Influence of the time-point of salivary contamination on dentin shear bond strength of 3 dentin adhesive systems.


Authors: Hitmi L, Attal JP, Degrange M

Abstract
PURPOSE: The aim of this study was to evaluate the influence of the duration of salivary contamination at different stages during the bonding procedures on shear bond strengths (SBS) of 3 dentin adhesives.

MATERIALS AND METHODS: Flat human dentin surfaces were produced by wet grinding on SiC paper 800. The adhesives used were Syntac Sprint (SS) (Vivadent), One Step (OS) (Bisco), Clearfil Liner Bond 2 (LB2) (Kuraray). Three durations of contamination (3 s, 10 s, and 20 s) at 3 stages (before adhesive application, after its application, and after its polymerization). In all cases the saliva was not rinsed off. Twenty-seven groups of 10 samples were studied according to 3 adhesives, 3 stages, and 3 durations of contamination. For each adhesive, 1 control group, 3 groups with contamination before adhesive application, 3 groups with salivary contamination on the uncured adhesive, and 3 groups with contamination after polymerization (except for SS) were studied. Composite cylinders (Z100, 3M; 3 mm Ø, 5 mm high) were polymerized on the surfaces and stored in 37 degrees C H2O for 48 hours prior to shear bond testing (v = 5 mm/min).

RESULTS: Anova and Scheffe tests showed that for the one-bottle systems tested, salivary contamination prior to adhesive application had no adverse effect on bonding efficacy, SBS decreased significantly when saliva contamination occurred after adhesive application. The self-etching primer tested was more tolerant to salivary contamination, except when the salivary contamination occurred before
the polymerization of the adhesive.

CONCLUSIONS: Salivary contamination does not have the same influence at different stages of the bonding process with modern adhesives. Pending better knowledge of the mechanisms involved in the influence of salivary contamination on bonded assemblies, it seems necessary to continue to recommend using the rubber dam in adhesive dentistry.

(11725670)
.- indexed for MEDLINE]

Durability of resin-dentin bonds.

J Adhes Dent. 1999;1(3):211-8

Authors: Shono Y, Terashita M, Shimada J, Kozono Y, Carvalho RM, Russell CM, Pashley DH

Abstract

PURPOSE: The purpose of this study was to determine if the durability of resin-dentin bonds could be evaluated more quickly if the bond specimen was divided into 1 x 1 x 8 mm beams incubated at 37 degrees C for a 90-day period.

MATERIALS AND METHODS: Extracted human third molars were prepared for bonding by removing the occlusal surface near the dento-enamel junction (superficial dentin group) or near the pulp (deep dentin group). The teeth were bonded either with MacBond, One Step or Clearfil Liner Bond 2, and then built up to form a flat resin composite crown. After 24 hours in water, each buildup was vertically divided into slabs 1 mm thick, the top half of which was resin, with the bottom half as dentin. Each slab was then vertically sectioned at 1-mm increments to create 1 x 1 x 8-mm beams of resin-bonded dentin. They were incubated for 1 day or 90 days at 37 degrees C, followed by measurement of the tensile bond strengths. The results were analyzed by the Least-Squares Means method at the 95% confidence level.
RESULTS: MacBond gave the highest (p < 0.05) 1-day bond strengths to superficial dentin, but significantly lower bond strengths were measured in deep dentin. There were no significant differences in the bond strengths of either One Step or Clearfil Liner Bond 2 to superficial vs deep dentin at 1 day, but at 90 days their bond strengths to deep dentin had fallen significantly (p < 0.05). Prepolymerized cylinders of resin composite bonded together with One Step showed little variation in bond strength over the 90-day experiment. SEM examination of the failed bonds showed increased porosity in intertubular dentin over time.

CONCLUSION: The results indicate that division of large specimens into many small beams accelerated the deterioration of bond strength in deep dentin in all three bonding systems and in both superficial and deep dentin in the MacBond treated specimens. This method seems promising for studying the durability of resin-dentin bonds.

