Research Article

Assessment of alveolar bone height in adolescents utilizing Cone Beam Computed Tomography: a retrospective radiographic analysis

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Abstract: Background: To assess the alveolar bone crest level (ABCL) by Cone Beam Computed Tomography (CBCT) and to investigate several variables as predictors for the height of the alveolar bone in adolescents. Materials and methods: Age, sex, and ethnic groups were recorded for each patient. CBCT images were used to obtain measurements of the interproximal alveolar bone level from the cementoenamel junction (CEJ) to the alveolar crest. The highest measurement in each sextant was recorded along with any presence of a vertical bone defect or calculus. Results: Total of 720 measurements were recorded for 120 subjects. No vertical bony defects or calculus were observed radiographically. Statistically significant ($P< 0.05$) differences were observed between ABCL measurements of males as compared to females, posterior teeth compared to anterior teeth and maxillary sextants in comparison to mandibular ones. Additionally, value of ABCL significantly increased in relation to sex ($r=0.309$), maxillary posterior ($r=0.509$) and mandibular posterior sextants ($r=0.506$). Linear regression analysis indicated that the latter variables can predict the height of marginal bone, other independent variables were considered redundant. Conclusions: There was a low-profile of marginal bone loss among adolescents. Male sex, posterior teeth, and maxillary teeth have higher tendency for decreasing alveolar bone height.

Keywords: Adolescent, Cone-Beam Computed Tomography, Alveolar Bone

Introduction

Children and adolescence can have any of the periodontal diseases as an independent entity or as a manifestation of systemic disease. Although periodontitis is more common in adults, the aggressive form is more prevalent among young patients (1, 2). Periodontal disease in young patients is usually mild and rarely results in significant discomfort. Mild disease can, however, progress into a more destructive one over time (3).

Generalized and localized forms of periodontitis have been identified affecting both the primary and permanent dentitions. The prevalence of periodontitis at a young age is low, but can be severe and rapidly progressing. Early detection and diagnosis of periodontal disease by routine screening and periodontal examination will help to initiate treatment as soon as possible (3).

Race and ethnic backgrounds may have a role in the prevalence of periodontal disease in young individuals (4). For example, the prevalence of gingivitis is more often found in Colombia and Bolivia than with Mexican children and adolescents (5).

Bitewing radiographs are usually taken in children for caries assessment, but they also show the alveolar bone height around teeth. Thus, analysis of these radiographs provides a good assessment of the periodontal condition in children in addition to the clinical measurements of attachment level and gingival bleeding (6). Albandar et al. (1991) used bitewing radiographs for the assessment of marginal bone levels in a 3-year study of Brazilian adolescents. The conclusion was that they provided a useful method for monitoring disease progression (7). Earlier studies using bitewing radiographs have shown that the incidence of bone loss in young patients varies between 0.8% and 20% which is much greater than that seen clinically (4).

Conventional radiographs are methods helpful in detecting the height of the alveolar bone crest but do not reveal information regarding the depth and width of bone defects. Cone Beam Computed Tomography (CBCT) provides better diagnostic and measurable information on alveolar bone levels (8, 9). CBCT provides high-resolution pictures combined with multilayer reconstructions and a high level of reproducibility (10).

Alveolar bone height can be accurately measured at buccal, lingual, mesial, and distal surfaces in young patients by utilizing CBCT images which provide more direct measurements of the proximal areas with no need for calibration (11). The question of what constitutes a ''normal'' distance from the cementoenamel junction (CEJ) to crestal alveolar bone was addressed by Hausmann et al. (1991) after perusal of contemporary literature revealed a lack of consensus (12). They demonstrated that a ''no bone loss'' distance ranging from 0.4 mm to 1.9 mm is consistent with no clinical attachment loss in 13- to 14-year-old adolescents (12). In the literature, there are wide variations for normal bone height in relation to the CEJ, ranging from 1 mm to 3 mm. An average distance of 2 mm is widely adopted in studies of patients without periodontal disease. In young adults, the mean alveolar bone height in relation to the CEJ is 1.4 mm and for people over 45 years this average is extended to 3 mm (8, 9, 13, 14).

