Dentin Adhesives--Ethanol-Water vs Acetone Based

A 36-Month Clinical Evaluation of Ethanol/Water and Acetone-Based Etch-and-Rinse Adhesives in Non-Carious Cervical Lesions.

Reis A, Loguercio AD:

Oper Dent 2009; 34 (4): 384-391

Class V restorations placed using an ethanol-based adhesive are retained better than those placed using an acetone-based adhesive.

Objective: To evaluate the clinical performance of 2 "one-bottle" etch-and-rinse adhesives (primarily retention and marginal quality) over 3 years.
Methods: The adhesives evaluated in this study were Adper Single Bond and One Step. Both are etch-and-rinse adhesives that use phosphoric acid to etch enamel and dentin, and both combine the primer and bonding agent steps in a single solution. Single Bond's solvent is ethanol and water; One Step's solvent is acetone. Each material was used with a microfill composite from its respective manufacturer, Filtek A110 with Single Bond and Micronew with One Step. Eighty-four subjects participated in the study, and each received one restoration of a non-carious cervical lesion. Two investigators placed the restorations under rubber dam isolation. No bevel or mechanical retention was placed. The restorations were evaluated at 6, 12, 18, and 36 months after placement following U.S. Public Health Service criteria. Each restoration was examined by 2 evaluators, who were not the same as those who placed the restorations.
Results: For Adper Single Bond, 2 restorations were lost at 12 months and 1 more was lost at 36 months. The 36-month retention rate was 92.3%. For One Step, restorations were lost at all of the recalls except the 6 month visit. The 36-month retention rate was 51.4%. The difference between the 2 materials was statistically significant. Marginal discoloration increased for both materials over time, but differences between materials were not significant.
Conclusions: Class V restorations placed using an ethanol-based adhesive were retained better than those placed using an acetone-based adhesive.
Reviewer's Comments: The adhesives tested in this study are from the same generation of materials. Both adhesives use phosphoric acid to etch enamel and dentin, but their chemistry is quite different. Single Bond includes an ethanol/water solvent, and One Step includes acetone. In general, acetone-based adhesives are known to be more technique sensitive than those containing ethanol. Such technique sensitivity might account for the difference in restoration retention rates observed in this study. Laboratory research indicates that the technique sensitivity is related largely to the amount of moisture present in the dentin surface; too much or especially too little water results in lower bond strengths. (Reviewer-Edward J. Swift, Jr, DMD, MS).

Keywords: Dentin Bonding, Clinical Trial

Print Tag: Refer to original journal article

Etch and Seal Proximal Lesions Without Cutting a Preparation

Infiltration of Fluid Resins Without Cutting Into Primary and Permanent Teeth in Children.

Berg JH, Dunn J:

Inside Dent 2009; 5 (September): online

A new technique can infiltrate proximal lesions with resin without tooth preparation.

Background: The authors provide a background on a technique for sealing proximal lesions with unfilled resin without cutting a preparation in the tooth. They reference several published manuscripts and have also discussed the techniques with clinicians who have ongoing clinical trials. A kit for accomplishing the steps for this is currently available in Europe and should be in the United States soon. **Description of Technique:** One must wedge the teeth apart sufficiently for the matrix to be placed. The etchant is hydrochloric acid rather than phosphoric acid, with the goal of a deeper, more rapid enamel etch. The etchant is applied with a device that has a syringe connector port and a clear matrix that has perforations to guide the acid into the contact. The matrix is changed, and a very fluid resin is then applied to the proximal surface with a similar matrix mated to a syringe connector port. The resin is flossed to limit overhangs prior to light curing. The authors offer photographs of 2 cases to demonstrate the technique.
Reviewer's Comments: I have been waiting for the opportunity to discuss this procedure. I believe it has a lot of merit with limited downside potential. Most resins will not penetrate the 1 to 1.5 mm thickness of the proximal enamel, so I do have some concerns that the "deep etch" is even a good idea. We have some data that resin applied to facial white spot lesions associated with orthodontic bands is an effective and conservative treatment option. I think we can readily apply that information to proximal lesions if we can overcome the access problems. I have not had the opportunity to use this kit, so there may be problems that limit usefulness. It is firm in my mind that one must use a good rubber dam to keep the surface isolated during the procedure. I have seen promises from authors that the resin indeed penetrates to the dentin, but I have not seen research showing that to be true. I actually believe that full penetration of a hydrophobic resin to the DEJ is unlikely to occur in the mouth. Phosphoric acid has been the enamel etchant of choice because it did not tend to form precipitates that inhibited bonding. I wonder if these papers were reviewed prior to selection of hydrochloric acid in these kits. (Reviewer-J.D. Overton, DDS).

Keywords: Sealing Proximal Lesions, Resin

Print Tag: Refer to original journal article

All-Ceramic FDPs Provide Good Results

Clinical Outcome of Three-Unit Lithium-Disilicate Glass-Ceramic Fixed Dental Prostheses: Up to 8 Years Results.

Wolfart S, Eschbach S, et al:

Dent Mater 2009; 25 (September): e63-e71

All-ceramic fixed dental prostheses require generous connector dimensions.

Background: All-ceramic single crown restorations have become very common and are nearly comparable to porcelain-fused-to-metal restorations in regard to reliability and longevity in appropriate indications. All-ceramic fixed partial dentures have not shown the same longevity to date. Clinical studies of ≥5 years have been done with alumina- and zirconia-based systems, but only shorter studies for pressed, lithium-disilicate-based restorations have been published.
Objective: To evaluate the clinical performance of single pontic, crown-retained, fixed dental prostheses (FDPs) fabricated from a pressed, lithium-disilicate glass-ceramic system (IPS e.max Press, Ivoclar-Vivadent).
Design: Prospective, clinical trial.
Methods: 36 three-unit FDPs were placed in 36 patients. All of the abutments were vital teeth, had bone levels to at least two-thirds of the root length, and had no active periodontal disease or periapical pathology. Selected patients exhibited good oral hygiene, probing depths no more than 4 mm, and no extreme parafunction. All of the pontics were equal to or smaller than the width of a molar. Thirteen different clinicians with a mean experience level of 3 years placed the restorations, each with the approval of supervising prosthodontists. Occlusal reduction of 1.5 mm and circumferential shoulders of 1.2 mm were prepared, impressions were made, and restorations were fabricated. The minimal connector dimensions were 4 mm x 4 mm in the posterior and 4 mm x 3 mm in the anterior. Nineteen of the FDPs were cemented with a glass-ionomer cement (Ketac Cem, 3M-ESPE), and 17 were adhesively cemented with Variolink II resin and Syntac Classic adhesive (both from Ivoclar-Vivadent). The glass-ionomer was used if the margins were subgingival. The restorations were evaluated at 1 to 3 weeks, 6 months, 12 months, and then annually for a minimum of 5 years and a maximum of 8 years. Any restorations that suffered fractures were subjected to fractographic analysis.
Results: 33 FDPs remained in the study, 6 with complications. Two cases required endodontic therapy, 2 cases exhibited ceramic veneer chipping (1 requiring repair), and 2 cases required recementation due to debonding. Two FDPs failed due to connector fracture, both in the adhesively cemented group, although the difference between the adhesive and conventional groups was not statistically significant. The overall 8-year survival rate was 93%.
Conclusions: 3 tooth bridges fabricated with pressed, lithium-disilicate material demonstrated a comparable survival rate (93%) to metal-ceramic bridges (95%).
Reviewer's Comments: This study presents very good outcomes for this type of FDP compared to other trials. One possible reason is the strict adherence to using generous connector dimensions and limited pontic span. Additionally, these FDPs were fabricated as totally pressed restorations with no additional veneering ceramic. One of the most frequent failure modes with other all-ceramic systems is through chipping of the veneering ceramic. This study does support use of these restorations in appropriate situations. (Reviewer-Daniel E. Wilson, DDS).

