
The Effect of Deep Traumatic Overbite on the Periodontium of the Upper Anterior Teeth in a Cohort of Adult Saudi Dental Patients

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ABSTRACT

Aim: to assess the relationship between deep overbite with palatal impingement and periodontal health status in a cohort of adult Saudi dental patients.

Materials and Methods:Ten patients (4 males and 6 females, aged 16 to 31 years old) with deep traumatic overbite and palatal impingement were examined. A Hawley retainer appliance with an anterior bite plate was provided for all patients. Pocket depth, bleeding index, gingival index, plaque index and mobility were recorded for four visits after using the appliance with fixed intervals in-between. Repeated measures analysis of variance (ANOVA) was used to assess the differences between visits, control /experimental teeth and surfaces (palatal /labial) for pocket depth, bleeding index, plaque index, gingival index and mobility.

Results:Statistically significant differences between visits 1-4 were reported for all measurements: pocket depth, bleeding index, gingival index, and mobility ($p \leq 0.05$), except for plaque index ($p=0.43$). Comparison between control vs experimental teeth showed significant differences for bleeding index ($p=0.026$), gingival index ($p=0.014$), and mobility ($p=0.00$).

Conclusion: The results of the current study showed a clear association between deep traumatic overbite with palatal impingement and the periodontal health of the upper anterior segment which indicate that traumatic overbite is a contributing factor in the development and pathogenesis of periodontal disease. In cases of deep overbite, using Hawley retainer with anterior bite plate can eliminate the gingival trauma and improve the general condition of the periodontium.

KEYWORDS: deep overbite, anterior bite plane, periodontal health, gingival trauma

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INTRODUCTION

Bite problems and malocclusion cases are frequently complicated with periodontal disease challenges. Normal occlusion and teeth alignment in the jaws have always been considered anatomically and functionally critical for the development and maintenance of a healthy periodontium. Orthodontics is widely accepted and proved to be the most conservative and predictable approach to treat many of the local etiologic factors that contribute to periodontal diseases and periodontal breakdown.¹⁻⁴

A deep overbite is where the vertical overlap of the upper and lower incisors exceeds half of the lower incisal tooth height. Complications associated with the deep overbite include soft tissue trauma, lack of inter-occlusal space and tooth wear, all of which can present significant challenges For the underlying periodontium. Most deep overbite cases are

asymptomatic and whenever the facial appearance is aesthetically acceptable, patients are unlikely to seek treatment. However, this type of malocclusion can be very problematic to both the patient and the treating dentist.⁵⁻⁷ Periodontal diseases etiology is multifactorial in which the pathogenesis process, to a great extent, is influenced by several local and systemic factors. The successful outcomes of orthodontic treatment are significantly affected by the patient's periodontal status as well as hard and soft tissue reaction to the biomechanical forces. Assumptions, as well evidence, that the correction of malocclusion and bite problems is undoubtedly beneficial to the future health of the periodontium in the literature are controversial.⁸⁻¹² The objective of this study was to evaluate the periodontal health condition of a cohort of adult Saudi patients who had received

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removable appliance with an anterior biteplate for initial treatment of deep traumatic overbite.

MATERIALS AND METHODS

Ten adult Saudi patients (4 males and 6 females, aged 16 to 31 years old), diagnosed with deep overbite associated with palatal impingement were included in the study. Patients had complete set of upper and lower anterior teeth without crowns or extensive fillings. No history of orthodontic or periodontal treatment was reported. Data were collected by examining each patient clinically under optimal clinical conditions with adequate lighting in the dental clinic of the College of Dentistry, King Saud University.

Each patient attended the clinic for five visits. Initial examination and impressions taking were completed on the first visit while the second visit was for delivering of the appliance (Hawley retainer with an anterior biteplate). The 3rd, 4th and 5th visits were for monitoring the periodontal status during and after using the appliance. Fixed time intervals between each visit were established for all patients. Instruments used in the clinical examination included a dental mouth mirror and periodontal probe (Michigan probe) with a blunt calibrated working end. Several indices and measurements were used to periodontally assess the patients including pocket (sulcus) depth, Bleeding Index¹³, Gingival Index¹⁴, Plaque Index¹⁵, and mobility.¹⁶⁻¹⁸

Maxillary central and lateral incisors were selected to be the site of examination since the periodontal structure of these teeth are the most likely to be affected by the impingement of the lower incisors. Maxillary right and mandibular left canines were selected as control sites, due to the fact that these teeth are not subjected to trauma from impingement (no contact between the opposing teeth and the periodontal structure of the control teeth).

