinar cells. Diuretics, anticholinergics, antipsychotics, anti-hypertensives, bronchodilators, anti-inflammatory medications and antidepressants are some examples of drugs that can interfere with salivary secretion and composition.

Xerostomia is defined as a dry mouth sensation. It usually has a positive correlation with a reduction in salivary secretion, but it can occur as a result of alterations in the chemical and/or viscoelastic properties of saliva.

Use of medication plays a significant role in the reduction of non-stimulated saliva flow, while psychological factors such as anxiety and stress can contribute to a dry mouth sensation. Symptoms such as burning mouth, thirst, altered speech, dry lips and ulcerated mucosa have been associated with both hyposalivation and xerostomia. Low salivary flow is also associated with a reduction in pH and buffering capacity, which can lead to an increase in the incidence of root and coronal caries. The elderly people are especially at risk, as increased longevity often results in increased drug consumption and/or systemic diseases with oral manifestations. Ship et al. estimated that approximately 30% of the population 65 years and older suffered from xerostomia and salivary gland hypofunction.
The objective of this study was to compare some of the salivary patterns (such as flow rate, pH and buffering capacity) of healthy elderly people not using xerostomic medication with those suffering from senile dementia and continuously using xerostomic medication.

Materials and Methods

Sample

Forty elderly individuals aged 60–86, attending the Medical Center for the Elderly (MCE) at the University Hospital of Brasilia, were divided into two groups of 20, matched by gender (five males and 15 females in each group). The MCE is a multidisciplinary centre that offers health care and physical activities to elderly people referred from the Brasilia’s Public Health Centres. The mean age in the experimental group (G1) was 69.6 years. In the control group (G2), it was 68.25 years. Individuals in G1 had mild senile dementia; some associated illnesses and continuously took medication. The dementia diagnosis was determined by the physicians of the MCE. The patients were first screened for cognitive mental deficit by the Mini Mental State Examination and then submitted to clinical evaluation and neuropsychological tests. Afterwards, they were categorised in normal, borderline, mild, moderate or severe dementia carriers, according to Clinical Dementia Rating. Individuals in G2 were healthy and did not use any medication. Individuals with Sjögren’s Syndrome and those who had been submitted to radiotherapy of the head and neck were excluded.

The research protocol was approved by The Ethical Committee, and informed consent was given by the people in the control group themselves and by the persons responsible for the elderly people in the experimental group.

Signs and symptoms assessment

During the first visit, medical history records were used to evaluate patients’ general health condition and their use of medication. Patients were asked a number of standardised questions to evaluate the occurrence of symptoms associated with the dry mouth sensation. During the clinical examination, all signs associated with xerostomia and hyposalivation were recorded. All the evaluation procedures were performed by the same examiner, who was calibrated to determine, through visual inspection, the most important warning signs of xerostomia such as dry and cracked lips, tongue fissures, candidiasis and ulcerated mucosa.

Saliva assessment

For saliva collection, individuals were instructed not to eat, drink or smoke 1 h before the examination. All the examinations were performed between 9.00 and 11.00 a.m. to minimise variations associated with the circadian cycle. Initially, non-stimulated saliva was collected (individuals inclined their heads to allow saliva to flow into a graded glass container). Stimulated saliva (chewing paraffin wax for 5 min) was then collected in another graded glass container previously cooled to avoid foam formation. The pH was analysed using a digital pH measurer (MPH 100 – Minipa, São Paulo, Brasil) from 2 ml of stimulated saliva and, immediately afterwards, the buffering capacity test was performed. For this, 0.5 ml of HCl (0.05 N) volume was added to the saliva sample and then the value recorded. This procedure was repeated three times, with a final acid volume of 2 ml. To calculate the buffering capacity, the Van Slyke formula was used: \( \beta = \Delta Ca / \Delta pH \), where \( \beta \) is the buffering capacity, \( \Delta Ca \) is the quantity of acid added in gm/l and \( \Delta pH \) is the change in pH induced by the addition of the acid.\(^{16}\)

Statistical analysis

A t-test was used to establish whether any difference existed between G1 and G2 with regard to age, non-stimulated and stimulated salivary flow, pH and buffering capacity. ANOVA was used to determine whether there were differences in the buffering capacity between those who were on xerogenic medication and those who were not. The Newman–Keuls post-hoc test was performed for comparison between the two groups. Then, a series of logistic regressions were performed to evaluate the relationship between xerogenic medication and the presence of other signs and symptoms in the individuals of the two groups. Univariate logistic regressions were performed, with the reported quantity of xerogenic medications used as the dependent variable and the signs and symptoms evaluated as independent variables. The variables that were shown to be significant in a univariate form were included in the stepwise multivariate model. The significant variable of the multivariate model had odds ratios with the respective intervals of confidence of 95% recorded. The entire analysis was performed by the SAS V.8 program (SAS Institute Inc., Cary,
Results

The prevalence of illnesses present in the individuals of Group G1 is shown in Fig. 1. The results, with reference to the symptoms associated with xerostomia or hyposialie and clinical signs, are shown in Table 1.

Table 2 shows the relationship between the oral signs and symptoms and the quantity of medication used by individuals in G1.

The results, with reference to age and salivary characteristics (flow, buffering capacity, pH), when comparing group G1 and G2, can be observed in Table 3.

Discussion

The results need to be treated with caution as no power calculation was conducted to define the number of individuals to be included in the study. However, it must be emphasised that the subjects selected for the control group were healthy individuals, without the use of any sort of medication. This specific criterion severely restricted the inclusion of subjects, as it is quite difficult to find elderly people who do not need to have some form of medication.