The aim of this retrospective analysis was performed to assess the height of the alveolar bone crest level (ABCL), as well as to examine the relationship between the patient age, ethnicity and sex with the alveolar bone height in adolescent patients aged between 14 to 18 years.

Materials and Methods

Study design

This retrospective analysis was conducted at Saint Louis University Center for Advanced Dental Education. This study was conducted after obtaining ethical approval in consistency with Helsinki declaration for human studies.

Study population

The radiographs of all adolescent patients 14 to 18 years of age and treated in the Graduate Orthodontics Department from 2006 through 2015 was reviewed. For each patient, age, sex, and ethnic group were recorded.

Inclusion criteria:

1. CBCT images were available for the subject
2. No primary teeth were present
3. Pre –orthodontic treatment radiographs were available
4. Patient were seen for orthodontic screening from 2006-2015

Exclusion criteria:

1. Unavailable CBCT for the subject
2. CBCT with only single arch image was present for the subject
3. Radiographs with major distortions of the examined areas
4. Patients with cleft lip and/or palate

Measurement procedure

The Digital Imaging and Communications in Medicine (DICOM) multifiles of each CBCT scan were imported into the Dolphin 11.8 3D software (Dolphin Imagining Systems LLC, Chatsworth, CA, USA) for analysis.

CBCT images were used to obtain measurements of the mesial and distal marginal alveolar bone height from the CEJ to the alveolar crest in all teeth. Using a digital measurement tool provided in the imaging software, the 3D image was oriented so the occlusal plane was parallel to the horizontal plane (Figure. 1).

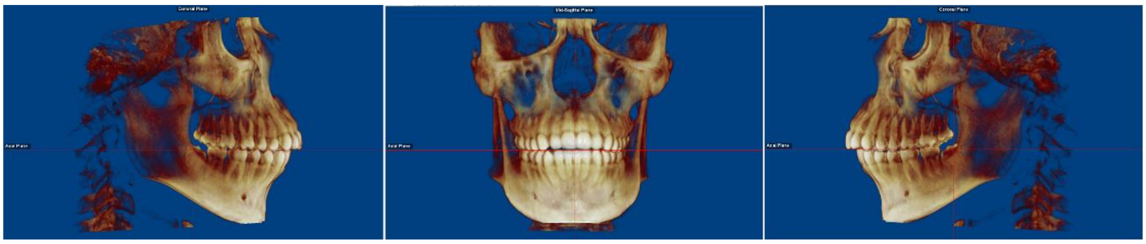

Figure 1: Standardized volume orientation of the CBCT images, occlusal plane is parallel to the horizontal plane.

Panoramic images were constructed for each maxillary and mandibular arch of each subject with the axial plane at the level of the CEJ and the sagittal plane bisecting each tooth in a mesiodistal direction at the CEJ level. Once oriented, this created a panoramic image for each dental arch (Figure. 2A). From this image, measurements from the mesial and distal aspects of each tooth were made from the most apical portion of the CEJ (where proximal enamel ends at the root surface seen radiographically) to the most coronal aspect of the marginal bone crest (Figure. 2B). The whole mouth was divided into 6 sextants; each dental arch was divided into posterior right, posterior left and anterior. The highest measurement in millimetres in a sextant was recorded along with any presence of a vertical bone defect and/or the presence of calculus. The measurements of the posterior sextants were averaged and designated as “Maxillary Posterior” and “Mandibular Posterior”. There was a total of four scores for each subject; measurements were excluded from sites next to extracted, partially erupted or unerupted/impacted teeth and distal aspect of the second molars. In teeth that were restored with fillings or crowns and the CEJ was obliterated, the most apical limit of the restoration was considered to be equivalent to the CEJ and was used as the reference point [15].