Bond strengths of self-etching primer adhesives to in vitro-demineralized dentin following mineralizing treatment.


Authors: Nakajima M, Ogata M, Harada N, Tagami J, Pashley DH

Abstract
PURPOSE: The purpose of this study was to determine if treatment of experimentally demineralized dentin with a calcium phosphate precipitating (CPP) solution could restore the bond strength of self-etching adhesives to that of normal mineralized control values.

MATERIALS AND METHODS: The occlusal surfaces of human teeth were exposed for bonding. The teeth were assigned to a mineralized control group or one of three demineralized (40% phosphoric acid for 60 s) experimental groups. One of the experimental groups remained untreated, while the other two were treated with the CPP solutions for either 1 or 10 min. All experimental groups were then chemically dehydrated with ascending acetone concentrations to prevent shrinkage prior to bonding with Clearfil Liner Bond 2 (LB2) or MacBond II (MBII). Composite buildups were made and vertically, serially sectioned into multiple slabs about 0.7 mm thick. Each slab was then trimmed for microtensile bond testing and SEM examination.

RESULTS: Both self-etching adhesives produced high bond strengths to control mineralized dentin (ca 42 and 37 MPa for LB2 and MBII, respectively). Acid etching with 40% phosphoric acid for 60 s followed by chemical dehydration significantly lowered (p < 0.05) bond strength to 26 and 27 MPa for LB2 and MBII, respectively, and created hybrid layers between 7 and 8 microns thick. When the demineralized dentin was treated with the CPP solution for 1 min, the bond strengths increased (p < 0.05) to 39 for LB2 and 42 MPa for MBII, and the hybrid layers were 11 microns thick. Increasing the CPP treatment time to 10 min lowered (p < 0.05) bond strengths but increased the hybrid layer thickness to 16 to 20 microns.

CONCLUSION: The use of calcium phosphate precipitating solutions may permit higher bond strengths of self-etching primers to demineralized (e.g., caries-affected) dentin.

(11317406)
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Field-emission scanning electron microscopy of resin-dentin interface morphology of seven dentin adhesive systems.

Field-emission scanning electron microscopy of resin-dentin interface morphology of seven dentin adhesive systems.


Authors: Tanumiharja M, Burrow MF, Tyas MJ, Carpenter J

Abstract

PURPOSE: The purpose of this study was to evaluate the resin-dentin interface morphology of 7 resin-based dentin adhesive systems (Solid Bond, EBS-Multi, PermaQuik, One Coat Bond, Gluma One Bond, Prime & Bond NT/NRC, and Clearfil Liner Bond 2V).

MATERIALS AND METHODS: Fourteen dentin disks 1.0 mm thick were obtained from superficial occlusal dentin of extracted human third molars, and finished with wet 600-grit silicon carbide paper. Two dentin disks were bonded using each of the adhesives above according to the manufacturers’ instructions, and a thin layer of flowable resin composite was applied. The specimens were kept in tap water for 24 h at 37 degrees C, and then assigned to one of two observational techniques: a fracture technique and an acid-base technique. Fracture technique: shallow grooves were cut, fixed in 10% buffered formalin, and dehydrated in an ascending ethanol series up to 100%, critical-point dried, and fractured along the prepared grooves. Acid-base technique: the specimens were embedded in epoxy resin, sectioned through the center, polished with diamond paste down to 0.25-micron particle size, and treated with 10% orthophosphoric acid for 10 s and 5% sodium hypochlorite for 5 min. All the specimens were mounted on aluminum stubs, gold sputter coated, and observed using field-emission scanning electron microscopy (FE-SEM).

RESULTS: All the dentin adhesive systems showed hybrid layer formation, but the thickness varied depending on the bonding system used. The self-etching priming
systems (Prime & Bond NT/NRC and Clearfil Liner Bond 2V) showed the thinnest hybrid layer at 1 to 2 microns, whereas the “single-bottle” system (Gluma One Bond) exhibited the thickest hybrid layer at 8 to 16 microns.

