Medical and Research Publications
International Open Access

Research Article **Journal of MAR Dental Sciences (Volume 6 Issue 4)**

Radiographic Study of Alveolar Bone Loss in Primary Molars

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Received Date: November 29, 2022

Published Date: December 05, 2022

Abstract

Alveolar bone loss has been reported in primary teeth of healthy young children with a variable prevalence.

Aim of the study: *Radiographic study of Alveolar Bone Loss and its risk factors in primary molars in Syrian children.*

Materials and Methods: *A total of 348 peri- apical radiographs (116 healthy Syrian school children, aged 6-9 years, fully erupted and non- exfoliating posterior teeth in occlusion, were included in this study. ABL were observed in three different times in mesial and distal side for each teeth to detect how much changed with time. Radiographs were divided into groups by: age, gender, tooth, proximal crown surface status, tooth location. Relation between Independent variables and ABL were studied.*

Results: *In this Syrian study 8,4% had experienced alveolar bone loss in their primary teeth during the ages 6-9 years. The CEJ-ABC distance ranged from 0.19 to 3.1 mm. ABL values was increasing with time. There was significant effect for Age and Proximal Crown Status variables on ABL values. There was no significant effect for gender, the mesial and distal sides, location of the tooth.*

Conclusion: *In children, alveolar bone loss was directly increased with time, associated with age and proximal status surface. Other according independent variables such as gender, the mesial and distal sides, location of the tooth had no significant effects on ABL values. Children with bone loss should be re-examined regularly because it had increased by time and because of the usual slow course of periodontal disease.*

Introduction

Alveolar bone loss has been reported in primary teeth of healthy young children with a variable prevalence (Pierro et.al. 2005), although in a lower frequency (Guimaraes et.al. 2010).It is often based on a single range of measurements from the cemento-enamel junction to the alveolar bone crest (CEJ-ABC distance). The CEJ-ABC distance is directly associated with aging in a normal periodontium in the primary dentition and that the presence of unsound surfaces can be a risk indicator for the development of alveolar bone loss (Vizzotto et.al 2011). In children, alveolar bone loss (ABL) was mainly associated with local factors such as proximal caries, inadequate restoration, and pulp pathosis (Zhang et.al 2006) (Pierro et.al 2009).

Proximal contact loss due to caries may contribute to the appearance of marginal alveolar bone loss (ABL) in the deciduous dentition (Drummond, Bimstein 1995). Although the observation that both the interproximal surface status and the age had influence on the CEJ- ABC distance values, the interaction between these variables was not a determinant for the increase CEJ- ABC distances (Tarmahomed Salle et al. 2012). Because of these different results, and there were limited data about the epidemiology and risk factors, decision was made to examine the alveolar Bone loss in primary molars in Syrian children

Aim of the study

Radiographic study of Alveolar Bone Loss by measuring the distance between the cement - enam- el junction (CEJ) and the alveolar bone crest in pri- mary molars in Syrian children.

Materials and Methods

Study Design: Long-sectional study. A total of 348 periapical radiographs (116 healthy Syrian school children, aged 6-9 years, fully erupted and non-exfoliating posterior teeth in occlusion, were included in this study. Radiographs were digitalized and stored as a jpg file. The scanning parameters were 300-dpi resolution and original size kept intact. Brightness and contrast were manually adjusted. They should display minimum distortion, no over- lapping of the proximal surfaces, and a clear image of the CEJ. Each tooth received a code to guarantee a random and blinded evaluation. The CEJ-ABC distance was measured with Image Tool 3.0 soft- ware. The distance from the cemento-enamel junc- tion to alveolar bone crest was measured from the mesial surface of the first primary molar to the distal surface of the second primary molar or the first per- manent molar if present.

ABL were observed in three different times (Initial Value, after 3 months, after 6 months) in two different sides (Mesial side, Distal side) for each teeth in the sample to detect how much changed with time.

