

# Horizontal and Vertical Bone loss After Active Orthodontic Treatment: A Clinical Retrospective Study

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## ABSTRACT

***Aims and objectives:*** The present study will be aimed to assess the Horizontal and vertical bone loss before and after active orthodontic treatment in 105 patients in the city of Alkharj, Riyadh region of the Kingdom of Saudi Arabia.

***Materials and methods:*** Pre and post orthodontic treatment OPG of 105 patients were selected from clinics in random from the Riyadh region of the kingdom of Saudi Arabia for the study. Descriptive statistics, analysis of variance, Scheffe post hoc analysis for group comparison, and level of significance.

***Results:*** When the OPG of 105 samples were studied, a statistically significant values and results [ $P < 0.05$ ] were revealed with relation to bone loss in upper left posterior area, bone loss in upper right posterior area, bone loss in lower left posterior area, bone loss in lower anterior area and bone loss in lower right posterior area before and after orthodontic treatment.

***Key words:*** Horizontal Bone loss , Vertical Bone loss, Orthodontic Treatment.

## 1. INTRODUCTION

With growing supply of adult patients, it is normal to manage patients who require rehabilitation of functioning and cosmetic sequelae after periodontal disease.<sup>1</sup> Pertaining to Orthodontics, the classical principle is that the tooth passes in front of the alveolar bone and never shifts its distance.<sup>4</sup> If this idea is right, you could swap roles without much effort. Retraction of the teeth during orthodontic care can cause excessive bone loss, decalcification, gingival recession, etc.<sup>2-</sup><sup>8</sup> Therefore, it's important to verify the true capability for bone remodelling in alveolar bone to avoid the unwanted side-effects. Previous studies evaluating the relationship between incisor retraction and alveolar bone width/height included a small sample size, which may affect the accuracy of the conclusions. Studies have even shown that subjects with advanced periodontitis can benefit from orthodontic treatment to improve their periodontal health<sup>9-14</sup>. The question of whether or not orthodontic movement may have negative effects on periodontal tissues, such as root resorption, pocket deepening, or attachment loss, has been evaluated in a number of investigations during the years. Three studies<sup>15-17</sup> had suggested that orthodontic appliances and forces induced by an active removable, functional or fixed orthodontic appliances,<sup>18,19</sup> and they have little or no relation to the dental decay development in the case of heavy periodontal and plaque formed inflammation. It was proposed that angular bony defects existed in the impacted

region where the contaminated teeth were evident. Moreover this association is not definitive, because angular defects have been detected adjacent to teeth subjected to normal occlusal forces.<sup>20</sup> Angular defects are found in interproximal areas when the osseous crest is thick as opposed to when it is thin.<sup>21</sup> Undesired periodontal changes after orthodontic treatment, such as gingival recession or alveolar bone loss, attract clinicians' attention prior to devising a treatment plan.<sup>22-28</sup>

## **2. MATERIALS & METHODS**

Pre and post orthodontic treatment OPG of one hundred and five patients were selected from clinics in random from the Riyadh region of the kingdom of Saudi Arabia for the study. Descriptive statistics, analysis of variance, Scheffe post hoc analysis for group comparison, and level of significance

### **Exclusion criteria's for teeth in the OPG**

1. If any proximal overlapping was present
2. If any crowding of teeth was present as it would obscure the CEJ location.
3. All the second molars
4. All third molars
5. Teeth to be excluded in the anterior area if they were technically blurred
6. Teeth to be excluded if superimposed by natural anatomical landmarks.

### **Inclusion criteria**

1. OPG of patients treated with orthodontic treatment
2. OPG of patients only from Riyadh region of Saudi Arabia

### **Measurement criteria**

1. Measurements will be made on both mesial and distal surfaces of each tooth.
2. If both the surfaces had horizontal type of bone loss, then the tooth was assigned to have horizontal bone loss.
3. If one of the tooth surfaces had a vertical defect or both the surfaces had vertical defects, then the tooth was assigned to have vertical bone loss.
4. In case of vertical defects, the vertical defect was considered to belong to the tooth along whose root surface the bottom of the defect was present.
5. For each sample [OPG] measure the horizontal and vertical bone height before and after the orthodontic treatment in sixdrants, which were as follows:

- a. Upper right [Before and after orthodontic treatment]
- b. Upper anterior [Before and after orthodontic treatment]
- c. Upper left [Before and after orthodontic treatment]
- d. Lower right [Before and after orthodontic treatment]
- e. Lower anterior [Before and after orthodontic treatment]
- f. Lower left [Before and after orthodontic treatment]

Table 1: Gender distribution among the participants

Gender	Frequency
Male	32
Female	73
Total	105

### 3. RESULTS

Table 2 and Figure 1 clearly compares the of bone loss in upper right posterior area before and after orthodontic treatment.

