

Effects of 2 bracket and ligation types on plaque retention: A quantitative microbiologic analysis with real-time polymerase chain reaction

Zeliha Müge Baka,^a Faruk Ayhan Basciftci,^b and Ugur Arslan^c
Konya, Turkey

Introduction: The aim of this study was to evaluate the effects of self-ligating brackets and conventional brackets ligated with stainless steel ligatures on dental plaque retention and microbial flora. **Methods:** Twenty boys (mean age, 14.2 ± 1.5 years) underwent bonding with self-ligating bracket systems and conventional standard edgewise bracket systems ligated with stainless steel ligatures with a split-mouth design. Clinical measurements, including plaque index, probing pocket depth, and bleeding on probing, were obtained before bonding, 1 week after bonding, and 3 months after bonding. Supragingival plaque samples were obtained at baseline and 3 months after bonding for the detection of bacteria. A quantitative analysis for *Streptococcus mutans*, *Streptococcus sobrinus*, *Lactobacillus casei*, and *Lactobacillus acidophilus* was performed using real-time polymerase chain reaction. The Mann-Whitney U test and the Hotelling T^2 multivariate test were used for statistical comparisons of the groups. **Results:** The numbers of *S mutans*, *S sobrinus*, *L casei*, and *L acidophilus* were not statistically different between self-ligating brackets and conventional brackets ligated with stainless steel ligatures ($P > 0.05$). The 2 archwire ligation techniques showed no statistically significant differences in plaque index, bleeding on probing, and probing pocket depth values of the bonded teeth ($P > 0.05$). All clinical parameters and the numbers of all microorganisms showed statistically significant increases from baseline to 3 months after bonding in both groups ($P < 0.001$). **Conclusions:** Self-ligating brackets and conventional brackets ligated with stainless steel ligatures do not differ with regard to dental plaque retention. (Am J Orthod Dentofacial Orthop 2013;144:260-7)

Orthodontic appliances have a negative impact on oral hygiene.¹ Orthodontic bands, brackets, and archwires used during fixed orthodontic treatment impede oral hygiene procedures and cause the accumulation of microbial dental plaque by creating new retention areas.^{2,3} Microbial dental plaque is the main etiologic factor in the development of dental caries and periodontal diseases.⁴ Enamel demineralization occurs around the brackets because of a decrease in the pH level caused by increases in the number and

volume of acid-producing bacteria, mainly *Streptococcus mutans*, *Streptococcus sobrinus*, and lactobacilli, and metabolism of sugars by these cariogenic bacteria.^{5,6} Enamel demineralization, termed white spot lesions, is a common side effect of orthodontic treatment. White spot lesions can be seen in approximately 50% of patients after fixed orthodontic treatment.⁷⁻⁹

Many studies have reported increases in the amounts of cariogenic microorganisms, including *S mutans* and lactobacilli, in the dental plaque and saliva of patients after the bonding of orthodontic appliances.¹⁰⁻¹⁵ During fixed orthodontic treatment, gingival inflammation occurs,^{1,16,17} and the pathologic changes in patients treated with fixed orthodontic appliances have been reported as mostly gingivitis, gingival bleeding, gingival enlargement, and increased periodontal pocket depth.¹⁸ The ligation method of the orthodontic archwires is an additional factor to be taken into account for microbial dental plaque retention. Elastic and stainless steel ligatures are used to tie stainless steel wires into the brackets and are often linked to the risk of dental caries in orthodontic

From Selçuk University, Konya, Turkey.

^aPostgraduate student, Department of Orthodontics, Faculty of Dentistry.

^bProfessor and chair, Department of Orthodontics, Faculty of Dentistry.

^cAssociate professor, Department of Microbiology, Faculty of Medicine.

All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and none were reported.

Based on the thesis of Zeliha Müge Baka for the PhD degree; supported by Selçuk University Research Projects (11102023).

Reprint requests to: Zeliha Müge Baka, Selçuk Üniversitesi, Dişhekimliği Fakültesi, Ortodonti AD, Selçuklu-42079, Kampüs/Konya, Turkey; e-mail, mugen97@hotmail.com.

Submitted, January 2013; revised and accepted, March 2013.

0889-5406/\$36.00

Copyright © 2013 by the American Association of Orthodontists.