The data were tabulated for descriptive statistics and analyzed using IBM-SPSS for windows version 23.0 (SPSS Inc., Chicago, IL). Repeated measures analysis of variance (ANOVA) was used to assess the differences between visits, control /experimental teeth and surfaces (palatal /labial) for pocket depth, bleeding index, plaque index, gingival index and mobility.

RESULTS

Descriptive statistics for all collected measurements per visit for both the control and the experimental groups are presented in tables 1, 2 and figures 1-5. Repeated measure ANOVA with interaction effects was used to assess changes in the mean scores over the 4 time points as presented by the 4 clinical visits (Table 3). Results indicated statistically significant differences between visits 1-4 for all measurements: pocket depth, bleeding index, gingival index, and mobility ($p \leq 0.05$), except for plaque index ($p = 0.43$). Comparison between control vs experimental teeth showed

significant differences for bleeding index ($p = 0.026$), gingival index ($p = 0.014$), and mobility ($p = 0.00$) (Table 3).

DISCUSSION

Malocclusion, in general, encompasses a variety of occlusal alterations that may occur in any or all the three facial planes, anteroposterior, transverse, and /or vertical. The relationship between malocclusion and periodontal diseases has been extensively studied in the literature where trauma from occlusion was thought to play a significant role in the pathogenesis of periodontal disease. However, some researchers presented different evidence that questioned the emphasis of occlusal trauma as a primary etiological factor in periodontal tissue destruction. Some studies indicated that when plaque is controlled, the occlusal status seems to make little, or no difference, on the development of periodontal disease on the other hand it can aggravate the progression of periodontal disease once it is established. Other investigators reported a weak relationship between malocclusion and development of periodontal disease later in life.¹⁹⁻²⁴ In this study, the goal was to assess the effect of using an orthodontic removable appliance with an anterior biteplate on the periodontal health status in a cohort of adult Saudi patients who had deep overbite associated with palatal impingement. The results indicated a significant improvement of pocket depth, bleeding index, gingival index, and mobility reported from the 2nd visit and continued to improve through the 3rd and 4th visits. However, no significant changes were observed in the plaque index between visits which could possibly be due to the patients' eagerness and motivation to initiate orthodontic treatment thus improving their oral hygiene habits. The results also showed significant difference in the bleeding index and gingival index between the control and experimental teeth which could be explained by the minimal amount of trauma that the control teeth are subjected to as compared to the experimental teeth (upper incisors) receiving direct trauma from the impingement.

These findings were in agreement with previous studies^{2,8,24} reporting that malocclusion and abnormal teeth positions are known as potential contributors to the periodontal disease initiation and progression especially when associated with occlusal trauma. Excessive functional stress may initiate the inflammatory reaction in the periodontium that is thought to exacerbate the destructive bacterial process. At the same time, the findings contradict some previous reports indicating weak relationship between periodontal disease and malocclusion.^{12,19,21}

Silness et al.²⁵ studied the association between alignment condition of the anterior teeth and dental health in a sample of adolescent population. They found that the oral hygiene and the gingival condition was directly related to the teeth position. Their results indicated that, in both sexes and jaws, anterior tooth segments with none or few non-aligned teeth

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had a more favorable periodontal state than segments with an increased number of non-aligned teeth.

In regard to the degree of mobility in the experimental group, results of the present study indicated that, teeth mobility showed significant changes with time. Mobility considerably improved between the 1st and 4th visits with much improvement at the 3rd and 4th visits. This could be explained by the improvement in the periodontal status and healing of the tissues after elimination of the causative factor which is trauma to the affected area.

In conclusion, the results of the current study indicated a clear association between deep traumatic overbite with palatal impingement and the periodontal health of the upper anterior segment suggesting that traumatic overbite is an important factor in the development and pathogenesis of periodontal disease. In cases of deep overbite, using Hawley retainer with anterior bite plate can eliminate the gingival trauma and improve the general condition of the periodontium.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Research Ethics Review Committee King Saud University, Riyadh, KSA with approval #E-17-2736.

