Efficacy of Natural Collagen Crosslinkers on the Compromised Adhesive Bond Strength to NaOCl-treated Pulp Chamber Dentin.


Authors: Cecchin D, Farina AP, Bedran-Russo AK

Abstract

PURPOSE: To evaluate the efficacy of natural collagen crosslinkers on compromised adhesive bond strength to NaOCl-treated pulp chamber dentin.

MATERIALS AND METHODS: Mesial surfaces of the pulp chamber dentin of 120 extracted human molars were obtained. The dentin fragments were divided into six groups according to the protocols used: no treatment (negative control), sodium hypochlorite (NaOCl) for 30 min and final irrigation with 17% EDTA for 3 min (positive control). After treatment with NaOCl and EDTA, the dentin surfaces of the experimental groups were treated for 5 min with one of the following: grape seed extract (GSE), tannic acid (TA), green tea (GT), or n-acetyl cysteine (NAC). Half of the samples of each group were bonded with an etch-and-rinse (Single Bond; 3M Oral Care) and the other half using a self-etch (Scotchbond Universal; 3M Oral Care) adhesive. The restoration was completed with composite. The bonded specimens were sectioned to produce sticks and subjected to the microtensile bond strength test. Data were analyzed by two-way ANOVA and Tukey’s HSD test (p < 0.05).

RESULTS: Both adhesives had similar bond strengths (p > 0.05). The NaOCl-treated group had significantly lower bond strength than the negative control (p < 0.05). The application of NAC did not recover compromised bonding (p > 0.05). On the other hand, GSE, TA and GT had significant reversal effects of the bond strengths to NaOCl-treated dentin (p < 0.05).
CONCLUSION: Compromised bonding of adhesives to NaOCl-treated dentin can be reversed by the application of either GSE, TA or GT.

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Treatment of an Adolescent Patient with Dentinogenesis Imperfecta Using Indirect Composite Restorations - A Case Report and Literature Review.


Authors: Soliman S, Meyer-Marcotty P, Hahn B, Halbleib K, Krastl G

Abstract
PURPOSE: To demonstrate the field of application and prospects of individually modeled indirect composite restorations for the treatment of children and adolescents based on a case of dentinogenesis imperfecta. Dental malformations can affect single or multiple teeth. In most cases, direct composite fillings can be placed. However, in severe cases, these restorations may be more challenging and error-prone, especially when occlusal adjustments are necessary. Since composite materials do not require a specific lamination strength and are easy to repair, they can be applied using the indirect technique, enabling conservation of more sound hard tissue than is possible when conventional restorations are used.
PATIENT AND METHODS: A young patient with dentinogenesis imperfecta type II underwent interdisciplinary full-mouth rehabilitation due to massive tooth wear and loss of vertical occlusion. First, a check bite was taken, and vertical occlusion was increased using overdentures. Six months later, a construction bite was taken over the existing overdentures (focusing on the sagittal dimension) to move the mandibular position more towards the anterior, correcting the skeletal Class II malocclusion. This resulted in a Class I intercuspitation with harmonization of the facial proportions. After a further six months, all teeth were restored using individually modeled indirect composite restorations, which preserved most of the sound hard tissue and restored esthetics and function.

CONCLUSION: Indirect composite restorations can be a valuable tool for improving occlusion, esthetics and function in the treatment of children and adolescents.

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Effect of Composite Polymerization Stress and Placement Technique on Dentin Micropermeability of Class I Restorations.


Authors: Fronza BM, Abuna GF, Braga RR, Rueggeberg FA, Giannini M
Abstract

PURPOSE: To investigate the effect of polymerization stress and insertion technique on dentin micropermeability of composites placed under pulpal pressure.