Keywords: Lithium Disilicate, Fixed Partial Denture, Longevity

Print Tag: Refer to original journal article

Bonding to Ceramics

The Effect of Surface Treatments on the Micro-Shear Bond Strength of a Resin Luting Agent and Four All-Ceramic Systems.

Torres SMP, Borges GA, et al:

Oper Dent 2009; 34 (July-August): 399-407

Air abrasion improves adhesion between a resin cement and 4 different types of ceramic.

Objective: To evaluate the bond strength between resin cement and ceramic materials using different surface treatment methods.
Materials/Methods: 12 rectangular ceramic specimens were made from the following materials: Cergogold; IPS Empress 2; Cercon; and In Ceram Alumina. These represent 4 different ceramic classes. Cergogold is a feldspathic porcelain, Empress 2 is lithium disilicate, Cercon is zirconia, and (as its name suggests), In-Ceram Alumina is alumina. Surfaces of the ceramics were etched with 9.5% hydrofluoric (HF) acid at varying times depending on the type of ceramic or were airborne particle abraded using 50 micron aluminum oxide. Some specimens of each material were left untreated as controls. After surface treatment, Panavia F resin cement was bonded to the surface using Clearfil Porcelain Bond, a mixture of an acidic primer and silane. Micro-shear bond strengths were determined using a universal testing machine. Additional specimens were examined using scanning electron microscopy (SEM) to evaluate the effects of surface treatment.
Results: The bond strength of Panavia to feldspathic porcelain improved from 11.4 MPa to approximately 20 MPa with either surface treatment. The most significant improvement in bond strength for Empress 2 was achieved with HF etching. Both treatments slightly improved the bond to In-Ceram Alumina. Air abrasion doubled the bond strength to zirconia, but HF etching actually decreased it.
Conclusions: Air abrasion improved adhesion between a resin cement and 4 types of ceramic; HF etching is not a suitable surface treatment for zirconia ceramic.
Reviewer's Comments: I am not sure that this study revealed anything that we did not already know; it is more confirmatory in nature. The 1 exception was that a 2-minute HF etch of alumina improved the resin bond strength, and the improvement was statistically significant. The SEM analysis showed that HF etching caused very minimal roughening of the surface in contrast to the prominent etch patterns observed with the feldspathic porcelain and lithium disilicate ceramic. In-Ceram Alumina contains only a small percentage of silica and, therefore, is not very susceptible to acid-etching. The ceramic primer used in this study has already been shown to provide good adhesion to high-strength ceramics such as alumina and zirconia. (Reviewer-Edward J. Swift, Jr, DMD, MS).

Keywords: Ceramics, Resin Bonding

Print Tag: Refer to original journal article

Changing Root Canal Irrigants?

Comparison of the Efficacy of Maleic Acid and Ethylenediaminetetraacetic Acid in Smear Layer Removal From Instrumented Human Root Canal: A Scanning Electron Microscopic Study.

Ballal NV, Kandian S, et al:

J Endod 2009; 35 (November): 1573-1576

Irrigants other than EDTA may better disinfect root canal dentin.

Objective: To evaluate the efficacy of 17% ethylenediaminetetraacetic acid (EDTA) and 7% maleic acid followed by 2.5% sodium hypochlorite in the removal of the smear layer in instrumented root canals.
Materials/Methods: 80 extracted human anterior teeth were used in this study. To be included, teeth should have 1 root canal only, have mature apex, not have internal resorption, and not be endodontically obturated. Teeth were decoronated to standardize the root length to 15 mm and specimens were allocated into 2 experimental groups (n=30) and one control group (n=20). Root canals were prepared with a step-back technique with 2.5% NaOCl irrigation. Final irrigation was as follows: (1) 17% EDTA for 1 minute followed by 2.5% NaOCl for 1 minute; (2) 7% maleic acid for 1 minute followed by 2.5% NaOCl for 1 minute; (3) 0.9% saline for 1 minute (control). A final irrigation to remove any precipitate was performed with distilled water. Roots were split into 2 halves and stored in deionized water at 37°C until scanning electron microscopy evaluation.
Results: There was a significant difference between EDTA and maleic acid treatment only at the apical third of the root canal.
Conclusions: Final irrigation with 7% maleic acid followed by 2.5% NaOCl is effective in removal of smear layer from apical third of root canals, which is crucial for disinfection and success of the treatment.
Reviewer's Comments: Different protocols for disinfection of root canals prior to obturation have been suggested and used in the dental practice. As the authors discussed, EDTA works in neutral pH and has its effect diminished over time as the result of a decrease in pH during conditioning of the root canal. On the other hand, maleic acid is highly acidic and may be a better demineralization agent for root canal substrates. Important to understand is that different acids will have different effects on obturation materials that might be bonded to the root canal. (Reviewer-Ricardo Walter, DDS).

Keywords: Laboratory Research, EDTA, Maleic Acid, Smear Layer, Disinfection

Print Tag: Refer to original journal article

Dentin Permeability Can Be Stopped

Effect of Desensitizing Agents on Dentin Permeability.

Ishihata H, Kanehira M, et al:

Am J Dent 2009; 22 (June): 143-146

Both MS Coat and Gluma Desensitizer seal dentin well.