Table 3 and Figure 2 clearly depicts and compares the bone loss in upper anterior area before and after orthodontic treatment

Table 4 and Figure 3 clearly compares the of bone loss in upper left posterior area before and after orthodontic treatment.

Table 5 and Figure 4 shows the bone loss in lower left posterior area before and after orthodontic treatment.

Table 6 and Figure 5 clearly shows the bone loss in lower anterior area before and after orthodontic treatment

Table 7 and Figure 6 clearly show the bone loss in lower right posterior area before and after orthodontic treatment.

Mean Age of the participants is 23.2 years minimum being 14 and maximum age being 55 years. Wilcoxon Signed Ranks Test was used for comparison of bone loss before and after orthodontic treatment. P value less than 0.05 is considered to be statistically significant.

Among the one hundred five samples selected in the study, thirty two were males and 73 were females.

Table 2: Comparison of bone loss in upper right posterior area before and after orthodontic treatment

Bone loss	Pre-treatment	Post treatment	Z	Sig
0% BL	104	88	-4.0	.00*
20% BL	1	17		

Total	105	105		
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Table 3: Comparison of bone loss in upper anterior area before and after orthodontic treatment

Bone loss	Pre-treatment	Post treatment	Z	Sig
0%BL	103	100	-1.34	.180
20%BL	2	5		
Total	105	105		

Table 4: Comparison of bone loss in upper left posterior area before and after orthodontic treatment

Bone loss	Pre-treatment	Post treatment	Z	Sig
0%BL	103	92	-3.207	.001*
20%BL	2	12		
20-50% BL	0	1		
Total	105	105		

Table 5: Comparison of bone loss in lower left posterior area before and after orthodontic treatment

Bone loss	Pre-treatment	Post treatment	Z	Sig
0%BL	104	88	-3.7	.000*
20%BL	1	16		
20-50% BL	0	1		
Total	105	105		

Table 6: Comparison of bone loss in lower anterior area before and after orthodontic treatment

Bone loss	Pre-treatment	Post treatment	Z	Sig
0%BL	105	73	-5.12	.000*
20%BL	0	20		
20-50% BL	0	12		
Total	105	105		

Table 7: Comparison of bone loss in lower right posterior area before and after orthodontic treatment

Bone loss	Pre-treatment	Post treatment	Z	Sig
0%BL	104	82	-4.49	.000*
20%BL	1	23		
20-50% BL	0	0		
Total	105	105		

Figure 1: Comparison of bone loss in upper right posterior area before and after orthodontic treatment

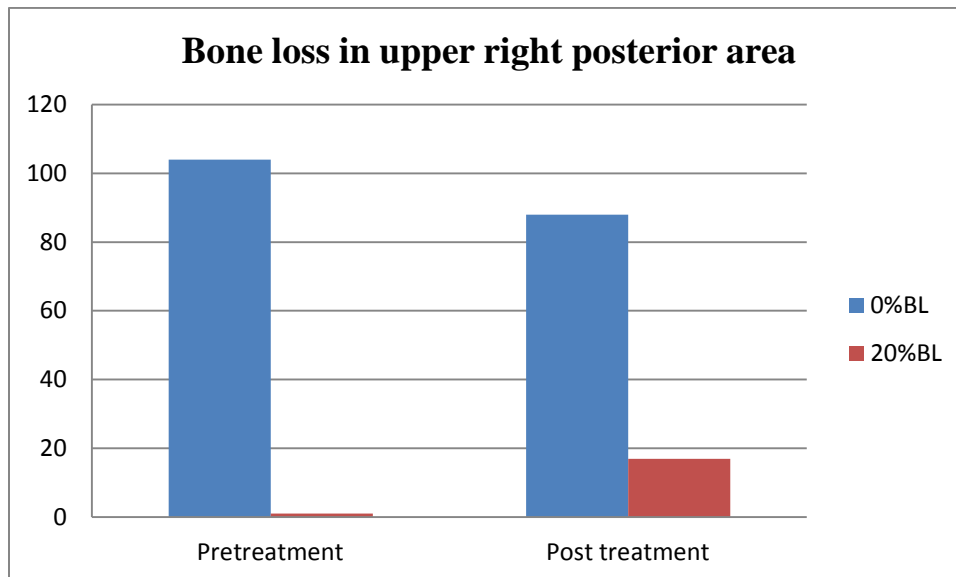


Figure 2: Comparison of bone loss in upper anterior area before and after orthodontic treatment

