A review of fluoride dentifrice related to dental fluorosis

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Abstract

Introduced to the commercial market 40 years ago, fluoride dentifrice now accounts for nearly all dentifrice purchased in the United States. During this same time, the prevalence and severity of dental caries has declined while dental fluorosis prevalence has increased. While the caries decline can be largely attributed to widespread fluoride dentifrice use, as well as many other sources of fluoride, several recent studies have attributed much of the increase in fluorosis prevalence to early use of fluoride dentifrice. This paper reviews these studies, as well as the efficacy of fluoride dentifrices with lower fluoride concentrations. Finally, recommendations regarding fluoride dentifrice to maintain caries prevention and reduce the risk of dental fluorosis are presented.(Pediatr Dent 21:266-272, 1999)

A Fluoride Work Group was constituted in 1996 by the Oral Health Program at the Centers for Disease Control and Prevention (CDC) with goals of reviewing mechanisms of action of fluoride in dental caries prevention, various methods of fluoride delivery, and associated risks of dental fluorosis.[1] The purpose of this paper is to present a summary of the portion of the review of fluoride dentifrices prepared for the CDC Fluoride Work Group's discussions that emphasized fluoride dentifrice and young children.

There is overwhelming evidence that fluoride dentifrice is a very effective means of caries prevention, and it has been postulated that fluoride dentifrice, along with community water fluoridation, are the main reasons for the caries decline in many industrialized nations. Although there is little question of the effectiveness of fluoride dentifrice in prevention of dental caries, concerns have been raised recently regarding the role of fluoride dentifrice in dental fluorosis. This paper reviews both studies of dental fluorosis that have considered fluoride dentifrice as a risk factor and the effectiveness of low-fluoride concentration dentifrices. Recommendations for optimal use of fluoride dentifrice are also presented.

Fluoride Dentifrice as a Risk Factor for Dental Fluorosis

The early work of Dean linked fluoride in drinking water sources both to reduced prevalence of dental caries and increased prevalence of dental fluorosis.[2,3] Drinking water fluoride content was considered to be the major risk factor in dental fluorosis until it was observed that "...fluorosis prevalence [had] increased relatively more in nonfluoridated areas .... indicating that other uses of fluoride may be more critical risk factors."[4]

As summarized in Table 1, although dentifrice was not identified as a risk factor for dental fluorosis in many of the earlier studies, nearly all studies reported in the last seven or eight years have demonstrated associations between dental fluorosis and use of fluoride dentifrice in early childhood. Many studies, particularly those reported prior to 1990, were not designed with fluoride dentifrice effects as a major focus.[5-10] Other studies used surrogate measures to evaluate fluoride dentifrice exposures.[11-14]

More recent studies specifically addressed dentifrice use in more detail, with most finding a relationship between early dentifrice use and dental fluorosis.[15,16] Moreover, other studies have used case control methodologies to assess the dental fluorosis and dentifrice use relationship. All of these studies have demonstrated significant relationships between fluoride dentifrice use and dental fluorosis. Osuji et al.[17] identified only two factors, tooth brushing with fluoride containing dentifrice prior to 25 months of age and prolonged use of infant formula beyond 13 months of age, as significantly associated with dental fluorosis in a fluoridated community. A study of 157 patients aged 8-17-years attending a university pediatric dentistry clinic in Iowa City identified greater exposure to fluoridated water (odds ratio=4.0) and fluoride dentifrice (odds ratio=2.7) as risk factors for dental fluorosis.[18] A larger study of somewhat similar design was conducted in a pediatric dental practice in Asheville, North Carolina.[19] This study found that initiating toothbrushing with fluoride dentifrice prior to age two was significantly associated with dental fluorosis, with odds ratios slightly greater than 3.0. In addition, for those drinking nonfluoridated water, daily fluoride supplement use was strongly associated with dental fluorosis (odds ratio=6.5).