Objective: To investigate the effect of 2 dentin desensitizing agents in regard to the inhibition of liquid flow through human dentin discs.
Materials/Methods: 1-mm thick dentin samples were cut from 14 human molars. The smear layer was removed with EDTA solution and the samples were rinsed with deionized water. A sample was placed in a device that had a chamber that could be pressurized to try to push fluid through the dentinal tubules to the other side. Each sample was tested prior to placement of a desensitizing agent to make certain that fluid would flow from one chamber to the next. Either MS Coat (MSC; marketed as "Pain Free" in the USA) or Gluma Desensitizer (GLD) was painted on the dentin according to package instructions.
Results: Both materials were very, very effective at preventing fluid movement from the pressurized chamber into the second chamber. In their discussion, the authors explain the mechanism of action of MSC as a superficial occlusion of the dentinal tubules. In clinical trials, this occlusion with MS Coat has been short lived because the oxalate precipitates blocking the tubules are soluble in oral fluids. The GLD has a clinical trial in which sensitive cervical lesions were desensitized immediately on application and the effect lasted up to the end of the 1-year trial. Protein in the tubules (albumin was used in the bench study) is critical for GLD to create successful occlusion of the tubules.
Reviewer's Comments: The authors are confident that this is a very simple device for laboratory testing of decreasing fluid flow through dentin. It appears they are correct. It could well serve the scientist with a new formula to test the product on the dentin disks prior to proceeding to clinical trials. There are a number of variables that occur in patients that are not tested with this device (acidic foods, toothpaste abraision, resting pH of saliva, mineral content of saliva, etc), so one could not conclude that success in the laboratory would go directly to success in the mouth. Some 13 years ago, 1 of our residents had tap water (our placebo) perform better than the 3 branded desensitizing agents he tested. (Reviewer-J.D. Overton, DDS).

Keywords: Desensitizing, Dentin Permeability

Print Tag: Refer to original journal article

Do Hemostatics Affect Dentin Bonding?

Bond Strengths of Resin Cements to Astringent-Contaminated Dentin.

Harnirattisai C, Kuphasuk W, et al:

Oper Dent 2009; 34 (4): 415-422

Bond strengths of resin cements to dentin contaminated with aluminum chloride astringent are similar to those obtained on normal dentin.

Objective: To evaluate the bond strengths of 2 resin cements (one using an etch-and-rinse adhesive and the other a self-etch adhesive) to dentin contaminated with a hemostatic agent.
Methods: 12 dentin disks (2-mm thick) were prepared by sectioning the crowns of extracted human molars. Dentin was polished to 600-grit, and each disk was sectioned into 2 halves. A hemostatic agent (25% aluminum chloride) was applied to 1 of those halves for 2 minutes with the other half left untreated as a control. The pH of the astringent was measured as 0.8. Resin cements were bonded to dentin according to manufacturer's instructions. The cements were Panavia F, which uses a self-etch primer, and Variolink II, which uses an etch-and-rinse adhesive. Specimens were stored in water for 24 hours and were tested for micro-shear bond strength using an EZ-Test universal testing device. Fracture modes were evaluated using scanning electron microscopy (SEM). In addition, the dentin surfaces were evaluated under the various experimental conditions (type of adhesive and contaminated or uncontaminated).
Results: For Panavia F, the mean bond strength to uncontaminated dentin was 22.2 MPa, and was actually slightly higher to contaminated dentin at 24.7 MPa. Similarly, the mean bond strengths of Variolink II to normal and contaminated dentin were 22.3 and 23.9 MPa, respectively. SEM showed that the hemostatic agent partially removed the smear layer from dentin, although the dentinal tubules remained occluded by smear plugs.
Conclusions: The bond strengths of 2 resin cements to dentin contaminated with 25% aluminum chloride were similar to those obtained on normal dentin.
Reviewer's Comments: The SEM image showing dentin treated with the astringent in this study looks very similar to dentin treated with a mild acid of the type used with some glass ionomer materials. I would not expect this to affect an etch-and-rinse adhesive much, but would have expected it to reduce the bond strength of a self-etch material. However, that was not the case, as bond strengths were not decreased by a 2-minute application of the astringent. Regardless, this is just 1 study using a very limited variety of materials, so clinicians should probably remain cautious about using astringent hemostatic agents in bonding procedures and minimize contact with dentin as much as possible. (Reviewer-Edward J. Swift, Jr, DMD, MS).

Keywords: Dentin Bonding, Hemostatics

Print Tag: Refer to original journal article

Photo-Polymerization Can Alter the Chroma, Hue of Composite

Light Polymerization-Dependent Changes in Color and Translucency of Resin Composites.

Del Mar Pérez M, Saleh A, et al:

Am J Dent 2009; 22 (April): 97-101

LED lights may result in more color shift than QTH lights.

Background: Polymerization can cause noticeable changes in the optical properties of resin composites, which complicates attempts to match nonpolymerized composite to the desired final shade. Polymerization-dependent changes in composite color vary according to the product and the specific shade. Changes are the result of simultaneous changes in lightness and chroma. Research shows that quartz tungsten halogen (QTH) lights produce less color change than occurs when curing with light emitting diode (LED) lights.
Objective: To determine the influence of the type of polymerization light on color changes and translucency of resin composites.
Materials/Methods: Specimens were formed from 2 resin composite materials, Artemis and Esthet-X. Eight shades and translucencies of each product were used. The color of nonpolymerized samples of each shade of both materials was measured using a spectrometer. Specimens were divided into 2 groups; one group polymerized 13 seconds with a QTH light and the other group polymerized 17 seconds with a LED light. After polymerization, specimens were again measured with the spectrometer to determine any color changes.
Results: Polymerization with the QTH and the LED lights showed similar trends in color changes. Lightness decreased after polymerization for the Artemis samples. Both lightness increases and decreases were measured for Esthet-X depending on the specific shade. Chroma generally decreased. Hue angle changes were material and shade dependent. In most cases, the translucency increased after polymerization. Range of color differences was higher for material polymerized with a LED light compared to specimens cured with a QTH light. Esthet-X shades appeared to exhibit variation in color depending upon whether a QTH or a LED light was used for polymerization. Shades with highest translucency values (C, SC, C-E, and G-E) demonstrated the highest translucency parameter changes, which were primarily determined by changes in the chroma and the hue.
Conclusions: Polymerization-dependent changes in the color and translucency of resin composites are influenced by the type of light used. Color changes were mainly produced by changes in the chroma that occur using either type of light. Changes in the translucency resulted from changes in hue with the LED light and changes in chroma with the QTH light. Translucency changes significantly influenced overall color changes observed after polymerization. The effects were similar with both types of curing lights.
Reviewer's Comments: Artemis and Esthet-X have similar compositions and particle sizes, so it is not surprising that any influence on color shift during photo-polymerization is similar for both materials. While this shift is not great, it points out a problem in matching tooth shades. We select a shade and then find that what matches well before polymerization does not match as well after curing. Experience with specific materials and their various shades is very important to the final shade matching process. (Reviewer-Thomas G. Berry, DDS).

Keywords: Curing Lights, Composite Restorations, Shades

Print Tag: Refer to original journal article

Chlorhexidine Preserves the Hybrid Layer

Chlorhexidine-Containing Acid Conditioner Preserves the Longevity of Resin-Dentin Bonds.

Stanislawczuk R, Amaral RC, et al:

Oper Dent 2009; 34 (July-August): 481-490

Chlorhexidine, either in aqueous solution after etching or in conjunction with the etchant, preserves the durability of the resin-dentin interface.