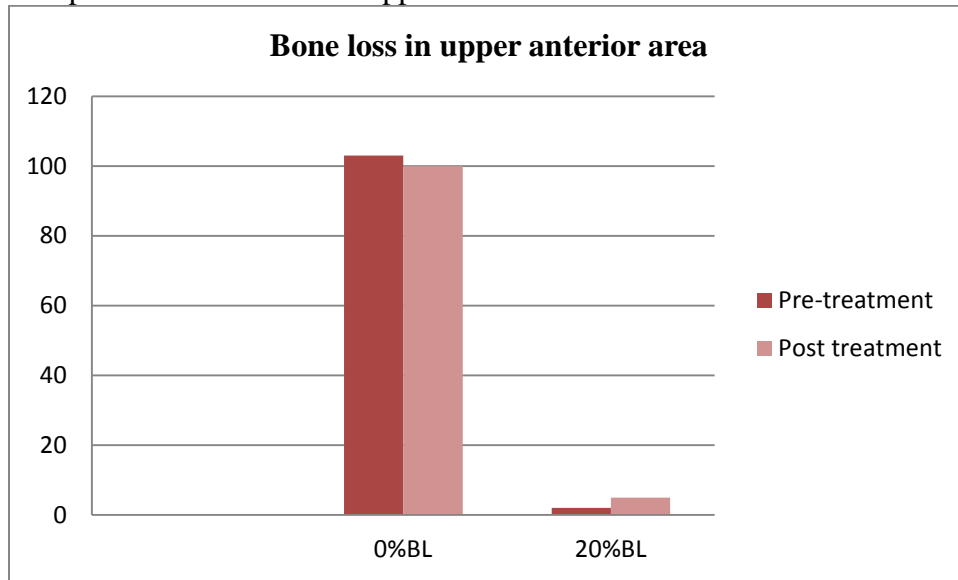


Figure 3: Comparison of bone loss in upper left posterior area before and after orthodontic treatment

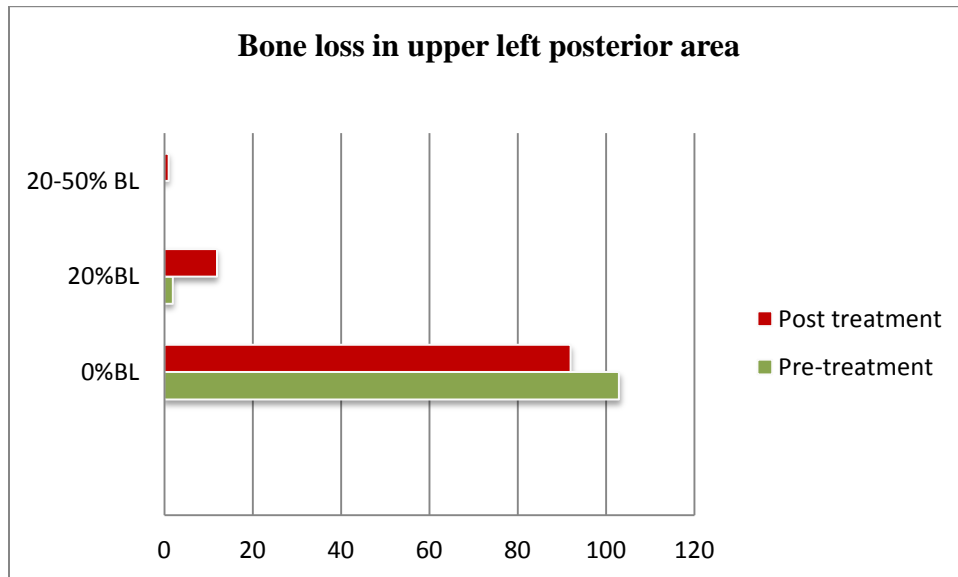


Figure 4: Comparison of bone loss in lower left posterior area before and after orthodontic Treatment

