

procedure improves the degree of conversion without altering the μ TBS of experimental universal adhesives.

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Fatigue limit of Y-Tzp ceramic after surface treatments



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Purpose: To evaluate the effect of two surface treatments on the biaxial flexural strength and fatigue limit of a Y-TZP ceramic.

Methods and materials: Disc-shaped specimens (1.2 mm × 12 mm, In Ceram YZ, Vita Zahnfabrik, DE) were produced and three surface conditions were tested: C (as-sintered, untreated), G (thin layer of porcelain glaze), and S (air abrasion with 30 μ m silica particles). Profilometric and phase transformation analyses were performed. At first, 20 Y-TZP discs were submitted to biaxial flexural strength ($n=20$), and the obtained values were used to determine the parameters for the stair-case approach. Flexural fatigue limits (FFLs) were obtained at 100; 1000; 10,000 and 100,000 cycles; initial load was 70% of the failure stress, with increments of 5% from the initial load, at a frequency of 0.5 Hz. One-way ANOVA and Tukey's test was applied to roughness results. Weibull statistics was used to analyze flexural strength results and regression analysis was performed for mean FFLs.

Results: Tetragonal to monoclinic transformation was only observed for S group (9.46% of monoclinic phase). Ra roughness values (μ m) and respective standard deviations were: C=0.29 (0.03)B, G=0.63 (0,1)A and S=0.31 (0.04)B. Weibull parameters m and s_0 (MPa) for each group with respective confidence intervals were: C: 11.1 (7.0–14.9) and 965.1 (918.5–1013.3), G: 12.1 (7.44–16.5) and 1,040.3 (991.3–1,091.1) and S: 7.27 (4.5–9.9) and 1,343.5(1239.7–1454.7). FFLs obtained for 100; 1,000; 10,000 and 100,000 cycles indicated different percentages of decrease in flexural strength for groups: C

– 11.4% (817.0 MPa), 14.9% (784,7 MPa), 16.6% (769.5 MPa) and 15.8% (777.0 MPa), respectively; G – 8.5% (912.5 MPa), 16.2% (835.6 MPa), 17.1% (826.9 MPa) and 24.1% (756.9 MPa), respectively; and S – 8.8% (1147.1 MPa), 12.8% (1096.9 MPa), 14.7% (1072.5 MPa) and 18.7% (1023.0 MPa), respectively. Fig. 1 shows the regression graphic, with initial strength and FFLs.

Conclusion: The application of a thin glaze layer of on Y-TZP surface resulted in higher decrease in fatigue limit, and also greater surface roughness in comparison to the other tested groups. Air abrasion significantly increased the flexural strength and fatigue limit of Y-TZP specimens, without significant decrease in material's reliability.

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Micropush-out dentin bond strength of a new Gutta-Percha and niobium phosphate glass composite



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Purpose: The aim of this study was to evaluate the micropush-out bond strength to root dentin and to characterize an experimental gutta-percha and niobium phosphate glass composite without sealer in an aqueous environment.

Methods and materials: Sixty human mandibular premolars were prepared using rotary NiTi instruments and irrigation with sodium hypochlorite and EDTA. The teeth were then randomly divided into 3 groups and filled with AH Plus sealer and gutta-percha Protaper (AH/Gutta), BC gutta-percha without sealer (Gutta/BC), and gutta-percha and niobium phosphate glass composite without sealer (Gutta/NbG). After 30 days in simulated body fluid, the specimens were submitted to the micropush-out test at a speed of 0.5 mm/min. The failure mode was analyze by SEM. An energy dispersive X-ray fluorescence spectrometry analysis and a scanning electron microscope with energy dispersive X-ray detector EDS were carried out to verify the composition of the tested materials. Data were statistically analyzed by one-way ANOVA and Tukey tests ($p < 0.05$).

Results: Groups AH/Gutta and Gutta/NbG showed bond strength of 2.83 ± 0.64 MPa and 2.68 ± 0.84 MPa respectively, with no statistically significant difference between them ($p > 0.05$). Group Gutta/BC had the lowest bond strength average of (1.34 ± 0.42) MPa, with statistically significant difference compared to the other groups ($p < 0.05$). Cohesive failures prevailed in the group AH/Gutta, whereas failures were mixed in the groups Gutta/BC and Gutta/NbG.

Conclusion: The experimental root filling composite (Gutta/NbG) in an aqueous environment, showed ability to

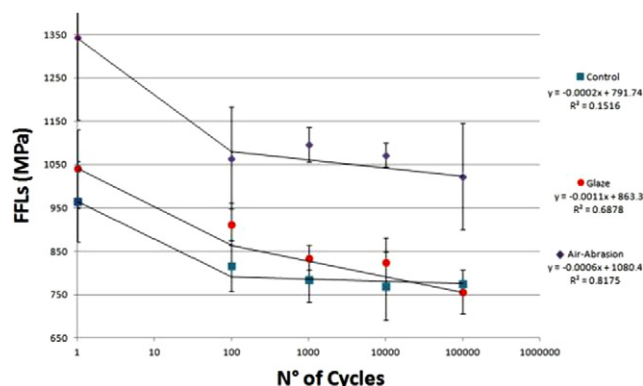


Fig. 1

adhere to root dentin equal to the current gold standard root filling with gutta-percha and sealer (AH/Gutta).

