Introduction

The diagnosis of periodontal disease is often neglected especially in pediatric patients not only because deciduous teeth are temporary, but also because there is a lack of knowledge about its actual impact in primary dentition [Oh et al., 2002; Bimstein et al., 2002]. Studies reported that patients with aggressive periodontitis in the mixed dentition had presented alveolar bone loss in the deciduous teeth [Sjödin et al., 1993]. The most effective measure to detect periodontal breakdown is to measure the loss of the attachment level by means of probing. However, in children, this measurement is difficult to be performed in the deciduous and mixed dentitions, especially because teeth might not be completely erupted, and also pain rising from probing limits this parameter. Thus, the bite-wing radiograph (BWR) can be an alternative method to assess alveolar bone loss (ABL) in children [Sjödin and Madisson, 1992; Jenkins et al., 1995], and it has been widely used and validated as a form of detecting periodontal breakdown. The distance between the cemento-enamel junction (CEJ) and the alveolar bone crest (ABC) is commonly set as the parameter for measurements in this technique. According to some authors, the average value in the intact deciduous dentition for this distance is around 1 mm [Sjödin and Madisson, 1992; Shapira et al., 1995; Bimstein et al., 1988; Sjödin and Madisson, 1994]. Pathological alveolar bone loss is detected when CEJ-ABC distances are higher than 2 mm [Sjödin and Madisson, 1992; Bimstein and Soskolne, 1988].

It should be noted that in the primary dentition, an increase in the CEJ-ABC distance can be associated with several factors, such as eruption of the adjacent permanent tooth, deciduous teeth exfoliation [Pierro and de Souza, 2005] and age [Bimstein et al., 2006; Bimstein, 1995; Shapira et al., 2005]. Pathological conditions such as proximal caries, occluso-proximal restorations [Bimstein et al., 2006; Bimstein, 1992; Bimstein et al., 1996] and specific subgingival microflora leading to periodontal disease establishment [Bimstein et al., 2002] have been significantly associated with increase in CEJ-ABC distances.

As alveolar bone loss in the primary dentition has been frequently associated with periodontal disease in the permanent dentition [Sjödin et al., 1993; Maragakis et al., 1998], it is important to determine the CEJ-ABC distance parameters. The aim of this study was to evaluate the CEJ-ABC distance in sound and unsound deciduous teeth, according to subject’s age and the presence of caries.

Materials and methods

The present study was approved by the Institutional
Review Board, Federal University of Rio Grande do Sul, Brazil. Nine hundred forty-four bitewing radiographs from 460 subjects aged 3-8 years-old were provided by the Federal University of Rio Grande do Sul archives. Radiographs from subjects that reported any systemic disease, previous orthodontic or periodontal treatment were not included in the study. Additionally, to be included, the radiographs should display a minimum or no distortion, no overlapping of the proximal surfaces and a clear image of CEJ. Moreover, teeth should be in occlusion and non-exfoliating process. Therefore, 334 radiographs (that belonged to 260 patients) fulfilled inclusion criteria and comprised the study sample.

Teeth were divided into two groups, according to the interproximal surface characteristics. Group 1 comprised only sound teeth, while Group 2 comprised teeth with enamel-dentin proximal caries. The radiographs were digitalized. Brightness and contrast were manually adjusted. Each tooth was assigned a code to guarantee a masked evaluation. The examiner was previously calibrated to the measurements by duplicate measurements of radiographs, with one week interval (ICC=0.83). The CEJ-ABC distance was measured with Image Tool 3.0 (The University of Texas Health Science Center, San Antonio, TX, USA). The standard length of the radiographic film was set as the initial calibration in order to correct for possible measurement distortion. The distal surface of the mandibular first deciduous molar and/or the mesial surface of the second mandibular deciduous molar were analysed. The measurement comprised the distance from the CEJ to the most cervical point of the ABC corresponding to the same interproximal surface in the crown, perpendicular to the occlusal surface. The mesial surface of the mandibular first deciduous molar was not included to avoid bias from the exfoliation of the mandibular canine; the distal surface of the mandibular second molar was not evaluated to prevent from bias of the eruption of the first permanent molar.

Data were analysed with SPSS 13.0 (SPSS Inc., Chicago, IL, USA) and SAS/STAT (SAS Institute Inc., Cary, NC, USA). Two-way ANOVA (p≤0.001) was used to assess the distance of CEJ-ABC considering the interproximal surface status and age. The present analysis uses the site as experimental unit and the level of significance was set at 5%.

Results

Descriptive mean values for the CEJ-ABC distance regarding tooth, surface status and age are shown in Table 1. The average for the CEJ-ABC distance in the distal surface of the mandibular first molar was different between sound and carious teeth (p<0.001). The same behaviour was observed in the mesial surface of the mandibular second molar.

Both the presence of lesion on the interproximal surface and the subject age influenced the mean CEJ-ABC distance. No interaction between these factors.