Of particular interest are a series of well-designed case control studies conducted by Pendrys et al.[20-23] in both fluoridated and non-fluoridated areas of New England. In these investigations, parents completed detailed, 32 or 41 item, self-administered questionnaires regarding infant feeding patterns, residence history, fluoride supplement use, brushing (with F dentifrice) frequency, and amount of fluoride dentifrice used per brushing up to eight years of age. Among residents of fluoridated communities, logistic regression analyses as reported in a 1994 study[20] found that mild or moderate fluorosis of early erupting permanent teeth was associated most strongly with (inappropriate) fluoride supplement use and frequent brushing prior to age eight. They reported a significant odds ratio of 2.80 for fluorosis among those who were frequent brushers prior to age eight.[20] A later paper[21] reported fluorosis to be related to (inappropriate) fluoride supplement use, frequent brushing, and use of larger than pea-sized amounts of dentifrice. The estimated percentage of cases of dental fluoro-

Accepted October 8, 1998

Table 1. Summary of Studies of Dental Fluorosis and Fluoride Dentifrice As a Risk Factor

Author	Year (Pub)	Age	Water*	N	Dentifrice as risk factor	Other risk factors	Dental fluorosis prevalence	Dental fluorosis index**
Houwink & Wagg[11]	1979	9-11	Non-F	133	No	None	<1 %	Dean's
Holm & Andersson[5]	1982	12	Non-F	134	No	F supplements	44.8%	TF
Butler et al.[6]	1985	7-19	Varied	2,592	No	Water F Water zinc Race	NR	Dean's
Szpunar & Burt[7]	1988	6-12	Varied	556	No	Water F Age F rinse Dental visits	36.3%	TSIF
Osuji et al.[17]	1988	8-10	F	633	Yes	Infant formula	12.9%	TF
Kumar et al.[8]	1989	7-14	Varied	884	No	F supplements	7.7% (F) 7.2% (non-F)	Dean's
Pendrys & Katz[22]	1989	11-14	Non-F	850	Yes	F supplements Family income	NR	FRI
Woolfolk et al.[9]	1989	9-13	Non-F	412	No	F supplements	22.3%	TSIF
Bohaty et al.[18]	1989	6-13	F	206	No	F supplements F gels/rinses	17.5%	Dean's
Woltgens et al.[10]	1989	13.4	Non-F	83	Yes	F supplements	73.5%	TF
Williams & Zwemer[13]	1990	12-14	Varied	374	No	Water F—Residence	65.2%	TSIF
Milsom & Mitropoulos[15]	1990	8	Varied	222	Yes	Water F—Residence	47.3% (F)† 21.7% (non-F)	DDE
Evans[16]	1991	10-11	Non-F	300	Yes	None	18.3%†	DDE
Riordan[14]	1993	7	Varied	350	Yes	Water F Weaning age	48.3%	TF
Clark et al.[27]	1994	6-14	Varied	1131	No	Parent Education F supplements Infant formula	60.2%	TSIF
Pendrys et al.[20]	1994	12-16	F	401	Yes	F supplements Infant formula	45.6%	FRI
Holt et al.[25]	1994	9-10	Varied	1,523	Yes	F supplements	18.5%	TF
Skotowski et al.[18]	1995	8-17	Varied	157	Yes	Water F	72.0%	TSIF
Lalumandier & Rozier[19]	1995	5-19	Varied	708	Yes	F supplements	77.8%	TSIF
Pendrys[21]	1995	12-16	F	916	Yes	F supplements	NR	FRI
Pendrys et al.[23]	1996	10-13	Non-F	460	Yes	F supplements	NR	FRI
Wang et al.[26]	1997	8	Non-F	383	Yes	F supplements	36%	TF
Rock & Sabieha[28]	1997	8-9	F	325	Yes	———	34%	TF

