Original Article

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THE EFFECTS OF ORTHODONTIC APPLIANCES COMPONENTS ON GINGIVAL ENLARGEMENT

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ABSTRACT:

Background: Fixed orthodontic appliances may impair plaque removal, proper oral hygiene, and affect gingival health. Gingival enlargement is affecting orthodontic patients starting at the interdental papillae 1 to 2 months into treatment. The objective of this study was to explore the association among gingival enlargement (GE) and components of orthodontics such as brackets, open bite plate (OBP), cemented molar bands and bonded molar tubes in patients underwent fixed orthodontic treatment.

Materials & Method: A sample of 172 patients underwent fixed orthodontic treatment for at least 3 months were examined by a single examiner for simple oral hygiene index (S-OHI) and gingival enlargement index. The SPSS version 17 was uesd to analyis data, and various comparisons were performed using the t-test. The significance level was set at $p<0.05$.

Result: The gingival index was higher among patients who wearing open bite plate (OBP) or treated by conventional brackets and who had cemented molar band and it was significant statistically at 5% level.

Conclusion: The type of fixed orthodontic appliance components was effective in the formation of gingival enlargement during the treatment process. Thus, the clinician should use brackets which may increase the likelihood of good oral hygiene during orthodontic treatment, as well as maintaining supragingival band margins and optimizing treatment with minimal use of accessories.

Keywords: Gingival enlargement, fixed orthodontic treatment, molar band, open bite plate (OBP).

INTRODUCTION:

The placement of fixed appliances can alter the oral hygiene accessibility and may complicate the periodontal health due to presence like bands, brackets, wires, and other orthodontic attachments have a high susceptibility to present plaque accumulation on teeth because of that results in moderate gingivitis and varying degrees of gingival enlargement (GE) [1-4]. Plaque accumulation is particularly increased on the cervical surface of brackets, below the leveling arch due to difficulty cleaning these sites. [5, 6]. Gingival enlargement is one of the most common soft tissue problems

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related to the fixed orthodontic appliances is [7, 8].

With an increasing patients number with older age groups seeking orthodontic treatment; there has been an increasing demand for esthetic alternatives to conventional fixed stainless-steel appliances.The conventional fixed appliances have some common problems associated with it during treatment these are:, conventional systems decrease the patient ability to maintain good oral hygiene; unaesthetic appearance of brackets, increase the risk of periodontal interruption because of continuous accumulation of plaque around the brackets, ill-fitting bands and wires [9-11] Parallel to metallurgic improvements in orthodontics, manufacturers presented self-ligating brackets (SLBs) to be more effective in maintaining the oral hygiene over conventional brackets (CBs) a well-known risk factor due to elimination of the ligatures and also reduced complexity of the bracket design causes less plaque accumulation [12, 13]. In spite of massive improvements in materials and technology, accomulation of plaque around orthodontic appliances remains a significant problem[10]. Zachrisson when compared periodontal changes in adolescents treated with cemented banded molars and those treated with cemented bonded molars, found that the bonded teeth had less plaque accumulation and gingival inflammation around it [14]. In some clinical studies showed that gingival enlargements associated with fixed orthodontic appliances are considered to be transitory with no permanent damage to the periodontal supporting tissues and were only partly reversible after appliance removal [3, 15, 16].

Previous studies have examined the effect of fixed orthodontic appliance components on the oral health status [3,5], periodontal status or microbial colonization[1,17-20]. Though, to our knowledge, no study has assessed the effect of fixed orthodontic appliance components and accessories on gingival enlargement. The current study focused on the evaluation of patients underwent fixed orthodontic treatment to investigate the association among gingival enlargement (GE) and components of orthodontics such as brackets, open bite plate, cemented molar bands and bonded molar tubes.

MATERIALS AND METHODS:

This was a cross-sectional study conducted at the outpatient clinic, Department of Orthodontics approved by the Research Ethics Committee of (approval number TJ-C20150314-), Tongji Medical College, Huazhong University of Science and Technology (HUST), Wuhan, China, during the period from July/2017 to April/2018. All patient's parents were informed

about the study procedures, and informed consent was obtained.

Patients were excluded based on the following exclusive criteria: Patients in the mixed dentition stage; usage of drugs that might cause gingival enlargement such as anti-epileptic drugs – Phenytoin; patients with any systemic disease, cleft or congenital malformations, or undergoing surgical exposure of impacted teeth; underwent professional scaling in the past five months; undergoing removable appliance treatment; pregnant and smokers. Before treatment, all patients received equivalent guidelines with regard to oral hygiene and motivation. Fixed orthodontic treatment patients were carried out with self-ligating brackets (SLBs) and conventional metal brackets (CBs), orthodontic bands were adapted to the molars with glass ionomer cement and sometime open bite plate (OBP) was used in patients who have a deep bite to prevent damage to the lower braces as well as to help reduce excessive vertical overlap of the anterior teeth, by separating the upper and lower posterior teeth.

The examination was performed in a systemic manner by the same examiner (YAM) beginning from right maxillary sextant. All permanent, fully erupted teeth, excluding third molars, were dried with a blast of air, afterwards, on the facial and lingual/palatal surfaces simplified oral hygiene index (OHI-S) [21] and gingival enlargement index proposed by Bokenkamp and Bohnhorst [22] were recorded in the appropriate box. Then, GE scores were summed and divided by the number of surfaces scored for each individual, which provided the overall patient GE score. These indices are described in Table I.

The OHI-S values range from 0 to 6, and the scores are categorized as; good: a score of 0.0 to 1.2, fair: a score of 1.3 to 3.0, poor: a score of 3.1 to 6.0. All patients whose OHI-S was fair and poor were excluded from this study.