<table>
<thead>
<tr>
<th>TOOTH</th>
<th>SURFACE STATUS</th>
<th>AGE (YRS)</th>
<th>N</th>
<th>AVERAGE</th>
<th>STANDARD DEVIATION (±)</th>
</tr>
</thead>
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<tr>
<td>Mandibular left first molar</td>
<td>Sound</td>
<td>3-5</td>
<td>53</td>
<td>0.74</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-8</td>
<td>69</td>
<td>0.94</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Carious</td>
<td>3-5</td>
<td>16</td>
<td>1.34</td>
<td>0.42</td>
</tr>
<tr>
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<td></td>
<td>6-8</td>
<td>28</td>
<td>1.37</td>
<td>0.59</td>
</tr>
<tr>
<td>Mandibular right first molar</td>
<td>Sound</td>
<td>3-5</td>
<td>56</td>
<td>0.74</td>
<td>0.24</td>
</tr>
<tr>
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<td>6-8</td>
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<td>0.92</td>
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</tr>
<tr>
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<td>6-8</td>
<td>17</td>
<td>1.42</td>
<td>0.33</td>
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<tr>
<td>Mandibular left second molar</td>
<td>Sound</td>
<td>3-5</td>
<td>62</td>
<td>0.65</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-8</td>
<td>74</td>
<td>0.76</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>6-8</td>
<td>6</td>
<td>1.51</td>
<td>0.90</td>
</tr>
<tr>
<td>Mandibular right second molar</td>
<td>Sound</td>
<td>3-5</td>
<td>66</td>
<td>0.62</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
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<td>6-8</td>
<td>63</td>
<td>0.74</td>
<td>0.28</td>
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<tr>
<td></td>
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<td>0.42</td>
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<td>6-8</td>
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<td>0.82</td>
</tr>
</tbody>
</table>

TABLE 1
Average (mm) and standard deviation for the CEJ-ABC distance in each tooth group.
was statistically observed, as shown in Table 2. The statistical interaction among age, clinical status and the tooth type (mandibular left second molar and mandibular right second molar) was not calculated because of the reduced number of samples. The CEJ-ABC distance was greater in teeth with caries in the interproximal surfaces and in older children.

Discussion

Radiographic examination is an important tool to assess the presence of caries and periodontal status. Different techniques can be used to determine the presence or severity of each disease in order to prevent or control them. Bitewing radiographs are efficient tools to detect marginal bone loss because they provide details regarding the sharpness of the structures [Jeffcoat, 1992]. Furthermore, this technique is adopted as a routine in clinical diagnosis, especially in children where periodontal clinical assessments are limited, mostly due to pain [Mariath et al., 2008]. The present study used the site unit of analysis. This kind of analysis is subjected to criticism. However, due to the encountered results, an analysis based on the individual was not possible without losing substantial information.

The average CEJ-ABC distance in mandibular deciduous molars with sound interproximal surfaces was <1.0 mm, in agreement with Bimstein and Soskolne, 1988; Sjödin and Matsson, 1992, and Bimstein and Garcia-Godoy, 1994. Interproximal surfaces with caries had the greater CEJ-ABC distances, however this was ≤2.0 mm. This fact may be associated with the absence of cavities, especially in superficial dentin lesions [Mariath et al, 2008]. Moreover, it seems reliable that the individual susceptibility and the local factors are probably associated with periodontal diseases in the primary dentition [Bimstein and Garcia-Godoy, 1994; Sjödin et al, 1995].

There was a statistical significant difference between the CEJ-ABC distance between sound and unsound surfaces, even presenting mandibular values of or equal to 2 mm [Vizzotto et al., 2011]. Similar results were previously reported by Bimstein et al. [1993]. These authors detected alveolar bone loss in 62.6% of the sites adjacent to proximal caries. Furthermore, the lack of proximal contact between adjacent teeth due to caries was responsible for a 9.1% increase in the alveolar bone loss, when compared to sites related to sound proximal surfaces. Unsound interproximal surfaces due to caries lesion or defective restorations may enhance bacterial adhesion, plaque development and also periodontal disease establishment, leading to alveolar bone loss [Jeffcoat, 1992].

There was a statistically significant difference between the CEJ-ABC distance regarding the age group, and higher values were observed for older patients. Bimstein and Soskolne [1988], Bimstein et al. [1993]. Bimstein [1995] and Shapira et al. [1995] also reported an association between age and the CEJ-ABC distance variation. This finding can be associated to continuous tooth eruption, facial growth and tooth wearing. Moreover, it might be associated with the increased time that the periodontal structures are exposed to dental plaque and consequently to the multiple health-disease cycles. However, Sjödin and Matsson [1992], Bimstein and Garcia-Godoy [1994] and Pierro [2005] did not find any association between age and CEJ-ABC distance. The main reasons for this finding could be the high incidence of proximal caries, the reduced number of subjects that joined the studies and the absence of age stratification.

Although the observation that both interproximal surface status and age influenced the CEJ-ABC distance values, in the present study the interaction between these variables was not a determinant for the increased CEJ-ABC distances.

Conclusion

This study shows that useful information regarding interproximal periodontal condition can be obtained through a radiographic analysis: from this examination it can be inferred that the presence of caries and age are probably interferes in the CEJ-ABC
distance. The present report encourages the paediatric dentist to carefully analyse bitewing radiographs in order to evaluate not only the caries status but also the periodontal profile of the patient.

References