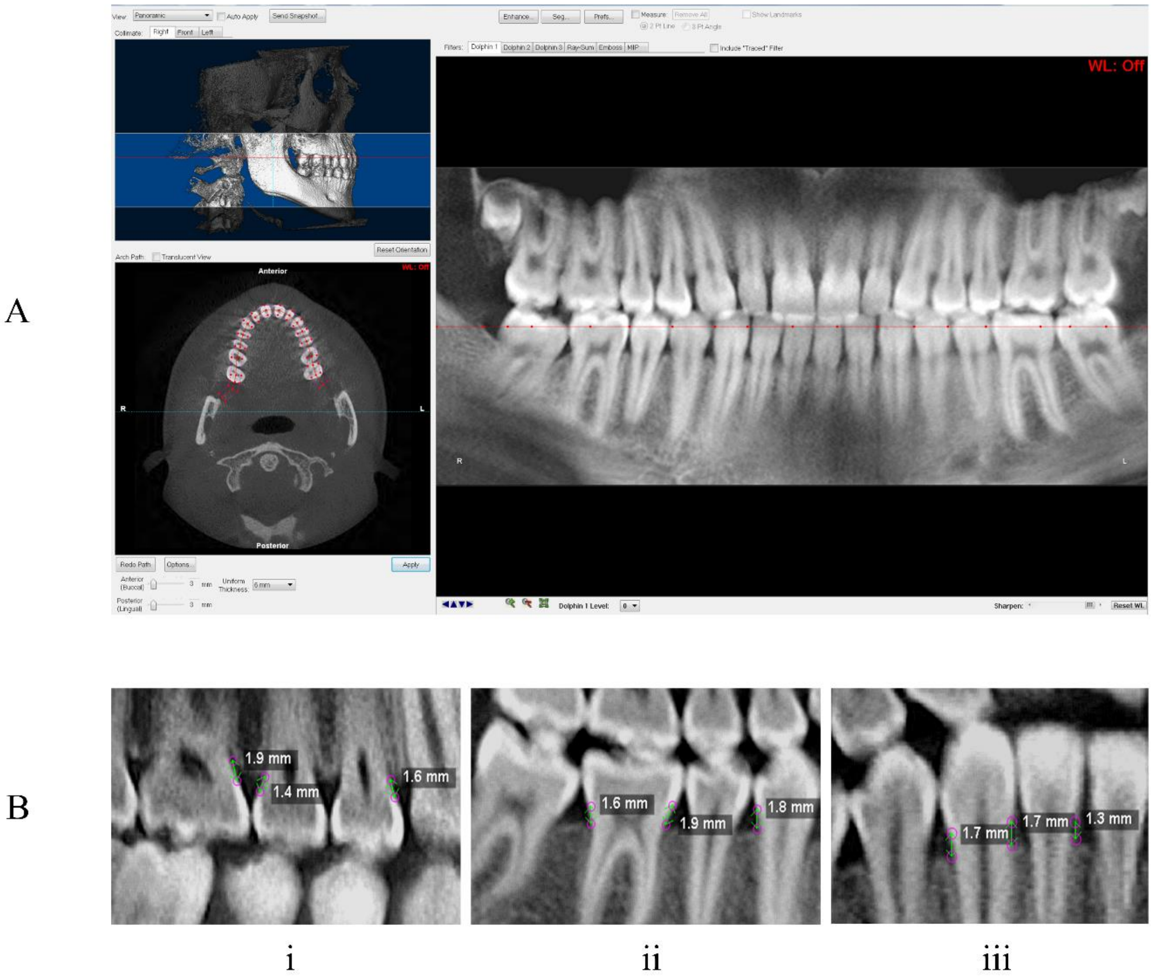

Figure 2: (A) Panoramic reconstruction from CBCT for both arches, the axial plane placed at the level of CEJ and the tooth was divided mesiodistally at this point by the sagittal plane. (B) Measurements in (mm) from the mesial and distal aspects of each tooth were made from the most apical portion of the CEJ to the most coronal aspect of the marginal bone crest: (i) maxillary right posterior sextant, (ii) mandibular right posterior sextant and (iii) mandibular anterior sextant.

All the data was collected by one examiner (Z. R. A.) who was calibrated by another expert dentist (D. D. M.) prior to collecting the measurements.

