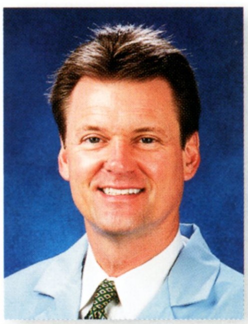
literature review



by
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The "C-Factor" Can Be a Curse to Restorative Dentists

CHOOSING AN OPTIMAL CERAMIC INLAY CEMENT

1. Gemalmaz D, Ozcan M, Alkumru N. A clinical evaluation of ceramic inlays bonded with different luting agents. *J Adhesive Dent* 3:273-283, 2001.

Ceramic inlays are a well-established treatment in contemporary restorative dentistry. The aim of this study was to evaluate the clinical performance of a fired ceramic inlay system using three different luting agents.

This study was an open assessment of 45 ceramic inlays (Ducera LFC, Ducera; Rosbach, Germany) placed in 26 patients. Forty were moderate-sized Class II restorations, two were four-surface extensive inlay restorations, two were Class I restorations, and one was an onlay. Three groups of 15 were cemented with two resin cements: Variolink high viscosity (Vivadent; Schaan, Liechtenstein) and Enforce (Dentsply Caulk; Milford, DE), and one polyacrylic acid-modified glass ionomer cement Geristore (Den-Mat; Santa Maria, CA). The restorations were evaluated every 6 months for the first year and yearly after that using a modified USPHS criteria; the margins were examined with a scanning electron microscope over a 4 to 46 month period.

Results: Seven inlays failed due to ceramic breakage. Five of those were luted with Geristore, one with Variolink, and one with Enforce. Marginal staining at 36 months was not noted for the two resin cements but was noted in 67% of the Geristore cemented inlays. The Geristore cemented inlays also had a higher percentage of underfilled margins at 1 year.

Conclusion: The success rate of inlays cemented with resin cements is higher than inlays cemented with a polyacrylic acid-modified glass ionomer cement.

Discussion: Resin cements remain the cement of choice for most ceramic inlays. Superior adhesive potential and physical properties result in reduced fracture potential and marginal deterioration.

THE C-FACTOR IS A "CURSE" TO POSTOPERATIVE SENSITIVITY

2. Yoshikawa T, Burrow MF, Tagami J. The effects of bonding system and light-curing method on reducing stress of different C-factor cavities. *J Adhesive Dent* 3:177-183, 2001.

Because light-cured composites cure faster than self-cured composites, higher stresses are developed in our direct restorations, which can lead to gap formation, secondary caries, and postoperative sensitivity. A major factor related to shrinkage is dependent upon the shape of a prepared cavity and is called the "configuration factor" (C-factor). The C-factor is calculated by dividing the number of bonded surfaces by the number of surfaces that are not bonded. Various techniques have been advocated to reduce contraction stresses in direct composites, such as a flexible adhesive resin layer or self-curing resins. The purpose of this study was to evaluate the effect of adhesive systems with different curing modes and the slow-start curing method in terms of marginal sealing and cavity wall adaptation of resin composite restorations with different C-factors.

Standardized preparations with C-factors of 2.3 and 3 were filled using three adhesives: Clearfil Photo Bond or Clearfil Liner Bond 2 (Kuraray; Osaka, Japan), or Super-Bond D Liner (Sun Medical; Shiga, Japan). All restorations were bulk-filled with Photo Clearfil Bright (Kuraray). The restorations were cured using a slow-start curing method with an initial light intensity of 270 mW/cm2 for 10 seconds at a distance of 10 mm, followed by a 5-second interval and then a 50-second cure at 600 mW/cm2 at a distance of 0 mm. The control group was cured for 60 seconds with a light intensity of 600 mW/cm2. Dye penetration techniques were used to measure marginal adaptation.

Results: Cavity-wall gap formation was significantly increased when the C-factor was increased form 2.3 to 3, except for Clearfil Photo Bond in the control group. The Super Bond D liner had significantly better cavity wall adaptation compared to the others, regardless of the C-factor. The slow-start curing method showed significantly improved marginal sealing and cavity wall adaptation for the C-factor of 2.3 for Clearfil Photo Bond and for both C-factors using Super-Bond D Liner.

Conclusion: It was concluded that the self-cured bonding resin, Super-Bond D Liner, in association with the slow-start curing method, showed improved adaptation of resin composite to the margins and floor of cavities regardless of C-factor.

Discussion: Super-Bond D Liner showed the best marginal sealing and resin composite adaptation to the cavity wall, regardless of light-curing method and the C-factor. It is believed that, due to the liner being elastic, having a high initial tensile bond strength, and being a self-cured bonding resin, it goes through an elastic phase. It is thought that this rubbery phase was able to absorb some of the shrinkage stresses that occur during the light-curing of resin composite. It also is believed that the slow-start technique may selectively initiate curing of the resin adjacent to the cavity walls, due to free radicals that already exist in the bonding resin.

