Effect of a stannous fluoride-containing dentifrice on caries reduction in children
II. Caries experience after one year


The idea of using a lower level of fluoride than commonly employed in the technic of topical applications but applying it more frequently to increase partially resistance to dental caries is not new. In commenting on this subject Bibby stated:

It seems obvious that if infrequent treatment can cause such definite changes in the progress of caries, more frequent treatments, the use of improved techniques of application or treatment using a more active fluorine reagent might accomplish a great deal more in the control of dental decay.

In this respect the use of a fluoride dentifrice might be ideal, since it would combine frequent applications with maximum convenience, because the fluoride would be applied as part of a regular oral hygiene procedure.

The data obtained on a stannous fluoride dentifrice reported in this study are the result of several years of intensive effort to find a highly active anticaries compound and a means of keeping it effective when incorporated in a dentifrice. The first report indicated that after six months of unsupervised use of a paste dentifrice containing stannous fluoride, the dental caries rate in children was reduced 53 per cent in DMF teeth and 71 per cent in total DMF surfaces. Since one of the important considerations of the utility of such a dentifrice is its continued effectiveness, this report presents the findings at the end of one year.

EXPERIMENTAL PROCEDURE

The method of conducting the study has been reported in detail. Five hundred and fourteen children were divided in two groups according to an estimate of their “caries expectancy.” The two groups of children were provided with dentifrices which were identical except that one contained 4,000 ppm stannous fluoride. This means that approximately 1.0 mg. fluorine and 3.0 mg. tin as stannous fluoride were used per gram of dentifrice. The composition of the dentifrice was as follows: heat-treated calcium

orthophosphate, 42 per cent; detergent (nonsoap), 2 per cent; humectant, 25 per cent; water, 29.2 per cent; binder, 1.4 per cent; stannous fluoride, 0.4 per cent and flavor. The children composing Group 1 received the nonfluoride dentifrice, whereas the children in Group 2 received the stannous fluoride dentifrice. The use of the dentifrice was not supervised. The children, ranging in age from 5 to 15 years, returned to the dental clinic at six month intervals in order to receive a dental prophylaxis, complete bitewing roentgenographic examinations and clinical dental caries examination.

DATA AND DISCUSSION

After one year of participation in the experimental dental caries program, 423 children returned for re-examination. Table 1 shows the average dental caries increments in terms of new DMF teeth and total new DMF surfaces along with various components of DMF surfaces in the two groups of children. Use of the stannous fluoride dentifrice resulted in a decrement in caries rate of 50.6 per cent in teeth which were noncarious at the time of the initial examination and a 49.3 per cent decrement in caries rate in all new DMF surfaces. The decrement in terms of total DMF surfaces is highly significant with a probability less than 0.0001. These estimates of effectiveness obtained at the end of the first year are somewhat lower than those obtained after six months.

The effect of the stannous fluoride-containing dentifrice on previously carious teeth is of special interest. There was a decrement of 40.5 per cent at the end of one year in DMF surfaces in previously caries-free teeth, whereas a 62.1 per cent decrement was observed in the surfaces of teeth that were previously carious. The finding of greater effectiveness in previously carious teeth is similar to the observation with an aqueous solution of stannous fluoride applied topically to children's teeth. In the study on topical applications, stannous fluoride resulted in a 97 per cent decrement in DMF surfaces in previously carious teeth and 52 per cent in DMF surfaces in previously caries-free teeth. When sodium fluoride was applied, the opposite effect occurred, that is, a lower degree of effectiveness was observed in previously carious teeth (28 per cent decrement) than in previously caries-free teeth (38 per cent decrement). This characteristic of topical sodium fluoride

treatment seems well established by several previous reports by independent workers. Thus it appears that stannous fluoride was most effective in those situations where topically applied sodium fluoride appears to be less effective.

Columns 6, 7 and 8 in Table 1 show the caries increments by DMF surfaces divided into their various surface components: proximal, occlusal, buccal and lingual. The most pronounced effect was in the proximal surfaces, which showed an 83.7 per cent decrement. This decrease compares favorably with the 100 per cent decrement at the end of 6 months, or a difference in the estimate of effectiveness of only about 15 per cent. The decrement found at the end of one year in the occlusal surfaces is similar to that found at the end of six months, there being a 29.8 per cent decrement after one year and 25.8 per cent at six months. The greatest difference, as observed in the protection afforded the various surfaces by the stannous fluoride dentifrice, can be noted in a comparison between the six month and one year data in the buccal and lingual surfaces. After six months there was reported a 70.1 per cent reduction in caries rate in the buccal and lingual surfaces, while after a full year the children in Group 1 had only a 12.8 per cent decrement as compared with those in Group 2. An explanation for this is lacking at the present time.