Statistical analysis

Choice of statistical test to determine the differences in ABCL according to different variables was based on results from Shapiro-Wilk W test. For normally distributed data, unpaired t-test was used dichotomized age groups while ANOVA test was used for comparing difference in different sextants. When the data were not evenly distributed, Mann-Whitney test was used for determination of differences between males and females. Multiple comparisons among different ethnic groups were performed by using Kruskal-Wallis test. All multiple comparison analysis (ANOVA, Kruskal-Wallis) were followed by *post-hoc* test. Correlation of ABCL, dependent variable, with different independent variables was determined by using backward linear regression analysis. Statistically significant level was set at $p< 0.05$. All statistics was performed by using Statistical Product and Service Solutions (SPSS) (version 25, IBM, USA).

Results

The number of the patient records included in the final analysis was 120 out of 747 records in this retrospective analysis, 627 records were excluded based on exclusion criteria. The total number of the measurements was equal to 720. The average age of the adolescents included in this study was 15.43 years and ranged between 14-18 years (Table 1). Distribution of the study population according to sex, ethnicity, age groups, and sextants is illustrated in Table 1.

Table 1: Demographic variables of the study population

Mean age (years)± SD	15.43± 1.06
Median age	15
Age range (years)	14-18
Sex	
Male	62 (51.7) §
Female	58 (48.3) §
Ethnic group	
White	88 (73.3) §
African American	24 (20) §
Hispanic	8 (6.7) §
Age groups (years)	
14	21 (17.5) §
15	53 (44.2) §
16	25 (20.8) §
17	16 (13.3) §
18	5 (4.2) §
Total	120 (100) §

§ frequency (percentage)

Analysis of the radiographs showed no vertical bony defects or calculus were identified in the total sample. The mean ABCL for all teeth was 1.6± 0.2 mm. The highest measurement recorded for ABCL was 2.5 mm and the lowest was 0.8 mm. Measurements of ABCL were significantly higher in males than females; however, no significant difference was observed among different ethnic and age groups (Table 2).

According to the sextants, maxillary posterior teeth showed significantly higher ABCL measurements than all other sextants. Mandibular posterior teeth had significantly higher ABCL than anterior teeth in both jaws. Yet, maxillary and mandibular anterior teeth did not show any significant difference in ABCL among them (Table 2). In addition, average ABCL measurements of the maxillary sextants were significantly higher than their mandibular counterparts (Table 2).

Table 2: Comparisons of ABCL according to different variables

Variables	Mean± SD (mm)	Comparisons	p value*
Sex†			
Male	1.452± 0.192	Male vs. Female	< 0.001
Female	1.586± 0.221		
Ethnic group§			
White	1.500± 0.199	African American vs. Hispanic	NS
African American	1.592± 0.268	African American vs. White	NS
Hispanic	1.538± 0.228	Hispanic vs. White	NS
Age groups (years)¶			
≤ 15	1.520± 0.187	≤ 15 vs > 15	NS
> 15	1.523± 0.261		
Sextants ǂ			
Max anterior	1.358± 0.284	Max Anterior vs. Mand Anterior	NS
Mand anterior	1.298± 0.337	Max Anterior vs. Mand Posterior	< 0.001
Max posterior	1.766± 0.238	Max Anterior vs. Mand Posterior	< 0.001
Mand posterior	1.664± 0.261	Mand Anterior vs. Max Posterior	< 0.001
		Mand Anterior vs. Mand Posterior	< 0.001
		Max Posterior vs. Mand Posterior	0.031
Jaws¶			
Max	1.630± 0.213	Max vs Mand	0.004
Mand	1.542± 0.254		
Total sample	1.6± 0.2		

* Significant level at p< 0.05 by using: † Mann-Whitney test, § Kruskal-Wallis test, ¶ Unpaired t-test, ǂ ANOVA test
NS, non-significant

Regression/correlation analysis was used to assess the association between the overall average ABCL (dependent variable) and the independent variables of this study. Results indicated a positive and significant relation between increasing ABCL measurements with male, mandibular anterior, and posterior sextants in both jaws (Table 3). Backward regression analysis showed that the predictors for increasing ABCL measurements were sex and posterior sextants of maxillary and mandibular jaws after excluding other independent variables (Table 4).

