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A Longitudinal investigation of the Periodontal changes in adult and adolescent orthodontic patients using bands or bonds on molars

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Abstract

The present study was carried out to evaluate the differences in periodontal response to orthodontic treatment between banded and bonded molar teeth as well as the differences between adults and adolescents.

The samples of the study consisted of 50 patients (16 adults and 34 adolescents) who were received full arch orthodontic appliances with banded or bonded molars. Clinical parameters included plaque and gingival indices as well as probing pocket depth were scored at [pretreatment and at 3, 6, 9, 12 months (during treatment) and at the end of the treatment]. The results demonstrated that during and at the end of the treatment, all the parameters were significantly higher for band molars than for analogous bonded molars. Also, the adolescents showed significantly higher levels of all clinical measurements than adults.

Introduction

Orthodontic therapy may affect the periodontium by favoring plaque retention, by direct injury to the gingiva as a result of overextended bands, and by creating excessive forces, unfavorable forces or both on the tooth and supported structure [1,2].

Dental plaque is organized in a biofilm complex that provides protection and nutrients for periodontopathic bacteria. Several factors can affect microbial colonization including restorations and orthodontic bands and brackets. [3-7]

During the last three decades, bonding brackets directly to tooth surfaces has become the most widely used method of securing fixed orthodontic appliances. During the same period, there has also been a dramatic increase in the number and percentage of adults receiving orthodontic treatment. Yet few systematic studies of periodontal implications of these changes have been undertaken. To date, most studies of periodontal disease among orthodontic patients have been conducted on adolescents whose teeth had been bonded. [8-13]

Zachrisson [14] compared treatment associated periodontal changes in adolescents treated with banded appliances and those treated with bonded appliances. The results of that investigation showed less plaque accumulation and gingival inflammation around bonded teeth.

Other studies of adolescents using fixed orthodontic treatment have showed that plaque accumulation and periodontal inflammation are more

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severe on molar region than on anterior teeth [15,16] and there is a reason to suspect that bonded molars experience less gingival inflammation than do banded molars. [17]

Other study compared adolescents and adults receiving fixed orthodontic treatment showed that adolescents had more gingival inflammation than adults. [18] However, in that study, no comparison was made between banded and bonded teeth.

The present study was conducted to test several hypotheses concerning differences in periodontal response to orthodontic treatment. Because periodontal pathology is most likely to be occurred first in the molar interproximal region, [19,20] that region was adopted as our experimental locus.

Determination the differences in periodontal response to orthodontic treatment between banded and a bonded molar as well as the differences between adults and adolescents was the aim of the present study.

Materials and method

The sample consisted of 50 consecutive patients, adolescents and adults, who were received fixed orthodontic treatment in both arches at orthodontic consultant clinic of the college of dentistry, University of Al-Mustansiriya, and who met the following criteria: (1) no history of rheumatic fever, congenital heart disease, blood dyscreasis, diabetes mellitus, or any type of periodontitis. (2) no antibiotic therapy or any antibacterial agent known to inhibit plaque during the previous 6 months; (3) between 10-16 years old for adolescent group and over 21 years for the adult group.

At the onset of the study there were 16 subjects (10femele, 6male) in the adult group and 34 subjects (20 female, 14 male) in the adolescent group. The mean age for the adolescent group was 14 years and the mean age for the adult group was 25 years.

Scaling and polishing were done for each patient one month prior to orthodontic treatment and the routine instructions and motivation for keeping good oral hygiene and plaque control were given to each patient shortly after pretreatment recordings were made. All these procedures were done by one periodontist for all patients included in the study. The periodontal recordings consisted of assessments of pocket depth and two clinical indices, the plaque index [21] (to measure plaque accumulation), the gingival index [22] (to measure gingival inflammation). All these measurements were recorded for each subject at the pretreatment examination (before appliance placement) and at 3, 6, 9, and 12 months and at the end of the treatment to determine the relation ship between the time progression and the severity of the periodontal changes. Pocket depth was defined as the distance from gingival margin to the bottom of the clinical of the clinical pocket and was measured with a calibrated William's periodontal probe.

For each patient assessment were made at two representative sites, on the mesiobuccal aspects of the maxillary first permanent molar and the mandibular left first permanent molar. All measurements were made by the same examiner.

Orthodontic treatment

Maxillary and mandibular full arch edgewise orthodontic appliances were placed for each subject and routine orthodontic treatment was delivered as necessary. None of the patients had fiberotomy or surgical exposure of impacted teeth.

The distribution of banded and bonded maxillary or mandibular molars among the adults and adolescents is shown in table (1).