Objective: To evaluate the effect of 2% chlorhexidine digluconate (CHX), delivered in aqueous solution or in the etchant gel, on the immediate and 6-month bond strengths and nanoleakage of 2 etch-and-rinse adhesives.
Materials/Methods: 42 human third molars were ground to expose occlusal dentin, which was polished to 600-grit. Two etch-and-rinse adhesives were used to bond composite to dentin (Adper Single Bond Plus and Prime & Bond NT). For each, the dentin surface was either remoistened with water or with 2% CHX after etching with a conventional 37% phosphoric acid gel. Also, etching was done using a 37% etchant that contained 2% CHX. The bonded specimens were sectioned for microtensile bond strength (MTBS) testing, which was accomplished using a universal testing machine. Failure modes were classified as being adhesive, cohesive, or mixed. Two sections from each tooth were evaluated for nanoleakage using a standard method.
Results: For the Single Bond control groups (no CHX), the mean MTBS declined from 27.2 MPa to 20.4 MPa at 6 months. Similarly, the mean MTBS of Prime & Bond declined from 22.0 MPa to 14.6 MPa. In contrast, when CHX was used with either application method, bond strengths did not decline over time. For example, the mean MTBS of Single Bond using 2% aqueous CHX was exactly the same (31.1 MPa) immediately and at 6 months. Nanoleakage of both adhesives increased with time, but less so when CHX was used.
Conclusions: Application of 2% chlorhexidine, either in aqueous solution after etching or in conjunction with the etchant, preserves the durability of the resin-dentin interface.
Reviewer's Comments: This is the most recent of many studies that have shown that CHX helps to stabilize the hybrid layer formed by etch-and-rinse adhesives. Acid-etching releases intrinsic dentinal enzymes called matrix metalloproteinases or MMPs, and these are able to degrade dentin collagen that is not encapsulated by resin, thus contributing to degradation of the hybrid layer. CHX, which has been used for years as a disinfectant, is also an effective MMP inhibitor, which explains its efficacy in preserving dentin bond strengths. (Reviewer-Edward J. Swift, Jr, DMD, MS).

Keywords: Dentin Bonding, Chlorhexidine

Print Tag: Refer to original journal article

Coffee Has Increased Staining Capacity During Home Bleaching

The Effect of Coffee Solution on Tooth Color During Home Bleaching Applications.

Attia ML, Aguiar FHB, et al:

Am J Dent 2009; 22 (June): 175-179

During home bleaching, encourage patients to avoid coffee.

Design/Objective: This bench top project evaluated human enamel chips and bovine enamel chips for color stability.
Materials/Methods: The chips were exposed to 16% carbamide peroxide 6 hours a day for 28 days. Half of the samples were placed in a coffee solution for 15 minutes after being bleached. The samples were routinely rinsed with water after every treatment and stored in artificial saliva. Each week, the samples were evaluated for color with a spectrophotometer.
Results: In the first 2 weeks, the samples that were not exposed to coffee reached a maximum bleach effect such that no significant color change was noted in weeks 3 or 4. The enamel exposed to coffee had significantly less color stability. The authors conclude that pigmented foods and beverages should be discouraged when patients are actively bleaching their teeth. The second conclusion was that bovine enamel and human enamel performed similarly in bleaching experiments, even though the enamel is clearly different colors.
Reviewer's Comments: I might have liked to have seen some samples that were bleached for 4 weeks, soaked in artificial saliva for 4 more weeks, and then exposed to coffee for 15 minutes a day for a few days. If I could offer to my patients that a short period of habit changes offered long-term positive effects, I might win more often. I think that it is probably good to advise my patients that are actively bleaching their teeth that consumption of highly pigmented foods might slow or alter the bleach effect. It is unrealistic to expect many of them to change long ingrained habits. It is probably possible to get many patients to wait at least 1 hour after bleaching before eating. (Reviewer-J.D. Overton, DDS).

Keywords: Bleaching, Carbamide Peroxide, Enamel

Print Tag: Refer to original journal article

Deciding Which Adhesive System to Use

Bond Strength of Self-Etch Adhesives to Pre-Etched Enamel.

Erickson RL, Barkmeier WW, Kimmes NS:

Dental Mater 2009; 25 (October): 1187-1194

Enamel bonding is improved by selectively pre-etching with phosphoric acid prior to the use of self-etching adhesive systems.

Background: Self-etching adhesive systems have been marketed as a suitable replacement for etch-and-rinse adhesives, touting a faster, less technique-sensitive application protocol, as well as less postoperative sensitivity. These materials have garnered a significant market share among practitioners. Among the concerns with these systems is the lower bond strength to enamel. In an effort to improve the bond to enamel, some have suggested adding a separate step involving phosphoric acid etching of the enamel.
Design/Objective: This in-vitro study examined the effect of enamel pre-etching on the enamel bond strengths of 4 self-etching adhesive systems as compared to an etch-and-rinse adhesive.
Materials/Methods: 4-mm enamel-bonding surfaces were created from extracted human molar teeth. Four self-etch adhesive systems were tested: Adper Prompt L-Pop (3M-ESPE); Clearfil SE Bond (Kuraray); Clearfil S3 (Kuraray); and Xeno IV (Dentsply Caulk). An etch-and-rinse system, Adper Single Bond Plus (3M-ESPE), was included as a control system. Each self-etch system was applied to 10 enamel specimens according to the manufacturer's instructions; another set of specimens were pre-treated with 35% phosphoric acid etchant prior to adhesive application. The etch-and-rinse system was applied to 10 enamel specimens. Resin composite, X100 (3M-ESPE), was placed and cured to all specimens. After 24 hours of water storage, each specimen was subjected to shear bond strength testing with an Instron machine. The bond strengths were calculated and the samples examined under scanning electron microscopy (SEM) for degree of etching.
Results: All 4 self-etching systems alone produced lower bond strengths than the etch-and-rinse adhesive. All 4 self-etching systems subjected to pre-etching showed statistically significant increases in shear bond strength bringing them to the level of the etch-and-rinse adhesive. The etching patterns of the self-etching systems alone demonstrated weaker etching as compared to the phosphoric acid etching. Resin penetration patterns for the pre-etched self-etch specimens were very similar to the control group.
Conclusions: Self-etching adhesive systems used according to manufacturer's recommendations are less effective relative to enamel bonding quality than either etch-and-rinse systems or pre-etched self-etching systems. This is due to the inferior etching patterns achieved with self-etching adhesive systems.
Reviewer's Comments: This study is in agreement with other studies that indicate lower quality enamel bonding with self-etching adhesive systems. The additional step of pre-etching enamel adds to the technique sensitivity and time required to apply these materials, thereby reducing their attractiveness to the practitioner. An additional concern is the issue of the enamel pre-etching negatively influencing the dentin bonding since there is no practical way of totally limiting the pre-etching step to enamel only. This enamel bonding issue, in combination with other studies calling the longevity of dentin bonding into question, gives us pause when considering the use of self-etching adhesive systems. (Reviewer-Daniel E. Wilson, DDS).