CONCLUSION: The ultramorphological structures of dentin bonding systems are determined by the composition of each system. Characterization of the interface of the adhesive system using the fracture technique provides additional information regarding the pattern of resin infiltration in some dentin bonding systems.

(11317372)
.- indexed for MEDLINE]

Long-term durability of the dual-cure resin cement/silicon oxide ceramic bond.


Authors: Foxton RM, Pereira PN, Masatoshi N, Tagami J, Miura H

Abstract
PURPOSE: To determine the effects of using a ceramic primer, ceramic bonding agent, or a combination of primer/bonding agent on the long-term durability of the dual-cure resin cement/silicon oxide ceramic bond.

MATERIALS AND METHODS: Ceramic blocks (Vita Celay Blanks), A2M, were cut into 1-, 2-, and 3-mm-thick slices and polished using 600-grit SiC paper. Group 1 consisted of pairs of 1- and 3-mm-thick slices, and Group 2 of pairs of 2- and 3-mm-thick slices. Ceramic surfaces were treated with 40% phosphoric acid and silanated using one of three treatments: (1) Clearfil Liner Bond 2V Primer (2V Pr)
and Porcelain Bond Activator (PBA), (2) Liner Bond 2V Primer/PBA and Liner Bond 2V Bond (2V Pr + Bd), and (3) Clearfil Photo Bond/PBA (P Bd). They were then bonded with a dual-cure resin cement (Panavia F) and light-cured for 20 s from each of six directions. After 24 h water storage at 37 degrees C, 0.7-mm-thick slabs were serially sectioned. Immediately thereafter, after one and six weeks, and after one year of water storage, two slabs were randomly selected from each subgroup and sliced into beams for the microtensile bond strength (microTBS) test. Data were evaluated with three-way ANOVA and Fisher’s PLSD test (p < 0.05) and failure modes determined using a laser-scanning confocal microscope.

RESULTS: After 1 day, there were no significant differences between 2V Pr, 2V Pr + Bd, and P Bd (p > 0.05), whereas after one year, significant differences were found (p < 0.05). For Group 1, the micriTBS of P Bd after one year of water storage was similar to that after one day. In both groups, microTBS of 2V Pr and 2V Pr + Bd significantly decreased over time (p < 0.05), which was accompanied by an increase in the percentage of complete adhesive failures.

CONCLUSION: The chemical composition of the multicomponent ceramic primer/bonding agent significantly affects the long-term durability of the dual-cure resin cement/silicon oxide ceramic bond. The presence of water in a ceramic primer has a significant detrimental effect on resin-ceramic bond durability. In addition, the thickness of the ceramic restoration influences dual-cure resin cement/ceramic bond durability.

(12236641)
.- indexed for MEDLINE]
different curing strategies.

**Durability of the dual-cure resin cement/ceramic bond with different curing strategies.**


Authors: Foxton RM, Pereira PN, Nakajima M, Tagami J, Miura H

Abstract

PURPOSE: To evaluate the effects of different curing strategies on the durability of the dual-cure resin cement/ceramic bond.

MATERIALS AND METHODS: Machinable ceramic blanks were cut into pairs of 3-mm-thick slices, which were then polished using wet 600-grit SiC paper. The slices were silanated using one of two ceramic priming systems: (1) Tokuso Ceramic Primer (TCP), and (2) K-etchant/Clearfil Liner Bond 2V Primer (LB2V)/Porcelain Bond Activator (PBA), and bonded with one of two dual-cure resin cements (Bistite II, Panavia F), to make four experimental groups. Each group was subjected to one of three curing strategies: (1) no light, (2) 20 s light exposure from one direction, and (3) 20 s light exposure from each of six directions. After 24 h water storage at 37 degrees C, 0.7-mm-thick slabs were produced by serially sectioning perpendicular to the bonded interface. Immediately thereafter, and after one and six weeks of water storage, two slabs were randomly selected and sliced into beams for the microtensile bond strength (microTBS) test. Data were evaluated using Kruskal-Wallis and Wilcoxon rank tests (p < 0.05), and failure modes determined using a laser-scanning confocal microscope.

