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Effect of flossing and brushing immediately prior to weekly fluoride mouthrinsing

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Abstract

The value of prior flossing and brushing in enhancing the caries inhibition of a 0.2% aqueous solution of sodium fluoride, used weekly as a mouthrinse, was studied. A total of 964 children, ages 11-13, were assigned randomly to three groups: (1) rinsing only, (2) brushing immediately prior to rinsing, and (3) flossing and brushing immediately prior to rinsing. All procedures were carried out under supervision, and effectiveness of oral hygiene measures was monitored using erythrocin disclosing tablets. For children who attended 80% or more of the sessions, the DMFS surface increment after three years was 3.37 for Group 1, 3.08 for Group 2, and 2.87 for Group 3. Comparing Group 1 and 3 shows a difference of 0.5 surfaces (14.8%), with the greatest difference in proximal surfaces (0.41 surfaces or 39.4%). Although the trends were in the expected direction, none of the differences were statistically significant.

Supervised fluoride mouthrinsing in the school setting has been adopted widely as a caries preventive measure. Currently, in the United States approximately nine million children are involved in such programs.[1] Typically, the procedure is carried out on a weekly basis, using a 0.2% aqueous solution of sodium fluoride. Results of 17 demonstration programs funded by the National Caries Program of the National Institute of Dental Research substantiated earlier findings that reductions in caries experience on the order of 20-30% can be expected.[2-5]

There are no studies in the literature in which brushing or flossing immediately prior to rinsing is used to enhance the efficacy of the rinsing procedure. One study[6] included groups which brushed immediately prior to rinsing although only the effect on gingivitis was examined. A clinical trial of two fluoride rinses[7] demonstrated a statistically significant relationship between oral hygiene and caries increment in both experimental groups and the placebo group. Since the relationship was of the same order of magnitude in all three groups, it was not possible to conclude that the fluoride was more effective in the presence of better oral hygiene. Two studies[8,9] have demonstrated that brushing a fluoride solution onto the teeth does not provide a greater benefit than using the solution as an oral rinse for the same number of treatments.

This study was carried out to determine the influence of prior oral hygiene practices on the efficacy of fluoride mouthrinsing.

Methods and Materials

The population selected for this study was sixth-, seventh-, and eigth-grade children (approximate age range of 11-13 years) residing in an unfluoridated community near Rochester, New York. All children whose parents consented to their participation were admitted to the study. However, data analyses were confined to those children in the age range of 11-13 who were not undergoing orthodontic treatment, a total of 964 children.

After stratifying for age and sex, study participants were assigned randomly to three study groups. All participants rinsed their mouths weekly, under supervision, with a 0.2% aqueous solution of sodium fluoride. The rinse was swished in the mouth for one minute and then expectorated.

Group 1 children rinsed only. Group 2 children, immediately prior to rinsing, brushed their teeth with an unfluoridated dentifrice. Group 3 children, immediately prior to rinsing, flossed their teeth with unwaxed dental floss and brushed with an unfluoridated dentifrice. All oral hygiene procedures were carried out under the supervision of a dental hygienist, using erythrocin disclosing tablets. In addition, 25% of Group 2 and Group 3 participants were selected randomly and examined for residual traces of disclosant on their teeth. Where necessary, the appropriate oral hygiene procedures were repeated until all plaque had been removed. At baseline, and again after one, two, and three years, all subjects received a clinical examination for DMFS, using an explorer* and a plane mirror. No radiographs were taken. Each of the authors examined one-half of the study participants at baseline and the same sub-

*Starlite No. 23 piano-wire explorer, Syntex Dental, Valley Forge, Pa.

Table 1. Attrition of Study Population by Group

Group	Number of Subjects Examined				% Loss
	Baseline Exam	One Year	Two Years	Three Years	Three-Year Period
1 (rinse only)	325	285	240	228	29.8
2 (brush/rinse)	316	276	237	220	30.4
3 (floss/brush/rinse)	323	286	246	218	32.5
Total	964	847	723	666	30.9

Table 2. Proportion of Subjects Participating in at Least 80% of Opportunities

Group	Percentage
1 (rinse only)	74
2 (brush/rinse)	73
3 (floss/brush/rinse)	70
Total	72

jects at the end of the first, second, and third years. Examiners were unaware of the study group assignment. The visual-tactile criteria of Radike[10] were used in the examinations.

The basis for statistical analysis was a four-way, repeated-measures analysis of variance: group (G) x sex (S) x age (A) x time (T), with time as the repeated measure, using only those effects involving group and time: GxT, GxAxT, GxSxT, GxSxAxT. Both the least squares and the unweighted means models were employed. In analyzing the DMFS data the model has been collapsed on age and sex, neither of which interacted with the group or time variables, and only the group x time effects are reported.

Results

Over the three years of the study 30.9% of the subjects dropped out (Table 1). The differences in attrition by group, although showing a trend of greater loss from Groups 2 and 3 than from Group 1, were not statistically significant.

The rate of compliance was examined because the experimental regimens represented varying levels of complexity, ranging from simple rinsing to the relatively complicated and time-consuming procedure of flossing. This was accomplished by recording whether or not each study subject participated in each of the opportunities to rinse, floss, or brush, whichever was appropriate. It was found that 72% of all study subjects participated in 80% or more of the opportunities over the entire three-year period (Table 2). Although there was a trend for the groups having the more complex tasks to be less compliant, the differences were not statistically significant.