Results

Of the original of 34 adolescent and 16 adults, three of the adolescents were excluded because the bonds which had originally been placed on their maxillary teeth repeatedly became loose and had to be replaced with bands. Three other adolescents and two adults did not complete the study because they missed multiple treatment appointments or study-related periodontal examinations. Complete study data were obtained for 14 adults and 28 adolescents. The mean treatment time for these patients was 16 months (SD=4.2 months).

At the treatment base line, there were no significant differences in periodontal status between banded and bonded molars (maxillary and mandibular) for the combined adult and adolescent groups (Figure 1-3). However, when pretreatment data for all banded and bonded adults were pooled and compared with similar data for adolescents. Adolescent molars had significantly higher values than did adult molars for Plaque Index, Gingival Index and Pocket depth (Table 2 & 3).

During the period of active orthodontic treatment for the combined adult and adolescent groups, the values for the Plaque and Gingival indices and Pocket depth were all significantly higher for banded maxillary and mandibular molars than for the analogous bonded molars (Figure 1-3). When all adolescents were compared with all adults, significantly higher levels for all clinical measurements were found (Table 2 & 3).

At the end treatment examination, there were significantly higher values for the Gingival index, Plaque index and Pocket depth for the combined adult and adolescent groups when banded molars were compared to bonded molars (Figures 1-3). In addition, significantly higher mean values were found for all clinical measurements for both maxillary and mandibular molars when the entire adolescent group was compared to the entire adult group (Tables 2 & 3).

Discussion

The results of the present study tend in general to confirm the hypotheses and finding of other similar studies. The data revealed that: (1) Banded molars in both adults and adolescents had significantly more plaque accumulation and gingival inflammation than bonded molars. (2) Adolescents whether banded or bonded, showed more plaque accumulation and gingival inflammation than adults before and with advancing time during orthodontic treatment. It was also noted that maxillary molars in general exhibited a greater amount of periodontal inflammation during treatment. This is also in agreement with several earlier studies. [11, 15, 23]

A highly probable explanation for the differences in periodontal status between banded and bonded molars is that plaque removal on the banded molars was made more difficult by the over hanging gingival margins of the orthodontic bands, causing prolonged gingival inflammation and finally loss of attachment and increasing probing pocket depth. [24] An alternative possible explanation for increasing pocket depth is the mechanical injury [25] caused by the subgingival placement of orthodontic bands.

Many of our findings are in agreement with those of previous studies. These include the observations

that molars with orthodontic bands have more plaque accumulation, gingival inflammation, [26-28] than non banded teeth or than banded or bonded anterior teeth. Further, they have a quantitatively and qualitatively different type of bacterial flora whose presence is positively associated with gingival inflammation.

Only mesiobuccal surfaces were used as study sites. They may have led to under estimation of the actual amount of periodontal inflammation. However, a previous study [19] revealed evidence that distal proximal surfaces show recordings of periodontal destruction similar to those of mesial surfaces. Buccal surfaces were not sampled because these surfaces tend to show less periodontal inflammation than proximal sites [20, 29] and are more likely to show tooth brush abrasion. [30]

When the periodontal status of all adults was compared with that of all adolescents, statistically significant differences were detected during orthodontic treatment.

There are several possible reasons why lower plaque accumulation and gingival inflammation levels were found adults than adolescents during orthodontic treatment. First, adults generally have teeth that are more fully erupted and have longer clinical crowns than adolescents. For this reason, bonded attachments and band margins in adults can be located further occlusally with respect to the gingival margin than is usually possible in adolescent, thus facilitating plaque removal. [18] Secondly, the increased hormonal levels that occur during pubertal growth during adolescence are associated with an increased degree of periodontal inflammation and gingival hyperplasia. [10] Thirdly, the periodontal indices used in this study were weighted heavily toward inflammatory changes such as redness; swelling and bleeding that are characteristics of gingivitis, a condition which is more prevalent in adolescents than in adults. [31]

The findings of this study are predicated on the delivery of preventive periodontal treatment in conjunction with orthodontic treatment to prevent the anticipated periodontal destruction resulted from markedly plaque accumulation around orthodontic appliances. In addition, during orthodontic treatment all patients must be received monthly reinforcement of instructions about keeping good oral hygiene and plaque removal.

Instructions and motivation for the patients to achieve self plaque control must include information about using interdental cleaning aids when are modified for orthodontic use. Also, with patients lacking manual dexterity or poor compliance it is advisable to use chemical plaque control (like chlorhexidine mouth wash) to assist those patients to keep a good oral hygiene during orthodontic treatment.