*Community water fluoride status; **Dean's=Dean's Fluorosis Index;[29] TF=Fluorosis index of Thylstrup & Fejerskov;[30] TSIF=Tooth Surface Index of Fluorosis;[31] FRI=Fluorosis Risk Index;[32] DDE=Developmental Defects of Enamel Index;[33] †Diffuse and/or diffuse/demarcated enamel defects; NR=Not Reported

sis attributable to greater dentifrice use (having brushed more than once per day with more than a pea-sized amount of dentifrice during the first eight years of life) from this study was 71%.[21]

Among residents of non-fluoridated communities, Pendrys and Katz[22] found that mild-to-moderate enamel fluorosis was strongly associated with fluoride supplement use (odds ratio=4.0) and high household income (odds ratio=6.6). The use of infant formula and fluoride dentifrice was not significantly associated with increased risk for fluorosis. However, a later study[23] of non-fluoridated areas reported that logistic regression techniques identified fluoride supplement use and frequent, early toothbrushing habits as significantly associated with mild-to-moderate fluorosis in both early and late enamel forming surfaces.

As a follow-up to their trial of low fluoride dentifrice in children between the ages of three to five years,[24] Holt et al.[25] compared the prevalence of dental fluorosis among high (1055 ppm F) and low (550 ppm F) fluoride dentifrice groups, when children were 9-10 years of age. This study found that use of fluoride supplements and use of the standard dentifrice (1055 ppm F) significantly increased the risk for fluorosis.

A study of eight-year-olds in Norway[26] where there is virtually no community water fluoridation, found that dental fluorosis was most prevalent (45%) among those who had used fluoride supplements "regularly," but was not detected among those who reported using supplements "not at all". Among those who had used supplements "periodically" and "seldom," fluorosis prevalence was 21% and 10%, respectively. Logistic regression identified regular supplement use and use of fluoride toothpaste prior to age 14 months as the only significant risk factors for dental fluorosis among children studied. [26]

Last, a study of 325 children between the ages of eight and nine years old living in optimally-fluoridated Birmingham, England, found strong associations between fluorosis in the maxillary central incisors and early dentifrice use and use of dentifrice with high (1500 ppm) fluoride concentration.[28] This study also found that DMF scores were significantly lower among children with fluorosis, and that a higher proportion of children who had no fluorosis had used a commercially available low fluoride dentifrice (500 ppm). While the study did find these associations between dentifrice use and fluorosis, it did not assess other potential fluorosis risk factors.

While case control methodologies, more detailed survey instruments, and multivariate analysis used in many of these more recent studies lend more credence to the results than the earlier studies using other methods, all of these studies have relied on retrospective assessment of fluoride exposures, often eight to ten years after the exposures have occurred. Thus, all studies relating dentifrice use to dental fluorosis are prone to recall bias. Therefore, specific inferences regarding the timing of fluoride exposures as they relate to dental fluorosis must be made with caution. Nevertheless, there is now compelling evidence that early, substantial use of fluoride dentifrice is an important risk factor for dental fluorosis.

Fluoride dentifrice accounts for approximately 98% of all dentifrice sold in the United States.[34] Fluoride dentifrice represents a potentially important source of fluoride ingestion among young children [35,36] who often lack the ability to spit out the dentifrice they use. Because of this, it has been proposed that to reduce fluoride ingestion, dentifrices with lower fluoride concentrations for young children be developed and marketed in the US as they have been in several other nations.[37,38] Clearly, reducing the fluoride concentration of dentifrice may reduce its anti-caries effectiveness. Therefore, the ideal lower fluoride dentifrice should not only reduce fluoride ingestion, but also be equally effective in caries prevention as currently marketed formulations of 1,000-1,100 ppm fluoride. The following section reviews studies of the effectiveness of dentifrices with lower fluoride concentrations.