Comparison of the groups verified that the average age in G1 was slightly higher than the age of participants in G2, although this difference was not statistically significant. Concerning the gender, there was a prevalence of female in both groups, but this difference did not interfere in the results, as the subjects were matched regarding this variable.

Table 1 Symptons described and signs observed in individuals of G1 and G2 related to xerostomia/hyposalivation.

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>G1 (n = 20)</th>
<th>G2 (n = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry mouth</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Burning of mucosa and tongue</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Taste alteration</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Altered speech</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Frequent thirst</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Difficulty with deglutition</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Signs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry and cracked lips</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Fissured tongue</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Candidiasis</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Ulcerated mucosa</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2 Independent variables used in the univariate logistic regressions, with the related use of xerogenic medication as dependant variable.

<table>
<thead>
<tr>
<th>Variable</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry and cracked lips</td>
<td>0.014*</td>
</tr>
<tr>
<td>Fissured tongue</td>
<td>0.052*</td>
</tr>
<tr>
<td>Candidiasis</td>
<td>0.41</td>
</tr>
<tr>
<td>Ulcerated mucosa</td>
<td>0.44</td>
</tr>
<tr>
<td>Burning of mucosa and tongue</td>
<td>0.14</td>
</tr>
<tr>
<td>Taste alteration</td>
<td>0.97</td>
</tr>
<tr>
<td>Speech difficulty</td>
<td>0.79</td>
</tr>
<tr>
<td>Frequent thirst</td>
<td>0.15</td>
</tr>
<tr>
<td>Deglutition difficulty</td>
<td>0.12</td>
</tr>
<tr>
<td>Dry mouth</td>
<td>0.084*</td>
</tr>
</tbody>
</table>

*significant univariate form; α = 0.1

Table 3 Descriptive statistics and comparative results of t-tests among individuals in G1 and G2.

<table>
<thead>
<tr>
<th>Variables</th>
<th>G1</th>
<th>G2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>69.60 5.90</td>
<td>68.25 8.25</td>
<td>0.55</td>
</tr>
<tr>
<td>Stimulated flow</td>
<td>0.69 0.39</td>
<td>0.90 0.67</td>
<td>0.23</td>
</tr>
<tr>
<td>Non-stimulated flow</td>
<td>0.17 0.17</td>
<td>0.73 0.35</td>
<td>0.000*</td>
</tr>
<tr>
<td>Buffering capacity</td>
<td>0.02 0.003</td>
<td>0.17 0.05</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>pH</td>
<td>6.71 0.55</td>
<td>6.95 0.42</td>
<td>0.12</td>
</tr>
</tbody>
</table>

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lack of consistent data capable of elucidating the effects of many supposedly xerostomia-inducing medications on salivary secretion. For that reason, it is recommended that the elderly should be assessed by a multidisciplinary team of health care practitioners, with regard to medical problems and potential polypharmacy complications.

A higher frequency of oral signs (visually determined) and symptoms (based on the patients’ complaint) was observed in individuals from G1, with emphasis on the absence of burning mouth complaints in G2, and the low occurrence of oral mucosa ulcerations in both groups. Navazesh et al. also demonstrated an association between dry lips and mouth complaints with the lack of saliva. In this study, those who presented with the greater number of signs and symptoms associated with xerostomia and hyposalivation were taking drugs related to dry mouth symptoms and a reduction in salivary production. It is well known that antidepressants (central-acting psychoactive agents) and anti-hypertensives (drugs acting on sympathetic system) belong to the group of medications that are the most likely to interfere negatively with salivary output.

Analysis of data with reference to salivary characteristics such as stimulated and non-stimulated flow, buffering capacity and pH revealed some important data. Although there was no statistically significant difference in stimulated salivary flow between the groups, it was observed that the mean stimulated saliva value for G1 was 0.69 ml/min, while for G2 it was 0.90 ml/min. A stimulated saliva volume of ≤0.8 ml/min can be considered as the cut-off point for classifying an individual as having hyposalivation, although according to Guggenheimer and Moore, xerostomic symptoms may occur without a measurable reduction in salivary gland output. However, analysis of the volume of non-stimulated saliva demonstrated that G1 differed statistically from G2. It revealed that continuous use of medication interfered with saliva production at rest, although without equating with the value generally considered to be able to classify an individual as having hyposalivation. However, the non-stimulated saliva value of ≤0.16 ml/min can be considered as a better indicator for an increased risk of caries.

For pH analysis and buffering capacity, stimulated saliva was used, as most individuals in G1 were not capable of producing sufficient non-stimulated saliva for determination of the buffering capacity. Nevertheless, stimulated saliva is more resistant than non-stimulated saliva to pH changes during HCl addition, which is shown to be a good indicator for determining the buffering capacity when evaluating the salivary parameter related to oral health. With regard to values corresponding to pH, no key variation was observed when the groups were compared. On the other hand, the buffering capacity of saliva in G2 was statistically higher (p > 0.001) than that of G1. This shows that individuals in G1 could be at a higher risk of dental mineral loss and consequent root caries.

Although the design of this study was not longitudinal but a case–control, it reinforces the importance of evaluating the use of xerostomic medication in elderly individuals. Clinicians must therefore be able to diagnose salivary disorders to provide appropriate treatment to reduce the impact of these on the patient’s quality of life.

It should be emphasised that the increase in life expectancy of the population will increase the need for qualified professionals to care for the elderly people, as the use of xerostomic medication increases the chance that they may present with signs and symptoms related to xerostomia, as well as alterations in stimulated saliva flow and buffering capacity.

Conclusion
The use of medication increases the chance that an elderly person may present signs related to xerostomia and alterations in stimulated saliva flow and buffering capacity.

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References

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