Comparative Study of Periodontal Status of Early Orthodontic Subjects treated with Self-ligating Brackets vs Conventional Edgewise Brackets

1Biken Shrestha, 2Xiubin Jin, 3Lili Chen, 4Rachana Shrestha

ABSTRACT

Objective: To evaluate the periodontal changes that occur during the leveling and alignment stage in orthodontic patients treated with self-ligating and conventional brackets.

Materials and methods: A total of 100 orthodontic subjects aged 12 to 20 years were scheduled for fixed orthodontic treatment were selected for this study. Subjects were divided into two groups—Group 1 consists of 50 patients treated with self-ligating bracket (SLB) (aged 13.88 ± 2.26) and Group 2 consists of 50 patients treated with conventionally ligated bracket group (aged 14.29 ± 2.46). Plaque index (PI), gingival index (GI), probing depth and bleeding on probing were recorded 1 week before bonding and 3 months after bonding. Paired t-test, unpaired t-test and Mann-Whitney U-test were performed to compare the groups statistically (p = 0.05).

Results: Significant increase in PI, GI, probing depth, bleeding on probing were observed in each Group 3 months after bonding. Though the periodontal parameters were increased more in Group 2 than in Group 1 in 3 months, no statistically significant differences were noted between the groups.

Conclusion: The use of SLBs or the conventionally ligated brackets have no difference in the periodontal response in early orthodontic patients. Oral hygiene prophylaxis before the start of the orthodontic treatment and its maintenance throughout the treatment duration is of prime importance.

Keywords: Self-ligating brackets, Conventional edgewise brackets, Periodontal status, Orthodontic subject, Comparative study.

INTRODUCTION

Adverse changes in microflora occur shortly after placement of orthodontic appliances, and these are reflected by increased plaque, bleeding and probing depth. These problems have been related to difficulties in maintaining oral hygiene, caused by the presence of orthodontic appliances, which can cause accumulation of bacterial plaque. The accumulation of plaque and the resultant alteration of the local microbial milieu may expose the tissues to the risk of developing periodontal inflammation, with notable changes in the biota.

Some studies have reported that the placement of orthodontic appliances affects the subgingival microbial composition, increasing the prevalence of periodontopathogens. Differences of periodontal response with different ligation techniques have been studied. Studies that compared elastomeric ligation and wires found more microorganism in patients with elastomeric rings than those with steel wires, and show no significant differences in the gingival index (GI), bonded bracket plaque index (PI), or pocket depths of the bonded teeth. Little information is available on comparisons of periodontal status in orthodontic patients with self-ligating brackets (SLBs) and conventional edgewise brackets (CBs) ligated with steel wire.

The purpose of this study was to evaluate the periodontal changes that occur in patients treated with SLBs and CBs ligated with steel wires during early orthodontic treatment. The null hypothesis of this study is that no differences in the periodontal status exist with SLBs and CBs between the initial leveling stages of orthodontic treatment.
MATERIALS AND METHODS

Subjects for the study were selected from the patients who came for orthodontic treatment in the Department of Orthodontics from December 2011 to July 2012. One hundred subjects (39 males, 61 females), were randomly enrolled from the age group 12 to 20 years without any sexual predilection. Subjects were randomly divided into two groups—Group 1 (Fig. 1) consisting of 50 subjects (17 males and 33 females) treated by SLBs (Tomy International Inc, Japan) and Group 2 (Fig. 2) consisting of 50 subjects (22 males and 28 females) with CBs (Equilibrium 2, Dentaurum, Germany), ligated with stainless steel ligatures. According to Pandis et al, the sample size of 16 patients per group at α = 0.05 yields a statistical power close to 0.8 for this kind of study. Informed consent of patients was acquired from the patient and the guardian. The protocol for the research project was undertaken with approval from the Ethics Committee.

Patients were excluded if they were users of systemic or subgingival antimicrobials within 3 months before the baseline examination, users of systemic medication for chronic diseases, those who had undergone periodontal treatment within 3 months before examination, smokers, pregnant women or lactating women and patients with any systemic disorder that could influence periodontal condition or response to treatment and periodontal pockets depth more than or equal to 3 mm.

Indices recorded were PI, GI, probing depth and bleeding on probing 1 week before bonding the brackets (T1) and 3 months after bonding (T2). All clinical examinations were carried out by the same clinician. Clinical measurements were conducted both at T1 and T2. Patients were advised regularly as with normal procedures to keep their oral hygiene clean. No dropouts were recorded during the study. It was not possible to measure the periodontal parameters blinded, but the researcher was blinded to the previous scores.

STATISTICAL ANALYSIS

The statistical package for the social sciences (SPSS), version 20.0 for Windows (SPSS Inc, Chicago, Ill) was used for descriptive and analytical statistical analysis. Paired t-test was used to compare PI, GI, PD and BOP at T1 and T2. Significance of difference between groups was determined using the unpaired t-test or the Mann-Whitney U test. A p-value of 0.05 was considered significant.