Table 2. Summary of Trials of Low-fluoride Dentifrices

Author	Year	Age[a]	Water[b]	Duration	Fluoride Concentration	N	Caries Increment	% Difference[c]	Statistically Significant Difference
Reed[39]	1973	6-14	Non-F	2 years	1000ppm NaF	362	3.20[d] (0.20)[e]	——	Yes[f]
					500ppm NaF	387	3.66 (0.22)	14.4	No
					250ppm NaF	379	3.70 (0.23)	15.6	No
					Placebo	397	4.00 (0.21)	25.0	——
Gerdin[40]	1974	3.5 (mean)	Non-F	2 years	1000ppm NaF	105	4.23[g] (3.53)[h]	——	No[i]
					250ppmKF-Mn	108	3.83 (3.21)	-9.0	
Forsman[41]	1974	10-11	Non-F	2 years	1000ppm MFP	137	3.03[d]	——	No[j]
					250ppm MFP	140	2.91	-4.0	No
					250ppm NaF	137	2.82	-6.9	No
					Placebo	145	3.25	7.3	——
		10-12	Non-F	2 years	1000ppm MFP	132	5.31[d]	——	No[i]
					250ppm MFP	130	5.17	-2.6	No
					Placebo	132	5.68	7.0	——
Koch et al.[42]	1982	12-13	NR	3 years	1000ppm MFP		5.8[d] (0.55)[e]	——	No[f]
					1000ppm NaF	514	6.1 (0.51)	5.1	No
					250ppm NaF		6.3 (0.46)	8.6	
Mitropoulos et al.[43]	1984	12-13	Non-F	32 mo.	1000ppm MFP	360	3.6[d] (3.93)[h]	——	Yes[i]
					250ppm MFP	365	4.29 (4.99)	18.8	
Winter et al.[24]	1989	2	NR	3 years	1055ppm MFP	1073	2.29[g]	——	No[i]
					550ppm NaF + MFP	1104	2.52	10.0	
Koch et al.[44]	1990	11-12	Non-F	3 years	970ppm NaF	209	10.1 (8.1)	——	Yes[i]
					250ppm NaF	203	12.7[d] (9.3)[h]	-20.5	

a=Age at baseline; b=Community water fluoride status; c=Compared with 1000 ppm as standard; d=DMFS; e=(Standard error of the mean); f=ANOVA; g=dmfs; h=(Standard deviation); i=Compared vs. other active dentifrice; j=Compared vs. placebo; NR=Not Reported

Effectiveness of Dentifrice with Lower Fluoride Concentrations

One of the earliest studies of low-fluoride dentifrices[39] found higher DMFS increment (which included radiographic examination) for reduced fluoride dentifrices over a two-year period when compared to 1000 ppm F dentifrice (Table 2). The DMFS increments were 14%, 16%, and 25% higher for the 500 ppm, 250 ppm, and placebo dentifrices, respectively, when compared to the 1,000 ppm control group. However, only the difference between the 1,000 ppm dentifrice and placebo was statistically significant.

A two-year trial of Swedish children[40] (mean age 3.5 years at baseline) compared dentifrices containing 1,000 ppm fluoride from sodium fluoride and 250 ppm fluoride from potassium fluoride-manganese (KF-Mn). This study found that the 1,000 ppm dentifrice group had 9% less def(s) increment in primary teeth compared to the 250 ppm group; however this difference was not statistically significant. Another study of Swedish children aged 10-12 years also found little difference between different fluoride compounds containing 250 ppm and 1000 ppm fluoride.[41] Similarly, a three-year trial of 12-13 year-olds found little difference in caries effectiveness between 250 ppm and 1,000 ppm dentifrices.[42]

In contrast, Mitropoulos et al[43] reported that 250 ppm MFP dentifrice was significantly less effective (19%) than a 1,000 ppm MFP dentifrice in a 32-month trial in children aged 12-13 years. A 1990 study of the anti-caries effectiveness of 250 ppm and 1000 ppm NaF dentifrices in Iceland also found that the lower fluoride dentifrice was significantly less effective (21%) in preventing caries in children between the ages of 11-12 years.[44]

On the surface, these studies may suggest that low fluoride dentifrices are significantly less effective in terms of caries prevention than standard 1,000 ppm dentifrices. However, of these studies, only one[40] was conducted on the appropriate, preschool age group, and this study did not find a statistically significant difference between 250 ppm and 1,000 ppm dentifrices. In addition, the fluoride content of most of the test dentifrices (250 ppm) may be too much of a departure from the standard 1,000 ppm dentifrice. A more practical dentifrice formulation may have fluoride concentrations in the range of 500-550 ppm.