RESULTS: After priming with TCP, microTBS of Bistite II significantly increased over time when exposed to light, whereas the microTBS of the no-light group significantly decreased over time (p < 0.05). After priming with TCP, microTBS of Panavia F increased over time, and after 6 weeks water storage, there were no significant differences in microTBS between the no-light and light-exposed groups (p > 0.05). Increases in microTBS were associated with increases in the number of cohesive failures in resin cement. After phosphoric acid treatment, priming with LB2V/PBA, and light exposure, microTBS of Bistite II remained stable, whereas that of Panavia F significantly reduced over time (p < 0.05). The microTBS of no-light LB2V/PBA groups reduced significantly over time (p < 0.05).
Effect of air abrasion and resin composite on microleakage of Class V restorations bonded with self-etching primers.

J Adhes Dent. 2001;3(3):265-72
Authors: Hannig M, Fu B

Abstract

PURPOSE: The purpose of this in vitro study was to determine the effect of air-abrasion pretreatment on microleakage of Class V resin composite restorations bonded with self-etching primers.

MATERIALS AND METHODS: A total of 54 Class V cavities prepared either with diamond burs or air abrasion (KCP 1000) was restored with resin composites using adhesive systems with self-etching priming agents (Clearfil Liner Bond 2 or Resulcin AquaPrime + Monobond) and thermocycled 2,500 times. The degree of dye penetration (0.5% methylene blue solution) was scored on an ordinal scale at 25X magnification on longitudinally cut sections of the specimens. Wall adaptation at the tooth-restoration interfaces was evaluated under a SEM using replicas of the sectioned teeth.
RESULTS: Severe microleakage occurred at the gingival dentinal margins, and less microleakage was detected at the enamel cavity margins. Nonparametrical statistical analysis (H-test) demonstrated no significant differences in microleakage among the different groups. Comparison of dye penetration data and SEM findings showed that with both self-etching priming agents, microleakage occurred in the absence of gaps.

CONCLUSION: Use of air abrasion in combination with self-etching priming agents cannot prevent microleakage at the dentin-resin interface of Class V resin composite restorations.

(11803714) - indexed for MEDLINE]

The effects of bonding system and light curing method on reducing stress of different C-factor cavities.

J Adhes Dent. 2001;3(2):177-83

Authors: Yoshikawa T, Burrow MF, Tagami J

Abstract

PURPOSE: The effect of the slow-start curing method on the marginal sealing and cavity wall adaptation on resin composite restorations with different C-factors was evaluated.

METHODS: Cylindrical cavities, 1 mm deep and 3 mm in diameter (C-factor=2.3) or 2 mm in diameter (C-factor=3) were prepared on flat superficial bovine dentin
surfaces. The teeth were restored with Clearfil Photo Bond, Clearfil Liner Bond 2 or Super-Bond D Liner adhesive systems followed by Photo Clearfil Bright composite. The resins were cured with a conventional method using 600 mW/cm² (tip-to-resin distance 0 mm) for 60 s, or the slow-start curing method of 270 mW/cm² (tip-to-resin distance 10 mm) for 10 s, followed by a 5-s interval, then 50 s at 600 mW/cm². After thermocycling, a dye penetration test was carried out. The dye penetration length was calculated as a percentage of the total cavity wall length.

RESULTS: Cavity-wall gap formation increased when the C-factor increased from 2.3 to 3, except in one material, Super-Bond D Liner, which showed good marginal sealing and resin composite adaptation to the cavity wall regardless of light curing method and C-factor.

CONCLUSION: It is necessary to take care when a cavity with a high C-factor is to be restored with resin composite. The combination of a flexible adhesive and the slow-start curing method would seem to be effective in reducing polymerization contraction stress for large C-factor cavities.

(11570686) - indexed for MEDLINE]