Groups	Composition – EDX (%)	μ push-out (MPa)	Failure mode (%)		
			Adhesive	Cohesive	Mixed
AH/Gutta	ZnO 90.6, BaO 6.0, SO ₃ 3.1, SrO 0.08, NiO 0.06	2.83 ± 0.64 (20) ^a	3.13	78.12	18.75
Gutta/BC	ZnO 30.3%, ZrO ₂ 34.4%, BaO 17.7%, SO ₃ 6.5%, TiO ₂ 4.7%, MgO 3.0%, SiO ₂ 2.1%, HfO ₂ 0.6%, CaO 0.3%, SrO 0.13%, Y ₂ O ₃ 0.04%, Fe ₂ O ₃ 0.04%	1.32 ± 0.42 (19) ^b	30.40	19.20	49.70
Gutta/NbG	ZnO 35%, BaO 32.8%, SO ₃ 15.2%, P ₂ O ₅ 1.3%, Nb ₂ O ₅ 1.09%, CaO 0.6%, Fe ₂ O ₃ 0.32%, Cr ₂ O ₃ 0.23%	2.68 ± 0.84 (20) ^a	41.73	5.52	52.75

Different letters indicate a statistical difference ($p < 0.05$).

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Bond stability of a chitosan-containing experimental adhesive



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Purpose: The aim of this study was to investigate the influence of aging on bond strength of a chitosan-containing experimental adhesive, assayed with microtensile bond strength test (μ TBS) and nanoleakage analysis.

Methods and materials: Sixteen extracted third human molars were selected and flat dentin surface was exposed and assigned to two groups ($N = 8$) after acid-etching: Group 1: a chitosan containing primer followed by an unsolvated bonding agent (R2: 70% BisGMA, 28.75% TEGDMA, 0.5% EDMAB, 0.5% TPO, 0.25% CQ); Group 2 (control): a primer without chitosan (30% HEMA, 20% ethanol, 50% MES) followed by R2. A layer of resin composite (Filtek Z250, 3M ESPE) was placed over the bonded surface and polymerized. Specimens were processed for μ TBS in accordance with the non-trimming technique and pulled to failure either after Chewing Simulation (TCS; 37 °C in 0.5 mL artificial saliva, submitted to 50 N occlusal load, 1 Hz, up to 1,200,000 cycles) or after storage in artificial saliva at 37 °C for the same time (approximately 3 weeks; T_0). Additional specimens were similarly processed to investigate nanoleakage expression under light microscopy and SEM. Statistical analysis was performed with the Mann-Whitney U -test ($p < 0.05$).

Results: μ TBS values are reported in Table 1.

Table 1 – Means ± SD of μ TBS (MPa).

Adhesive system	T_{CS}	T_0
Group 1	28.38 ± 8.78 ^{aA}	26.04 ± 8.73 ^{aA}
Group 2	17.98 ± 6.01 ^{bB}	25.45 ± 8.67 ^{aA}

Different superscript lower case letters indicate a statistical difference in column and different superscript capital letters indicate a statistical difference in rows ($p < 0.05$).

Conclusion: Chitosan addition to the experimental primer affected the bond strength and interfacial nanoleakage

expression after chewing simulation (T_{CS}). Further studies are needed to clarify the effect of chitosan blended within dentin bonding systems.

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P5

Fracture resistance of CAD/CAM manufactured veneer crowns with zirconia framework



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Purpose: The aim of this study was to evaluate the in vitro influence of the thickness of veneering ceramics on the fracture resistance of zirconia based crowns veneered with CAD/CAM manufactured ceramic.

Methods and materials: 20 identical zirconia1 frameworks (1.0 mm thickness) were manufactured by CAD/CAM2 and 20 crowns with two different occlusal thicknesses (Groups TF1 = 1.0 mm and TF2 = 2.0 mm; $n = 10$) were milled using a CAD/CAM manufactured feldspathic ceramic3 veneer that was cemented onto zirconia frameworks using resin cement4. All crowns were mechanically cycled ($F_{max} = 200$ N; 2,000,000 cycles; 3.0 Hz) and after the cycling the presence of chipping and delamination was observed on a stereomicroscope. The fracture test was performed (0.5 mm/min, 1000 kgf load cell), the failure mode was classified and the failure origin was determined as well. The data (in kgf) were statistically analyzed using t -Student test (5%). 1Vita In-Ceram YZ, Vita Zahnfabrik. 2CEREC InLab MC XL, Sirona Dental Systems. 3Vita TriLuxe Forte, Vita Zahnfabrik. 4Panavia F 2.0, Kuraray.

Results: The mean values and standard deviation of the maximum fracture strength (kgf) and coefficient of variation for each experimental group ($n = 10$) were respectively: TF1 $n = 148.2 \pm 31.4$; 21.24 and TF2 $n = 211.0 \pm 33.1$; 15.70. For t -Student test TF1 and TF2 showed statistical difference ($p < 0.05$). Table 1 shows the classification of failure mode according to the classification in cracking, chipping, delamination and catastrophic fracture and according to Burke's classification.