CONFLICT OF INTEREST

The author declares no conflict of interest, financial or otherwise.

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TABLES

Table 1: Descriptive Statistics for the collected measures per visit - control teeth

		Visit-1		Visit-2		Visit-3		Visit-4	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pocket depth	Labial surface	2.1167	0.6481	1.9	0.5164	1.9	0.3944	1.7833	0.401
	Palatal surface	2.05	0.5986	2.0167	0.4191	2	0.4714	1.75	0.4795
Bleeding index	Labial surface	0.667	0.6939	0.4	0.4022	0.4	0.3944	0.3	0.3583
	Palatal surface	0.7167	0.401	0.4833	0.254	0.4667	0.3496	0.2667	0.3063
Gingival index	Labial surface	0.75	0.6149	0.6	0.4593	0.55	0.4235	0.4333	0.5043
	Palatal surface	0.8	0.6025	0.7333	0.4856	0.65	0.4611	0.4667	0.5488
Plaque index	Labial surface	0.6833	0.687	0.6167	0.5215	0.6667	0.5443	0.6167	0.6337
	Palatal surface	0.8333	0.4714	0.65	0.5179	0.65	0.4935	0.4667	0.4635
Mobility		0	0	0	0	0	0	0	0

Table 2: Descriptive Statistics for the collected measures per visit – experimental teeth

		Visit-1		Visit-2		Visit-3		Visit-4	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pocket depth	Labial surface	2.1	0.5194	1.8667	0.6226	1.8667	0.6349	1.75	0.5583
	Palatal surface	2.2417	0.535	1.8667	0.6564	1.85	0.7273	1.825	0.7682
Bleeding index	Labial surface	0.8917	0.4764	0.6417	0.478	0.6083	0.5271	0.4333	0.5089
	Palatal surface	0.9167	0.3664	0.775	0.5016	0.6333	0.5763	0.5	0.6298
Gingival index	Labial surface	1.1583	0.6933	0.8333	0.5	0.7333	0.4645	0.625	0.4734
	Palatal surface	1.1917	0.5401	0.9833	0.3235	0.775	0.4497	0.65	0.5223
Plaque index	Labial surface	0.5417	0.5974	0.3667	0.4717	0.425	0.5898	0.3667	0.5558
	Palatal surface	0.6833	0.4694	0.4583	0.4783	0.4833	0.4678	0.4167	0.4303
Mobility		0.65	0.3162	0.7	0.3291	0.3	0.3073	0.25	0.2357

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Table 3: Repeated Measure ANOVA with Interaction Effects (CNT: control, EXP: experimental)

		Sum of Squares	df	Mean Square	F	P value
Pocket depth	Visits 1-4	2.528	3	0.843	7.919	0.001
	Teeth (CNT vs EXP)	1.41	1	1.41	0.025	0.877
	Surfaces	6.27	1	6.27	0.539	0.482
Bleeding index	Visits 1-4	3.673	3	1.224	10.927	0.0
	Teeth (CNT vs EXP)	1.806	1	1.806	7.109	0.026
	Surfaces	0.109	1	0.109	0.994	0.345
Gingival index	Visits 1-4	3.993	3	1.331	4.229	0.014
	Teeth (CNT vs EXP)	2.417	1	2.417	9.207	0.014
	Surfaces	0.201	1	0.201	2.243	0.168
Plaque index	Visits 1-4	1.035	3	0.344	0.948	0.431
	Teeth (CNT vs EXP)	1.299	1	1.299	8.751	0.16
	Surfaces	8.03	1	8.03	0.655	0.439
Mobility	Visits 1-4	0.813	3	0.271	13.765	0.0
	Teeth (CNT vs EXP)	4.512	1	4.512	37.561	0.0

