BUCCAL MUCOSA RIDGING AND TONGUE INDENTATION: INCIDENCE AND ASSOCIATED FACTORS

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Abstract

Buccal mucosa ridging and tongue indentation have been considered as one of the visible and reliable signs of bruxism. However, there have not been any reports justifying this relationship scientifically. Moreover, there have not been any studies reporting specific procedures to assess them. Thus, the purpose of the present study was to determine the clinical incidence of buccal mucosa ridging and tongue indentation and assess the possible relationship between certain factors that can influence their occurrence. A total of 244 (178 males and 66 females) dentulous adults from 20 to 59 years of age, who were employees at the Bank of Yokohama, were randomly selected. At first, the buccal mucosa ridging and tongue indentation were classified into three groups based on their intensity: none, mild, and severe. The incidence of both conditions in the different age groups, as well as the incidence by gender was evaluated. Furthermore, the possible relationships between buccal mucosa ridging and tongue indentation and age, gender, clenching awareness, grinding awareness, headache, neck stiffness, vertical dimension, temporomandibular joint (TMJ) pain to palpation, masticatory muscle tenderness to palpation, and the presence of premature contacts were evaluated using the chi-square test. A positive relationship was found between the occurrence of buccal mucosa ridging and tongue indentation and gender \((p < 0.01)\); both conditions were observed more frequently in females than in males. A positive relationship was also found to age; the group between 20–29 years old showed the highest incidence. The vertical dimension had a positive relationship with the occurrence of both buccal mucosa ridging and tongue indentation. Other factors evaluated did not show any correlation.

Key words: Buccal mucosa ridging—Tongue indentation—Parafunction—Bruxism—Clenching

INTRODUCTION

Oral parafunction habits such as nocturnal and/or diurnal bruxism have been observed for many years. To examine them, a number of clinical signs and symptoms (abnormal wear pattern, increased tooth mobility, masticatory muscle tenderness, muscle hypertrophy, temporomandibular joint discomfort) have been considered\(^{1,5,7}\). Within the clinical
signs, buccal mucosa ridging and tongue indentation (scalloping on the lateral borders of the tongue) have been also considered to be clear indicators of bruxism activity\(^2,4,8\). These studies have reported that these two conditions are due to the soft tissues being thrust against the surfaces of the teeth\(^2\) and that the scalloping of the tongue is caused by creating a vacuum with the tongue; thus it will be found thrust against the palate and anteriorly and laterally against the lingual surfaces of the teeth\(^4\). It is also reported that both entities disappear when the parafunction ceases. However, there have not yet been any studies examining scientifically the relationship between these two conditions (buccal mucosa ridging and tongue indentation) and bruxism behavior.

The purpose of the present study was to determine the clinical incidence of buccal mucosa ridging and tongue indentation and to assess the possible relationship between certain factors that can influence their occurrence.

**MATERIALS AND METHODS**

A total of 244 (178 males and 66 females) dentulous adults from 20 to 59 years of age, who were employees at the Bank of Yokohama, were randomly selected (Table 1 and Table 2). All the subjects were fully informed and agreed to participate in this study. A questionnaire and clinical examination were carried out in each subject (Fig. 1). One investigator performed all the clinical examinations.

1. **Anamnestic data**

Some data were taken from a patient questionnaire completed without assistance prior to examination. Questions were related to some oral habits (clenching and grinding) as well as headache, neck stiffness, and TMJ pain awareness (Fig. 1). The questionnaire was also used for demographic information (age, gender) for this study. Subjects were divided into four age groups, each spanning ten years.

<table>
<thead>
<tr>
<th>No. Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male 178 73</td>
</tr>
<tr>
<td>Female 66 27</td>
</tr>
<tr>
<td>Total 244 100</td>
</tr>
</tbody>
</table>

Table 1 Number and gender of subjects

<table>
<thead>
<tr>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>24.2</td>
</tr>
<tr>
<td>45</td>
<td>18.4</td>
</tr>
<tr>
<td>59</td>
<td>24.2</td>
</tr>
<tr>
<td>81</td>
<td>33.2</td>
</tr>
<tr>
<td>244</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2 Age distribution

2. **Clinical Examination**

1) Buccal mucosa ridging and tongue indentation: the cheek mucosa along the occlusal line as well as the lateral borders of the tongue were assessed to determine the presence of buccal mucosa ridging and tongue indentation. They were classified into three groups according to intensity: none, mild and severe.

2) Muscle palpation: the masseter and temporal muscles were palpated bilaterally. Any evidence of tenderness to palpation was recorded.