The only study of low fluoride dentifrice that utilized both a sample of young, preschool children and a 500-550 ppm dentifrice was reported by Winter et al.[24] This three-year, double-blind trial compared effectiveness of 550 ppm and 1055 ppm fluoride dentifrices in children who were two years of age at baseline by measuring dmf increments between groups. The caries increment was slightly higher (10%) in the low-fluoride dentifrice group after three years, but the difference was not statistically significant. The authors concluded that the low fluoride "toothpaste possessed a similar anticaries activity to the control paste and could therefore be recommended for use by young children."[24] However, their conclusion was based on a single study and additional trials of such dentifrices should be conducted.

Discussion and Recommendations

Questions of both statistical and clinical significance need to be addressed in drawing conclusions and making recommendations about use of fluoride dentifrice. This is especially true concerning lower than standard versus standard (1,000-1,100 ppm F) concentration fluoride dentifrices, as there are sparse data regarding their relative effectiveness. In addition, studies addressing risk factors for dental fluorosis have relied solely on retrospective data collection methods so that specific, detailed conclusions concerning the magnitude and timing of risk must be drawn with caution.

In making recommendations, consideration of both individual and group needs is important, and while some recommendations may be made broadly, others are targeted at specific small groups. It is also important to consider any such recommendations in the context of very low caries prevalence in much of the industrialized world, the nearly ubiquitous sources of fluoride in the US, and the total fluoride intake in young children when developing teeth are at risk for dental fluorosis. Clearly, children have numerous opportunities for fluoride exposures from foods and beverages, water, dietary fluoride supplements, fluoride rinses and gels, and professionally-applied fluorides, as well as dentifrice. Because fluoride dentifrice use is modifiable, because fluoride exposures from dentifrice often occur frequently (two or more times per day), and because fluoride concentrations in dentifrice are relatively high (compared to water, other beverages, and foods which may also be sources of frequent exposures), strong recommendations or guidelines regarding its use may be particularly effective in reducing fluorosis prevalence.

There are important gaps in our knowledge about the effectiveness of lower concentration fluoride dentifrices in caries prevention. Although most researchers and decision-makers know of the evidence for a dose-response relationship, this relationship is not as consistent or straightforward as it is assumed to be, and data are especially sparse concerning the caries preventive effects with preschool children most at risk for dental fluorosis. While additional studies are needed for young children that are not at high risk for caries but may be at high risk for dental fluorosis, it is appropriate to consider recommendations that dentifrices containing 500-550 ppm F be marketed in the US and endorsed for use by preschool children. However, such recommendations are based on only those publications by Winter et al.[24] and Holt et al.[25] showing caries prevention that was slightly, but not significantly, lower among pre-school children using 550 ppm F dentifrice compared to those using 1055 ppm F dentifrice. The latter of these publications demonstrated substantially less dental fluorosis among 550 ppm F dentifrice users. Therefore, it is prudent to consider the use of low concentration fluoride dentifrice with 500-550 ppm F as an appropriate recommendation for groups and individuals in the US from birth to six years of age at "normal" or low risk for dental caries.

To that end, it appears that the time has come for the Food and Drug Administration to formally evaluate low fluoride dentifrices with fluoride concentrations of 500-550 ppm F for use in young children. Consideration should be given not only to caries preventive effects, but also to dental fluorosis risk. Further, agencies such as the National Institute of Dental and Craniofacial Research and the Centers for Disease Control and Prevention should actively promote and support additional trials of low fluoride dentifrices in US preschool populations to more adequately define their effectiveness in dental caries

and fluorosis prevention. Grant and contract mechanisms should be used to provide federal support for such important investigations.

