Microtensile bond strength of varying zirconia cores and glass veneers

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Abstract

Purpose: The objective of this study was to determine the core-veneer bond strength between zirconia-based core ceramics and glass veneers using the microtensile bond strength test.

Materials and Methods: Three zirconia core ceramic systems (Cercon®(C), Lava™(L), and ZENO®(Z)) were used in this study. Each ceramic core was veneered with three different glass veneers (Cercon®Ceram Kiss (CK), Lava™Ceram (LC), and IPS e.max®Ceram (E)) according to the manufacturers' recommendations. Nine groups of bilayered blocks were obtained. Microbar specimens (1mm x 1mm x 8mm) were cut from each veneered zirconia block to a required size. There were twenty microbars in each group. These microbars were loaded in tension with a crosshead speed of 0.5 mm/min until fracture. The fracture surfaces of each specimen were observed using the optical and scanning electron microscopes. Failure modes were classified as interfacial or cohesive failure. One-way ANOVA and the Dunnett T3 multiple comparison tests were used to determine the differences in the bond strength between the experimental groups at α=0.05.

Results: During the cutting procedure, the delamination of Zeno® zirconia veneered with Lava™ Ceram occurred. This group was excluded from the statistical analysis. The zirconia cores that bonded to their commercial veneering porcelains seemed to have greater microtensile bond strength than those of the other groups (C-CK 26.3±11.2MPa, Z-E 22.7±8.6MPa and L-LC 22.7±9.6MPa). The mean bond strength values of L-E (10±2.3MPa), C-E (12±5.2MPa) and Z-CK (12.2±5.1MPa) were significantly lower than those of groups mentioned earlier ($P<0.05$). However, the failure mode of all groups was interfacial which fracture originated from the interface between zirconia core and liner or between liner and glass veneer.

Conclusions: The zirconia cores veneered with the recommended veneering porcelain or porcelain of the same manufacturer exhibited superior bond strength. The failure mode of all groups was identified as interfacial failure.

Keywords: microtensile / CAD-CAM / zirconia / coefficient of thermal expansion / ceramics / interface

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