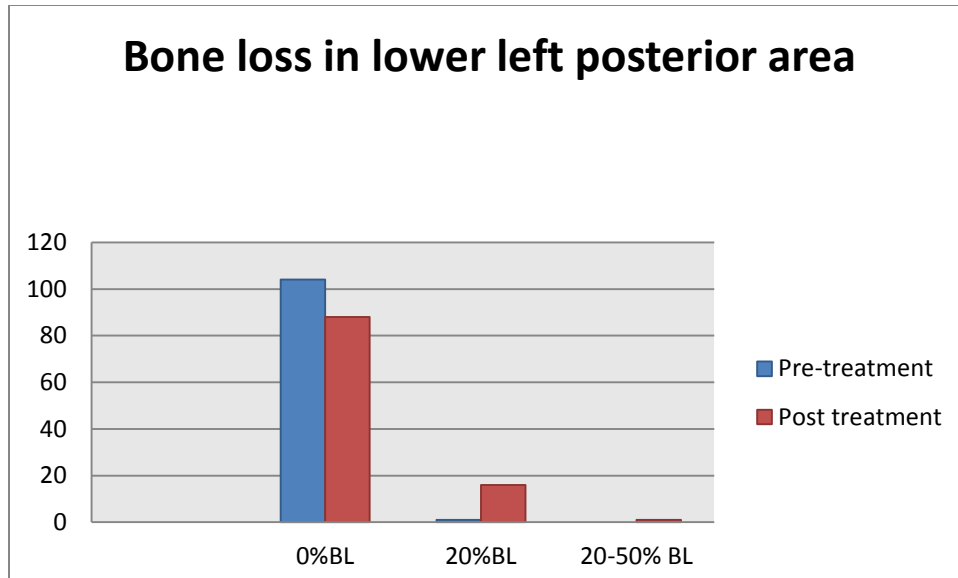


Figure 5: Comparison of bone loss in lower anterior area before and after orthodontic Treatment

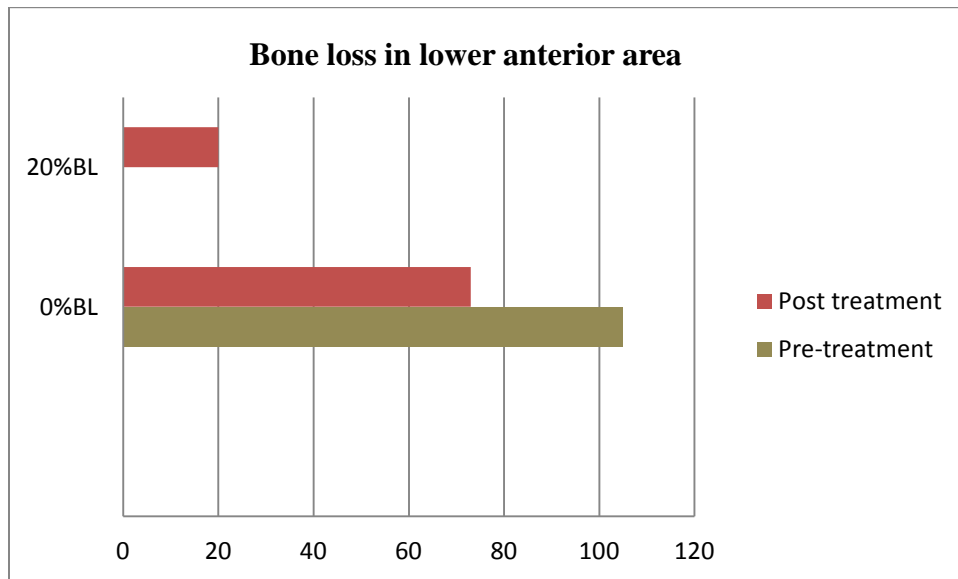
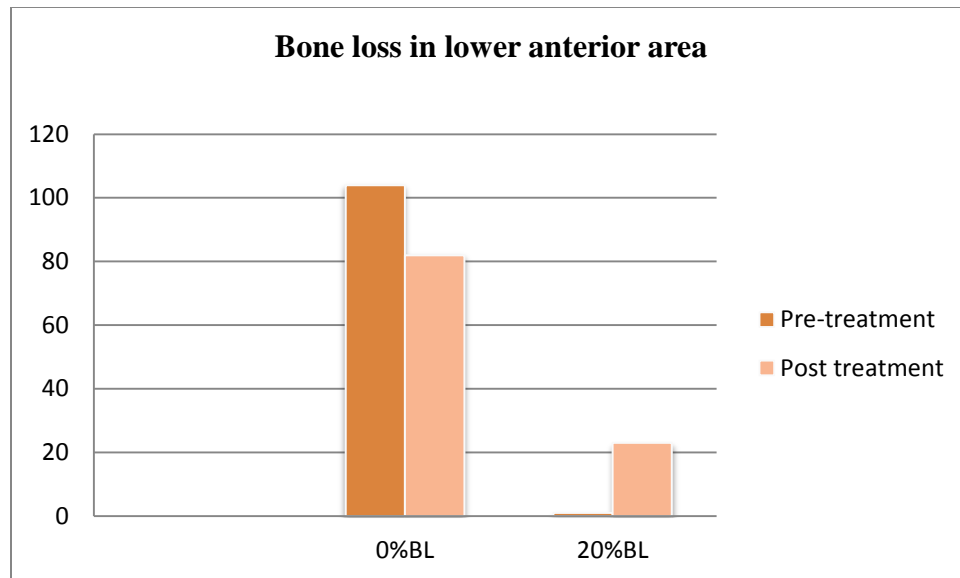


