Keywords: Tooth wears, dentoalveolar compensation

Introduction

“Tooth wears” is an all-embracing term used to describe the combined processes of erosion, attrition and abrasion, or when the specific diagnosis can not be determined (Fig. 1). Erosion is defined as the chemical dissolution of teeth by acids other than those produced by bacteria. Attrition is the wear of tooth against tooth, and abrasion is the wear of teeth by physical means other than opposite teeth. The term “pathologic tooth wear” has been used to describe the state when the destruction of the teeth has reached a level at which restorations are indicated (1, 3, 5, 8, 11).

Fig. 1.

The craniofacial complex is not a static entity in the adult, but is subject to intrinsic and extrinsic factors, which may influence its morphology. It has been previously accepted that no appreciable changes occur in this structure during adulthood, although there is now evidence that the craniofacial complex does, indeed, change throughout adult life, albeit at a much slower rate than around puberty. In addition, alterations in the dentition may well have widespread influences, leading to further differences in the morphology of the adult craniofacial complex (1, 5, 12).

The developing occlusion responds to discrepancies in the skeletal dental base by changes in the axial inclinations of the teeth and by alterations in the supporting alveolar bone, and this dentoalveolar compensatory mechanism assist the establishment of the occlusion. As wear is a feature common to all dentitions, it would not be unexpected to find a similar compensatory response to tooth wear in the adult. Consequently, the effect of reduction in crown height through wear may have a bearing on vertical facial morphology, and there is some previous evidence to support this (13).

In this investigation, it is aimed at determining adult age-related differences in vertical facial dimensions as a result of dental wear.

Materials and Methods

The study sample group consisted of 20 subjects (12 males, 8 females) obtained by sequential referrals of dental practitioners requesting an opinion on the management of vertical tooth wear. The mean age of the sample was 52.4 years and all samples included in the investigation showed loss by wear of incisor crown length. The control group consisted of 20 students in the dentistry school (14 males, 6 females) obtained from a pool of radiographic data originally recorded as part of orthodontic assessments (Fig. 2).
The mean age of the control group was 22.0 years, when dental development was consider to be completed. No subjects with severe malocclusion or tooth wear were included.

All subjects included in the study had standardized panographic and cephalometric lateral radiographs which were taken in natural head posture.

Cephalometric measurements were taken using a digitiser from a number of locations such as anterior total face height (N-Me), posterior total face height (S-Go), anterior lower face height (ANS-Me), anterior upper face height (N-ANS), lower dentoalveolar height (Ii-MP) and upper dentoalveolar height (Is-PP). In addition SN/Go-Gn, MP-PP, Ocl-PP and Ocl–MP angles were used to evaluate vertical direction measurements (2) (Fig. 3).

In panographic radiographs two measurements were recorded: the first one was that from the inferior border of the mandible to the lower edge of the foramen (x) while the second was from the inferior border to the superior border of the alveolar bone (y). According to Wical and Swoop (14) the approximate ratio between the distance from the inferior border to the superior border of the alveolar bone (y) and from the inferior border of the mandible to the lower edge of the foramen (x) was considered to be 3/1 (y/x) (15) (Fig. 4).

Distribution form was assessed by calculation of differences analyzed using the Student’s- t test ( p<0.001= ***, p<0.01= **, p<0.05= *).

<table>
<thead>
<tr>
<th>n=20</th>
<th>SAMPLE</th>
<th>SD</th>
<th>CONTROL</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Me</td>
<td>144.55</td>
<td>7.70</td>
<td>135.15</td>
<td>8.23</td>
<td>3.60</td>
<td>**</td>
</tr>
<tr>
<td>N-ANS</td>
<td>60.05</td>
<td>3.66</td>
<td>58.85</td>
<td>4.64</td>
<td>0.90</td>
<td>---</td>
</tr>
<tr>
<td>ANS-Me</td>
<td>84.45</td>
<td>5.80</td>
<td>76.30</td>
<td>6.90</td>
<td>4.01</td>
<td>***</td>
</tr>
<tr>
<td>S-Go</td>
<td>93.30</td>
<td>5.63</td>
<td>90.00</td>
<td>6.92</td>
<td>1.65</td>
<td>---</td>
</tr>
<tr>
<td>SN-GoGn</td>
<td>35.75</td>
<td>7.25</td>
<td>30.00</td>
<td>5.00</td>
<td>2.91</td>
<td>**</td>
</tr>
<tr>
<td>MP-PP</td>
<td>28.05</td>
<td>5.78</td>
<td>22.55</td>
<td>5.16</td>
<td>3.14</td>
<td>**</td>
</tr>
<tr>
<td>Ocl-PP</td>
<td>11.20</td>
<td>4.17</td>
<td>7.70</td>
<td>3.49</td>
<td>2.87</td>
<td>**</td>
</tr>
<tr>
<td>Ocl-MP</td>
<td>16.85</td>
<td>4.50</td>
<td>14.85</td>
<td>3.71</td>
<td>1.52</td>
<td>---</td>
</tr>
<tr>
<td>Is-PP</td>
<td>35.55</td>
<td>3.44</td>
<td>32.40</td>
<td>3.45</td>
<td>2.88</td>
<td>**</td>
</tr>
<tr>
<td>Ii-MP</td>
<td>48.15</td>
<td>4.72</td>
<td>42.90</td>
<td>3.87</td>
<td>3.84</td>
<td>***</td>
</tr>
</tbody>
</table>
Descriptive statistics for the variables recorded and for the differences between the control and the study sample groups included mean values and standard deviations for each variable. Distribution form was assessed through the analysis of differences using the Student’s- t test (Table 1).