Keywords: Self-Etching Adhesive, Pre-Etching, Shear Bond Strength

Print Tag: Refer to original journal article

Do Hydrophilic Adhesives Drain Water From Dentin?

Effect of Dentinal Water on Bonding of Self-Etching Adhesives.

Hashimoto M, Fujita S, et al:

Dent Mater J 2009; 28 (September): 634-641

Water drawn from dentin might compromise the longevity of restorations done with all-in-one adhesives.

Objective: To evaluate the effects of dentin wetness and water storage on the bond strength of different adhesive systems.
Materials/Methods: 90 unerupted human third molars were selected. Teeth had their occlusal surfaces ground flat prior to treatment according to the following protocols: (1) wet bonding technique - bonding performed on wet dentin with specimens being stored in water for 24 hours prior to testing; (2) bonding performed as in group #1, but specimens were stored in a desiccator for 24 hours until testing; (3) dentin was desiccated for 5, 10, 20, 40, or 60 minutes prior to bonding and kept in a desiccator for 24 hours until testing. Bonding procedures were performed using 2 all-in-one adhesives (BeautiBond [Shofu] and OptiBond All-In-One [Kerr]) and 2 two-step self-etching adhesives (FL-Bond II [Shofu] and Clearfil Protect Bond [Kuraray]) following manufacturers' instructions. Clearfil AP-X (Kuraray) build-ups were made for test purposes. After storage, the specimens were sectioned, tested in microtensile, and evaluated under scanning electron microscopy.
Results: Bond strengths for group #1 decreased in the following order: FL-Bond II, OptiBond All-In-One, Clearfil Protect Bond, and BeautiBond. Statistical differences among those adhesives were not disclosed in the manuscript and are probably nonexistent. Also, there were no differences in bond strength between specimens bonded in wet conditions in groups #1 and #2. A positive correlation was found between drying time prior to bonding and bond strength of all-in-one adhesives (group #3). That correlation could not be verified for two-step self-etching adhesives. Microscopic evaluation revealed water blisters in the adhesive layer of all-in-one adhesives. Few or no blisters were noticed after 40 to 60 minutes of drying. No water blisters were noticed for two-step self-etching adhesives.
Conclusions: Water blister formation in hydrophilic adhesives can be attributed to the supply of water from dentin through osmosis.
Reviewer's Comments: All-in-one adhesives are known by their hydrophilicity. Although that is believed to contribute to deterioration of bonding over time, its clinical relevance is still uncertain. To avoid that, the use of materials that have a hydrophobic resin layer (ie, three-step etch-and-rinse and two-step self-etching adhesives) is recommended. (Reviewer-Ricardo Walter, DDS).

Keywords: Laboratory Research, Dentin, Bonding, Self-Etching.

Print Tag: Refer to original journal article

Oral-B Advantage 123 Defeats Colgate 360° Manual Toothbrush

Replicate Single-Use Comparative Study of Plaque Removal With Two Contemporary Manual Toothbrushes.

Terézhalmy GT, Walters P, et al:

Am J of Dent 2009; 22 (June): 189-192

Oral B 123 gets plaque in hard to reach areas.

Objective: To compare the Oral-B Advantage 123 and the Colgate 360° manual toothbrushes in regard to their efficacy in removing plaque following a 24-hour void in oral hygiene.
Participants/Methods: Patients (n=50) did no oral hygiene for 23 to 25 hours prior to the test. A red plaque disclosing solution was swished for 1 minute, and an examiner scored buccal and lingual surfaces for plaque. The patients were given 1 of 2 test toothbrushes and asked to brush in their usual manner for 1 minute supervised by a researcher. The subject did not have a mirror during the brushing process. An examiner then rescored the plaque. Over the course of 1 month, each subject participated 4 times with different random orders for the 2 brands of brushes.
Results: The post-brushing plaque reduction for the whole mouth was 0.251 for the Oral-B Advantage 123 brush and 0.244 for the Colgate 360° toothbrush. The statistical difference in plaque removal (*P* value) was 0.006 in favor of the Oral-B Advantage 123.
Conclusions: The final conclusion was "significantly better plaque removal" with the Oral B Advantage 123.
Reviewer's Comments: Boy! I have some difficulty with thinking I can see a clinically evident change when the performance difference is 2.79% better plaque removal for one brush over another. Application of Grandma statistics seems warranted in which a "real" treatment difference might be present ≥10%. I am more than willing to recommend to my patients the Oral-B Advantage 123 if they ask me what brand they should use. However, if my patient told me they had 4 Colgate 360° brushes in their home, I would not tell them to toss them in the garbage. While patients are instructed to brush for 2 minutes, the average time that people actually brush is <1 minute, so that part of the study design is realistic. I am just a little reluctant on the conclusions that a real difference in performance was identified in this study. (Reviewer-J.D. Overton, DDS).

Keywords: Toothbrush, Plaque

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Efficacy of Desensitizers

Dentin Hypersensitivity: A Randomized Clinical Comparison of Three Different Agents in a Short-Term Treatment Period.

Ozen T, Orhan K, et al:

Oper Dent 2009; 34 (July-August): 392-398

Three different desensitizing agents (Gluma, UltraEZ, and Duraphat) tested in this clinical study are effective in relieving dentin hypersensitivity.

Objective: To evaluate the clinical efficacy of 3 desensitizing agents in providing short-term relief from dentinal hypersensitivity.
Participants/Methods: The desensitizing agents used in this study were Gluma Desensitizer (an aqueous solution of HEMA and glutaraldehyde), Duraphat fluoride varnish, and UltraEZ potassium nitrate gel. Distilled water was used as a placebo. Fifty-two patients, with an average age of 33 years, participated in the study, and a total of 208 teeth, with sensitive exposed cervical dentin, were treated. Air/water and air blasts were used as the thermal and evaporative stimuli. Patients were asked to rate the pain they experienced along a 0 to 100 visual analog scale (VAS). This was done before treatment and at 1 day and 7 days after treatment.
Results: The mean pre-treatment VAS score was 59, with a range of 40 to 76. At 24 hours after treatment, the average VAS score had declined by 8 to 11. Over 50% of the treated teeth were pain free at 24 hours. At 7 days, >90% were pain free. The reductions in tooth sensitivity from pretreatment to 24 hours and from 24 hours to 7 days were statistically significant. Differences between the treatments were not statistically significant, and all were significantly different from the placebo.
Conclusions: 3 different desensitizing agents tested in this clinical study were effective in relieving dentin hypersensitivity.
Reviewer's Comments: This study might not be directly related to "cosmetic dentistry," but dentin hypersensitivity is fairly prevalent and is something that our patients ask about. Treatment of hypersensitivity follows 2 specific paths, either physical blockage of the dentinal tubules or modification of the nerve response to stimuli. The agents used in this placebo-controlled study represent both approaches, with Gluma and Duraphat plugging the tubules and the potassium nitrate in UltraEZ decreasing the nerve response. Each of these products appeared to be effective for reducing sensitivity of exposed cervical dentin. None were significantly more effective than the others. It should be noted that this was a short-term study, with the final evaluation done at 7 days after treatment. The observed efficacy may or may not persist over time, and could vary by product. (Reviewer-Edward J. Swift, Jr, DMD, MS).