Figure 6: Comparison of bone loss in lower right posterior area before and after orthodontic Treatment



#### 4. DISCUSSION

This clinical retrospective study evaluated the possibility of Horizontal and Vertical Bone loss after active orthodontic treatment. However, there are only few studies and case reports regarding the possibility of Horizontal and Vertical Bone loss after active orthodontic treatment. Animal studies have confirmed that orthodontic movement is not detrimental for periodontal tissues if plaque control is provided, but in presence of inflammation it can lead to further periodontal breakdown.<sup>29</sup>

The results of this study on the assessment of horizontal and vertical bone loss before and after active orthodontic treatment supported the results of the geometric morphometric analysis. A significant reduction in bone thickness and a decrease in the vertical marginal bone to nearly one-third of its original value were found on the lingual side. Thickness decreased significantly after treatment, and the VBL results revealed the same negative alteration. Yodthong et al.<sup>30</sup> studied alveolar bone thickness during maxillary incisor retraction and reported that labial bone thickness at the crystal level significantly increased, whereas Sarikaya et al.<sup>31</sup> found that changes in alveolar bone thickness were not significant. The results of this study on the assessment of horizontal and vertical bone loss before and after active orthodontic treatment supported the results of a homogeneous research conducted by Juliana F. Morais et al in the year 2018. The results of this study on the assessment of horizontal and vertical bone loss before and after active orthodontic treatment supported the results of a similar study conducted by Jager F et al in the year 2017. Furthermore the results of this study on the assessment of horizontal and vertical bone loss before and after active orthodontic treatment also supported the results of a similar study conducted by Valmy Pangrazio-Kulbersha, Brynn Jezdimirb, Mariana de Deus Haugheyc, Richard Kulbershd, Paul Winee, Richard Kaczynskif in the year 2013. Moreover the results of this study on the assessment of horizontal and vertical bone loss before and after



active orthodontic treatment had great similarity to the results of another indistinguishable study conducted by Udom Thongudomporna, Chairat Charoemratroteb and Sarayut Jearapongpakorn in the year 2015 and eventually as a matter of fact the results of this study on the assessment of horizontal and vertical bone loss before and after active orthodontic treatment supported and buttressed the results of an interchangeable study conducted by Juliana F. Moraisa, Birte Melsenb, Karina M. S. de Freitas, Nuria Castello Branco, Daniela G. Garib and Paolo M. Cattaneo in the year 2018.

## 5. CONCLUSION

These observations have not yet been verified by other studies and this has only been a preliminary review. Additional analysis needs to be conducted to record the pre-treatment vertical and horizontal bone loss before and during successful orthodontic treatment with wider samples and a longer follow-up time. This research may have certain limitations. All the conclusions of the study are constrained by their retrospective existence. Using the 105 Pre treatment and Post treatment OPGs found it impossible to derive the precise results of Horizontal and vertical bone loss after an active orthodontic treatment. The sample size of the present study was comparatively limited [105 pre and post treatment OPGs]. Its predictive power might not be so high. Thus the power simulation proved that the present analysis could draw a conclusion using appropriate sample size.

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