ABSTRACT

Stannous fluoride's tooth desensitizing effects are likely due to this agent's ability to occlude dentinal tubules. In vitro iodide permeability and SEM studies have previously shown that human dentin samples brushed with a SnF₂ dentifrice exhibited significant tubule occlusion (J. Arends et. al., JDR, 74, Abstract #984). The aim of the present study was to compare the effects of SnF₂ product treatments on the iodide permeability of root dentin in situ. A 4-leg, randomized crossover study was conducted in which 10 subjects used each of the following products: (1) Crest® Gum Care (CGC - 0.454% SnF₂ dentifrice); (2) Crest® Gum Care placebo (no SnF₂); (3) Regular Crest (RC - 0.243% NaF) + GelKam® (0.4% SnF₂ anhydrous gel); and (4) RC + GelKam® placebo (GKP - no SnF₂). Subjects used each test product for two weeks, brushing twice per day (morning & evening) with each test product. Results from the iodide permeability (IP) assessment are reported as average values in µg iodide cm⁻² (parenthesis enclose SD). For polished roots in treatments 1-4, IP values were: 51(41)a, 162(72)c, 85(10)a and 89(41)b respectively (a < b < c, p < 0.05, t-test). For unpolished roots in treatments 1 - 4, IP values were: 75(46)a, 229(90)c, 68(37)a and 115(48)b respectively (a < b < c, p < 0.05, t-test). We conclude that there is no significant difference in the iodide permeability of roots treated with either CGC or the combined regimen of RC + GK. These results suggest that brushing with CGC would be expected to provide desensitizing effects similar to those provided by GK.

INTRODUCTION

Anhydrous gel products containing 0.4% stannous fluoride have been clinically shown to reduce the pain associated with dentin sensitivity (W.J. Thrash, et. al., International Dent J, 44, No. 1, Supplement 1, pgs 107-118, 1994). The observed clinical effects of the anhydrous stannous fluoride gels appear to be related to occlusion of dentinal tubules following repeated topical application. It has been previously shown (J. Arends & J.B. Shaffer, JDR, 74, Abstract #984) that human dentin samples brushed in vitro with an aqueous based stabilized stannous fluoride dentifrice exhibited tubule occlusion similar to what was observed in dentin samples treated with a 0.4% stannous fluoride containing anhydrous gel. Results of this work suggested that the stabilized stannous fluoride dentifrice would possess dentinal desensitizing effects in vivo, similar to that seen for anhydrous stannous fluoride gel products.

OBJECTIVE

The purpose of this study was to compare, in situ, the effects of two commercially available stabilized SnF₂ products on tube occlusion, as measured by iodide permeability of root dentin.

MATERIALS AND METHODS

Products Tested

- Crest® Gum Care (CGC) - 0.454% stannous fluoride/aqueous dentifrice base (Procter & Gamble Company)
- Crest® Gum Care placebo (CGCP) - 0% stannous fluoride/aqueous dentifrice base
- Gel-Kam® (GK) - 0.4% stannous fluoride/anhydrous gel (Colgate Palmolive Company)
- Gel-Kam® placebo (GKP) - 0% stannous fluoride/anhydrous gel

Dentin Preparation

- Roots from human teeth were cut longitudinally with a water-cooled thin blade saw

Polished Dentin Samples

- Samples were embedded in PMMA, except for the cut surface
- Surfaces were polished on 400 and 1200 grit wet sand paper
- Samples were kept moist throughout the polishing procedure
- Dentinal smear layers were removed from all polished surfaces by treating the root with a 0.5M EDTA solution for one minute

Study Design

- Four-leg, randomized cross-over design with 10 subjects
- Subjects fitted with a dental prosthesis holding four dentin samples
- Two dentin samples, one polished and one intact, were placed on each side of the prosthesis
- Subjects used each test product for two weeks, brushing twice per day (morning & evening) with the dentin samples inserted in the prosthesis
- Subjects brushed with the test products in the following manner: For CGC and CGCP - two minute brushing; for GK and GKP - one minute with NaF control dentifrice (Regular Crest®) followed by two minutes with GK or GKP
- Following two weeks treatment, root sections were collected for iodide permeability assays
- Fresh root surfaces were used for each treatment

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Intact (Unpolished) Dentin Samples

- Samples were embedded in PMMA, except for the curved surface
- Samples brushed once with a non-fluoridated dentifrice prior to study start

Iodide Permeability Assays

- Rectangular windows (3x3 mm) were made on the samples using nail varnish
- Samples were dipped in 0.5M NaI solution for five minutes and blotted dry using facial tissue
- Samples were then placed in 3 ml water for 15 minutes and slowly agitated
- After sample removal, 60 µl ISA was added to the solution and iodide content measured using an Orion iodide electrode
- Surface area of each sample was measured under a stereomicroscope and iodide permeability calculated as µg iodide per cm²

RESULTS

Table 1. Iodide Permeability of Polished Dentin Samples

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Iodide Permeability in µg/cm²*:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crest® Gum Care</td>
<td>51 (41)a</td>
</tr>
<tr>
<td>Crest® + Gel-Kam®</td>
<td>55 (10)a</td>
</tr>
<tr>
<td>Regular Crest® + Gel-Kam® Placebo</td>
<td>89 (41)b</td>
</tr>
<tr>
<td>Crest® Gum Care Placebo&gt;</td>
<td>162 (72)c</td>
</tr>
</tbody>
</table>

* mean of 20 samples per treatment; parentheses enclose standard deviations

In situ brushing of polished dentin surfaces with Crest® Gum Care or Gel-Kam® resulted in significantly reduced iodide permeability relative to brushing with the placebo products.

Table 2. Iodide Permeability of Intact (Unpolished) Dentin Samples

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Iodide Permeability in µg/cm²*:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crest® Gum Care</td>
<td>75 (46)a</td>
</tr>
<tr>
<td>Regular Crest® + Gel-Kam®</td>
<td>68 (37)a</td>
</tr>
<tr>
<td>Regular Crest® + Gel-Kam® Placebo</td>
<td>115 (48)b</td>
</tr>
<tr>
<td>Crest® Gum Care Placebo&gt;</td>
<td>229 (90)c</td>
</tr>
</tbody>
</table>

a<b<c, p<0.05; t-test

* mean of 20 samples per treatment; parentheses enclose standard deviations

In situ brushing of intact dentin surfaces with Crest® Gum Care or Gel-Kam® resulted in significantly reduced iodide permeability relative to brushing with the placebo products.

CONCLUSION

- There were no significant differences in the iodide permeability of dentin treated in situ with either Crest® Gum Care or a combined regimen of Regular Crest® and Gel-Kam®.
- These results suggest that brushing with Crest® Gum Care would provide clinical desensitizing effects.

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