Prevalence of Condylar Sclerosis in Patients with Temporomandibular Disorder

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Prevalence of Condylar Sclerosis in Patients with Temporomandibular Disorder

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Abstract

The aim of this study was to determine the prevalence of morphological changes of the condyle (Sclerosis) in patients with Temporomandibular Disorder. We have developed a retrospective epidemiological study using medical records of 1000 clinical data forms, with their respective exams (working models in type III dental stone plaster and planigraphy of TMJ) from patients who sought care at the Department of Diagnostic and Advice to Patients with Temporomandibular Disorder at the Dentistry School of the Federal University of Juiz de Fora in Minas Gerais, Brazil (TMJ Service) between 2003 and 2009. We included female patients aged between 6 to 74 years old with an average of 34.4 years old. Three variables were analyzed with logistic regression model: posterior tooth loss, morphological changes and age. Data were organized, and then analyzed by Wilcoxon and binomial statistical tests. A comparison was made between the data in the study and those obtained from a literature review. The results showed no relationship between tooth loss and posterior condylar morphological changes (p>0.05). There was a positive correlation between tooth loss and age variables (p < 0.05), i.e., Exp (B) = 1.105. The results of this study demonstrated that the posterior tooth loss and aging are not the main factors for the development of degenerative joint changes in female subjects.

Introduction

Temporomandibular dysfunction is a general term that covers a range of clinical problems in the temporomandibular joint and muscles of the orofacial¹ region. It is subdivided into TMJ disorder, disorder of the muscles of mastication, or both². It has an etiology of multifactorial traits and has become more accepted since the 1970’s³. The etiology of these disorders is presented in three main factors:-occlusion and Anatomical-occlusion and TMJ⁴⁻⁶ neuromuscular and psychological⁷⁻⁹. Temporomandibular disorders affect 50 to 60% of the population with predominance in women¹⁰⁻¹² and in 5% of them, the problem seems to have significance at some point in their lives¹³. However, many of these women are unaware of their pathology¹³,¹⁴. Studies report the interferences that prevent the correct ratio between the conoid and the fossa. These interferences occur mainly in poor dental positions arising from skeletal malformations, edentulous spaces and dental crowding. The decreased vertical dimension, whether for loss of posterior support due to absence of teeth or other factors, can affect neuromuscular postural and proprioceptive state. However, it is said that only the presence of an occlusal state changes will not be enough to trigger a TMD, but the association with other risk factors¹³⁻¹⁵.

In surveys conducted about occlusal variables and their relationship with the emergence of TMDs, some authors have reported controversy in this relation¹⁶⁻¹⁷. They have analyzed the variable absence of posterior teeth and, as a result, showed a small association between occlusal factors and TMD, stating that the absence of posterior teeth had not interfered or had limited effect.

The condylar joints have shapes and various extensions and an ability to change shape and remodeling¹⁸. These changes may be related to changes of occlusal pattern that exceed their physiological limits, becoming pathological. On the other hand, the structures can adapt to overload by means of joint remodeling, bone sclerosis or suffer erosions¹⁹.

According to what has been exposed, the objective of this research was to evaluate planigraphies of the TMJ as a method for the analysis of morphological changes in mandibular condyles in two groups of female patients with TMD, with and without loss of posterior dental elements, evaluated through working models in dental stone type III.

Method

The study was conducted at the Federal University of Juiz de Fora (UFJF) at the Service of Diagnostic and Supervision of Patients with Temporomandibular Disorder (TMJ Service) of the Dentistry School. Clinical records were selected in ascending order, and their proper working models in dental stone type III of
upper and lower arches of 1000 patients seeking care at the TMJ Service during the period from 2003 to 2009. After application of the exclusion criteria, a total of 649 records with their respective planigraphies of the TMJ and working models were selected. The sample contained: female patients between 6 and 74 years of age (average of 34.4 years old) with and without posterior dental loss.