MATERIALS AND METHODS: One high-viscosity conventional (HC; Filtek Supreme Ultra; 3M Oral), one low-viscosity conventional (LC; Filtek Supreme Ultra Flowable; 3M Oral), one high-viscosity bulk fill (HBF; Filtek Bulk Fill Restorative; 3M Oral), and one low-viscosity bulk fill (LBF; Filtek Bulk Fill Flowable; 3M Oral) composite were evaluated. Polymerization stress was measured with materials bonded to acrylic rods in a universal testing machine (n = 5). Class I preparations were made in extracted molars, in which tooth roots were removed and the pulpal chambers cleaned. Preparations were coupled to a hydraulic device to simulate pulpal pressure during composite placement (n = 5). Conventional composites were placed in two horizontal increments, while bulk fill materials were placed in one, single increment. Fluid flow rate (µl/min) and dentin micropermeability (%) were monitored. The restoration interface was observed under confocal laser scanning microscopy.

RESULTS: LC and LBF presented statistically significant higher polymerization stress than HC and HBF. Fluid flow rate and dentin micropermeability did not differ among the groups. However, different patterns of fluid infiltration and interface integrity were observed. HC and HBF presented well-sealed surrounding margins with small gaps along the pulpal wall, while HBF demonstrated more cracks in the adhesive layer. LC and LBF restorations had larger gaps along all bonded interfaces.

CONCLUSION: No difference in polymerization stress was found when conventional and bulk fill composites with similar viscosities were compared. Neither polymerization stress or placement technique demonstrated a significant effect on dentin micropermeability. The incremental placement technique using a conventional, high-viscosity composite exhibited qualitatively better marginal integrity.

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Dentin Bond Strength of Experimental Composites Containing Bioactive Glass: Changes During Aging for up to 1 Year.

Abstract

PURPOSE: To investigate dentin bond strength of experimental composites based on a bis-GMA/TEG-DMA composite filled with a varying amount (0 to 40 wt%) of bioactive glass 45S5 (BG) at a total filler content of 70 wt%.

MATERIALS AND METHODS: Specimens for shear bond strength testing (diameter = 3.12 mm, height = 3 mm) were bonded to human dentin using a two-step self-etch adhesive and subjected to aging in water at 37°C for 1 week, 1 month, 3 months, 6 months, and 1 year. A total of 600 specimens were prepared (6 materials × 5 aging times × 20 specimens per experimental group). Bond strength was tested by loading specimens in a universal testing machine at a constant crosshead speed of 0.5 mm/min until fracture. Reliability analysis was performed using Weibull statistics.

RESULTS: Experimental composites with a low BG content (up to 5 wt%) showed dentin bond strength and reliability comparable to those of the commercial reference composite. A further increase in the BG amount diminished both bond strength and reliability. The bond strength decline was linearly dependent on the amount of BG when observed within each aging time. One-year aging in water caused no deterioration of bond strength, but diminished bond reliability. The reliability after 1-year aging was similar among all composites, including the...
Can the Use of a Warm-Air Stream for Solvent Evaporation Lead to a Dangerous Temperature Increase During Dentin Hybridization?


Authors: Silva EMD, Penelas AG, Simmer FS, Paiva RV, Moreira E Silva VL, Poskus LT

Abstract
PURPOSE: To analyze the effect of a warm-air stream for solvent evaporation on the temperature rise in the pulp chamber during dentin hybridization.
MATERIALS AND METHODS: Dentin disks with thicknesses of 0.5, 1.0 and 1.5 mm were obtained from extracted human molars. A model tooth was set up with the dentin disks between a molar with an exposed pulp chamber and a crown with an occlusal preparation. A K-type thermocouple connected to a digital thermometer was placed in the molar root until it entered the pulp chamber and made contact with the dentin disks. After 10 s of adhesive application, solvent evaporation was performed for 10, 20, 30, and 40 s and the increase in...
temperature was monitored for 200 s after the warm-air stream began.

