Effect of an 8.0% arginine and calcium carbonate in-office desensitizing paste on the shear bond strength of composites to human dental enamel

ALEXANDER GARCÍA-GODOY, BS & FRANKLIN GARCÍA-GODOY, DDS, MS

ABSTRACT: Purpose: To evaluate the effect of 8.0% arginine and calcium carbonate, in-office desensitizing paste (Colgate Sensitive Pro-Relief Desensitizing Paste) on the shear bond strength of composites to human dental enamel. Methods: Two resin composites (Filtek Supreme, Premise) and human dental enamel were used. 16 samples per composite were prepared. Caries-free extracted human molars, not older than 3 months, and stored in distilled water were used for this portion of the experiment. Buccal and lingual surfaces were polished with high polishing pastes to create a uniform flat surface area to which the cylindrical composite samples were bonded. After polishing, the samples were rinsed in tap water and stored at 100% relative humidity. The resin composites were used to form cylindrical samples 3 mm x 1.6 mm, which were light-cured with a Demetron curing light according to the manufacturers’ instructions. For each composite, 32 surfaces were used; 16 were a control group with the enamel polished with a water slurry of flour of pumice. The experimental group had the enamel polished with the 8.0% arginine and calcium carbonate desensitizing paste, using disposable latex free prophy cups with a slow speed hand piece at 3,000 rpm using moderate to light pressure, according to manufacturer’s instructions. The composite cylinders were bonded to the enamel with their respective etching agents and adhesives and left in distilled water for 48 hours, after which the samples were sheared with an Instron testing machine at 0.5 mm/minute. After shearing, all samples were analyzed with a stereo microscope to evaluate failure pattern (failure at the enamel surface, failure at the composite surface, or mixed failure, at both enamel and composite surfaces). SEM images of selected surfaces were made to depict the overall morphology of the surface of dental materials used after 8.0% arginine and calcium carbonate desensitizing paste, application and shear strength tests. ANOVA and Student-Newman-Keuls tests (P< 0.05) were used to evaluate the difference among the groups. Results: The 8.0% arginine and calcium carbonate desensitizing paste did not have a significant effect on the shear bond strength of the composites tested to enamel. (Am J Dent 2010;23: 324-326).

CLINICAL SIGNIFICANCE: The 8.0% arginine and calcium carbonate in-office desensitizing paste did not affect the shear bond strength to enamel of the composites tested.

Introduction

Before placing sealants and dental composites on enamel surfaces, it has been recommended to clean the surface with a water slurry of flour of pumice to remove any biofilm that may preclude proper bond strength.1

Traditionally, prophylaxis pastes are not recommended immediately before acid etching enamel due to the perceived effect that the oils and fluoride in some of these pastes may have on the quality of the bonding.2

Recently, a new in-office desensitizing paste, which contains 8.0% arginine and calcium carbonate, has been introduced. Research has demonstrated that this in-office desensitizing paste provide immediate and lasting relief from dentin hypersensitivity after one professional application, either before or after a dental prophylaxis.3,4 A daily use dentifrice, also containing 8.0% arginine with 1450 ppm MFP in a calcium carbonate base has also been introduced, with similar demonstrated dentin hypersensitivity benefits.5,7

This study evaluated the effect of 8.0% arginine and calcium carbonate desensitizing paste, on the shear bond strength of resin composite to human enamel.

Materials and Methods

Two resin composites (Filtek Supreme, Premise), human dental enamel, flour of pumice, and an 8.0% arginine and calcium carbonate desensitizing paste, were used in this study.

Shear bond strength - Caries-free extracted human molars, not older than 3 months, and stored in distilled water were used for this portion of the experiment. Buccal and lingual surfaces were polished with high polishing pastes to create a uniform flat surface area to which the cylindrical composite samples were bonded. After polishing, the samples were rinsed in tap water and stored at 100% relative humidity. The resin composites (Filtek Supreme and Premise) were used to form cylindrical samples 3 mm x 1.6 mm, which were light-cured with a Demetron curing light according to the manufacturers’ instructions. A Demetron radiometer was used to verify light intensity (750 mW/ cm²). For each composite, 32 surfaces were used; 16 were a control group with the enamel polished with a water slurry of flour of pumice. The experimental group had the enamel polished with the 8.0% arginine and calcium carbonate desensitizing paste, using disposable latex-free prophy cups (Web LF Prophy Cup) with a slow speed hand piece at 3,000 rpm using moderate to light pressure according to manufacturer’s instructions.

The composite cylinders were bonded to the enamel with their respective etching agents and adhesives and left in dis-
Table. Effect of the 8.0% arginine and calcium carbonate desensitizing paste on resin composites bond strength to enamel.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean (MPa)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filtek Supreme</td>
<td>16</td>
<td>21.7</td>
<td>2.5</td>
</tr>
<tr>
<td>8.0% arginine</td>
<td>16</td>
<td>22.5</td>
<td>2.3</td>
</tr>
<tr>
<td>Premise</td>
<td>16</td>
<td>19.4</td>
<td>3.3</td>
</tr>
<tr>
<td>8.0% arginine</td>
<td>16</td>
<td>19.9</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Similar letters denote no statistical significant difference.

Fig. 1. A. Filtek Supreme. Enamel cleaned with the 8.0% arginine and calcium carbonate desensitizing paste demonstrating a mixed failure. Adhesive and enamel can be seen after debonding. B. No adhesive remains on the surface (x650).

Fig. 2. Premise. A and B. Enamel cleaned with pumice. Mixed adhesive-enamel failure. x650.

Cleaning the enamel with the 8.0% arginine and calcium carbonate desensitizing paste did not affect the bond strength to enamel of the composites tested (Filtek Supreme and Premise) compared to a prophylaxis done with a pumice slurry (P > 0.05) (Table). Filtek Supreme, bonded to enamel treated with the 8.0% arginine and calcium carbonate paste showed a higher bond strength value than Premise bonded to enamel cleaned with flour of pumice or 8.0% arginine and calcium carbonate paste (P < 0.05).

Figures 1 and 2 show representative SEM images of the debonded samples. After debonding, similar morphological characteristics were observed between surfaces cleaned with the 8.0% arginine calcium carbonate paste and the flour of pumice.

Results

In this study, there was no statistically significant difference between the prophylaxis groups. The 8.0% arginine and calcium carbonate desensitizing paste did not affect the shear bond strength to enamel of the composites tested. Other studies using prophylaxis pastes1,8,9 showed that the use of the pastes had no significant effect on the bond strength values of...
the resin tested. Another study, also reporting similar results, demonstrated that use of the 8% arginine and calcium carbonate desensitizing toothpaste had no effect on the bond strength of composites bonded to dentin following application of the desensitizing paste.

A previous study using the 8.0% arginine and calcium carbonate desensitizing paste, reported no significant effect on the surfaces of the substrates tested (human enamel, gold, resin composite, amalgam, and porcelain). This study confirms that the use of the paste is safe to use as a polishing agent during dental prophylaxis.

The use of the 8.0% arginine and calcium carbonate desensitizing paste may be beneficial when performing prophylaxis previous to bonding procedures in areas near dentin as it has been shown to produce desensitizing effects.

The results of the present study, therefore, show that the 8.0% arginine and calcium carbonate desensitizing paste can be safely used in dentistry from the standpoint of surface morphology and shear bond strength to enamel with the composites tested.

References