

Effects of vacuum-formed retainers on periodontal status and their retention efficiency

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Introduction: The stability of treatment results is a major concern in orthodontics. Numerous retention regimens to maintain stability have been introduced. The objectives of this study were to evaluate the effects of vacuum-formed retainers (VFRs) on periodontal tissues and the retention efficiency of VFRs. **Methods:** Forty patients were included in this study. Clinical effectiveness of VFRs for nighttime use only over a 12-month period was assessed by using the American Board of Orthodontics' Objective Grading System. Periodontal measurements and indexes were recorded and evaluated immediately after removal of the braces and after 1, 6, and 12 months of VFR use. **Results:** There was no significant change in the total Objective Grading System score between the end of the active treatment period and the end of the 12-month retention period. However, regarding periodontal measurements, the plaque and gingival indexes decreased, whereas the bleeding on probing, probing depth, calculus index, and clinical attachment loss increased between the evaluated periods. **Conclusions:** In terms of periodontal health, the use of VFRs resulted in a slight periodontal attachment loss that seemed to be clinically insignificant, without gingival inflammation or recession. In terms of stability, VFRs were found to be effective in orthodontic retention. (Am J Orthod Dentofacial Orthop 2017;152:830-5)

The success of an orthodontic treatment should not be defined only as the achievement of perfectly aligned teeth and occlusion; the definition must also consider the stability of the results. Long-term studies have shown that relapse occurs in approximately 70% of orthodontic patients, and that it is impossible to predict the degree of relapse.^{1,2} In the long term, relapse can be associated with changes related to growth and orthodontic treatment.³ Up to a year may be needed for the periodontal tissues, alveolar bone, and surrounding soft tissues to reorganize and adapt to the new positions of replaced teeth.^{4,5} Therefore, it is important to help prevent relapse with appropriate retention procedures.

Studies have introduced numerous retention regimens aimed at preventing relapse after orthodontic treatment. The most commonly prescribed types have been Hawley retainers, bonded canine-to-canine retainers, and vacuum-formed retainers (VFRs).⁶⁻¹⁰ Despite their disadvantages, such as reduced vertical settling and occlusal wear, VFRs are becoming increasingly popular due to their improved esthetics, ease of application, reduced cost, and ease of fabrication.^{7,11-13} The influence of retention regimens on periodontal health is as important as their effectiveness in preventing relapse. To date, only a few studies have focused on the periodontal health implications of orthodontic retainers.¹⁴⁻¹⁸ The aims of this study were to evaluate the effects of VFRs on periodontal health and their retention effectiveness.

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

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MATERIAL AND METHODS

The study protocol was approved by the Ethics Committee of Istanbul University Faculty of Medicine for Human Subjects. The study was carried out at the Departments of Orthodontics and Periodontology clinics, Faculty of Dentistry, at Istanbul University. Written informed consent was obtained from all subjects or their legal guardians before their inclusion.



Fig. Maxillary and mandibular VFRs.

Forty patients were included in this study. The test group comprised 21 patients (14 female, 7 male) with a mean age (\pm standard deviation) of 15.9 ± 2.0 years (range, 12–19 years). The control group comprised 19 patients (16 female, 3 male) with a mean age of 16.0 ± 2.7 years (range, 10–19 years). Subjects in the test group received fixed orthodontic therapy using a straight-wire appliance. The control subjects were periodontally healthy persons who received no orthodontic treatment and were age-matched with the test group. This group was used to confirm the periodontal health status of the patients who had orthodontic treatment before the application of retainers. Values of the control group were also used as healthy references for comparisons with the test group.

Subjects were excluded from the study if they met any of the following criteria: (1) severe malocclusion according to the American Board of Orthodontics (ABO) discrepancy index; (2) need for fixed retention; (3) disability preventing removable appliance use; (4) periodontal disease; (5) any systemic disease, at any time, that could influence the periodontium; (6) antibiotic, anti-inflammatory, or steroid drug use; (7) rapid maxillary expansion; (8) interdental stripping or gingival fiberotomy; (9) cleft lip or palate or orthognathic surgery, or (10) smoking.

Among the participants who met the criteria for inclusion, those with similar degrees of malocclusion were included in the study. Degree of malocclusion was assessed by determining the ABO discrepancy index, based on candidates' initial records.¹⁹ Initial periodontal records were taken at the debonding appointment after

removal of the braces but before adhesive removal or polishing. Immediately after the records were taken, residual adhesives were removed, polishing was performed, oral hygiene instructions were given, and alginate impressions were taken for preparation of VFRs.

VFRs were constructed by the same laboratory technician with 0.04-in plastic material (Essix ACE; Dentsply International, York, Pa), which was trimmed to extend 2 mm in the buccal direction and 2 to 4 mm in the lingual direction (Fig). VFRs covered all of visible surfaces of all teeth. VFRs were produced and fitted on the same day as debonding. Upon receiving their VFRs, participants were instructed to wear them full-time for the first week and only at night thereafter, and to clean them once a day.

To assess the clinical effectiveness of the VFRs, retainers were scored by using the ABO's Objective Grading System (OGS). Scoring was performed on the basis of casts and panoramic radiographs taken at the debonding appointment and 12 months after debonding.²⁰ All measurements were performed by the same researcher (M.Ç.) using an ABO measuring gauge.

Initial periodontal measurements were performed at the beginning of the study at the same appointment when the fixed appliances were removed, before tooth surface cleaning. After these measurements were recorded, all test group patients received scaling, polishing, and oral hygiene instructions before application of the VFR. Test group patients were recalled for periodontal examinations at 1, 6, and 12 months after receipt of the VFR. Comparisons between time points in the test group were referenced to the 1-month measurement

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