Keywords: Desensitization, Dentin

Print Tag: Refer to original journal article

Are All Temporary Resin Materials Equally Strong?

Flexural Strength of Interim Resin Materials for Fixed Prosthodontics.

Nejatidanesh F, Momeni G, Savabi O:

J Prosthodont 2009; 18 (August): 507-511

Bis-acryl resins are stronger than methacrylate-based materials for temporary restorations.

Background: Desirable characteristics of temporary restorations used in prosthetic treatments include wear resistance, color stability, and strength. Regarding strength, interim restorations should resist to functional loads and removal forces. These qualities are greatly influenced by the type of material (eg, bis-acryl resin, methacrylate resin).
Objective: To compare the flexural strength of different materials used for fabrication of temporary fixed restorations.
Methods: The materials tested were Acropars (Marlic Medical Co, Iran), DuraLay (Duralay Corp, IL), Protemp 3 Garant (3M ESPE, MN), Tempron (GC, Japan), TempSpan (Pentron, CT), Trim (Bosworth Co, IL), and Unifast LC (GC America, IL). Ten specimens for each material were made following the proper American Dental Association specification. Specimens were stored in artificial saliva at 37°C for 14 days and thermocycled prior to testing. A 3-point bending test was performed using a universal testing machine.
Results: The results were as follow: TempSpan > Protemp 3 Garant = Tempron > Duralay > Unifast LC > Acropars > Trim.
Conclusions: The authors concluded that bis-acryl temporary materials (ie, TempSpan and Protemp 3 Garant) have higher flexural strength than methacrylate resins.
Reviewer's Comments: As pointed out by the authors in the discussion, bis-acryl resins are stronger than other temporary materials. One of the characteristics of TempSpan that may explain its better performance may be its probable higher degree of monomer conversion (dual-cured chemistry). The other bis-acryl resin tested, Protemp 3 Garant, is a chemically-cured material that has been shown to be a strong temporary material in other in vitro studies. Yet, it did not perform as well as TempSpan. Differently from the bis-acryl resins, Trim showed poor results. This material is prone to deformation, which has been confirmed in the present study. All failures for this material related to extreme plastic deformation rather than fracture. (Reviewer-Ricardo Walter, DDS).

Keywords: Laboratory Research, Temporary Restoration, Resin, Strength

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Can Heat From Curing Lights Hurt the Pulp?

Effects of Intrapulpal Temperature Change Induced by Visible Light Units on the Metabolism of Odontoblast-Like Cells.

De Souza PPC, Hebling J, et al:

Am J Dent 2009; 22 (June): 151-156

Be aware of the heat generated by your curing light.

Design/Objective: This laboratory study looked at the effect of heat from different light curing units (quartz tungsten halogen [QTH] vs light emitting diode [LED]).
Materials/Methods: The investigators used extracted teeth that were cut into 0.5-mm thick dentin wafers. They determined the permeability of the disks and placed the disks into 2 balanced groups based on permeability. For reasons I do not understand, they did not match the light intensity of the light cure units. The QTH produced 553 mW/cm2, while the LED produced 240 mW/cm2. The temperature increase was measured on the pulp side of the disks with the lights 3 mm from the dentin chip surface. In a separate experiment, odontoblast-like cells from a uniform cell culture were placed on the pulp side of the dentin disks, and the disks were irradiated by the light units at a distance of 3 mm from the dentin disk surface.
Results: The QTH had a greater increase in temperature than did the LED at 10, 20, 30 and 40 seconds. The QTH had 63% cell viability while the LED had 66% cell viability. By their statistics, this 3% difference made the LED the same as the control, while the QTH was different from the control. However, the cell viability was not statistically different for the QTH when matched to the LED.
Reviewer's Comments: At times, things get published that do not seem quite right. The failure to match the energy output of the QTH light and the LED light seems to make all the findings suspect if we are looking for clinically relevant information. There are LED lights that produce the same or even more energy than QTH lights, so it is possible to match the light output within a limit of say 10%. A lot of sophisticated equipment was dedicated to this set of experiments. While the authors may disagree with me, it appears disappointing that the research design had such a glaring error. (Reviewer-J.D. Overton, DDS).

Keywords: QTH, LED, Quartz Tungsten Halogen, Light Emitting Diode, Odontoblast

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Does Distance Affect Curing and Leakage of Composite?

Influence of Photoactivation Protocol and Light Guide Distance on Conversion and Microleakage of Composite Restorations.

Fróes-Salgado NRG, Pfeifer CSC, et al:

Oper Dent 2009; 34 (July-August): 408-414

Soft-start light activation at a distance of 7 mm significantly reduced composite microleakage with very little effect on degree of conversion.

Objective: To evaluate the degree of conversion and microleakage of composite light-cured from 3 different distances using 3 different methods.
Methods: The same composite (Esthet-X) and halogen curing light (VIP) were used in the study. Composite specimens (2-mm thick) were light-activated at distances of 0, 3, and 7 mm from the light guide. The exposures were 600 mW/cm2 for 40 seconds or 400 mW/cm2 for 60 seconds or a soft-start mode. The soft-start mode included an initial 20-second exposure at 200 mW/cm2 followed by 40 seconds at 500 mW/cm2. The degree of conversion within composite specimens was measured using FTIR spectroscopy. For microleakage testing, Class V preparations were made in bovine incisors. The incisal margins were in enamel and the cervical margins in dentin. Composite was bonded using the Prime & Bond NT total-etch adhesive system and was placed in a single increment. The composite was light-activated using the same methods as in the conversion test. The restored teeth were immersed in silver nitrate, sectioned, and examined at 25x magnification. Leakage was scored using a 0 to 3 scale.
Results: The degree of conversion of the top surfaces of composite specimens was significantly less when activated from 7 mm than from 0 or 3 mm. At the bottom surface of the specimens, the degree of conversion was similar for all curing distances. Differences between the curing methods were not significantly different at either the top or bottom surface. Using the highest intensity exposure (600 mW/cm2), microleakage was lower at the 3- and 7-mm distances than at 0 mm. For the soft-start method, leakage was significantly less at the 7-mm distance than from 0 or 3 mm.
Conclusions: Soft-start light activation at a distance of 7 mm significantly reduced composite microleakage with very little effect on the degree of conversion.
Reviewer's Comments: Numerous laboratory studies have shown that soft-start curing techniques can improve the margin quality of composite restorations, just as this one does. However, the effect was seen here only when the light guide was positioned 7 mm from the top of the composite. Therefore, I am not convinced that this study has much direct clinical relevance. (Reviewer-Edward J. Swift, Jr, DMD, MS).

Keywords: Light-Curing, Soft Start, Microleakage

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Application of a desensitizing gel prior to in-office bleaching results in less postoperative sensitivity.

