Improvement in the Bonding of Y-TZP by Room-temperature Ultrasonic HF Etching.

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Abstract

PURPOSE: To investigate the effects of room-temperature etching with hydrofluoric acid (HF) in the presence and absence of ultrasonic irradiation on the bonding of yttria-stabilized tetragonal zirconia polycrystals (Y-TZP) to resin.

MATERIALS AND METHODS: Y-TZP specimens were etched with 40% HF at room temperature for different time periods (2, 5, 10, 15, 30, 60, and 90 min) with and without ultrasonic exposure. The surface roughness, micromorphology, dimensions, and phases of the treated Y-TZP specimens were evaluated by atomic force microscopy (AFM), scanning electron microscopy (SEM), digital caliper measurement, and x-ray diffraction, respectively. The HF etching conditions that resulted in the most drastic Y-TZP surface morphology and highest roughness values were used to prepare specimens for shear bond strength (SBS) testing; the effect of thermocycling on SBS was also examined. Alumina-sandblasted Y-TZP specimens were used as the control.

RESULTS: The Y-TZP surfaces etched with HF without ultrasonic exposure for 30, 60, and 90 min and those surfaces ultrasonically etched with HF for 10 and 15 min were severely etched, although their dimensions were not changed by etching. Monoclinic-phase zirconia was observed only in the alumina-sandblasted Y-TZP specimens. Surface roughening from HF etching for 30 min and ultrasonic etching for 10 min resulted in higher mean SBS compared to roughening with alumina sandblasting.

CONCLUSION: Ultrasonic etching with 40% HF at room temperature for 10 min may be used as an alternative roughening method for improving the bonding of Y-
TZP.

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