The exclusion criteria were: total edentulous patients in at least one of the arcades, male, the absence of one or more anterior dental elements in at least one of the arcades, records with their respective complementary tests incomplete. The absence of one or more upper or lower third molars was not considered as posterior dental loss to criteria sort.

The present study had the concern to achieve a uniformity of measurement parameters of the sampling. The analysis of medical records with their respective complementary examinations was conducted by a single examiner previously calibrated (calibration intra-examinator)\textsuperscript{16-20}. First, the examinations (working models of the upper and lower arches obtained in dental stone type III, properly occluded) allowed sorting into two general categories: Group 1: with loss of posterior dental elements; Group 2: no loss of posterior dental elements, according to exclusion criteria.

Later, for the analysis of planigraphies of TMJ, the gauging was performed by a dental surgeon specialist in Radiology and included discussions of definitions and changes in numerous examples of morphological changes in condylar joint highlighted in planigraphies of TMJ, resulting in an atlas, with examples to be consulted whenever there was a doubt related to the observations\textsuperscript{21}.

The presence of one or more of the following morphological changes at the condyles has been analyzed as described\textsuperscript{21}.

a) Sclerosis: augmented radiopacity of the compact bone (Picture 1).

To analyze the presence of changes in the articular surfaces, (bone cortex /compact bone) we took into consideration the characteristics of a normal TMJ (Picture 2), and its possible adaptations\textsuperscript{22}.

b) Normality: in the sagittal plane, convex in shape. Its dimensions vary between 5.5 and 16 mm, with an average of 9.8 mm. (Picture 2).

Finally, the data collected through the analysis of planigraphies and models have been recorded in the worksheets and analyzed later in statistical methods.

The results were tabulated and submitted to a descriptive statistical analysis.

The Wilcoxon test was used to compare the average age of the groups with and without posterior dental loss. The Chi-square test assessed the independence between the posterior dental loss and morphological changes in left and right condylar joints. The Binomial test compared the ratios of posterior dental loss and non loss within the group that presented and did not present morphological changes in right and left condylar joints. The test has also compared the proportions of the sample with and without morphological changes within each age group.

The logistic regression model assessed the independence or association between independent variables (quantitative and qualitative), with the dependent variables (dichotomous quality).

All the results of these tests, as well as their purpose of applications are shown in tables and graphs included in the results of the present research.

**Results**

The data correspond to 649 observations of variables in female individuals, people with TMD, according to the following distribution of age (Graph 1). Of the total of patients, 406 had posterior tooth loss, while 243 did not present posterior tooth loss (Graph 2), with age brackets as shown in Table 1.

In table 2, the total sample of all patients analyzed provided a relationship between female patients and male patients equals ratio 5: 1. In Table 3, the sample showed an average ratio of 4: 1, suggesting higher prevalence of TMD in patients of the female gender. It was noticed that the average age of individuals who have dental loss is significantly higher than the average of the individuals that did not show posterior tooth loss (Table 4).

Tables 5 and 6 show the independence test between tooth loss and condylar morphology changes in right and left condyle and portray a describable \( p \) 0.05 level. That fact justifies that the association between tooth loss and condylar morphological alterations in left and right condyle is almost null.

Graphs 3 and 4 show the comparisons between the proportions of posterior tooth loss occurrences within each type and the morphological changes of right and left condyles.

The logistic regression of a dichotomous dependent variable, in this case, the tooth loss with loss: 1 and without loss: 0, according to quantitative, or qualitative quantitative, or qualitative forecasting methods (in this
Discussion

The selected group was that of women considering the largest proportion of these for the appearance of TMD. According to what has just been stated, it has been found a higher occurrence among female patients with a proportion of 4:1. That leads to, in relation to age, young adults are more affected by emotional charge possibly due to student and professional activities, with an average ratio of women to men of 5:1, and a prevalence between 21 and 40 year-olds. Young women are more susceptible to TMD, fact previously reported in this research, in which 51% of female individuals are between 20 to 40 years old.