3) TMJ palpation: temporomandibular joints were palpated bilaterally, and any sign of discomfort or pain was recorded.

4) Premature contact: the subjects were asked to bring their lower jaws upward until the teeth reached the first contact. The presence of any premature contact was recorded.

5) Vertical dimension: this assessment was based on the Willis Method, which measures the distance from the pupils of the eye to the rima oris (angulus oris) and the distance from the anterior nasal spine (subnasal point or base of the nose) to the inferior border of the chin\(^3,7\). When these measurements are equal, the jaws are considered at their normal vertical dimension.
The possible relationships between buccal mucosa ridging and tongue indentation and age, gender, clenching awareness, grinding awareness, headache and neck stiffness, TMJ pain to palpation, vertical dimension, masticatory muscle tenderness to palpation, and the presence of premature contacts were evaluated using the chi-square test.

1. **Questionnaire**

   Anamnestic data (Table 3) from the questionnaire revealed that the highest percent of subjects responded negatively to the awareness of clenching and grinding (10.7% were awarded). Of the total population, 50.8% reported having headache and neck stiffness.
2. Clinical examination

The clinical data (Table 4) indicated that, when the muscles were palpated to observe any sign of tenderness to palpation, only nine subjects from the entire population (3.7%) reported pain. Premature contacts were observed in 181 subjects (74.2%). The assessment of the vertical dimension based on the Willis method suggested that 125 subjects (51.2%) had results lower than or equal to 0 mm, and 119 subjects (48.8%) had results higher than 0 mm.

The TMJ assessment suggested that 8 subjects (3.3%) reported pain on palpation; 236 subjects (96.7%) did not.

As shown in Table 4, 61.5% of the population (150 subjects) presented buccal mucosa ridging and 51.2% of the population (125 subjects) presented tongue indentation. These two conditions were further analyzed to observe their distribution by gender, age, and intensity. Table 5 shows the distribution of buccal mucosa ridging and tongue indentation in males and females from different age groups (20–29, 30–39, 40–49 and 50–59); the percentages are related to the number of subjects who presented buccal mucosa ridging and tongue indentation within the group. Subjects between 20 and 29 years of age (Table 5) exhibited the highest prevalence of buccal mucosa ridging (47 subjects, 83% females and 17% males), while subjects between 40 and 49 years of age exhibited the lowest prevalence (31 subjects, 12.9% females and 87.1% males). With respect to tongue indentation, subjects between 20 and 29 years of age had the highest prevalence (44 subjects, 81.8% females and 18.2% males), while subjects between 30 and 39 years of age had the lowest (25 subjects, 28% females and 72%...
males). Based in their intensity, these two conditions were further classified into three groups: none, mild and severe. Table 6 shows the distribution of buccal mucosa and tongue indentation in males and females according to intensity (the percentages are related to the total sample \( n = 244 \)). With respect to buccal mucosa ridging (Table 6), 83 males (34.0%) and 11 females (4.5%) did not present this condition; 73 males (29.9%) and 41 females (16.8%) showed the mild type; and 22 males (9.0%) and 14 females (5.7%) showed the severe type. With respect to tongue indentation (Table 6), 98 males (40.2%) and 21 females (8.6%) did not show this condition; 66 males (27.0%) and 32 females (13.1%) showed the mild type, and 15 males (6.1%) and 12 females (4.9%) showed the severe type. The intensity of these two conditions and their distribution was analyzed according to age, and the results are shown in Table 7 (No. and percentages are related to the total sample \( n = 244 \)). The mild type of both conditions was observed at high prevalence in the group between 20 and 29 years of age (14.8% for buccal mucosa ridging and 40.2% for tongue indentation).
Table 8  Relationship between presence of buccal mucosa ridging and tongue indentation and examined factors

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Age</th>
<th>Grinding awareness</th>
<th>Clenching awareness</th>
<th>Headache</th>
<th>Muscle tenderness</th>
<th>Premature contacts</th>
<th>TMJ pain to palpation</th>
<th>Vertical dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buccal mucosa ridging</td>
<td>*</td>
<td>*</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>*</td>
</tr>
<tr>
<td>Tongue indentation</td>
<td>*</td>
<td>*</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>*</td>
</tr>
</tbody>
</table>

NS = Not significant, * = significant (p<0.01)

and 14.3% for tongue indentation). The severe type of both conditions was infrequent in subjects between 50 and 59 years of age (2.9% for buccal mucosa ridging and 1.6% for tongue indentation). In this group, the percentage of absence in both conditions was the highest (17.2% for buccal mucosa ridging and 21.0% for tongue indentation).

