Fracture Resistance and Bond Strength of Two Machinable Ceramic Materials Luted With Adhesive Cement

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Abstract

Objectives: To evaluate the influence of composition, as well as, surface conditions of two machinable all-ceramic materials on the fracture resistance of bonded inlays and ceramic-resin bond strength, with the investigation of the stress pattern involved during bonding testing. Materials and methods: Fracture resistance test: 12 feldspathic inlays and 12 lithium disilicate inlays were fabricated using CEREC3 In Lab (Sirona MCXL, Bensheim, Germany). The inlays of each group were subdivided into 2 subgroups according to surface treatment and subjected to cyclic loading for 5000 cycle followed by static loading till failure. Microtensile bond strength test: 12 pairs of feldspathic specimens and 12 pairs of lithium disilicate glass ceramics were prepared. Each pair was cemented using an adhesive resin cement, then was cut down into 1mm2 microbars. Each microbar was subjected to tensile load till failure. Then finite element analysis was carried out. Results: Fracture resistance: Etched lithium disilicate inlays showed the highest mean fracture resistance value (2485.6Ñ108.4 N), while unetched feldspathic inlays showed the lowest mean fracture resistance value (1551.6Ñ83.080). Statistical analysis showed a significant difference in mean fracture resistance values (N) between inlays of different materials, as well as between etched and unetched inlays. Microtensile bond strength: Etched lithium disilicate glass specimens showed the highest microtensile bond strength values (75.706 MPa), while unetched feldspathic specimens showed the lowest microtensile bond strength values (26.502 MPa). Conclusion: This study suggests that the difference in the composition of ceramic materials, as well as, their surface condition significantly affect their fracture resistance and ceramic-resin bond strength. In addition, bending should be considered during microtensile bond strength testing using the lateral mode of specimen attachment.

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