The purpose of this study was to relate female patients with temporomandibular disorder, with the variables age, morphological changes in articular condyle, posterior tooth loss and non-loss. Okeson reported that the occlusal condition can cause TMD through two mechanisms: acute changes in occlusal condition that can lead to a co-contraction response leading to pain, and the presence of orthopedic instability. However, it has been evidenced that occlusal factors, mainly posterior dental loss is not related to the etiology of TMD, in accordance with the results of the present research.

As for the prevalence of morphological changes in 649 female individuals in this research, a methodology of classification of these changes was used and related to occlusal posterior tooth loss factor and age of the sample individuals. Wang et al. showed in their study that the controversy of this association still remains. Some authors claim that the loss of molar support is related to the severity of osteoarthritis or with TMD, a fact that contradicts the results of this study. Also, according to Wang et al., some recent cross-sectional and longitudinal epidemiological studies have shown that there is no significant relationship between individuals with shortened arcades of three to five occlusal units and individuals with complete dental arches. The results indicated that individuals who had lost their posterior teeth, with a smaller amount of lost teeth, but with distributed loss in more quarters, have a higher prevalence of TMD, so the variable number of missing posterior teeth was not significant in accordance with the present work.

Although Seligman Pullinger showed a small association between occlusal factors and TMD, the variable absence of posterior teeth had no or had limited effect on the incidence of TMD. That same year, the same authors conducted a similar study in which they found the same result. The result also resembles the present study in which the entire sample was with TMD, but when related to the variable absence of posterior teeth and morphological changes in articular condyle, the variables were independent p<0.05, i.e., there was no relationship between tooth loss and morphological changes in articular condyle.

On the other hand, Richards studied two Australian aboriginal populations, through their dried skulls that were found in the South Australian Museum. The first group consisted of 37 men and 37 women, members of the tribe Narrinyeri, residing along the course of the tribe Narrinyeri.
Murray River and its lake; the second group was composed of members of the Kauma tribe, and there was significant geographic and cultural interaction between the groups. Thus, it was concluded that, despite the two populations show differences in the patterns established previously in the number of missing teeth, craniofacial morphology and tooth wear, the study did not differ significantly from other similar studies. Morphological changes in articular condyle were related to age, and faceting and erosion were aspects related to the older age groups.

Still in that context, Parker et al 36 reported in their work that comparisons between several autopsy studies of ATMs indicated that the frequency and location of morphological changes in the ATMs are larger among older people. However, the results of those studies showed that there was no relationship with this present research, since there was no relationship between loss of posterior teeth and condylar changes 37, 38. Also, there was no relationship between aging and morphological changes39, 40. The proportion is significant in the younger groups between 0 to 19 year-olds with significance level equal to p=0.000.

Whittaker et al40 and Widmalm et al41 changed that conclusion in a study conducted later. Respectively, with 93 male and female skulls exhumed from the crypt of the Christ Church in Spitalfields, London, where it has also been evaluated the anteroposterior and mesiolingual dimensions, as well as the shape of the condylar surface. In addition, the present teeth, degree of occlusal wear, age and gender, the variables were analyzed through a logistic regression model, P < 0.01. It has been concluded that aging was related to morphological changes in the condyle. Although the tooth loss was greater than in the skulls studied in the British Museum of Natural History, there was no relationship between tooth loss and condylar bone remodeling. However, during a study with 224 fresh corpses, their 248 ATMs were investigated in both men and women, and it was concluded that the tooth loss evolves with the age42, in accordance with the current research. Morphological changes in the ATM did not have significance for both genders. Also, there were no statistical differences in the prevalence of morphological changes in the joints of people with 10 or more natural teeth in each jaw when compared with those without natural teeth. The findings of this study indicate that the genre and teething are not the main factors leading to the development of pathologies of the ATM in individuals of advanced age, which agrees with the findings of the present research.