Radiographs were divided into groups by: age, gender, tooth, proximal crown surface status and dental condition (carious lesions/restorations /ssc/sound) and timing of radiograph. The examiner was previously calibrated (Intraclass correlation coefficient - ICC>0.80). No information regarding the timing of each radiograph (initial or follow- up examination was provided. Relation between Independent variables and ABL were studied.

Statistics Analysis

Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS version 13). Time effect on ABL (mm) values according to Studied sides Study: A Pairwise T Student test was applied to know if there were significant differences in ABL variable's values between the three studied times (Initial Values, After 3 months, After 6 months) according to Studied Side variable. Relations between Independent variables and ABL variables were studied. To know if there were significant effect of each one of the Studied Independent Variables (Age, Gender, Tooth side, Tooth Vertical Location and Proximal Crown Status) on ABL values according to Studied Side and Studied Time Variables a Multivariate General Linear Model test was applied. A p-value of < 0.05 was considered statistically significant.

Results

In this Syrian study the retrospective analysis of available radiographs from the primary dentition showed that 8,4% had experienced bone loss in their primary teeth during the ages 6-9 years.

ABL were measured at three different times (Initial Value, after 3 months, after 6 months). The CEJ-ABC distance ranged from 0.19 to 3.1 mm, the mean for all surfaces. Most of the measurements were 2 < mm, and measurements 3 > mm were found, in low percentages after 6 months, at the distal surfaces of teeth.

There were significant differences in ABL variable's values between the three studied times (Initial Values, After 3 months, After 6 months), indicate that ABL values after 3 months and after 6 months were greater than initial values, ABL values after 6 months were also greater than after 3 months' values. There was significant effect of Age and Proximal Crown Status variables on ABL values, P-

values were lower than 0.05, for Age and for Proximal Crown Status (whatever the studied time and the studied side was). All Other P-values for gender, the two studied sides groups (Mesial Side Group, Distal Side Group), location of the tooth were much greater than 0.05, so there were no significant effects of the according independent variables on ABL values.

Discission

This study assessed ABL by measuring the distance from CEJ to ABC from the mesial surface of the first primary molar to the distal surface of the second primary molar or the first permanent molar if present in periapical radiographs.

Periapical radiographs were considered the most efficient technique to assess incipient alveolar bone loss because of their ability to detect details in the sharpness of the structures.There were limited data about the epidemiology and risk factors/indicators of ABL in primary dentition in Syrian children. There were similar studies in Jordan (Ababneh et al. 2011) and China (Zhang et al. 2006).

In this Syrian study the retrospective analysis of available radiographs from the primary dentition showed that 8,4% had experienced bone loss in their primary teeth during the ages 6-9 years. In the population studied, there was an overall prevalence of periodontal bone loss of 26% in an Australian school-aged group (Darby et al. 2005). However 28% of the Vietnamese children and 5% of the Swedish children had experienced bone loss in their primary teeth during the ages 4-11 years (Matsson et al. 1995). In this present study the ABL ranged from 0.19 to 3.1 mm, the mean for all surfaces at three different times (Initial Value, after 3 months, after 6 months). The CEJ-ABC distance ranged from 0.00 to 4.49 mm, the mean for all surfaces was 0.84 ± 0.44 mm, in the study of Al Jamal et al. 2011. The mean ABLwas 1.22mm for sound surfaces and less than 2mm even for unsound surfaces, in the study of Vizzottc et al 2011. ABC had medians from 0.58 mm to 1.39 mm (range 0.0 to 4.44 mm) for primary molars, in the study of Needleman et al. 1997. The mean ABL for all primary tooth surfaces was 1.0 mm in the study of Sjödin et al. 1992. Individual surfaces displayed distances ranging from 0.0-4.0 mm of the variables tested for association with the CEJ-MBL distance, eruption of neighboring permanent tooth and exfoliation of neighboring primary tooth seemed to be associated with large CEJ-MBL distances. When surfaces with these characteristics were excluded, a CEJ-MBL range of 0.0-2.0 mm was obtained.