FIGURES

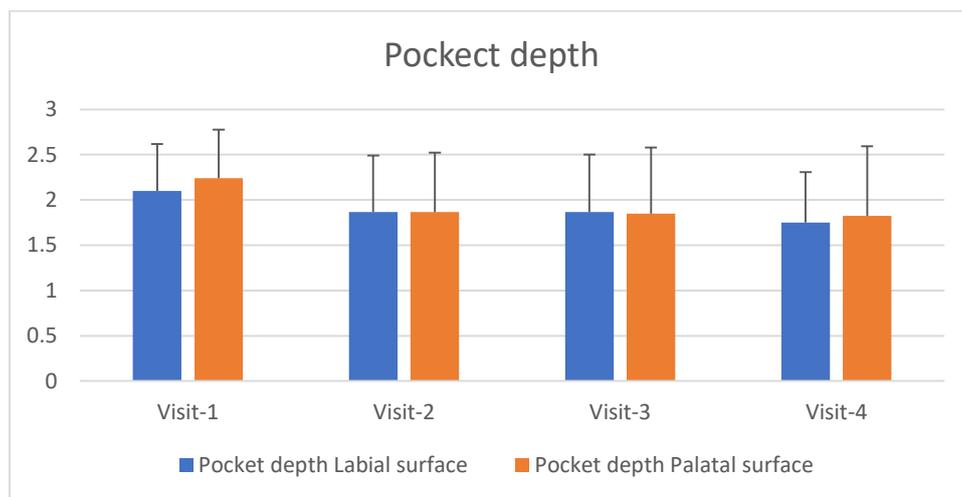


Figure 1: Mean and SD of pocket depth in experimental group across the four visits.

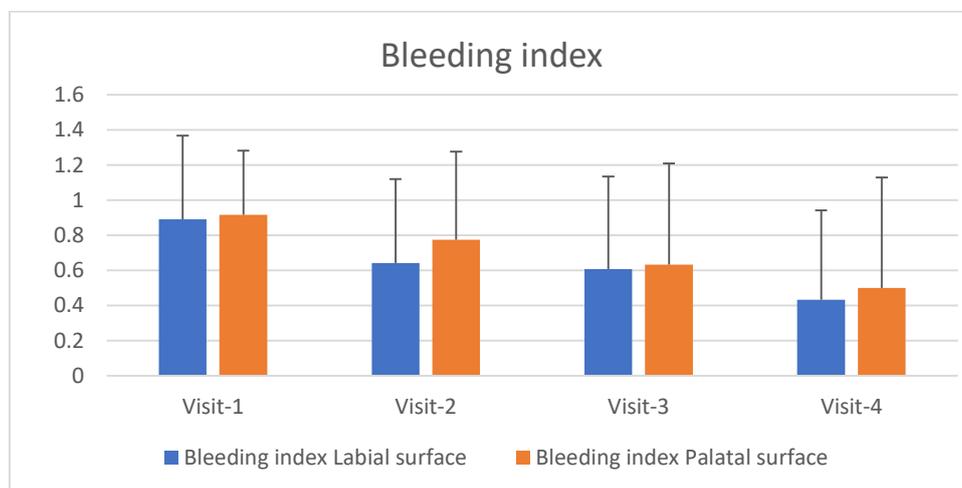


Figure 2: Mean and SD of bleeding index in experimental group across the four visits.

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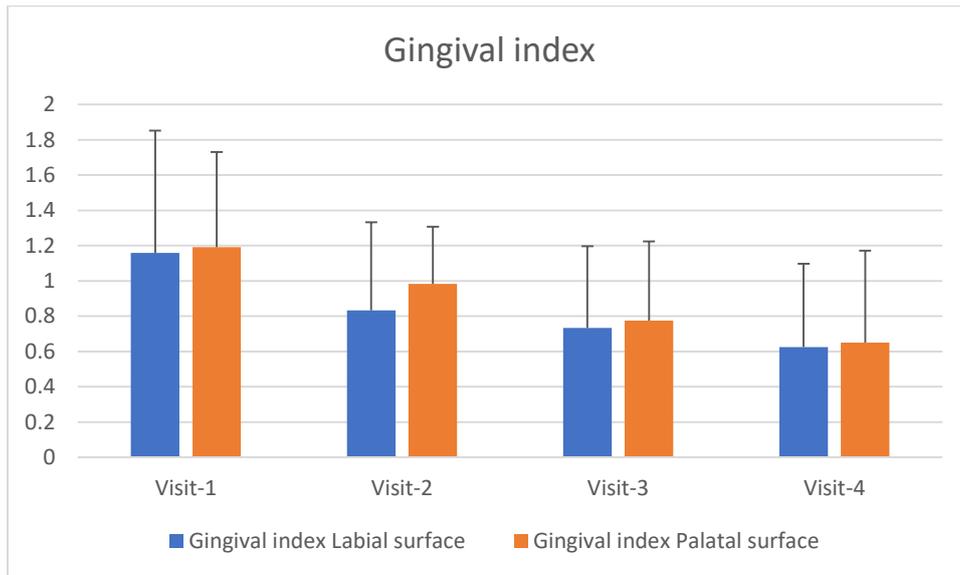


Figure 3: Mean and SD of gingival index in experimental group across the four visits.