Due largely to the secular decline in dental caries and the "diffusion effect"[45] groups and individuals at average risk for caries in the late 1990s are at relatively low absolute risk compared with historical norms and rates in many developing nations. Thus, even without additional corroborating studies, the best balance between prevention of caries and dental fluorosis favors reduced concentrations of about 500-550 ppm F for most US preschoolers. However, those groups or individuals judged to be at increased risk would have more favorable benefit/risk ratios for the use of standard 1000-1100 ppm F dentifrices. This approach extends the increasingly important concept of risk assessment[46] to include choice of fluoride concentration in dentifrice. Although there are no widely accepted norms for caries risk assessment in preschoolers, the same considerations apply as with older children. For example, previous caries history for the child, siblings, and parents; the family's dental knowledge and preventive orientation; the child's physical and cognitive status and use of medications; the child's oral disease preventive behaviors; the child's total fluoride exposures; and possibly the results of microbial caries activity tests may be considered.[47] Clearly, for very young children with little opportunity to assess caries experience, caries risk assessment may be difficult.

Ingestion of fluoride from dentifrice can be substantial among those young children who use it, with a majority of children using fluoride dentifrice by two years of age. Intake of fluoride from dentifrice is directly related to the amount of dentifrice used. Thus, it has been widely recommended that preschool-age children use small "pea-sized" amounts of toothpaste.[45] While such recommendations are prudent, it is unclear whether these recommendations have had the desired effect. Recent studies have provided conflicting evidence regarding dentifrice use. The data from Adair et al[48] suggest continued substantial use of fluoride containing dentifrice, while data from Levy et al[49] suggest smaller amounts of dentifrice are used. However, there may be some bias in the latter longitudinal study due to possible "Hawthorne" effect with ongoing participation.

Thorough water rinsing and expectoration following brushing also can reduce ingestion from fluoride dentifrice, but this may dilute the caries-prevention benefits. Also, few preschool children are capable of rinsing and spitting. Thus, rinsing with water after brushing does not appear to be a viable strategy for limiting fluoride ingestion from dentifrice among young preschool children, who conceivably could actually swallow more dentifrice in attempting to rinse and spit. A few studies have shown that reduced toothpaste tube orifices result in reduced amounts of dentifrice used.[50] Dentifrices, especially those marketed for children, should have smaller openings, or toothpaste "pumps" that dispense no more than the appropriate small "pea-sized" amount should be recommended for use by young children.

Two recent studies[48,49] have demonstrated that dentifrice flavored for children tends to increase the amount used, thereby presumably increasing ingestion and the risk for dental fluorosis. Thus, appropriate precautions should be recommended for the use of such products, including limited orifice openings and pump dispensers as discussed previously. Stronger messages regarding appropriate amounts, including label admonishments, should also be encouraged.

Specific recommendations regarding fluoride dentifrice are:

- The Food and Drug Administration should formally evaluate and consider acceptance of low fluoride dentifrice (550 ppm F). In their evaluation they should consider both caries effectiveness and risk for dental fluorosis. Such dentifrices should be targeted for use by young (preschool) children who are not at high risk for dental caries. Such recommendations are consistent with those made by Horowitz[37] and by the Ad Hoc Subcommittee on Fluoride as published by the Department of Health and Human Services (HHS).[51]

- The Food and Drug Administration should review labeling requirements for dentifrice to make the fluoride concentrations more apparent and should formulate guidelines for instructions regarding prudent use in young children. These recommendations are consistent with those proposed by HHS,[51] the "Changing Patterns of Fluoride Ingestion" conference held in North Carolina,[52] and a Canadian National Workshop on Fluorides.[53]

- The National Institute of Dental and Craniofacial Research and the Centers for Disease Control and Prevention should support additional well-controlled clinical trials of low fluoride dentifrices of sufficient duration and follow-up to assess both dental caries and fluorosis prevention. Such trials should be conducted with populations of children in the targeted preschool age group. Such recommendations are also consistent with those made by Horowitz,[37] HHS,[51] the North Carolina Conference,[52] the Canadian Workshop,[53] and Levy et al.[47]