Results and Discussion

In the statistical evaluation anterior total face height (N-Me) in the study sample was found to be greater than in the control with an average difference of 8.1mm (p<0.01), and the value of anterior lower face height (ANS-Me) was greater by 7.2 mm (p<0.001). Anterior upper face height (N-ANS), lower dentoalveolar height (Ii-MP) and upper dentoalveolar height (Is-PP) emerged to be greater with respect to control group (p<0.001) (p<0.01). Ocl-PP angle measurement also established statistically significant difference (p<0.01) (Table 1). Measurements of the panographic radiographs, “x” and “y” distances also showed statistically significant differences between the study sample and control group (p<0.05). Ocl-PP angle measurement also established statistically significant difference (p<0.01) (Table 1). Measurements of the panographic radiographs, “x” and “y” distances also showed statistically significant differences between the study sample and control group (p<0.05). The mean ratio between the inferior border of the mandible to the lower edge of the foramen and from the inferior border to the superior border of the alveolar bone (y/x) was 2.87:1 in the study samples and 3.01:1 in the control group, with a standard deviation of 0.23 (Table 2, Fig. 5).

The reconstruction of a severely worn dentition is very complex and difficult problem, representing a real challenge to the dentist. The best treatment for any wear depends on its early recognition, which is difficult to be achieved. It is important to distinguish between physiologic and pathologic tooth wear and to determine when and how to intervene. When teeth become worn out, a serious problem is created, especially if there is no vertical space for restoration and alteration in the vertical dimension of necessary occlusion. Despite warnings against increasing vertical dimension of occlusion, there is evidence from long-term observations that supports the view that, as a general rule, the patient adaptations to such an occlusion is stable (7, 9, 12).

Longitudinal material is the most valuable for determining the nature of any such changes, and Thompson and Kendrick (14), and Kendrick and Risinger (6) report an increase in facial dimensions with age. An extensive study by Tallgren (13) also indicated that an increase in facial height occurs with advancing age beyond the point where growth is normally considered to be completed.

Interpretation of the differences in total facial height between the groups is required to understand presence of wear. In this study the dimension recorded for anterior total (N-Me) and lower face height (ANS-Me) in the wear samples showed a significantly greater dimension than control group. For anterior upper face height (N-ANS) and posterior total face height, the value was greater in the wear sample but statistically was not significant. Mandibuler plane (MP) – palatal plane (PP), occlusal plane (Ocl) – palatal plane (PP) angles and lower and upper dentoalveolar height in the wear sample was greater than the control group. However, with respect to loss of crown height, these findings demonstrated that maxillar and mandibuler and dentoalveolar height compensation are likely to occur (Fig. 6).

The location of the mental foramen relative to the inferior and superior borders of normal mandibles, as expressed by the mean ratio of total bone height to height of the foramen above the inferior border, appears to be consisted enough to justify its use as a reference point in clinical studies. Since the bone below the foramen constitutes a predictable proportion of the total bone height in the majority of normal subjects, and since this bone is not significantly affected by resorption until extreme atrophy occurs, its height may serve as the basis for...
estimating the original mandibuler height in elderly subjects (2, 15).

Clinically, the lower edge of the mental foramen appears to be a more useful reference mark in panographic radiographs. Observing the distance from the inferior border of the mandible to the lower edge of the foramen and using the approximate ratio of 3:1 can help to estimate conveniently the original height of the mandible before resorption (15).

According to our findings, “x” and “y” dimensions statistically were significantly greater than control group, but mean ratio of y/x was equal for both sample and control groups. This result shows that there is an equal compensation both in the lower and upper part of the mental foramen in the mandible.

The results presented in this study support Kiliaridis et al.’s (7) hypothesis which suggests that functional hyperactivity of the masticatory system imposed increased stress on the bony structures of the craniofacial complex with possible influences on its structure.

Ideally, changes in facial morphology associated with this condition should be studied longitudinally, but in the case of tooth wear this is not possible. Because all dentitions exhibit wear as normal part of the ageing process, and it is impossible to predict whether any individual will be severely affected. In practice therefore, the “effect” of wear must be studied by cross-sectional comparison with other samples. Again, as wear is a normal part of the ageing process, it is extremely difficult to find age-matched samples, which do not themselves exhibit wear.

Consequently, other effects of ageing on the craniofacial skeleton are difficult to separate from the effects of wear (3, 4). In this study the mean age of the control group is such that facial growth is complete and thus differences between the groups may be considered to be mainly due to the wear process, although the presence of late adult age changes must be considered.

This study has been present in 25th Annual Conference EPA, September 6-8, PRAG-2001

REFERENCES