<http://dx.doi.org/10.1016/j.ajodo.2013.03.022>

patients.¹³ Many studies have evaluated the effects of fixed orthodontic appliances on dental plaque retention and microbial flora.^{2,11,12,14,15,19-27} However, few studies have evaluated the effect of the ligation method.^{13,28-33}

In previous studies, although various techniques have been used for the assessment of microbial flora, the microbiologic culture technique was the most widely used.^{15,29,32,34-38} However, the laboratory procedures for this technique can be faulty, time-consuming, and laborious. Recently, to overcome these limitations, polymerase chain reaction (PCR) has been used. PCR is a simple, fast, and accurate method for the identification and detection of microorganisms; in this method, specific DNA fractions are used, and small numbers of pathogens can be detected in the sample.^{39,40}

Recently, the effects of self-ligating brackets on oral hygiene have been investigated, and a few studies are available on this topic. The hypothesis that we investigated was that self-ligating brackets have an advantage in terms of the accumulation of plaque because of the absence of ligatures. To our knowledge, no study has compared the effects of self-ligation and stainless steel wire ligation on dental plaque retention and microbial flora with real-time PCR. Therefore, our aim was to evaluate the effects of self-ligating brackets and conventional brackets ligated with stainless steel ligatures on dental plaque retention and microbial flora using real-time PCR and a split-mouth design.

MATERIAL AND METHODS

Twenty boys were randomly selected from patients about to start orthodontic treatment with maxillary and mandibular fixed appliances in the orthodontic department of Selçuk University in Konya, Turkey. Their mean age was 14.2 ± 1.5 years (range, 11.0-16.7 years). This study was approved by the ethics committee of Selçuk University Meram Medical School (number 2011/233), and written informed consent was obtained from the patients or their parents. We evaluated the clinical index examinations and the supragingival plaque samples from these subjects at different times during the study. Inclusion criteria were minimal or moderate crowding, nonextraction fixed orthodontic therapy, permanent dentition, adequate oral hygiene, and use of the right hand while brushing the teeth. Exclusion criteria were impacted or missing teeth (except molars), systemic disease, and use of antibiotics within the previous 3 months.

After the initial examination, all patients underwent supragingival scaling and polishing and were given instructions on dental hygiene. They were instructed to brush their teeth thrice a day. They were provided standardized toothpastes and toothbrushes and asked not to

use any other oral-care products during the study. Also, they were asked to maintain their routine eating habits. No additional information about oral hygiene was given during the 3 months. Three weeks after the initial examinations, the patients were given appointments for the sampling and bonding processes.

This investigation was designed as a split-mouth study. The patients were randomly assigned to 2 groups: in the first group, bonding was performed with self-ligating brackets (Damon Q; Ormco, Orange, Calif) in the maxillary right and mandibular left dentitions and conventional edgewise brackets (Roth-equilibrium 2, 722-341; Dentaaurum, Pforzheim, Germany) in the maxillary left and mandibular right dentitions. In the second group, bonding was performed using conventional edgewise brackets in the maxillary right and mandibular left dentitions and self-ligating brackets in the maxillary left and mandibular right dentitions, both with 0.022-in slots. The conventional edgewise brackets were ligated with 0.010-in conventional stainless steel ligature wires. A 0.014-in copper-nickel-titanium archwire was used for the initial leveling. During the study period, no additional materials, such as chains, coil springs, or figure-8 ligatures, which could have adversely affected oral hygiene, were used. Clinical periodontal measurements were obtained before bonding, 1 week after bonding, and 3 months after bonding. Supragingival plaque samples were obtained before bonding and 3 months after bonding.

Clinical periodontal measurements, including plaque index, probing pocket depth, and bleeding on probing, were obtained before bonding, 1 week after bonding, and 3 months after bonding. Plaque index, probing pocket depth, and bleeding on probing values were recorded for all bonded teeth, except for the molars, at 3 sites per tooth. The periodontal evaluation was carried out by the same trained clinician (Z.M.B) using a periodontal probe (Hu-Friedy, Chicago, Ill).

Supragingival plaque samples were obtained before bonding and 3 months after bonding. The microbiologic samples were collected before the clinical periodontal evaluation by the same clinician (Z.M.B.). The sampling process was conducted in the morning, and the patients were asked to abstain from eating or toothbrushing on the days of their appointments. At each appointment, the ligatures and archwires were carefully removed. The sampling sites were isolated from water and saliva with cotton rolls and gently air dried. Sterilized curettes were used to obtain microbial samples from the labial surfaces of the lateral incisors. The samples from the maxillary right lateral incisor and the mandibular left lateral incisor were pooled, and the samples from the maxillary left lateral incisor and the mandibular right

Download English Version:

<https://daneshyari.com/en/article/3116050>

Download Persian Version:

<https://daneshyari.com/article/3116050>

[Daneshyari.com](https://daneshyari.com)