That the stannous fluoride dentifrice was effective in reducing the initiation of new dental caries in teeth erupting during the one year study period is indicated by the data in Table 1, which shows that the children’s teeth had a 37.9 per cent decrement in surfaces attacked in the stannous fluoride group. The fact that this figure is somewhat lower than the over-all decrement in DMF surfaces of 49.3 per cent may reflect the order in which the different tooth surfaces are attacked by caries. The occlusal surfaces of the most susceptible teeth are usually the first to decay, and it is these surfaces which showed a low decrement in this study.

Among the children in Group 1 there were a total of 66 reversals in diagnosis, whereas there were 178 in the children in Group 2. Again, this finding is reminiscent of the study of topical applications of sodium fluoride and stannous fluoride in which there was a significantly greater number of reversals in diagnosis in the children treated with stannous fluoride than in either the control or sodium fluoride groups. It has been reported that reversals in diagnosis are to be expected in any clinical dental caries study conducted in such a manner.

Table 2 • Average increase in caries experience in DMF surfaces by age

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Group 1 Control</th>
<th>Group 2 SnF₂</th>
<th>Percent- age decrement</th>
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<tbody>
<tr>
<td></td>
<td>Number Average</td>
<td>Number Average</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>18  2.33</td>
<td>17  1.65</td>
<td>29.2</td>
</tr>
<tr>
<td>7</td>
<td>45  2.11</td>
<td>42  1.09</td>
<td>48.3</td>
</tr>
<tr>
<td>8</td>
<td>44  1.45</td>
<td>43  1.37</td>
<td>5.5</td>
</tr>
<tr>
<td>9</td>
<td>18  2.56</td>
<td>22  0.73</td>
<td>71.5</td>
</tr>
<tr>
<td>10</td>
<td>10  1.50</td>
<td>19  1.11</td>
<td>26.0</td>
</tr>
<tr>
<td>11</td>
<td>16  5.31</td>
<td>14  1.93</td>
<td>63.7</td>
</tr>
<tr>
<td>12</td>
<td>11  4.45</td>
<td>16  1.81</td>
<td>39.3</td>
</tr>
<tr>
<td>13</td>
<td>15  5.27</td>
<td>15  2.73</td>
<td>48.1</td>
</tr>
<tr>
<td>14</td>
<td>20  5.20</td>
<td>13  1.77</td>
<td>66.0</td>
</tr>
<tr>
<td>15</td>
<td>12  4.25</td>
<td>13  2.85</td>
<td>33.0</td>
</tr>
</tbody>
</table>

that the initial and second examinations are completely independent of each other as they were in both of the studies in which stannous fluoride was used. It has been suggested\(^9\) that where the experimental group has a greater proportion of reversals than the control group, this difference may be due in part to the arrest of incipient carious lesions.

Table 2 shows the number of subjects in each age group and the percentage decrement in caries rate at each age. There is no indication in these data of a relationship between age and the effect of the stannous fluoride dentifrice. Such a relationship was apparent in the data at the end of six months.\(^2\)

**Summary**

After 12 months of unsupervised use of a stannous fluoride dentifrice, a decrement of 51 per cent in DMF teeth and 49 per cent in total DMF surfaces was noted. The proximal surfaces were best protected from caries, showing an 84 per cent decrement, while the occlusal surfaces had a decrement of 30 per cent. The stannous fluoride dentifrice appeared to affect the teeth already decayed to a greater degree than previously carious-free teeth. The age of the subject apparently was not a major influence on the effectiveness of the stannous fluoride dentifrice.

**The temporomandibular joint:**

**upward force of the condyles on the cranium**

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In 1910 and again in 1921, Alfred Gysi\(^1,2\) contended that the mandible acted as a lever with the temporomandibular joint as the fulcrum. G. H. Wilson\(^3\) as early as 1920 purported to show “with a true physical demonstration” that the muscular force on the mandible was “expended upon the bolus of food and not any portion of it upon the condyle.” Gysi’s contention survived until 1946, when Robinson\(^4\) made a restatement of Wilson’s theory. In trying to show conclusively that the temporomandibular joint “was not meant to bear heavy stresses,” Robinson bolstered this old generalization for the dissenters by presenting his interpretation of some anatomical dissections and a diagram of forces. By 1949 this view had been widely adopted, and Moyers\(^5\) thought that his electromyographic studies supported Robinson’s conclusions.

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