- Manufacturers should be encouraged to aggressively market dentifrice dispensers with small orifices or fixed amount "pumps" for use by young children. They should be encouraged or required also to warn parents concerning overuse of dentifrices flavored for children. This recommendation is consistent with those of HHS,[51] the North Carolina Conference,[52] the Canadian Workshop,[53] and Levy et al.[47]

- Dentists, dental hygienists, physicians, and other professionals, as well as dentifrice manufacturers should continue to recommend the use of a small "pea-sized" amount of dentifrice be used in tooth brushing for young children. This quantity should be no more than about 0.25 g of dentifrice. In addition, preschool children should be well-supervised in their use of fluoride dentifrice, and the dentifrice should be placed on a child-size toothbrush by a parent or other adult. Such recommendations are consistent with those of many others.[45,47,52,53]

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Abstract of the Scientific Literature

Oral Hygiene in the Control of Occlusal Caries

The caries experience of children is predominantly occlusal pit and fissure caries. The purpose of this study was to compare the caries preventive effects of a program which emphasizes professional tooth cleaning and oral health education with one based on fissure sealing and topical fluoride application on occlusal surfaces of newly erupted first permanent molars. Four hundred and four Australian school children (207 experimental group and 197 control group) with a mean age of six years participated in this study. The children were examined initially and at 12 and 24 months by a calibrated examiner. Children enrolled in the experimental group received an initial professional cleaning and oral health education. Recall intervals of 6, 7, 8, 9, or 12 months for individual children were based on an assessment of parental cooperation, active lesions, stage of eruption of the first permanent molars and status of occlusal surfaces. At each recall appointment, oral hygiene instruction was re-enforced. Members of the control group received a once only professionally applied topical fluoride (10% stannous fluoride paste) to the occlusal surfaces of newly erupted molars and fissure sealants to high-risk teeth with a glass ionomer cement. After 24 months, the children in both the experimental and control groups had an average DMFT score of 0.30. The results suggest no significant differences between the two preventive strategies with respect to the control of occlusal caries in newly erupted molars.

Comments: All the participants in this study had access to organized school preventive dental care and resided in communities with optimally fluoridated water supplies. Additionally, the majority of children used fluoride toothpaste. This could have impacted the study outcome. SJF

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Oral Hygiene in the control of occlusal caries. Arrow P: Community Dent Oral Epidemiol 26:324-30, 1998.
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Abstract of the Scientific Literature

Acceptance of Dental Care Following Early Extractions Under Rectal Sedation

This study examined the amnesic effect of rectal sedation with diazepam (0.7mg/kg body weight) in 46, 4-6 year-old children (23 boys, 23 girls) who had received this sedation for extraction of traumatized primary incisors between 2 and 4 years previously (at age range 15-44 months), and its influence on their future ability to cooperate in the dental setting. Information on the child's cooperation during intervening dental appointments was obtained from clinic records and parent interviews. Amnesia concerning the extractions was reported in 85% of the children, and on some occasion 29% had exhibited behavior management problems (BMP). Lack of amnesia was associated significantly with BMP ($P<0.002$), and a tendency subsequently to not accept dental care. Parents were able to predict their child's subsequent acceptance of dental care with a significant degree of success ($P=0.02$). Positive acceptance of subsequent dental care is greatly enhanced if preschool children experience amnesia in association with extractions.

Comments: In very young children, the amnesia associated with rectal sedation with diazepam, a fast-acting and amnesia-inducing bezodiazepine, appears to have a beneficial effect on their future ability to cooperate in the dental setting. It should be noted, however, that this was a retrospective study with the observations on previous amnesia appearing to be recorded 2-4 years after the dental procedure (extractions of primary incisors) was performed. LBM

No reprints available.

Acceptance of dental care following early extractions under rectal sedation with diazepam in preschool children. Jensen B, Schroeder U. Acta Odontol Scand 56:229-32, 1998.
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