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Research Article

Age Related Assessment of Bone Loss of Orthodontic Patients with Panoramic Radiograph

Siddharth Mehta[1]*, Deepak Singhal[2], Kamal Bajaj[3], Esha Nagpal[1], Shantanu Sharma[4], Kimi Mittal[4] and Vikas Jharwal[1]

[1]Associate Professor, Department of Orthodontics, Mahatma Gandhi Dental College and Hospital, MGUMST, Jaipur, India

[2]Associate Professor, Department of Public Health Dentistry, Manipal College of Dental Sciences, Manipal University, Manipal, Karnataka, India

[3]Professor and Head, Department of Orthodontics, Mahatma Gandhi Dental College and Hospital, MGUMST, Jaipur, India

[4]Assistant Professor, Department of Orthodontics, Mahatma Gandhi Dental College and Hospital, MGUMST, Jaipur, India

***Corresponding Author:** Siddharth Mehta, Associate Professor, Department of Orthodontics, Mahatma Gandhi Dental College and Hospital, MGUMST, Jaipur, India.

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Abstract

Aim: To assess bone loss for Indian individuals from mandibular first molar using orthopantogram.

Materials and Methods: Orthopantogram was obtained for 90 Indian subjects in the age group 10 - 30 years. The subjects were randomly divided into two samples; a study sample (n = 65) and a test sample (n = 25). A regression equation to calculate bone loss was generated from BL (distance between crestal bone and CEJ) and applied on test sample to check for reliability of equation.

Results: There was a significant positive correlation between actual bone loss and age (r = 0.377: P = < 0.0001) in the study group. The regression equation generated from the study sample was Calculated Bone Loss = -0.658 + (0.453 x Age). When used on test sample, the mean difference between bone loss and calculated bone loss value was 3.41 ± 3.91 mm.

Conclusion: The method of correlating bone loss of mandibular first molar and the age of Indian individuals can be applied for periodontal assessment and plan orthodontic treatment.

Keywords: *Age; Bone Loss; Mandibular Molar; Orthopantogram*

Introduction

Awareness for orthodontic treatment has risen among adults. The patients in the age group 18 years and above have been reporting in record numbers to gain advantage from orthodontic treatment. Probable reasons are a boost in confidence with attractive smile, improved oral health and treatment affordability [1,2]. However, the treatment modality greatly differs between young orthodontic patients and adults as growth modification procedures are not possible in adults. In young patients where there is more focus on growth modification procedures; surgical options and camouflage are options available for adults due to lack of growth. Another point of difference is prevalence of periodontal problems in adults [3]. Since most orthodontic appliances pose difficulty in oral hygiene maintenance, it is more important that periodontal problems are under control before orthodontic treatment.

Aim of the Study

Therefore, the aim of this study was to determine the amount of bone loss acceptable for an age to go ahead with orthodontic treatment. The objectives were to check for a relation between age and bone loss values, and to assess the variation of calculated and actual bone loss of test sample.

Materials and Methods

Orthopantogram (OPG) is an orthodontic pretreatment record. Anonymized digital orthopantogram of 90 patients in the age group 10 - 30 years, who had registered for orthodontic treatment were selected from the records of the department. The subjects were randomly divided into 2 groups- a study sample of 65 patients and a test sample of 25 patients. In each orthopantogram, a mandibular first molar was randomly chosen. Subjects with a history of previous orthodontic treatment, with cleft lip and palate, syndrome or systemic disease were excluded from the study.

Measurement

Age and gender of the patients were noted and Digimizer software was used to mark the points and perform measurements in the digital orthopantogram at 60% magnification (Figure 1). The linear distance between crestal bone and cemento-enamel junction (CEJ) on mesial/distal aspect of either of Mandibular first molar was measured (whichever was greater) and denoted as Bone loss (BL). A single observer performed all the measurements.

Figure 1: *Measurement of bone loss (BL).*

All statistical analysis was performed using the SPSS software package (SPSS for Windows 10, IBM SPSS Statistics 20.Ink, Chicago). Association between age and Bone Loss (BL) was calculated using Pearson's correlation. From the study sample (n = 65), a regression equation was derived using linear regression. This was, then, applied on the test sample (n = 25). The difference between the actual and calculated bone loss was calculated using paired t test and noted as error. A $P < 0.05$ was considered to be statistically significant.

Results

The study sample comprised of 65 patients (males = 45; females = 20). Mean age of the study population was 22.45 ± 4.78 years. A statistically significant positive correlation was obtained between age and bone loss suggesting bone loss increases with age ($r = 0.377$: $P = <0.0001$; Graph 1). Using linear regression function in SPSS (Table 1), the regression equation derived was

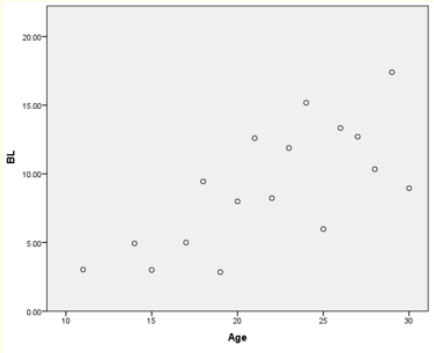
Calculated Bone Loss = -0.658 + (0.453 x Age)

$r^2 = 0.142$

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0.658	3.207		-0.205	.838
Age	.453	.140	.377	3.230	.002

Table 1: *Calculation of regression equation.*

Dependent Variable: BL.