RESULTS: The temperature increase was significantly influenced by the thickness of the dentin disks (0.5 mm = 1.0 mm > 1.5 mm). With respect to the duration of the warm-air stream, the temperature increase was as follows: 10 s < 20 s < 30 s < 40 s (p < 0.05). The highest temperature was found after 40 s with dentin disks that were 0.5 mm (16.6°C) and 1.0 mm (15.8°C) thick, whereas the lowest temperature increase occurred after 10 s with a dentin disk that was 1.5 mm thick (4.1°C) (p < 0.05).

CONCLUSION: The temperature in the pulp chamber was strongly influenced by the dentin thickness and the duration of the warm-air stream. Thinner dentin and a longer duration of the warm-air stream both lead to a greater temperature increase in the pulp chamber.

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Does Luting Strategy Affect the Fatigue Behavior of Bonded Y-TZP Ceramic?


Authors: Fraga S, de Jager N, Campos F, Valandro LF, Kleverlaan CJ

Abstract

PURPOSE: To evaluate the effect of different luting strategies on the fatigue failure load (FFL) and stress distribution of Y-TZP disks luted to epoxy resin substrate.
MATERIALS AND METHODS: Y-TZP disks (diameter = 10 mm; thickness = 0.7 mm) were assigned to five groups according to the luting strategy (n = 15): CC: no zirconia surface treatment, composite cement; G_CC: application of a thin glaze layer on zirconia followed by hydrofluoric acid etching and silanization, composite cement; Al_CC: air abrasion of the zirconia surface with 125-µm Al2O3 particles, composite cement; Si_CC: tribochemical silica coating (30-µm SiO2 particles), composite cement; ZP: air abrasion of the zirconia surface with 125-µm Al2O3 particles, zinc-phosphate cement. The disks were luted to the epoxy resin substrate. The FFL was evaluated by the step-test method. The load was applied in stages of 10,000 cycles, starting with 600 N, followed by increments of 200 N. Samples were loaded until fracture or to a maximum of 100,000 cycles. FFL data were submitted to Kaplan-Meier (α = 0.05) and Weibull analyses. Conditions simulating a strong and a weak bond between Y-TZP and epoxy resin were evaluated in the finite element analysis (FEA).

RESULTS: Luting strategy influenced the FFL (p < 0.001) and the stress distribution of Y-TZP disks. Al_CC (2227 ± 149 N) and Si_CC (2133 ± 235 N) showed the highest FFL values, followed by CC (1800 ± 293 N) and G_CC (1280 ± 147 N), while ZP showed the lowest FFL value (680 ± 101 N). The highest Weibull modulus occurred in Al_CC (18.2). A strong bond reduced the tensile stress concentration in the Y-TZP luting surface, while a weak bond between Y-TZP and the epoxy resin favored the concentration of tensile stresses.

CONCLUSION: Air abrasion with aluminum oxide and silica-coated alumina particles improves the FFL of bonded Y-TZP. Zinc-phosphate cement should be used very carefully in the cementation of zirconia restorations, since it results in lower values of FFL than composite cements.

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Different Surface Treatments on the Bonding Performance of a CAD/CAM Composite Block.

Influence of Ambient Air and Different Surface Treatments on the Bonding Performance of a CAD/CAM Composite Block.


Authors: Ali A, Takagaki T, Nikaido T, Abdou A, Tagami J

Abstract

PURPOSE: To evaluate the bond strengths of time elapsed after sandblasting with alumina particles on a CAD/CAM composite block treated with different surface conditioning methods.

MATERIALS AND METHODS: A CAD/CAM composite block (CCB) was cut into 72 slices of approximately 2 mm thickness. The CCB slices were divided into three groups according to sandblasting pressure (0.1 MPa, 0.2 MPa, or untreated), and then divided into two subgroups according to the time elapsed after sandblasting: same-day or one-week dry storage under controlled laboratory conditions before cementation. Surface roughness was observed by confocal laser microscopy (CLSM) (n = 20); then the wettability of the CCB surfaces was examined using a contact angle (CA) measuring device on a droplet of deionized water (n = 12). Next, CCB slices were divided into three subgroups according to the surface treatment: Clearfil Ceramic Primer (CP), Clearfil Universal Bond (UB), or a mixture of Clearfil Porcelain Bond Activator and Clearfil tri-S Bond ND Quick (NDP). All CCB slices were then cemented with Panavia V5 and stored at 37°C in distilled water for 24 h and cut into sticks (n = 10). The sticks were subjected to microtensile bond strength (µTBS) testing, and failure mode analysis was performed using scanning electron microscopy. The µTBS results were subjected to 3-way and 2-way ANOVA (α = 0.05).

