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Effects of bonding area size, surface treatment and specimen configuration on the push out test for assessing bonding and stress distribution to Y-TZP

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ABSTRACT

Purpose: to evaluate the influence of specimen configuration, bonding area and zirconia surface treatment on the push out bond strength to Y-TZP and on the stress distribution using finite element analysis (FEA). Materials and Methods: 240 Y-TZP blocks with a central perforation were assigned to 8 groups (n=30) according to the adhesive area (macro-test: 5 x 5.5 x 4 mm and micro-test: 5 x 5.5 x 1 mm), material inserted in the perforation (resin cement or composite resin) and surface treatment (silanization or tribochemical silica coating+silanization). Push-out bond strength test, failure modes evaluation and FEA were performed. Results: Three-way ANOVA showed that bond strength was statistically higher for composite resin (p=0.00) and for macro specimens (p=0.00). Surface treatment significantly increased the adhesion, except for 'resin cement macro-test' (p=0.00). Finite element analysis showed that the stresses were more homogeneously distributed at the interface of micro-specimens. Conclusion: Macro-push out with composite resin or cement does not appear to be promising when evaluating adhesion to zirconia ceramics; micro-push out with composite resin filler is an adequate method; the tribochemical silica coating surface treatment can be evaluated by all tested methods in the current study, except for the macro-test with resin cement condition.

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