Table 3: Correlation between ABCL and different independent variables

Independent variables	R†	p value*
Age	0.079	0.197
Sex	0.309	< 0.001
Ethnic groups	0.127	0.084
Max anterior teeth	0.097	0.147
Mand anterior teeth	0.201	0.014
Max posterior teeth	0.509	< 0.001
Mand posterior teeth	0.560	< 0.001

† Pearson's correlation coefficient

* Significance at p< 0.05

Table 4: Regression analysis for predictors of ABCL (dependent variable)

Variables [a]	R^2	Std. Error of the Estimate	95% CI	t	p value
Sex	0.137	0.20400	0.061-0.208	3.610	0.001
Max posterior teeth	0.259	0.18815	0.231-0.437	6.428	0.0001
Mand posterior teeth	0.318	0.18111	0.276-0.480	7.344	0.0001

[a] Variables excluded by backward method were age, ethnic group, upper and lower anterior teeth

Discussion

The current CBCT-based retrospective analysis showed that the average ABCL in adolescent subjects was equal to 1.6 mm. However, an increase in the distance from the CEJ to the crest of the alveolar bone at the interdental areas was associated positively with the sex of the subject and posterior location of the teeth. Early detection of periodontal disease in children and adolescents ensures a high likelihood of a successful therapeutic outcome, primarily by reduction of etiologic factors, remedial therapy and development of an effective maintenance protocol [3, 16].

Radiographs contribute not only in the diagnosis of periodontal disease but also in the assessment of the prognosis of periodontally involved teeth, development of a treatment plan and the evaluation of the recurrence or progression of the disease [17].

In comparing periapical radiographs with CBCT imaging for detecting alveolar bone loss, CBCT was the only method that allowed for an analysis of different tooth surfaces and an improved visualization of the morphology of a bony defect [9, 18]. When compared with conventional radiography, the CBCT radiation dose is equivalent to a full-mouth series and approximately three to seven times the dose of a panoramic radiograph depending on the setting in use. On the other hand, when compared with conventional radiography, CBCT has far greater potential for providing information [8, 9, 19]. CBCT was used in this study because it provides the most accurate measurements from the regular radiographs used for patient screening.

Linear measurements between the CEJ and the alveolar crest or the bottom of the bony defect are used often to characterize the amount of bone loss in osseous periodontal defects [15]. In the current study, the highest ABCL measurement recorded was 2.5 mm, while the lowest was 0.6 mm which is in agreement with results from previous studies [8, 9, 20] who reported normal bone height in relation to the CEJ might range from 1 mm to 3 mm, although a distance of 2 mm is more widely adopted in studies of patients without periodontal disease [21]. In young adults, the mean alveolar bone height in relation to the CEJ is 1.4 mm and for people over 45 years this average is extended to 3 mm [22]. Armitage (1999) stated that the radiographic measurement of the CEJ to bone crest of 2 mm or more is an appropriate cut-off point for bone loss [23]. Darby et al. (2005) considered no bone loss if the distance from the CEJ to ABCL was ≤2 mm; questionable bone loss if the distance from the CEJ to ABCL was >2 and <3 mm; and definite bone loss if the distance from the CEJ to ABCL was ≥3 mm [4].

There was a statistically significant difference in ABCL between the mandibular and maxillary teeth. A lower prevalence of significant differences in the mandible would seem to be consistent with previous literature [21, 24] and might be attributed to relatively simpler root anatomy and more favorable radiographic conditions in mandibular molar and premolar areas [24]. Furthermore, direct measurements of the alveolar bone crest (ABC)-CEJ distances from dried skulls of a Romano-British population were also greater for maxillary posterior teeth with a reverse trend noted for the anterior region [25].

