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University of Baghdad
College of Dentistry

EVALUATION OF PEEK CAD/CAM-FABRICATED ORTHODONTIC FIXED LINGUAL RETAINER ADHESION AND DESIGN

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By

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ABSTRACT

Objective: A retention should be considering an integral phase following all active orthodontic treatment. Due to there lifelong retention, the fixed lingual retainer was the one recommended by the orthodontist. Advanced CAD/CAM lingual retainers has been developed in progress. The new CAD/CAM PEEK fixed retainer was one of these retainers with no evalauted adhesion, design and aging. Therefore, the aim of study was to evaluate the PEEK retainer adhesion and design followed by aging test.

Material and methods: For adhesion test, 54 CAD/CAM PEEK pads were exposed to three distinct surface pre-treatments (98 %sulfuric acid, sandblasting, and combination) followed by three different conditioning (Single Bond Universal (SBU), Visio.link, and Heliobond). After pre-treatment, they were analyzed using FTIR and SEM. Shear bond strength, failure analysis, and best adhesion were explored after bonding to premolars with the Transbond^{TM} system.

For the design test, 6 pads with central hole, and 18 mini-retainers of 3x4mm and 2.5x3.5mm sizes, as well as connectors of 2mm and 1.5mm heights, were attached to the premolars using the best adhesion before shear bond strength (SBS) test.

Finally, for aging test, 6 bonded mini-retainers were artificially aged for 30 days' water storage and 5000 thermocycling before being compared to the unaged group. One-way ANOVA and the t-test were used to evaluate the results.

Results: After PEEK sulfonating, FTIR revealed novel spectra, and SEM indicated etched PEEK porosity, sandblasting irregularity, and dispersed porosities of the combination. Etching produced greater SBS than other methods. However, the combined pre-treatment provided no advantages over etching alone. SBU had the greatest SBS after etching, whereas Visio

had the best adhesive after sandblasting. Resin-enamel failure was shown by etching, whereas resin-PEEK failure was revealed by sandblasting. For the design, Perforated pads and the 2mm connection have greater SBS. The bigger pad revealed a little variation in SBS. Furthermore, artificial aging had little effect on the SBS.

Conclusion: The strongest adhesion of PEEK retainer was acid etching followed by SBU without impaction of aging. The optimal design was the perforated 3x4mm pads connected by a 2mm high connection.

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