Assessing the Effect of a Desensitizing Agent Used Before In-Office Tooth Bleaching.

Tay LY, Kose C, et al:

J Am Dent Assoc 2009; 140 (October): 1245-1251

Patient satisfaction with in-office bleaching could be improved by application of a desensitizing material prior to bleaching.

Background: In-office tooth bleaching offers our patients faster results compared to take-home bleaching. Usually, this is accomplished with higher concentrations of hydrogen peroxide with or without specialized lights. Along with these faster results is a higher incidence of tooth sensitivity. In some cases, the sensitivity is enough to cause patients to discontinue treatment.
Design/Objective: This double-blind, randomized, controlled, clinical trial examined the effectiveness of a desensitizing agent used prior to in-office bleaching in terms of decreased postoperative tooth sensitivity.
Participants/Methods: 30 patients were selected with anterior teeth shade C2 or darker when measured on a value oriented Vita Classical shade guide. Patients were included who had caries and restoration-free anterior teeth and had not bleached their teeth previously. The subjects were randomly divided into 2 groups. The experimental group received an application of a desensitizing gel consisting of 5% potassium nitrate and 2% sodium fluoride (Desensibilize KF 2%, FGM Dental Products) for 10 minutes prior to bleach application. The control group received a placebo gel applied in the same fashion as the experimental gel. Neither the patient nor dentist was aware of the contents of the gel. In-office bleaching was then accomplished with a 35% hydrogen peroxide gel with a light-cured resin dam to protect the gingival tissue. The bleaching agent was applied for a total of 45 minutes. This was repeated 1 week later. Shade evaluation was accomplished using calibrated examiners and the value oriented shade guide prior to bleaching and after both office visits. Each patient recorded his or her tooth sensitivity daily on a 5-point scale ranging from no sensitivity to severe discomfort.
Results: There was no significant difference in bleaching efficacy between the experimental and control groups. There was a mean change of 6.2 shade guide units for the experimental group and 6.1 for the placebo group. Approximately 46.7% of the experimental group experienced tooth sensitivity on the day of bleaching as compared to 86.7% of the placebo group. The degree of sensitivity was significantly higher in the placebo group with 60% reporting "moderate" or "considerable" discomfort compared to 13% in the experimental group.
Conclusions: The application of a 5% potassium nitrate, 2% sodium fluoride desensitizing gel prior to in-office bleaching does not interfere with results, but does significantly limit the postoperative sensitivity.
Reviewer's Comments: This study is in agreement with other studies demonstrating the efficacy of potassium nitrate application in reducing the sensitivity associated with take-home bleaching. No reduction in the extent of tooth lightening was noted. The results of this study suggest that the extra 10 minutes taken to apply a desensitizing material to our patients' teeth prior to in-office bleaching would be well worth it. (Reviewer-Daniel E. Wilson, DDS).

Keywords: Desensitizing, Tooth Whitening, Potassium Nitrate, In-Office Bleaching

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Preparation Effects on Bonding of a Self-Etch Adhesive

Effect of the C-Factor and Dentin Preparation Method in the Bond Strength of a Mild Self-Etch Adhesive.

Marques MSM, Kenshima S, et al:

Oper Dent 2009; 34 (July-August): 452-459

Preparing dentin with a fine carbide bur provides the best adhesion with the least variation for a mild self-etch adhesive system.

Objective: To evaluate the effects of C-factor and smear layer on the dentin bond strengths of a mild self-etch adhesive.
Materials/Methods: 25 third molars were used for bond strength testing and 12 were used for a scanning electron microscopy (SEM) evaluation of smear layers. Two factors were considered (the C-factor flat surface vs the prepared cavity) and surface preparation method (coarse or fine diamond, and coarse or fine carbide bur). Five specimens were made for each experimental condition. The prepared cavities were Class V preparations on buccal and lingual surfaces. Flat dentin surfaces were created on the opposite side of each tooth. As controls, some flat surfaces were ground with either 60-grit or 600-grit silicon carbide abrasive paper instead of the diamond or carbide burs. Composite was bonded to the preparations and flat surfaces using Clearfil SE Bond, which includes a mild self-etch primer. Specimens were sectioned for microtensile bond strength (MTBS) testing, which was accomplished using a universal testing machine. Additional specimens were prepared for SEM evaluation.
Results: For dentin prepared with diamonds, MTBS values ranged from 28.8 MPa to 34.8 MPa, and differences based on C-factor or coarseness were not significant. For specimens prepared with carbide burs, mean MTBS values ranged from 20.2 MPa to 32.6 MPa. Bond strengths were lower when a coarse carbide bur was used or when the C-factor was high. As would be expected, the coarse preparation methods tended to form thicker smear layers.
Conclusions: Preparing dentin with a fine carbide bur provides the best adhesion with the least variation for a mild self-etch adhesive system.
Reviewer's Comments: Previous studies have reported that preparation methods can affect the performance of mild self-etch adhesive systems. Specifically, preparing the tooth with a coarse diamond results in lower dentin bond strengths. Most studies have shown that carbide burs create more appropriate smear layers than diamonds for these adhesives. That was not always the case in the present study. However, the authors used a "coarse" carbide bur without describing what it is, so their results with this coarse carbide bur are difficult to interpret. (Reviewer-Edward J. Swift, Jr, DMD, MS).

Keywords: Dentin Bonding, Self-Etch

Print Tag: Refer to original journal article

Bisphosphonates and Root Canal Therapy--An OK Combination

A Retrospective Clinical and Radiographic Study on Healing of Periradicular Lesions in Patients Taking Oral Bisphosphonates.

Hsiao A, Glickman G, He J:

J Endod 2009; 35 (November): 1525-1528

Oral bisphosphonates seem not to affect periradicular healing after root canal therapy.

Objective: To evaluate the healing of periradicular lesions after endodontic therapy in patients taking oral bisphosphonates.
Participants/Methods: 727 subjects, who had nonsurgical root canal treatment performed between 2001 and 2008 at Baylor College of Dentistry, were initially selected. Inclusion criteria were a preoperative lesion with a diameter of at least 2 mm and subject was taking oral bisphosphonate for at least 1 year prior to treatment. Subjects not taking bisphosphonates served as controls. Root canals were treated with a crown-down technique using rotary instruments under sodium hypochlorite irrigation. Root canals were obturated with warm vertical and cold lateral compaction of gutta-percha or RealSeal (Sybron Endo). The outcome of the endodontic therapy was assessed after a minimum of 7 months.
Results: A total of 34 teeth from 28 subjects fulfilled the inclusion criteria. Of those, 26 were initial treatments and 8 were re-treatments. The age of the subjects ranged from 50 to 89 years (mean, 66.4 years). The oral bisphosphonates taken by the subjects were Fosamax, Actonel, and Boniva, which had been taken from 2 to 12 years, with an average of 5 years by the time of treatment. Thirty-eight teeth in 30 subjects served as controls. Of those, 33 were initial treatments and 5 were re-treatments. Subjects' age in the control group ranged from 55 to 87 years (mean, 67.9 years). Nine (4 re-treatments and 5 initial treatments) of 34 cases in the study group and 7 (1 retreatment and 6 initial treatments) of 38 cases in the control group were considered nonhealing at the recall. The overall healing rate of subjects taking oral bisphosphonates was not different from subjects in the control group.
Conclusions: Oral bisphosphonates seem not to affect healing of periradicular lesions after root canal therapy.
Reviewer's Comments: Neither the use of bisphosphonates nor the length of oral bisphosphonate treatment showed association with the incidence of nonhealing periradicular lesions after root canal therapy. Root canal treatment should be seen as a viable treatment option for patients at risk of complications due to oral bisphosphonate therapy. (Reviewer-Ricardo Walter, DDS).