Even though the differences in level of compliance were modest, it was decided to subject the data to two separate analyses: of the total study population, and of the 80% compliance subsample. The latter analysis provided a more accurate description of the efficacy of the procedure, while the former analysis more closely represented the findings which are likely to occur in a typical community situation.

Table 3 shows DMFS total and type of surface for all subjects completing the study (N = 666). None of the differences were statistically significant, nor were there any discernible trends in the data.

Table 4 shows analogous DMFS data for the subsample of the population demonstrating at least 80% compliance with the experimental regimen (N = 481). Again, the differences were not statistically significant, although the data were more consistent and a clear trend was demonstrated. Group 2 (brush/rinse) recorded a lower caries increment than Group 1 (rinse only), and Group 3 (floss/brush/rinse) recorded a lower increment than Group 2. However, the maximum difference in increment, between Groups 1 and 3, was only 0.5 surfaces after three years. As might be expected, most of the reduction in increment occurred in proximal surfaces.

Discussion

Two issues are interrelated closely in this study: efficacy and practicality. Probably the most favorable feature of weekly supervised fluoride mouthrinsing programs is the ease of implementation and the generally high level of cooperation from children, teachers, and school administrators, over protracted time periods. Although this study did not have a placebo rinse control group, previous con-

Table 3. DMFS Increment All Subjects

Group	Occlusal Surfaces			Buccolingual Surfaces			Proximal Surfaces			All Surfaces		
	Baseline	Three Years	Increment	Baseline	Three Years	Increment	Baseline	Three Years	Increment	Baseline	Three Years	Increment
Rinse only N = 228	2.40	3.90	1.50	1.25	1.84	0.59	0.72	1.82	1.10	4.37	7.56	3.19
	*(2.30)	(3.36)		(1.92)	(2.49)		(1.67)	(3.61)		(4.93)	(8.30)	
Brush/rinse N = 220	2.32	4.03	1.71	1.31	1.92	0.61	0.85	1.72	0.87	4.49	7.67	3.18
	(2.26)	(3.19)		(1.84)	(2.28)		(2.17)	(3.42)		(5.40)	(7.72)	
Floss/brush/rinse N = 218	2.43	4.34	1.89	1.36	2.10	0.74	0.83	1.74	0.91	4.62	8.16	3.54
	(2.61)	(3.50)		(1.72)	(2.44)		(1.85)	(3.29)		(5.11)	(7.95)	

* (± Standard deviation)

Table 4. DMFS Increment Subsample Participating in at Least 80% of Opportunities

Group	Occlusal Surfaces			Buccolingual Surfaces			Proximal Surfaces			All Surfaces		
	Baseline	Three Years	Increment	Baseline	Three Years	Increment	Baseline	Three Years	Increment	Baseline	Three Years	Increment
Rinse only N = 169	2.30	3.98	1.68	1.17	1.83	0.66	0.68	1.72	1.04	4.15	7.52	3.37
	*(2.29)	(3.33)		(1.89)	(2.49)		(1.56)	(3.22)		(4.83)	(8.08)	
Brush/rinse N = 160	2.19	3.81	1.62	1.21	1.82	0.61	0.74	1.59	0.85	4.14	7.22	3.08
	(2.21)	(3.17)		(1.76)	(2.22)		(2.23)	(3.49)		(5.35)	(7.86)	
Floss/brush/rinse N = 152	2.15	3.84	1.69	1.30	1.87	0.57	0.69	1.32	0.63	4.13	7.00	2.87
	(2.14)	(3.11)		(1.62)	(2.22)		(1.42)	(2.49)		(4.28)	(6.60)	

* (± Standard deviation)

trolled clinical trials have documented the efficacy of the rinsing procedure.[2-4] The importance of the present study, therefore, was two-fold: (1) measuring any improvement in efficacy from the prior oral hygiene procedures, and (2) measuring the impact of the prior oral hygiene procedures on the practicality of supervised rinsing.

On the basis of the findings from this study, a modest additional reduction in dental caries occurred only in that sample of the population that demonstrated the higher level of compliance. Although this finding provides some tentative encouragement, it should be emphasized that 28% of the study subjects were excluded from that analysis because of their inability or unwillingness to comply fully with the experimental regimen.

Data collected on the time required to carry out the various procedures showed that Group 1 subjects, in clusters of 10-12, required 5 minutes or less to rinse. Group 2 subjects, confined to smaller clusters of 8, required approximately 10 minutes to brush and rinse. Group 3 subjects, in clusters of only 4-6, required approximately 15 minutes to floss, brush, and rinse. While Group 1 could carry out rinsing in any available space, Groups 2 and 3 required a sink with running water and a mirror. Also, in the event that a subject missed a scheduled opportunity, making up the missed rinse was easier to arrange for subjects in Group 1 than in Groups 2 and 3. Clearly, increased complexity in carrying out the oral hygiene procedures was not matched by a comparable derivation of benefits.

Conclusion

On the basis of the findings reported in this study, it is concluded, that implementation of oral hygiene procedures prior to weekly fluoride mouthrinsing in a supervised, school-based program is not indicated.

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