References

1- Butler J, Dowling P. Orthodontic bonded retainers. J Ir Dent Assoc. 2005; 51(1):29-32.
2- Newmwan M, Takei H, Carranza F. Carranza's clinical periodontology. 9th ed. Saunders, 2003; 191-193.
3- Naranjo AA, Trivino ML, Jaramillo A, Betancourth M, Botero JE. Changes in subgingival microbiota and periodontal parameters before and 3 months after bracket placement. Am J Orthod Dentofacial Orthop. 2006; 130(3):275.
4- Abdulwahab A, Nidhal H. Ghaib. Bacterial dental plaque in orthodontic patients. J of Baghdad College of Dentistry. 2002; 15: 59-61.
5- Pandis N, Vlahopoulos K, Madianos P, Eliades T. Long term periodontal status of patients with mandibular lingual fixed retention. Eur J Orthod. 2007; 29(5): 471-6.
6- Gomes Sc, Varela CC, Da Veiga SL, Rosing CK, Oppermann RV. Periodontal conditions in subjects following

orthodontic therapy, A preliminary study. Eur J Orthod. 2007; 29(5): 477-81.
7- Ristic M, Vlahovic Svabic M, Sasic M, Zelic O. Clinical and microbiological effects of fixed orthodontic appliances on periodontal tissues in adolescents. Orthod Craniofac Res. 2007; 10(4): 187-95.
8- Hollander L, Ronnerman A, Thilander B. Root resorption, marginal bone support and clinical crown length in orthodontically treated patients. Eur J Orthod. 1980; 1: 197-205.
9- Sadowsky C, BeGole E. Long-term effects of orthodontic treatment on periodontal health. Am J Orthod 1981; 80: 156-172.
10- Boyd RL, Longitudinal evaluation of system for self-monitoring plaque control effectiveness in orthodontic patients. J Clin Periodontol 1983; 10: 380-388.
11- Hamp S, Lundstrom F, Nyman S. Periodontal conditions in adolescents subjected to multiband orthodontic treatment with controlled oral hygiene. Eur J Orthod 1982; 4: 77-86.
12- Kennedy DB, Joondeph DR, Osterberg SK, Little RM. The effect of extraction and orthodontic treatment on dentoalveolar support. Am J Orthod 1983; 84: 77-86.
13- Polsen AM, Reed BE. Long-term orthodontic treatment on crestal alveolar bone level. J Periodontol 1984; 55: 28-34.
14- Zachrisson BU. A posttreatment evaluation of direct bonding in orthodontics. Am J Orthod 1977; 71;173-189.
15- Sjolien T, Zachrisson BU. Periodontal bone support and tooth length in orthodontically treated and untreated persons. Am J Orthod 1973; 64: 28-37.
16- Zachrisson BU, Alnaes L. Periodontal condition in orthodontically treated and untreated individuals, Loss of attachment, gingival pocket depth and clinical crown height. Angle Orthod 1973; 43: 402-411.
17- Zachrisson BU. Bonding in orthodontics. Orthodontics-current principles and techniques. St. Louis, CV Mosby, 1985; 485.
18- Boyd RL, Leggott PJ, Quinn RS, Eakle WS, Chambers D. Periodontal implications of orthodontic treatment in adults with reduced or normal periodontal tissues versus those of adolescents. Am J Orthod Dentofacial Orthop 1989; 96: 191-199.
19- Schei O, Waerhaug J, Lovadal A, Arno A. Alveolar bone loss as related to oral hygiene and age. J Periodontol 1959; 20: 7-16.
20- Anerud A, Loe H, Boyen H, Smith M. The natural history of periodontal disease in man. Changes in gingival health and oral hygiene before 40 years of age. J Periodontal Res 1979; 14: 526-540.
21- Silness J, Loe M. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. Acta Odont Scand 1964;22:121-135.
22- Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odont Scand 1963;21:533-551.
23- Trosello V, Gianelly A. Orthodotic treatment and periodontal status. J Periodontol 1979;50:665-671.
24- Lang NP ,Keil RA, Anderhalden K. Clinical and microbiological effects of subgingival restorations with overhanging or clinically perfect margins. J Clin Periodontol 1983;10:563-578.
25- Lundstrom F, Hamp S-E, Nyman S. Systematic plaque control in children undergoing long-term orthodontic treatment. Eur J Orthod 1980;2:27-39.
26- Kloehn JS, Pfeifer JS. The effect of orthodontic treatment on the periodontium. Angle Orthod 1974;44:127-134.
27- Baxter DH. The effect of orthodontic treatment on alveolar bone adjacent to the cemento-enamel junction. Angle Orthod 1976;37:35-47.
28- Pearson LE. Gingival height of the lower central incisors in the orthodontically treated and untreated. Angle Orthod 1968;28:337-339.
29- Clerehugh V, Lennon MA, Worthington HV. Aspects of the validity of buccal loss of attachment ≥ 1mm in studies of early periodontitis. J Periodontol 1988;14:207-210.
30- Zachrisson BU. Cause and prevention of injuries to teeth and supporting structures during orthodontic treatment. Am J Orthod 1976;69:285-300.
31- Page RC. Gingivitis. J Clin Periodontol 1986;13:345-355.