RESULTS: All groups showed a statistically significant increase in wettability accompanied by decreased µTBS after one week; however, the UB group exhibited stable performance after one week.
CONCLUSION: The time elapsed after sandblasting with alumina particles affects the bond strength, but it had no significant effect on the UB group.

(Efficacy of Plasma Treatment for Decontaminating Zirconia.


Authors: Piest C, Wille S, Strunskus T, Polonskyi O, Kern M

Abstract

PURPOSE: To evaluate the influence of contamination and plasma treatment on the bond strength of resin to zirconia ceramic.

MATERIALS AND METHODS: After immersion in saliva or the use of a silicone disclosing agent, polished and airborne-particle abraded zirconia specimens were cleaned either ultrasonically in 99% isopropanol or with nonthermal plasma. Uncontaminated zirconia specimens were used as control. For chemical analysis, specimens of all groups were examined with x-ray photoelectron spectroscopy (XPS). Plexiglas tubes filled with composite resin were bonded to ceramic specimens with a phosphate-monomer-containing luting resin. The influence of contamination and cleaning methods on ceramic bond durability was examined by tensile testing after 3 and 150 days of water storage, with an additional 37,500 thermocycles during the 150-day storage.

RESULTS: XPS showed an increase in the amount of oxygen and a decrease in the amount of carbon on the zirconia surface after plasma treatment. After contamination with silicone, XPS revealed a high amount of Si residue on the surface that none of the investigated cleaning processes could completely remove.
The tensile bond strength to uncontaminated zirconia ceramic was durable, but was significantly reduced by contamination.

CONCLUSION: Plasma treatment was effective in removing salivary contamination but not silicone disclosing agent residue from the bonding surface of zirconia.

A Randomized, Controlled, Split-mouth Trial Evaluating the Clinical Performance of High-viscosity Glass-ionomer Restorations in Noncarious Cervical Lesions: Two-year Results.


Authors: Çelik EU, Tunac AT, Yilmaz F

Abstract

PURPOSE: To compare the two-year clinical performance of high-viscosity glass
ionomer (Hv-GIC) restorations in noncarious cervical lesions with nanohybrid composite restorations applied with a three-step etch-and-rinse adhesive (E&Ra/nanoC).

**MATERIALS AND METHODS:** One hundred thirty-four noncarious cervical lesions were included and assigned to two groups according to the split-mouth design. The cervical lesions in the experimental group were restored with an Hv-GIC (Equia, GC), while a nanohybrid composite (G-aenial, GC) with a three-step etch-and-rinse adhesive (Optibond FL, Kerr) was applied as the control. All tested restorative materials were used according to the manufacturers’ instructions. Clinical evaluation was performed after one week, six months, one year, and two years using World Dental Federation criteria. Data were analyzed using Friedman’s ANOVA and Mann-Whitney U-tests ($\alpha = 0.05$).

**RESULTS:** After two years, Hv-GIC restorations had a retention rate of 91% in comparison to 100% for E&Ra/nanoC restorations. Significant differences existed between the two restorative materials solely with respect to the retention parameter after two years ($p = 0.008$).

**CONCLUSIONS:** The two-year clinical performance of Hv-GIC was clinically acceptable. However, the retention of E&Ra/nanoC restorations was significantly better than that of Hv-GIC restorations after two years.

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**Editorial: From open-access to ‘predatory’ publishing.**

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Authors: Van Meerbeek B, Frankenberger R
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