There was a statistically significant difference between the values of the anterior and posterior teeth ABCL. This is not in accordance with other studies that found higher ABCL in anterior teeth versus posterior teeth [22]. In general, the diagnostic accuracy of imaging modalities was low for anterior teeth. The difference in the diagnostic accuracy of CBCT between anterior and posterior teeth is likely the result of the difference in the morphology of the alveolar bone between these areas [8].

The mean ABCL for females was significantly lower than their male counterparts. This is in accordance with other studies that found an association between sex and the prevalence of periodontal disease in which more males than females showed evidence of periodontal breakdown [26, 27]. Overall, males were found to have significantly greater ABC-CEJ distances than females. However, it must be remembered that in the vast majority of cases the results for males were still within the range consistent with periodontal health that is less than 3 mm [28]. Further support was obtained from regression analysis which showed that sex together with posterior location of the teeth in the oral cavity can be used as predictors for increasing ABCL measurements. Other variables were excluded from the backward regression model including the age, ethnic groups, and anterior teeth in the maxillary and mandibular jaws. The overall ABC-CEJ distance increases with age [29]; however, this is not a linear relationship but follows the pattern of facial growth. The results of one study indicate that different levels of ABC-CEJ distances might be considered as a cut-off value for radiographic diagnosis of alveolar bone loss at different ages [25, 26, 30].

Ethnic differences in periodontal bone loss have been well documented in many studies [5, 21, 31, 32]. Which is inconsistent with findings of our study regarding ethnicity. There are significant racial differences in both the prevalence of early-onset forms of periodontitis and associated host factors. It is currently unclear whether these differences are due to genetic or environmental factors. Whether one group are truly more susceptible to periodontitis than other racial groups remain to be fully clarified. Undoubtedly periodontal epidemiology is advancing, but issues relating to definition of the clinical signs of periodontitis and how to factor in tooth loss due to periodontitis have not yet been resolved.

Destructive periodontal diseases have also been reported disproportionately more prevalent and severe in AA relative to other American populations. Differences in subgingival microbiota and host immune response have also been reported for AA, implying that risk factors for disease progression may also differ for these populations. Although greater destructive periodontal disease prevalence and severity were found in the AA group, environmental and demographic variables, such as occupational status, may have a greater influence on risk indicators associated with disease prevalence and progression in these populations [32, 33].

Limitations to retrospective studies is that they only provide information about association not causation. Another limitation to CBCT imaging has been reported in a previous study [34] is that different sagittal planes positions may alter the severity of bone loss in the anterior teeth. For our study, it should also be stressed that these results relate to a population seeking care at a dental school. The question arises whether patients seeking dental care at a dental school are representative of the community population.

Conclusions

This study revealed that male gender, posterior teeth and maxillary teeth expressed higher ABCL values than other independent variables within the adolescent population. Thus, they could potentially be used as predictors for marginal bone height. Further researches are necessary to establish whether this difference is attributable to disease, biologic factors, or environmental factors.

Conflict of interest: None.

References

1. Califano JV. Position paper: periodontal diseases of children and adolescents. *J Periodontol*. 2003;74:1696-704.
2. Papapanou PN, Sanz M, Buduneli N, Dietrich T, Feres M, Fine DH, Flemmig TF, Garcia R, Giannobile WV, Graziani F, Greenwell H, Herrera D, Kao RT, Kebschull M, Kinane DF, Kirkwood KL, Kocher T, Kornman KS, Kumar PS, Loos BG, Machtei E, Meng H, Mombelli A, Needleman I, Offenbacher S, Seymour GJ, Teles R and Tonetti MS. Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *J Clin Periodontol*. 2018;45:S162-S170.
3. Clerehugh V and Tugnait A. Diagnosis and management of periodontal diseases in children and adolescents. *Periodontol 2000*. 2001;26:146-68.
4. Darby IB, Lu J and Calache H. Radiographic study of the prevalence of periodontal bone loss in Australian school-aged children attending the Royal Dental Hospital of Melbourne. *J Clin Periodontol*. 2005;32:959-965.
5. Botero JE, Rösing CK, Duque A, Jaramillo A and Contreras A. Periodontal disease in children and adolescents of Latin America. *Periodontol 2000*. 2015;67:34-57.
6. Bimstein E and Soskolne AW. A radiographic study of interproximal alveolar bone crest between the primary molars in children. *ASDC J Dent Child*. 1988;55:348-50.
7. Albandar JM, Buischi YA and Barbosa MF. Destructive forms of periodontal disease in adolescents. A 3-year longitudinal study. *J Periodontol*. 1991;62:370-6.
8. Mol A and Balasundaram A. In vitro cone beam computed tomography imaging of periodontal bone. *Dentomaxillofac Radiol*. 2008;37:319-24.

