The effects of different pretreatments on the microtensile bond strength of a self-etch adhesive system applied to eroded enamel.

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Abstract

It is a challenge to properly bond to eroded enamel, thus, this study assessed the effects of different pretreatments on the microtensile bond strength (µTBS) of self-etch adhesive system applied to eroded enamel, before and after thermocycling. The highest immediate µTBS values were observed in the groups that were previously treated with 35% phosphoric acid and 20% chitosan. Although the thermocycling had reduced the bond strength values, the 35% phosphoric acid and 35% tin chloride had contributed to the preservation of the µTBS values. Therefore, different experimental pre-treatments may be used as alternatives to bond self-etch adhesive system to eroded enamel.

Key words: Microtensile bond strength, enamel, erosion.

Introduction

Currently, there is an increase in the overall incidence of dental erosion\(^1\). The eroded enamel has morphological and structural changes, such as increased roughness\(^2\) and decreased hardness\(^3\), showing to be a bad substrate for adhesive procedures. Therefore, the aim of this study was to evaluate the effects of different pretreatments on the microtensile bond strength (µTBS) of a self-etch adhesive system applied to eroded enamel after thermocycling.

Results and Discussion

A hundred bovine enamel blocks were randomly divided into 5 groups according to the pre-treatments: G1) No treatment; G2) 35% Phosphoric acid; G3) 35% Tin chloride; G4) 20% Chitosan, and; G5) 35% Tin chloride + 20% Chitosan. Half of the samples were subjected to the microtensile bond strength 24h after the adhesive procedures were performed and the other half was subjected to 10,000 cycles between 5°C and 55°C before bond strength evaluation. The two-way Analysis of Variance demonstrated an interaction between pretreatments (\(p=0.0009\)) and thermocycling (\(p=0.0247\)) over the microtensile bond strength values. However, there was no interaction between these factors (\(p=0.7766\)). The differences between groups are described in Chart1. The chitosan application is comparable to phosphoric acid etching in the immediate bond strength. And while tin chloride presented lower immediate bond strength values, it contributes to maintaining the adhesive performance after thermocycling. The phosphoric acid etching is the gold standard treatment for dental enamel, however, may be a very aggressive procedure to eroded enamel.\(^4\) On the other hand, the chitosan has remineralizing potential, due to its ability to bind both the tooth structure and the remineralizing components.\(^4\) Also, tin chloride is a cationic polyvalent metal, commonly used as mouthrinses solutions and used to coat eroded enamel.\(^5\)

Chart1. Means and ± standard deviations of the microtensile bond strength (MPa) values of the different enamel pretreatments as a function of the thermal cycling.

<table>
<thead>
<tr>
<th>Enamel pretreatment</th>
<th>Without thermal cycling</th>
<th>Artificial aging</th>
<th>With thermal cycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>26.06 (5.48)(^a)</td>
<td>24.46 (3.83)(^c)</td>
<td>24.46 (3.83)(^c)</td>
</tr>
<tr>
<td>G2</td>
<td>30.25 (2.20)(^a)</td>
<td>28.95 (5.86)(^a)</td>
<td>28.95 (5.86)(^a)</td>
</tr>
<tr>
<td>G3</td>
<td>24.57 (3.85)(^c)</td>
<td>24.29 (3.96)(^c)</td>
<td>24.29 (3.96)(^c)</td>
</tr>
<tr>
<td>G4</td>
<td>30.18 (3.21)(^a)</td>
<td>27.65 (3.81)(^a)</td>
<td>27.65 (3.81)(^a)</td>
</tr>
<tr>
<td>G5</td>
<td>29.67 (3.09)(^a)</td>
<td>27.92 (5.32)(^a)</td>
<td>27.92 (5.32)(^a)</td>
</tr>
</tbody>
</table>

\(^a\) Distinct uppercase letters indicate statistical differences between columns and lowercase letters indicate statistical difference between rows (\(p<0.05\)), according to Tukey's HSD test.

Conclusions

The 20% chitosan application, associated or not with 35% tin chloride, may be an alternative pretreatment before adhesives procedures on eroded enamel instead of 35% phosphoric acid.

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