RESULTS

A total of 100 patients (39 males, 61 females; mean aged 14.0 ± 2.34) were enrolled in the study, irrespective of gender. First group consists of 50 subjects (17 males and 33 females; mean age 13.88 ± 2.26) treated by SLBs and second group consists of 50 subjects (22 males and 28 females; mean age 14.29 ± 2.46) with CBs, ligated with stainless steel ligatures (Table 1).

Plaque Index

The mean PI, in Group 1, at T1 was 0.74 ± 0.36 and at T2 was 1.25 ± 0.32. In Group 2, PI at T1 was 0.89 ± 0.30 and T2 was 1.51 ± 0.34. There was statistically significant increase in PI observed from T1 to T2 (Table 1). No significant difference was observed of PI scores between Groups 1 and 2 (Table 2).

Gingival Index

In Group 1, GI at T1 was 0.70 ± 0.30 and at T2 was 1.18 ± 0.14. In Group 2, GI at base line was 0.73 ± 0.36 and after 3 months was 1.21 ± 0.11 (Table 1). There was statistically significant increase in GI after 3 months. And, statistically no significant difference in GI between Groups 1 and 2 was noted (Table 2).

Probing Depth

In Group 1, mean probing depth (PD) at T1 was 1.21 ± 0.17 mm and at T2 was 1.49 ± 0.22 mm. In Group 2, mean
probing depth at T<sub>1</sub> was 1.28 ± 0.19 mm and at T<sub>2</sub> was 1.55 ± 0.24 mm (Table 1). There was significant increase of PD in T<sub>2</sub> compared to T<sub>1</sub>, no statistically significant difference was noted between the Groups 1 and 2 (Table 2).

**Bleeding on Probing**

Bleeding on probing (BOP) score in Group 1 was 0.056 ± 0.042 in T<sub>1</sub> and 0.132 ± 0.101 in T<sub>2</sub>. In Group 2, at T<sub>1</sub> BOP score was 0.084 ± 0.080 and after 3 months 0.156 ± 0.084 (Table 1). The BOP significantly increased after 3 months in both the groups, but there was no significant difference between the Groups 1 and 2 (Table 2).

The periodontal indices are also shown in Graph 1.

**DISCUSSION**

Bonded orthodontic brackets hinder access for good oral hygiene and create microbial shelters, resulting in the accumulation of plaque. The appliance architecture specifically, the archwire ligation method is an additional factor influencing bacterial colonization.

Trials have compared the impact of CBs and elastomeric ligation on plaque retention. The teeth ligated with steel wires and elastomeric rings show no significant differences in the GI, bonded bracket PI, or pocket depths of the bonded teeth. The comparison of impact of SLBs and conventional brackets have been evaluated in few studies. Pellegrini et al<sup>24</sup> studied patients bonded with SLB and CBs were bonded with split-mouth design and plaque samples were assayed at 1 and 5 weeks after bonding found that teeth bonded with SLB attachments had fewer bacteria in plaque than did teeth bonded with edgewise appliances with elastomeric ligation concluding that self-ligating bracket appliances promote reduced retention of oral bacteria.

According to Pandis et al<sup>25</sup> SLBs do not have an advantage over conventional brackets with respect to the
periodontal status. Pandis et al\textsuperscript{13} found no difference in the demographics and oral hygiene indices (simplified plaque index and DMFT index) between orthodontically treated patients between conventional and SLBs. Pejda et al\textsuperscript{26} showed that the SLBs and CBs did not show statistically significant differences in periodontal clinical parameters.

In our study, we compared periodontal status of the SLBs with conventional brackets ligated with steel ligature wires. We found no significant difference in PI, GI, PD and BOP between the two groups after 3 months of onset of the orthodontic treatment. Our results were similar to the finding of other studies.

Studies have demonstrated increased amounts of \textit{Streptococcus mutans} and lactobacilli in saliva and dental plaque during orthodontic treatment.\textsuperscript{10,27} To prevent detrimental effects of orthodontic treatment on periodontal and gingival tissues, oral hygiene programs before orthodontic treatment were strongly recommended.\textsuperscript{28,29}

In our study, all patients received oral hygiene education before treatment.

CONCLUSION

The use of SLBs or the CBs has no difference in the periodontal response in orthodontic patients during leveling and alignment stage. Bracket designs do not seem to have effect on the periodontal response but on the individual and alignment stage. Bracket designs do not seem to have effect on the periodontal response during orthodontic patients during leveling and alignment stage. Bracket designs do not seem to have significant differences in periodontal clinical parameters.

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DISCLAIMER

The authors received no financial assistance from the manufacturing companies of the brackets used in this study. There are no proprietary, financial, professional or other personal interests of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in the manuscript.

REFERENCES


