that the tensile bond strength for group 7 was significantly higher than that for groups 1, 2, 3, 4, and 6, but not for group 5. No significant difference was found between the polished (group 7) and the roughened (groups 8-10) specimens. Water storage or thermocycling had a significant effect on the bond to the roughened test groups but not to the polished one. Bond strengths of the etched, grit blasted, and combination groups gradually increased after water storage and after thermocycling. The silane bond was also capable of resisting hydrolytic attack in boiling water.

Conclusion: The authors conclude that a durable resin-ceramic tensile bond can be obtained with appropriate silane application without the need for hydrofluoric acid etching of the ceramic surface.

COMMENTARY

A current trend in laboratory bonding studies is a shift away from the traditional shear test methods and toward modified tensile tests to minimize nonuniform stresses at the bonding interface. Concurrent findings illustrate the importance of the chemical component of the resinceramic bond and conclude that silane treatment may play a greater role than surface roughening. The results of this study offer excellent validation for this trend and indicate that certain silane application methods might eliminate the need for hydrofluoric acid etching. The large discrepancies between the results of different studies raise the question of the clinical relevance of in vitro bond strength testing methods in general. None of the conventional bond strength tests can exactly simulate the various stress patterns and modes of failure as

they occur in the oral cavity. Improved testing methods and application of clinically relevant influencing parameters may help to better understand these patterns. Nevertheless, laboratory tests are indispensable tools to identify superior materials and techniques in a standardized manner before their reliability is evaluated in clinics.

SUGGESTED READING

- Chadwick RG, Mason AG, Sharp W. Attempted evaluation of three porcelain repair systems—what are we really testing? J Oral Rehabil 1998; 25:610–615.
- Della Bona A, Anusavice KJ, Shen C. Microtensile strength of composite bonded to hot-pressed ceramic. J Adhes Dent 2000; 2:305-313.
- Della Bona A, Van Noort R. Shear versus tensile bond strength of resin composite bonded to ceramic. J Dent Res 1995; 74:1591-1596.
- Øilo G. Bond strength testing-what does it mean? Int Dent J 1993; 43:492-498.

ARE ADHESIVE TECHNOLOGIES NEEDED TO SUPPORT CERAMICS? AN ASSESSMENT OF THE CURRENT EVIDENCE

F.J.T. Burke, G.J.P. Fleming, D. Nathanson, P.M. Marquis Journal of Adhesive Dentistry 2002 (4:7-22)

ABSTRACT

Objective: This article reviews the effects of adhesive technology on the success of all-ceramic restorations in laboratory and clinical studies.

Materials and Methods: The authors reviewed laboratory and clinical studies of the influence of cementation media selection on the performance of all-ceramic restorations.

Results: Conventional testing methods reveal large variations in the fracture strengths of materials used for all-ceramic restorations, such as dispersion-strengthened, glass-infiltrated, castable, pressable, and machinable ceramics. However, the annual clinical failure rate reported in the literature is remarkably consistent at about 3%. This rate indicates little correlation between the average fracture strength of ceramics and their resultant clinical performance and longevity. Several laboratory and clinical studies have emphasized the effects of adhesive technologies on the performance of all-ceramic restorations. Laboratory studies examining the surface sealing and strengthening effects of resin on ceramics strongly recommend the use of composite resins as luting materials. Results from both clinical and laboratory studies reveal that all-ceramic crowns bonded with resin-based cements show significantly superior fracture toughness than those cemented with conventional acid-based (zinc phosphate and glass ionomer) cements.

Conclusions: Results of research from three different sources laboratory fracture studies comparing restorations luted with resin versus other materials, clinical trials, and laboratory studies evaluating the surface sealing/strengthening effect of resin on ceramics—strongly suggest the use of adhesive technologies and composite resins for luting all-ceramic restorations.

COMMENTARY

The thoroughness and clear conclusion of this literature review make it an exemplary one, even though it does not fulfill all of the strict requirements for a systematic review. The culled research articles indicate the necessity of adhesive technologies and composite resin cements for final insertion of all-ceramic restorations. Adhesive bonding procedures require additional steps that are technique sensitive but offer several advantages besides ceramic reinforcement, including increased retention and reduced leakage. Esthetic and biologic factors should be convincing enough to make the additional efforts worthwhile, especially if metal-ceramic restorations are not applicable or would require significantly more invasive treatment.

SUGGESTED READING

Blatz MB, Sadan A, Kern M. Bonding to silica-based ceramics: clinical and laboratory guidelines. Quintessence Dent Technol 2002; 25:54–62.

Kramer N, Lohbauer U, Frankenberger R. Adhesive luting of indirect restorations. Am J Dent 2000; 13:60D-76D.

Söderholm KJM. The key for the indirect technique. In: Roulet JF, Degrange M, eds. Adhesion: the silent revolution in dentistry. Carol Stream, IL: Quintessence Publishing, 2000:81–105.

©2004 BC Decker Inc

Editor's Note: We welcome readers' suggestions for topics and contributors to Critical Appraisal. Please address your suggestions to the section editor:

Critical Appraisal Edward J. Swift Jr, DMD, MS Department of Operative Dentistry University of North Carolina, CB#7450, Brauer Hall Chapel Hill, NC, USA 27599-7450 Telephone: 919-966-2770; Fax: 919-966-5660 E-mail: Ed_Swift@dentistry.unc.edu

The Bottom Line feature will follow in Part II of the series.

Copyright of Journal of Esthetic & Restorative Dentistry is the property of B.C. Decker Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.