Conclusion

According to the methodology used in this research and within the limits of this study, it is concluded that:

a) There was no association between the variables age, posterior tooth loss and non loss of posterior teeth and the variable morphological change of the condyle (Sclerosis).

b) The proportions of female posterior tooth loss differ both in groups with morphological changes of the condyle and in groups without such changes.

c) Aging caused increase in the likelihood of loss of posterior teeth.

References


11. Glaros AG, Tabacchi KN, Glass EG. Effect of


Illustrations

Illustration 1
Picture 1- Sclerosis

Illustration 2
Picture 2- Normality
Illustration 3

Chart 1: Distribution of ages by age group
Illustration 4

Table 1: Age Range and Sample Average

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
<th>Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>74</td>
<td>34.4</td>
<td>13.0</td>
</tr>
</tbody>
</table>
### Table 2: Gender frequency distribution: all patients

<table>
<thead>
<tr>
<th>Gender</th>
<th>Absolute</th>
<th>Relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>159</td>
<td>15.9%</td>
</tr>
<tr>
<td>Female</td>
<td>841</td>
<td>84.1%</td>
</tr>
</tbody>
</table>

**Totals**: 1000 (100.0%)
Illustration 6

Table 3- Gender frequency distribution: actual data

<table>
<thead>
<tr>
<th>Gender</th>
<th>Real Absolute</th>
<th>Real Relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>159</td>
<td>19.7%</td>
</tr>
<tr>
<td>Female</td>
<td>649</td>
<td>80.3%</td>
</tr>
<tr>
<td>Totals</td>
<td>808</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Illustration 7

Chart 2: Percentage of cases with and without posterior tooth loss

- 37.40% with loss
- 62.60% without loss
Table 4: Comparison of averages

<table>
<thead>
<tr>
<th></th>
<th>Age Average</th>
<th>Standard Deviation</th>
<th>Descriptive Level “p”</th>
</tr>
</thead>
<tbody>
<tr>
<td>With loss</td>
<td>39,8</td>
<td>12,3</td>
<td></td>
</tr>
<tr>
<td>Without loss</td>
<td>25,4</td>
<td>11,7</td>
<td>0,000</td>
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</table>
Table 5: Test of independence between tooth loss and sclerosis of the right condyle

<table>
<thead>
<tr>
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<th>Without Esclerosis</th>
<th>With Sclerosis</th>
<th>Descriptive Level “p”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed</td>
<td>Expected</td>
<td>Observed</td>
</tr>
<tr>
<td>With loss</td>
<td>242</td>
<td>242,3</td>
<td>1</td>
</tr>
<tr>
<td>Without loss</td>
<td>405</td>
<td>404,7</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td>647</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Table 6: Test of independence between tooth Loss and sclerosis of the left condyle

<table>
<thead>
<tr>
<th></th>
<th>Without Esclerosis</th>
<th>With Sclerosis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without loss</td>
<td>243</td>
<td>0</td>
<td>243</td>
</tr>
<tr>
<td>With loss</td>
<td>405</td>
<td>1</td>
<td>406</td>
</tr>
<tr>
<td>Totals</td>
<td>648</td>
<td>1</td>
<td>649</td>
</tr>
</tbody>
</table>

Descriptive Level “p”

0.439
Illustration 11

Chart 3: Comparison between loss of posterior teeth and sclerosis

Illustration 12

Chart 4: Comparison between the proportions of loss occurrences within the morphological changes of the left condyle
Illustration 13

Table 7: Forecasters of the right condyle

<table>
<thead>
<tr>
<th></th>
<th>Sclerosis</th>
<th>Age</th>
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<tbody>
<tr>
<td>Significance “p”</td>
<td>0.713</td>
<td>0.000</td>
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</tbody>
</table>
Illustration 14

Table 8: Wald Statistic

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wald</th>
<th>Significance</th>
<th>Exp(B)</th>
<th>Lower Limit (95%)</th>
<th>Upper Limit (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idade</td>
<td>8, 8</td>
<td>0,000</td>
<td>1,105</td>
<td>1,09</td>
<td>1,12</td>
</tr>
</tbody>
</table>