



“INFLUENCE OF SURFACE TREATMENTS ON BOND STRENGTH OF RESIN CEMENT TO CAD/CAM CERAMICS”

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Abstract:

The aim of this study was to investigate the bond strength of a resin cement (RelyX Veneer, 3M Oral Care) to feldspathic (Cerec Blocs, Dentsply Sirona) and leucite-reinforced (IPS Empress CAD, Ivoclar Vivadent) CAD/CAM ceramics submitted to different surface treatments: G1, 5% hydrofluoric acid (HF) application for 20s; G2, 5% HF application for 60s; G3, 10% HF application for 20s; G4, 10% HF application for 60s; G5, Monobond Etch and Prime (Ivoclar Vivadent) (MEP) application for 20s; G6, MEP application for 60s. For groups G1, G2, G3 and G4 a silane was applied for 1 min after HF treatment. Resin cement cylinders were adhered to the treated surface and shear bond strength (SBS) test was performed, after 24-h immersion in distilled water at 37°C, using a universal testing machine (EZ-Test, Shimadzu). SBS data were analyzed by one-way ANOVA followed by Tukey's post hoc test ($\alpha=0.05$). Fractured samples were analyzed with an optical microscope (KH 8700, Hirox) and were classified according to the failure: adhesive (ADE), cohesive in ceramic (COC), cohesive in resin cement (COR), mixed between adhesive and ceramic (MAC), mixed between adhesive and resin cement (MAR), mixed between adhesive, resin cement and ceramic (MARC). MEP showed higher bond strength for both ceramics. Application of 5% HF for 20s reduced the bond strength to feldspathic ceramic. The HF concentration (5% or 10%) did not influence the bond strength to leucite-reinforced ceramic.

Key words:

CAD CAM, adhesion, shear strength

Introduction

Adhesion of resin cements to CAD/CAM ceramics is directly associated with the surface treatment of these materials prior to cementation. HF treatment increases the surface energy¹, while silane can chemically bond to the ceramic glass matrix². MEP is an alternative conditioner that promotes micromechanical and chemical adhesion.

Results and Discussion

Table 1. Shear bond strength means (SD) of resin cement bonded to CAD/CAM ceramics (MPa).

CAD/CAM Ceramic	Surface treatments					
	G1	G2	G3	G4	G5	G6
Feldspathic	11.5 (3.0)	18.5 (3.8)	13.4 (1.9)	17.2 (2.9)	17.4 (3.3)	19.3 (2.4)
	C	A	BC	AB	A	A
Leucite-reinforced	16.1 (3.8)	14.0 (2.6)	16.7 (4.2)	17.4 (3.7)	21.0 (4.9)	21.9 (4.2)
	BC	C	ABC	ABC	AB	A

Means followed by different letters are statistically different for the same ceramic ($p<0,05$).

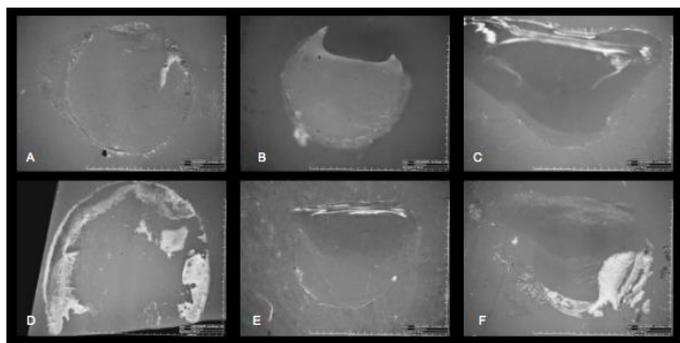


Figure 1. Representative micrographs of each failure mode after shear bond strength test: ADE (A), COC (B) COR (C), MAC (D), MAR (E), MARC (F).

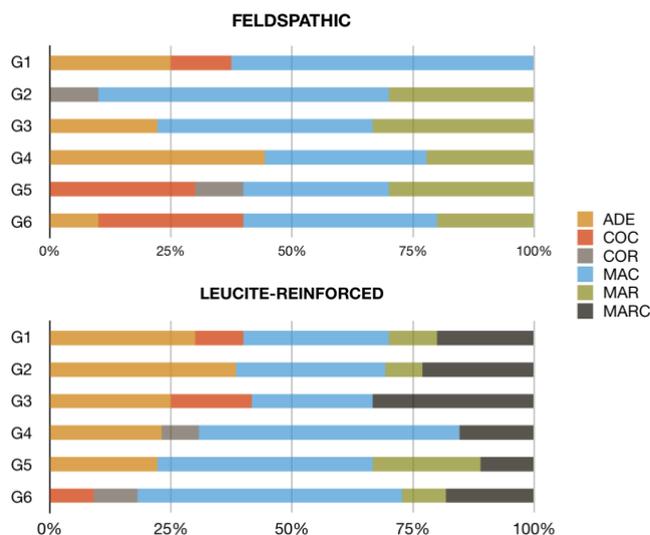


Figure 2. Failure modes for each group after shear bond strength test.

Conclusions

For feldspathic:

- Short-time application of HF (20 s) reduced the bond strength for 5 and 10% concentration (G1 and G3).
- MEP, 5% and 10% HF (applied for 60 s) yielded higher bond strength, with less than 40% of ADE failure.

For leucite-reinforced:

- MEP showed higher bond strength than those obtained with 5% HF, with predominance of mixed failures.
- HF concentration (5% or 10%) did not influence the bond strength.

Acknowledgement

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1 Bona, AD. *Adesão às cerâmicas: evidências científicas para o uso clínico*. São Paulo: Artes Médicas, 2009.

2 Matinlinna, J.P.; Lung, C.Y.K.; Tsoi, J.K.H.; *Silane adhesion mechanism in dental applications and surface treatments: A review*. Dent Mater. 2018;34(1):13-28.