

READER'S FORUM

Ahn HW, Kim KA, Kim SH

A new type of clear orthodontic retainer incorporating multi-layer hybrid materials.

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Clear thermoplastic retainers are widely used in a contemporary clinical orthodontic practice and, yet, it has not been a popular research subject in the literature. I feel this article is appropriate in terms of the quality of information communicated as well as the level of interests among readers of the KJO like myself.

Q1. One of the concerns in dealing with a multi-layer vacuum-formed retainer (VFR) could be the amount of discomfort experienced by patients due to increased thickness of the membrane material and greater volume of the appliance itself. I would appreciate the authors' comment regarding this area.

Q2. Tensile test and water absorption test results have been reported in this article. However, wear test was not conducted in the study even though it could be an equally important factor for a VFR in the oral environment.

Q3. The concept of removable multi-layer vacuum-formed appliances could be expanded beyond its function as retainers. Are the authors aware of any recent development or attempt to use such devices for other clinical purposes?

Questioned by

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A1. Firstly, we want to thank for the insightful comments. Concerning the first question, the reinforced resin core of the VFR should be minimally added to cover the central grooves on the occlusal surfaces while its height should not exceed 1 mm. Also, the resin core could be skipped out on the maxillary second molars to allow reduced thickness as well as settling of the posterior occlusion during the retention period. Since the multi-layer VFR is worn only during sleep, normal settling after removing the braces is not hindered. In addition, since it is known that patients well tolerate up to 4 mm thickness of their mouth guards, the thickness of the multi-layer VFR should not be an issue as it is certainly within the range.

A2. This is a pilot study, which requires an even more thorough evaluation of its mechanical properties including wear test and fracture test. However, such tests are inherently limited in that it is often difficult to mimic the exact oral environment. Previous wear test studies failed to find a significant correlation between *in-vivo* and *in-vitro* study results, and most likely highly-ductile materials may not be suitable for the fracture test. Three-bodied wear test may not be recommended for evaluation of removable appliances, while two-bodied wear test may produce only confounding results when enamel is used as an abradant due to the unique forms and material characteristics of each tooth. Also, the clinical importance of fatigue wear and fracture from cycling loading may be difficult to understand as they are often described as initial wear near the contact points. Therefore, any future

follow up study should be designed to minimize such challenges mentioned earlier.

A3. We agree with the statement. Removable oral appliances are widely used in all aspects of clinical dentistry, and an improvement of material characteristics by incorporating multi-layers can be directly applied to other items such as temporomandibular joint splints, night guards and mandibular advancement devices for obstructive sleep apnea patients. Also, clear aligner and

retainer functions could be readily merged through the multi-layer VFR prepared on a set up model in order to resolve minor rotation and space at the time of brace removal.

Replied by

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