9. de Faria Vasconcelos K, Evangelista KM, Rodrigues CD, Estrela C, de Sousa TO and Silva MA. Detection of periodontal bone loss using cone beam CT and intraoral radiography. *Dentomaxillofac Radiol*. 2012;41:64-9.
10. Lund H, Gröndahl K and Gröndahl HG. Cone beam computed tomography for assessment of root length and marginal bone level during orthodontic treatment. *Angle Orthod*. 2010;80:466-73.
11. Leung CC, Palomo L, Griffith R and Hans MG. Accuracy and reliability of cone-beam computed tomography for measuring alveolar bone height and detecting bony dehiscences and fenestrations. *Am J Orthod Dentofacial Orthop*. 2010;137:S109-19.
12. Hausmann E, Allen K and Clerehugh V. What alveolar crest level on a bite-wing radiograph represents bone loss? *J Periodontol*. 1991;62:570-2.
13. Aass AM, Albandar J, Aasenden R, Tollefsen T and Gjermo P. Variation in prevalence of radiographic alveolar bone loss in subgroups of 14-year-old schoolchildren in Oslo. *J Clin Periodontol*. 1988;15:130-3.
14. Källestål C and Matsson L. Criteria for assessment of interproximal bone loss on bite-wing radiographs in adolescents. *J Clin Periodontol*. 1989;16:300-4.
15. Kim TS, Obst C, Zehaczek S and Geenen C. Detection of bone loss with different X-ray techniques in periodontal patients. *J Periodontol*. 2008;79:1141-9.
16. Oliver RC, Brown LJ and Löe H. Periodontal diseases in the United States population. *J Periodontol*. 1998;69:269-78.
17. Pepelassi EA and Diamanti-Kipioti A. Selection of the most accurate method of conventional radiography for the assessment of periodontal osseous destruction. *J Clin Periodontol*. 1997;24:557-67.
18. Bagis N, Kolsuz ME, Kursun S and Orhan K. Comparison of intraoral radiography and cone-beam computed tomography for the detection of periodontal defects: an in vitro study. *BMC Oral Health*. 2015;15:64.
19. Dong T, Yuan L, Liu L, Qian Y, Xia L, Ye N and Fang B. Detection of alveolar bone defects with three different voxel sizes of cone-beam computed tomography: an in vitro study. *Sci Rep*. 2019;9:8146.
20. Zhou Z, Chen W, Shen M, Sun C, Li J and Chen N. Cone beam computed tomographic analyses of alveolar bone anatomy at the maxillary anterior region in Chinese adults. *J Biomed Res*. 2014;28:498-505.
21. Wong BK, Leichter JW, Chandler NP, Cullinan MP and Holborow DW. Radiographic study of ethnic variation in alveolar bone height among New Zealand dental students. *J Periodontol*. 2007;78:1070-4.
22. Persson RE, Hollender LG and Persson GR. Assessment of alveolar bone levels from intraoral radiographs in subjects between ages 15 and 94 years seeking dental care. *J Clin Periodontol*. 1998;25:647-54.
23. Armitage GC. Development of a classification system for periodontal diseases and conditions. *Ann Periodontol*. 1999;4:1-6.
24. Reed BE and Polson AM. Relationships between bitewing and periapical radiographs in assessing crestal alveolar bone levels. *J Periodontol*. 1984;55:22-7.
25. Whittaker DK, Parker JH and Jenkins C. Tooth attrition and continuing eruption in a Romano-British population. *Arch Oral Biol*. 1982;27:405-9.
26. Wolfe MD and Carlos JP. Periodontal disease in adolescents: epidemiologic findings in Navajo Indians. *Community Dent Oral Epidemiol*. 1987;15:33-40.
27. Hansen BF, Gjermo P and Bergwitz-Larsen KR. Periodontal bone loss in 15-year-old Norwegians. *J Clin Periodontol*. 1984;11:125-31.
28. Dummer PM, Jenkins SM, Newcombe RG, Addy M and Kingdon A. An assessment of approximal bone height in the posterior segments of 15-16-year-old children using bitewing radiographs. *J Oral Rehabil*. 1995;22:249-55.
29. Sarajlić N, Topić B, Brkić H and Alajbeg IZ. Aging quantification on alveolar bone loss. *Coll Antropol*. 2009;33:1165-70.
30. Boyle WD, Jr., Via WF, Jr. and McFall WT, Jr. Radiographic analysis of alveolar crest height and age. *J Periodontol*. 1973;44:236-43.
31. Corbet EF and Leung WK. Epidemiology of periodontitis in the Asia and Oceania regions. *Periodontol 2000*. 2011;56:25-64.