3. Statistical Analysis

To determine whether there was a relationship between the occurrence of buccal mucosa ridging and tongue indentation and gender, age, clenching awareness, grinding awareness, headache awareness, muscle tenderness to palpation, premature contact, vertical dimension, or TMJ pain to palpation, the chi-square test was used. There was a positive relationship between the occurrence of buccal mucosa ridging and tongue indentation and gender (p<0.01). Among the females (66), 83.3% showed buccal mucosa ridging and 68.2% of them showed tongue indentation. There was a positive correlation with age (p<0.01); 79.7% and 73.3% of subjects between 20–29 and 30–39 year of age respectively presented buccal mucosa ridging. With respect to tongue indentation, a positive correlation to age was also observed, but only in the group of subjects between 20–29, in which 74.6% showed the condition.

The awareness of clenching, grinding, headache, presence of premature contact, muscle tenderness to palpation, and TMJ pain did not correlate the occurrence of buccal mucosa ridging or tongue indentation. However, a positive relationship (p<0.01) was found between these two conditions and vertical dimension. The relationships between the occurrence of these two conditions and gender, age, grinding awareness, clenching awareness, headache, and clinically examined factors are shown in Table 8.

DISCUSSION

The buccal mucosa ridging and tongue indentation have been reported to be clear and reliable indicators of bruxism activity. In the current investigation, the presence of oral parafunctions such as bruxism (clenching, grinding) was not assessed; only a simple questionnaire related to the awareness of clenching and/or grinding was used. We can not completely affirm that there is no relation between the occurrence of buccal mucosa ridging and tongue indentation and grinding and/or clenching, but our data suggest that there is no significant relationship between these two conditions and the awareness of clenching and grinding. In the literature, it is common to find studies reporting abnormal cheek-biting behavior, which produces hypertrophy of the oral mucosa with a characteristic diffuse white scaly appearance as a result of chronic mechanical irritation by teeth. A number of studies have reported that tongue thrusting behavior can produce indentations in the tongue as a consequence of the pressure exerted against the teeth. These two behaviors, cheek biting and tongue thrusting, have been considered as parafunctions different from bruxism. Thus, we believe that bruxism can not be mentioned as the only factor responsible for the occurrence of buc-
cal mucosa ridging and tongue indentation. However, as mentioned before, in this study, only clenching and grinding awareness was investigated. Thus, to verify that there is no relationship between bruxism and the occurrence of buccal mucosa ridging and tongue indentation, it is necessary to clinically diagnose the presence of bruxism by mean of an electromyographic device and then investigate whether any such relationship exists.

As shown in the results, there was a significant relationship between age and the occurrence of both conditions (buccal mucosa ridging and tongue indentation); they were observed with high prevalence in the subject group between 20 and 29 years of age. Moreover, our results also suggested a positive relationship to gender; these two conditions were observed in higher percentages in females than in males. The reason for these results is not yet clear. Perhaps young females have high levels of stress, which may influence the occurrence of buccal mucosa ridging and tongue indentation. As mentioned before, in this study, the sample was randomly selected from a group of employees at the Bank of Yokohama. In the group between 50 and 59 years of age, the total number of subjects was 81, and the number of males was markedly higher than the number of females (77 males and 4 females). Moreover, only one female presented the buccal mucosa ridging, and no females presented the tongue indentation, but it does not mean that the incidence was lower in females than males. This result could be due entirely to sample size. For this reason, we considered that, in future studies, it is necessary to carry out a study based on a balanced group by age and gender.

We also found a positive correlation between low vertical dimension and the occurrence of these two conditions. As is known, the distance between the teeth is the interocclusal distance frequently referred to as the “freeway space”, which on average is about 3 mm. This distance obviously varies from person to person. In the current study, a total of 125 subjects (51.2%) showed results lower or equal than 0 mm (based in the Willis method). The reduction of the vertical dimension in the subjects selected in this study, may be due to the natural gradual wear of the teeth or be a consequence of unconscious bruxism behavior. In cases of a reduction of the vertical dimension, when the mandible is at rest, the tissues from the cheek and tongue will press against the teeth because of the vacuum effect that occurs inside the mouth. As a consequence, buccal mucosa ridging and tongue indentation may appear. These results could not be compared with any others, because no scientific report related to the incidence of the above mentioned buccal mucosa ridging and tongue indentation has yet been published.

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REFERENCES


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