In this present study ABL values after 3 months and after 6 months were greater than initial values, ABL values after 6 months were also greater than after 3 months' values. So it had been detected that CEJ-ABC distances have significantly increased with time as the study of Vizzotto et al. 2011.

In this present study the most interesting relationship was between alveolar bone loss and age. A positive significant correlation was found between the mean measurement of ABL and age ($p < 0.05$). The ABC-CEJ distance seemed to increase with age.

Several studies had correlated the CEJ-MBL distances to the subject age which usually increases with increasing age (Vizzotto et al. 2011, Needlman 1997). It could result from facial growth, continuous eruption of teeth, tooth wear due to attrition and exfoliation patterns. Several studies did not find any relationship between age and ABL in the primary dentition (Tarmahomed Salle 2012, Al Jamal et al. 2011, Guimaraes et al. 2010, Pierro et al. 2009, and Darby 2005. The lack of relationship found might be explained by the narrow age range utilized in their study, 7 to 9 years (Al Jamal et al. 2011, Sjodin and Matson 1992), and 2 to 5 years (Pierro et al. 2009) and by the fact that at during this period of time the increase of the CEJ-ABC distance is relatively pronounced than at other ages.

In this present study a positive significant correlation was found between the mean measurement of ABL and proximal crown status ($p < 0.05$). This increase was greater in unsound when compared to sound surfaces.Several studies had correlated the ABL to the proximal crown status (Vizzotto et al. 2011). Faulty restorations, exfoliation, and partial eruption adjacent to measured surfaces had significant effect on the CEJ- ABC distance (Al Jamal et al. 2011). The distance was significantly greater in areas of interproximal restorations and open contacts, and there was a tendency for the distances to be greater in areas of interproximal caries (Needlman et al. 1997). Several studies did not find any relationship between ABL and proximal crown status in the primary dentition. So dental condition (carious lesions/restorations) had no effect on -MBL distances (Tarmahomed Salle et al. 2012, Pierro et al. 2009).

In this present study a negative significant correlation was found between the mean measurement of ABL and gender ($p < 0.05$). Boys and girls presented similar CEJ-ABC distances, without a statistically significant difference.Several studies did not find differences in ABL when comparing both genders (Tarmahomed Salle et al. 2012, Pierro et al. 2009). Several studies had correlated the ABL to the subject gender (Guimaraes et al. 2010, Needlman et al. 1997, Brown et al. 1996). It was more frequent among males than females with a male-to-female ratio of 1.6:11 in BL groups (Ababneh et al. 2010). However a female-to-male ratio of 1.7:1 in BL groups (Sjödin et al. 1993). Females exhibited better periodontal health than males (Brown et al. 1996). There were no significant differences in ABL variable's values between the mesial and distal sides of the teeth whatever the Studied time was ($p < 0.05$). The distal sites exhibited higher prevalence of ABL (Guimaraes et al. 2010). May be this due to self-administered oral hygiene at distal surfaces was more difficult than at

mesial sites. These findings were also reported by Nevertheless, others studies found BL more frequent at mesial surfaces than at distal ones. Latcham, et al.1983 reported that this might be due to the fact that mesial sites erupt into the mouth in advance of distal surfaces, and thus are exposed to destructive etiological factors for a longer period.

In this present study there were no significant differences in ABL variable's values between the location of the tooth whatever the Studied time was ($p < 0.05$). Another study found that the CEJ-ABC distances were greater in the maxilla than in the mandible (Al Jamal et al. 2011).

Conclusion

In children, alveolar bone loss was directly increased with time. It had been associated with age and mainly associated with local factors such as proximal status surface. Other according independent variables such as gender, the tow studied sides groups (Mesial Side Group, Distal Side Group), location of the tooth had no significant effects on ABL values. Children with bone loss should be re-examined regularly because it had increased by time. Caution should be exercised when children are screened for alveolar BL because of the usual slow course of periodontal disease.

Periapical radiographs were useful in epidemiological studies because they are daily required during clinical practice and are usually kept in the patient' records after the treatment, providing easy management of these data.

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