32. Craig RG, Boylan R, Yip J, Bamgboye P, Koutsoukos J, Mijares D, Ferrer J, Imam M, Socransky SS and Haffajee AD. Prevalence and risk indicators for destructive periodontal diseases in 3 urban American minority populations. *J Clin Periodontol*. 2001;28:524-35.
33. Dye BA and Selwitz RH. The relationship between selected measures of periodontal status and demographic and behavioural risk factors. *J Clin Periodontol*. 2005;32:798-808.
34. Zhang X, Li Y, Ge Z, Zhao H, Miao L and Pan Y. The dimension and morphology of alveolar bone at maxillary anterior teeth in periodontitis: a retrospective analysis—using CBCT. *Int J Oral Sci*. 2020;12:4.

العنوان: تقييم ارتفاع العظم السنخي عند المراهقين باستخدام التصوير المقطعي المحوسب للشعاع المخروطي: تحليل شعاعي بأثر رجعي

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المستخلص:

الخلفية: لتقييم مستوى قمة العظم السنخي (**ABCL**) بواسطة التصوير المقطعي المحوسب للحزمة المخروطية (**CBCT**) وللتحقق من العديد من المتغيرات كمؤشرات لارتفاع العظم السنخي عند المراهقين.

المواد والطرق: تم تسجيل العمر والجنس والمجموعات العرقية لكل مريض. تم استخدام صور **CBCT** للحصول على قياسات لمستوى العظم السنخي القريب من تقاطع المينا وسمنت الجذر (**CEJ**) إلى القمة السنخية. تم تسجيل أعلى قياس في كل سدس من كلا الفكين مع وجود أي عيب عمودي في العظام أو وجود القلح.

النتائج: تم تسجيل إجمالي 720 قياسًا لـ 120 شخصاً. لم يُلاحظ أي عيوب عظمية رأسية أو رواسب الأسنان إشعاعيًا. لوحظت فروق ذات دلالة إحصائية (**P <0.05**) بين قياسات **ABCL** للذكور مقارنة بالإناث والأسنان الخلفية مقارنة بالأسنان الأمامية والاسنان في الفك الاعلى مقارنة بالفك الاسفل. بالإضافة إلى ذلك ، زادت قيمة **ABCL** بشكل ملحوظ فيما يتعلق بالجنس (**r = 0.309**) ، والفك العلوي الخلفي (**r = 0.509**) والفك الخلفي السفلي (**r = 0.506**). أشار تحليل الانحدار الخطي إلى أن المتغيرات الأخيرة يمكن أن تتنبأ بارتفاع العظم الهامشي

الاستنتاجات: كان هناك انخفاض في مستوى فقدان العظام الهامشي بين المراهقين. اضافة الى ذلك يقل ارتفاع العظم السنخي بين الذكور وفي الأسنان الخلفية والأسنان العلوية.