SPSS* Statistics Version 17 was used for statistical analysis (IBM Corp., Armonk, NY, USA). All comparisons were performed by t-test. The significance level was set at the 0.05.

RESULTS:

There were 172 patients, age range 11 to 35 years of both sexes, 59 were wearing conventional brackets (CBs) and the remaining 113 were wearing self-ligating brackets (SLBs). Out of those 172 patients, 49 patients had a band and bonded molars at both arches and only sixty-six of the 172 patients had treated by open bite plate. This study revealed that the patients who treated by conventional brackets have a high chance prevalence of GE (0.82±0.48) compared with self-ligating bracket

and it was statistically significant (p= 0.013) (Table 2). Although the patients who treated without open bite was more than those who treated with (OBP) in the present study. We found that upper arch gingival enlargement index was higher among patients who treated with open bite plate (1.06±0.55), and it was highly significant statistically at 5% level (p=0. 00) (Table 2).

In the present study, we also found that the gingival index showed a statistically significant association between the cemented molar band and bonded molar tube groups (p=0.001) (Table 3). The occurrence of gingival enlargement was greater in the banded molars (1.09±0.58). Statistically significant results were obtained showing that the prevalence of gingival enlargement in males whether they had banded or bonded molars were more than females (p= 0.005, p=0.024) (Table 4).

DISCUSSION:

The presence of the orthodontic band, bracket, wire and other auxiliaries create a profound challenge for hygiene maintenance and interproximal dental care becomes more difficult [3] especially in the posterior region. [23, 24] Although all patients received routine oral hygiene education, the GE parameters showed significant differences between the SLBs and CBs group. Higher prevalence of GE with conventional brackets can be attributed to several factors: patient innate flora, orthodontic bands, or surface roughness of stainless-steel ligature [9]. This finding is in agreement with Pellegrini et al. [25] who reported that self-ligating appliances promote reduced retention of oral bacteria but it is in in conflict with the findings of other studies reported no significant difference between conventional and self-ligating brackets for plaque bacteria levels.[26-28] This contradictory result can be attributed to the difference in study design, the type of SLBs used, study population, age and statistical analyses.

The results of the present study found that there was a statistically significant in GE scores between the band and bonded tube molars. GE score was more occurrence in bonded molars. Our findings corroborate those of Alexander [29] Boyd and Baumrind [30] who found increased inflammatory activity in cemented bands compared to bonds. Likewise, Huser et al observed in their study an increase in micriobial colonization and tissue destruction among patients with orthodontic bands [31].This finding clearly demonstrates that GE was expected in teeth which are banded rather than bonded, which may be explained by factors like the orthodontic bands mechanically irritate gingival tissues, chemical

irritation may happen due to the cement used to retain the band, the greater likelihood of posterior food impaction and the tendency to brush more effectively anteriorly rather than posteriorly[32]. Considering the patient's gender, we found that males, whether they had banded or bonded molars showed more gingival inflammation enlargement than female. This result might be due to that females may be paying more attention to their oral health. In this study we also found that the patients wear OBP had more tendency to occurrence GE. This result may be due to the direct injury of OBP to the gingival. It also may be due to increasing in the amount of visible supra- and subgingival plaque which occurs as a result of changes occurring in the microbial ecology when placement of OBP.

CONCLUSION:

Clinical findings suggest that; better not to use CBs brackets with ligatures in patients with poor oral hygiene, the clinician should try to optimizing treatment with minimal use of accessories and it will better to use of properly fitting molar bands with proper cementation when molar bands are selected.

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TABLES:

Table 1 : Description of the assessed indexes

Debris Index	
Scores	**Criteria**
0	No stain or debris present
1	Soft debris covering not more than one third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered
2	Soft debris covering more than one third, but not more than two thirds, of the exposed tooth surface.
3	Soft debris covering more than two thirds of the exposed tooth surface.
Calculus Index	
Scores	**Criteria**
0	No calculus present
1	Supragingival calculus covering not more than third of the exposed tooth surface.
2	Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
3	Supragingival calculus covering more than two third of the exposed tooth surface or a continues heavy band of subgingival calculus around the cervical portion of the tooth or both.
Gingival Enlargement Index	
Grade	**Criteria**
Grade 0	No signs of gingival overgrowth
Grade I	Gingival hyperplasia confined to interdental papilla
Grade II	Hyperplasia of interdental papilla and marginal gingival
Grade III	Gingival hyperplasia covering at least three-quarters of tooth crowns

Table 2 : Mean and standard-deviation values of the gingival index for each group

variables		Frequency %	Mean	SD	P value
Brackets type	Conventional brackets	59 (34.3%)	0.82	0.48	0.013*
	Self-ligating brackets	113 (65.7%)	0.63	0.45	
Wear OBP	No	106 (61.6%)	0.63	0.49	0.00*
	Yes	66 (38.4%)	1.06	0.55	

* Significant at P <.05.

Table 3 :gingival enlargement index in bonded and banded molar teeth. (N=49)

variables	Mean	SD	P value
Band	1.09	0.58	0.00
bond	0.34	0.46	

* Significant at P <.05.

Table 4 : The Distribution of the gender of the cemented banded and bonded molar

	Band Molars				bonded Molars			
Gender	N	Mean	SD	P value	N	Mean	SD	P value
Male	24	0.50	0.54	0.005*	24	0.36	0.50	0.024*
female	25	0.20	0.30		25	0.30	0.30	

* Significant at P <.05.