Keywords: Bisphosphonate, Root Canal, Endodontic, Healing

Print Tag: Refer to original journal article

Storage Temperature Affects Shelf Life of Adhesives

Effects of Storage Temperature on the Shelf Life of One-Step and Two-Step Self-Etch Adhesives.

Ma S, Fujita K, Nishiyama N:

Oper Dent 2009; 34 (July-August): 472-480

The shelf life of self-etch adhesive systems is strongly affected by storage temperature.

Objective: To examine the effects of storage temperature and time on the chemistry and bond strengths of 2 self-etch adhesive systems.
Materials/Methods: The adhesives tested in this study were Clearfil Mega Bond Primer (which we know in the U.S. asClearfil SE Bond, so I will call it SE Bond for this review) and Clearfil Tri-S Bond (TSB). SE Bond uses a self-etch primer and Tri-S Bond is an "all-in-one" self-etch adhesive. Each material was stored at 8°C (refrigerator), 20°C (air conditioned room), and 40°C (incubator) for 1, 3, 7, and 14 weeks. At the end of each storage period, they were analyzed for hydrolysis of the 2-hydroxyethyl methacrylate (HEMA) and 10-methacryloxydecyl dihydrogen phosphate (MDP) monomers. For bond strength testing, bovine teeth were ground to flat, 1000-grit dentin surfaces. Composite was bonded to dentin using the same adhesives after 14 weeks of storage at the various temperatures. As a control, bonded specimens were prepared fresh. Shear bond strengths were determined using a universal testing machine (following thermocycling of some specimens). Finally, additional bonded specimens were prepared for evaluation with scanning electron microscopy (SEM).
Results: The hydrolysis rate of HEMA and MDP was strongly dependent on storage temperature. At 40°C, hydrolysis was 4 times faster than at 8° or 20°. However, this had no apparent effect on hybrid layer formation as observed by SEM. Shear bond strengths were not significantly less than the controls except for specimens that had been stored at 40°C (ie, those that had the most hydrolysis of monomers).
Conclusions: The shelf life of self-etch adhesive systems is strongly affected by storage temperature.
Reviewer's Comments: The manufacturer of the 2 products tested in this study states that they have a shelf life of 21 months when stored at 2°C to 8°C. However, the study showed that even cold storage could not prevent hydrolysis of the resin monomers, although it did reduce the rate of hydrolysis. This is a fairly complex study and hard to follow in some portions unless you are a chemist. However, based on their results, the authors' clinical recommendations make sense. They recommend storing self-etch adhesive materials in the refrigerator when not in use and that they should be used as soon as possible after purchase. The materials should be removed from the refrigerator at least 30 minutes or so before use. (Reviewer-Edward J. Swift, Jr, DMD, MS).

Keywords: Dentin Bonding, Shelf Life, Storage Temperature, Self-Etch Adhesives

Print Tag: Refer to original journal article

Study Compares Two Types of Crowns and Their Luting Process

Fracture Performance of Computer-Aided Manufactured Zirconia and Alloy Crowns.

Rosentritt M, Behr M, et al:

Quintessence Int 2009; 40 (September): 655-662

The method of luting does not appear to affect fracture resistance.

Background: Computer-aided design/manufacturing (CAD/CAM) restorations do not require adhesive cementation, and they possess increased strength. These high-strength ceramics can be created by several processes. They demonstrate high fracture strength and high structural reliability compared to conventional glass-ceramics. However, a conventional glass-ceramic veneer placed over the core for esthetic reasons creates the potential for fracture/chipping of the outer ceramic.
Design/Objective: This in vitro study evaluated whether there is a significant difference between fracture force and performance of all-ceramic and metal-based crowns undergoing force application.
Materials/Methods: Molars were mounted in molds allowing 0.1 mm maximum axial and vertical mobility. Preparations had 1-mm shoulders. Sixteen crowns were made from 4 material types. Eight crowns of each group were adhesively luted using Variolink 2 with Syntac Classic, and the other 8 were cemented with zinc oxide-phosphate cement. Specimens were artificially aged with mechanical loading and thermal cycling to simulate 5 years of service. Crowns were checked for failures after every 100,000 loading cycles. After aging, crowns were loaded until failure. Failure modes were recorded as: initial crack; chipping in veneer ceramic; chipping exposing framework; or fracture of core or tooth. Failure location and size were analyzed under scanning electron microscopy (SEM) magnification and noted.
Results: The mean fracture resistance of tested systems varied between 1,111 N and 2,038 N for conventional cementation and 1,181 N and 2,295 N for adhesive bonding. Fracture force with adhesive bonding was lower for Academy laser sintering, Digizon, and Lava systems compared to conventional cementation. Veneering ceramic chipping was the primary failure type. No significant difference in defect propagation was recorded for either adhesive bonding or conventional cementation. No significant difference exists between fracture force and performance of all-ceramic and metal-based crowns after simulated clinical service. Cementation and adhesive bonding demonstrated no significant influence on fractures despite forces greater than expected in oral function. Crown dimensions did not influence results. Fracture patterns demonstrating fracture strength depend primarily on strength of veneering ceramic. These results were comparable to those comparing adhesively bonded glass- or leucite-reinforced all-ceramic systems. Cement type did not influence fracture resistance of crowns with high-strength cores, but significantly influenced fracture strength of glass-ceramic crowns. Veneer chipping occurred inter-facially between cores and veneering ceramic or within the veneering ceramic. The fracture area of porcelain fused to metal crowns was smaller than for all-ceramic crowns.
Conclusions: Fracture force and performance for all-ceramic and metal-based crowns were not dependent on crown material or cement type. Adhesive bonding is required for non-zirconia ceramic systems, but it is not required for high-strength ceramic crowns.
Reviewer's Comments: Advertisements for zirconia crowns emphasize their great resistance to fracture. These statements are true. The problem is always the glass-ceramic placed over the core to achieve good esthetics. We still need to be careful to have control of occlusal forces. (Reviewer-Thomas G. Berry, DDS).

Keywords: Posterior Crowns, Metal-Ceramic, All-Ceramic

Print Tag: Refer to original journal article