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Effects of an etching solution on the adhesive properties and surface microhardness of zirconia dental ceramics.

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Abstract

STATEMENT OF PROBLEM: Conventional approaches to adhesive bonding are not applicable to zirconia restorations. Recently, an etching solution, Zeta Etching Solution (ZES), has been introduced for etching the surface of zirconia. The effects of this etching solution on the bond strength and mechanical properties of zirconia are unknown.

PURPOSE: The purpose of this in vitro study was to examine the effects of ZES on the bond strength and surface hardness of zirconia.

MATERIAL AND METHODS: Two different types of partially stabilized tetragonal polycrystalline zirconia (TZP), Prettau zirconia (group P) and anterior Prettau (group AP), were evaluated with and without ZES etching. Each group was bonded to a zirconia substrate by using an adhesive resin cement. After 24 hours of storage in distilled water, the bond strength of the zirconia was analyzed. Vickers hardness was determined by using a microhardness tester. Scanning electron microscopy was used to analyze the surface microstructure and determine the mode of failure for each specimen. Results were analyzed and compared using 1-way ANOVA and Student t tests (α=.05).

RESULTS: Scanning electron microscopy analysis showed that etching the surface of zirconia with ZES etching solution for 60 minutes changed the morphological characteristics and microstructure of zirconia, making the surface more irregular. The changes were more pronounced for AP specimens. Etching with ZES significantly increased the shear bond strength of zirconia (P<.05) in AP specimens. The bond strength of Prettau (P group) specimens after ZES etching did not increase significantly (P>.05). An adhesive failure mode was observed for P zirconia specimens, whereas zirconia specimens exhibited a cohesive mode of failure. No significant decrease (P>.05) was observed in the mean Vickers hardness numbers.

CONCLUSIONS: Within the limitations of this in vitro study, it was concluded that etching

in ZES for 30 minutes significantly enhanced the shear bond strength of highly translucent anterior Prettau (AP) zirconia restorations. Moreover, etching with ZES did not adversely affect the surface hardness of the zirconia specimens tested.

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