Graph 1: *Scatter diagram of Bone Loss to Age of study sample (n = 65).*

This mathematical calculation was applied on test sample of 25 patients (males = 10; females = 15). Mean age of the test population was 23.28 ± 3.49 years. The mean difference between bone loss value and calculated bone loss value was 3.41 ± 3.91 mm (Table 2). Maximum difference between the 2 values of bone loss was 17.1 mm (Table 3).

	n	Mean	Sd	t-value	P-value
Actual Bone loss	25	10.72	5.8	0.808	0.427
Calculated Bone loss	25	9.89	1.6		
Mean difference	25	0.834	5.2		
Absolute difference*	25	3.41	3.91	Min = 0.07	Max = 17.1

Table 2: *Comparison of actual and calculated bone loss in mm (Paired t -test).*

Absolute difference in mm	Total Frequency
< 4 mm	18
4 - 8 mm	4
> 8 mm	3
Total	25

Table 3: *Frequency distribution of absolute difference between actual and calculated bone loss.*

Discussion

Most orthodontic patients will show signs of gingivitis at some time point. Periodontal health varies at different time points in an individual. There is a decrease in the facultative anaerobes and an increase in anaerobic rods, spirochetes and motile micro-organisms with fixed appliance therapy [4,5]. Previous studies and research have assessed the effect of orthodontic treatment on periodontal levels [6]. Some found no difference in the periodontal levels post orthodontic treatment and without orthodontic treatment [7]. However, there are a limited number of studies which assess the bone level appropriate for orthodontic treatment. In our study, we tried to derive an equation which could predict bone levels for a particular age group.

Crestal bone loss changes the position of center of resistance and force needed to move the tooth. The orthodontist can, in such situations, judiciously control the force applied on the tooth and bring about movement.

Mandibular first molars were chosen as they are the first permanent tooth to erupt into oral cavity. In a study by Personn., *et al.* [8], great agreement was noted between intraoral periapical and panoramic radiograph suggesting OPG readings as acceptable for periodontal evaluation.

Kaimenyi., *et al.* [9] suggested direct measurement from the CEJ to alveolar bone rather than the measurement of the tooth length within the bone while assessing bone loss from panoramic radiographs. In our study we measured the same value as bone loss and correlated it age wise. The mathematical equation derived from the study sample, showed bone loss acceptable for a given age, irrespective of gender. This calculated value can be considered as baseline value to compare bone loss. The mean of absolute difference between calculated bone loss and actual bone loss was 3.41 ± 3.91 mm. Some subjects showed greater bone loss than acceptable and were the ones where greater care was needed. In such patients, periodontal regenerative procedures could be tried before initiating orthodontic treatment.

Magnification was kept 60% to correctly measure the values and bone loss of 4mm was assumed acceptable for starting orthodontic treatment. 72% of test sample (18) had absolute difference values less than 4 mm. Thus, this method can help predict the bone loss numerically for an orthodontic patient for a given age.

This can be considered as a pilot study and a greater sample can be collected to check the applicability of such an equation on other teeth and different population group. Limitations of this method are examiner variability and missing mandibular molar.

Conclusions

The method of correlating bone loss on mesial/ distal aspect of mandibular first molar and the age of Indian individuals can be applied for periodontal assessment.

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Conflict of Interest

The authors declare no conflict of interest.

Bibliography

1. Tayer BH and Burek MJ. "A survey of adults' attitudes towards orthodontic therapy". *American Journal of Orthodontics* 79.3 (1981): 305-315.

2. G Muthu Laakshmi. "Reasons for Seeking Orthodontic Treatment among South Indian Population-A Questionnaire Study". *Journal of Pharmaceutical Sciences and Research* 8.7 (2016): 692-695.

3. Nattrass C and Sandy JR. "Adult orthodontics: a review". *British Journal of Orthodontics* 22.4 (1995): 331-337.

4. Bloom RH and Brown LR. "A study of the effects of orthodontic appliances on oral microbiological flora". *Oral Surgery, Oral Medicine, Oral Pathology* 17 (1964): 658-667.

5. Diamanti-Kipioti A., *et al*. "Clinical and microbiological effects of fixed orthodontic appliances". *Journal of Clinical Periodontology* 14.6 (1987): 326-333.

6. Eliasson LA., *et al*. "The effects of orthodontic treatment on periodontal tissues in patients with reduced periodontal support". *European Journal of Orthodontics* 4.1 (1982): 1-9.

7. Polson AM., *et al*. "Long term periodontal status after orthodontic treatment". *American Journal of Orthodontics and Dentofacial Orthopedics* 93.1 (1988): 51-58.

8. Persson RE., *et al*. "Comparison between panoramic and intra-oral radiographs for the assessment of alveolar bone levels in a periodontal maintenance population". *Journal of Clinical Periodontology* 30.9 (2003): 833-839.

9. Kaimenyi JT and Ashley FP. "Assessment of bone loss in periodontitis from panoramic radiographs". *Journal of Clinical Periodontology* 15.3 (1988): 170-174.

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