Table 1: Distribution of bonded versus banded molars

Groups	Bonded	Banded	Total
Maxillary			
Adult	5	9	14
Adolescent	5	23	28
Total	10	32	42
Mandibular			
Adult	4	10	14
Adolescent	10	18	28
Total	14	28	42

Tables 2: Maxillary molars

	Pretreatment			During treatment			End of treatment		
	Adult (n=14)	Adoles. (n=28)	Sig.	Adult (n=14)	Adoles. (n=28)	Sig.	Adult (n=14)	Adoles. (n=28)	Sig.
Plaque Index	0.65	0.59	NS	1.51	1.71	S	2.05	2.25	S
Gingival Index	0.6	0.62	NS	1.37	1.66	S	1.85	2.2	S
Pocket depth	1.9	1.96	NS	2.7	3.14	S	3.33	3.82	S

Tables 3: Mandibular molars

	Pretreatment			During treatment			End of treatment		
	Adult (n=14)	Adoles. (n=28)	Sig.	Adult (n=14)	Adoles. (n=28)	Sig.	Adult (n=14)	Adoles. (n=28)	Sig.
Plaque Index	0.57	0.6	NS	1.38	1.6	S	1.85	2.33	S
Gingival Index	0.52	0.57	NS	1.25	1.53	S	1.8	2.1	S
Pocket depth	1.8	1.87	NS	2.52	3.13	S	3.18	3.7	S

Figure 1: Mean Plaque Index (PL I) of the combined adult and adolescent groups for maxillary or mandibular banded or bonded molars

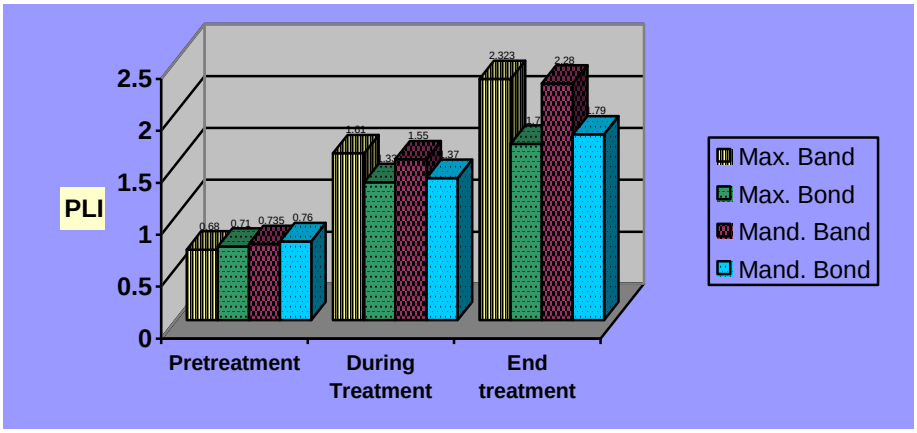

Figure 2: Mean Gingival Index (G I) of the combined adult and adolescent groups for maxillary or mandibular banded or bonded molars

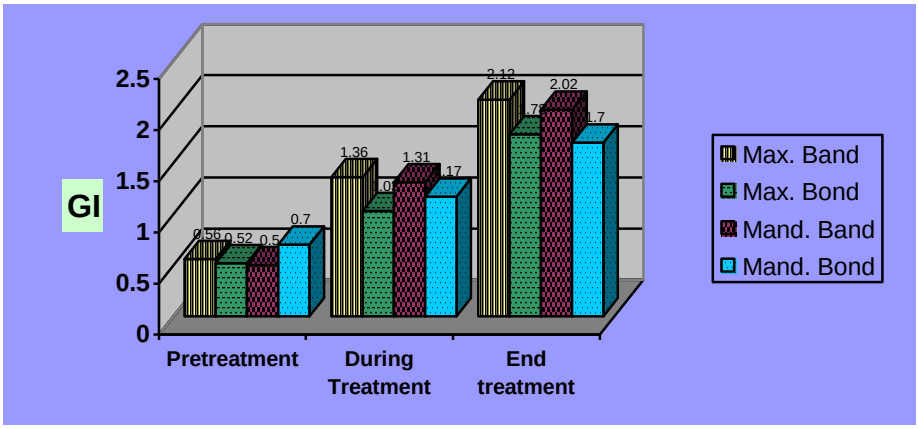

Figure 3: Mean Pocket depth (PD) of the combined adult and adolescent groups for maxillary or mandibular banded or bonded molars