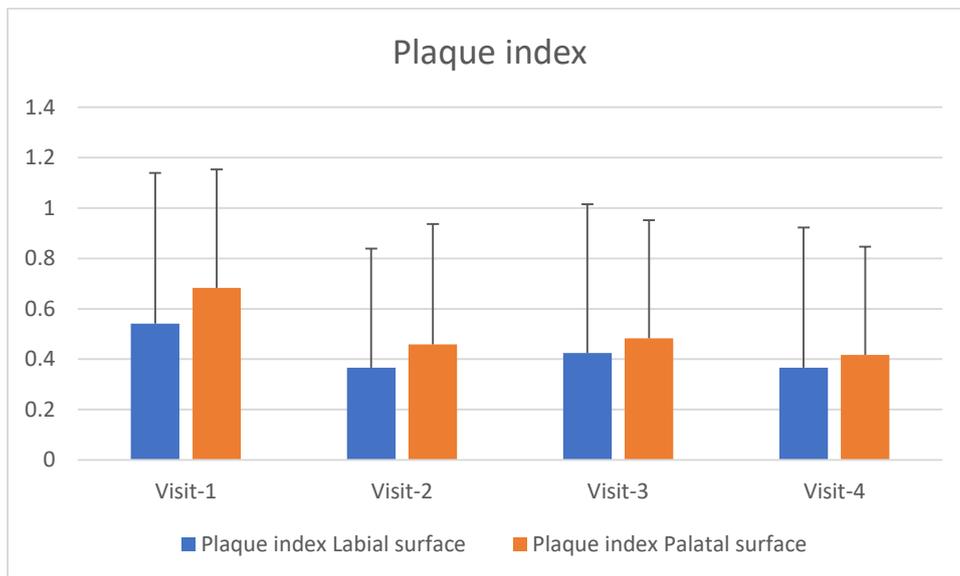


Figure 4: Mean and SD of plaque index in experimental group across the four visits.

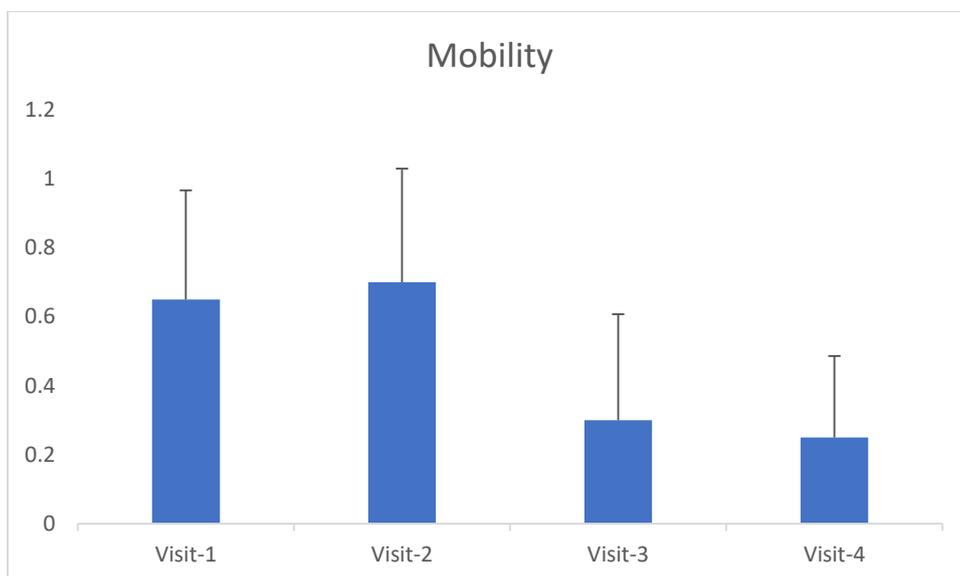


Figure 5: Mean and SD of mobility in experimental group across the four visits.