If this technique holds up clinically, it may increase the potential to bulk-fill composites and decrease chair time.

POROSITY: AUTO VERSUS HAND MIXING

3. Covey DA, Ewoldsen NO. Porosity in manually and machine mixed resin-modified glass ionomer cements. *Operative Dent* 26:617-623, 2001.

Discs 76 and 800 microns thick were made from a resin-modified glass ionomer cement (Fugi II LC, GC America Inc; Alsip, IL) using hand-mixing and auto-mixing techniques. The thin RMGIC discs were examined using digital imaging software that determined the number and volume of the cement pores. Shear punch tests were conducted on the thicker discs.

Results: The number and total volume of pores in the manually mixed specimens were considerably greater than the machine mixed specimens. The shear punch test results were significantly higher with the machine-mixed group.

Discussion: While machine-mixed capsules cost more, the benefits may be worth it. If you take into consideration the indirect costs of using mixing pads, instruments, aseptic techniques, and the labor involved, the auto-mixing approach may even be less expensive. The author has used Fugi II and other RMGIC for many years for bases, liners, pulp caps, and as a filling material in high caries environments. The machine-mixed capsules offer many advantages. The main advantage of the hand-mixed material is the ability to vary the volume of the cement mixed.

HOW LONG DO YOU WAIT TO BOND AFTER HOME BLEACHING?

4. Cavalli V, Reis AF, Giannini M, Ambrosano GMB. The effect of elapsed time following bleaching on enamel bond strength of resin composite. *Operative Dent* 26:597-602, 2001.

This study evaluated the effect of different carbamide peroxide gel concentrations, using the mouthguard technique, on the shear bond strengths of resin composite at post-bleaching intervals of 1 day, and 1, 2, and 3 weeks. Materials used were: Opalescence 10% and 20% (Ultradent Products, Inc.; Salt Lake City, UT) Whiteness 10% and 16% (FGM Produtos Odontologicos; Joinville, SC, Brazil), Scotchbond MultiPurpose bonding agent and Z-100 composite resin (3M Dental Products; St Paul, MN). Human enamel was used in simulated intraoral conditions.

Results: There was no significant difference between the results from the various materials and concentrations for each time interval. There was a direct relationship between bond strength and post-bleaching time for the four post-treatments intervals. Statistical evaluation indicated a reduction in bond strength until 2 weeks post-bleaching, and the bleaching concentration did not affect the bond strengths. It took 3 weeks for the enamel to return to conditions that lead to normal bond strengths.

Discussion: If at all possible, delay bonding to enamel for more than 2 weeks (3, if possible).

FIBER-REINFORCED CROWN STRENGTH!

5. Behr M, Rosentritt M, Latzel D, Kreisler T. Comparison of three types of fiber-reinforced composite crowns on their fracture resistance and marginal adaptation. *J Dentistry* 29:187-196, 2001.

The aim of this study was to investigate the fracture resistance and marginal adaptation of single molar crowns made with three different fiber-reinforced composites (FRC).

Crowns made of TargisVectris (TV) (Ivoclar; Schaan, Lichtenstein), Sculpture/Fibrekor (SF) (Jeneric Pentron; Wallingford, CT) and belleGlass/Connect (bC) (Kerr; Pforzheim, Germany) were fabricated on standardized preparations .8 mm deep and bonded to human molars. The specimens were thermal cycled, mechanical loaded, and finally loaded to fracture.

Results: The actual fracture resistance was highest for the SF crowns, followed by the TV and bC crowns, respectively. There was no significant difference in the three groups and all exceeded the load that dental restorations must exceed in the molar region by a safety margin of 200 N.

Discussion: From a strength point of view, fiber-reinforced composite crowns seem to have enough strength to allow them to be considered an acceptable restorative option in the molar region. It was hypothesized that the reasons that the polyethylene fiber reinforced bC crowns were weaker than the glass fiber-reinforced other crowns may be due to a lack of a chemical bond between these fibers and the composite, and possible voids created during manual resin adaptation versus the preimpregnated glass fibers used in the SF and TV.

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The ACCD is very sad to announce the death of

Michael J. O'Brien,

the founder of O'Brien Dental Lab in Corvallis, Oregon. Recognized as a visionary in the field, he leaves behind a legacy that has inspired many. The Academy extends its deep condolences to his family, friends, and colleagues.

The Michael J. O'Brien Scholarship Fund has been set up for a dental school scholarship at Oregon Health Sciences University. Memorial donations can be made at any Citizen's Bank branch or sent to O'Brien Dental Lab, 4311 SW Research Way, Corvallis, OR 97333.