ASDC AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN

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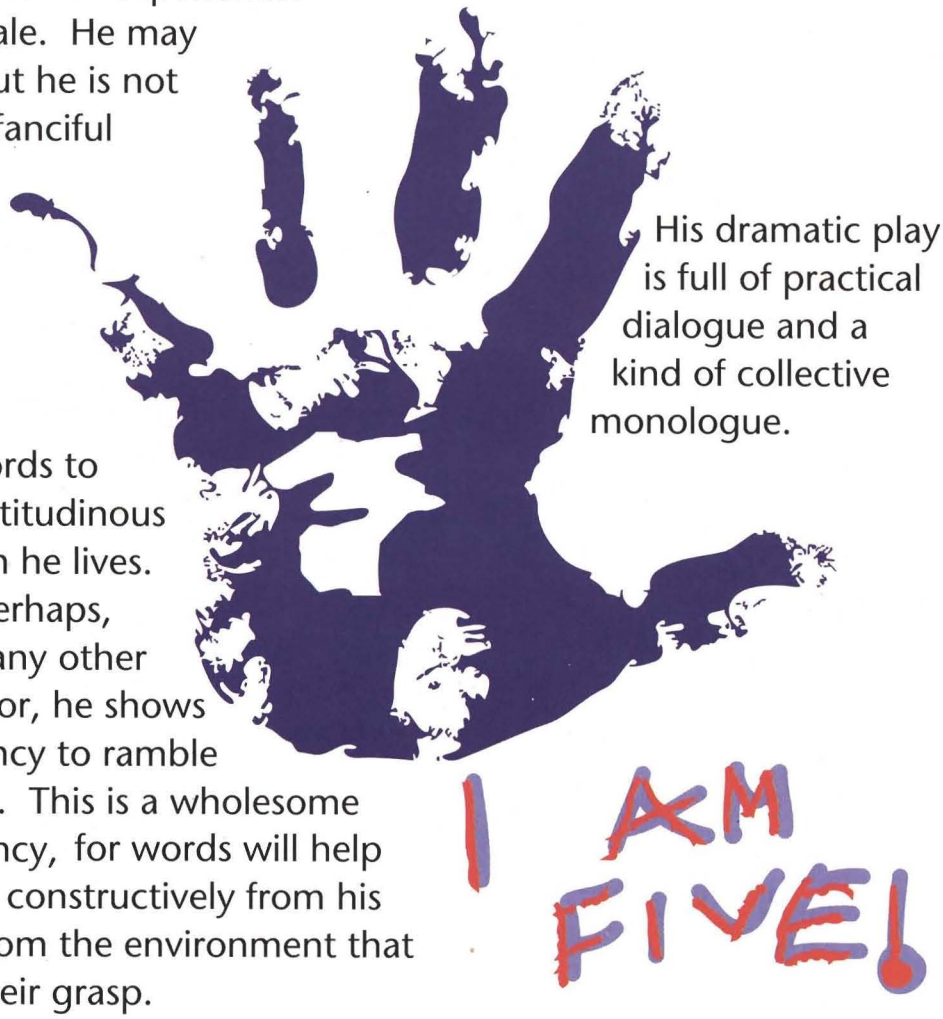
JOURNAL OF DENTISTRY FOR CHILDREN

Five is a great talker. The volubility of the fourth year yielded an increased vocabulary of perhaps 2,000 words. He has overcome most of his infantile articulation. He uses connectives more freely when he narrates an experience. He can tell a tale. He may exaggerate; but he is not given to over-fanciful invention.

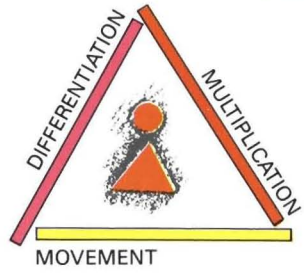
His dramatic play is full of practical dialogue and a kind of collective monologue.

He is using words to clarify the multitudinous world in which he lives. In language perhaps, more than in any other field of behavior, he shows a slight tendency to ramble out of bounds. This is a wholesome growth tendency, for words will help to detach him constructively from his mother and from the environment that hold him in their grasp.



Arnold Gesell–1946

IT IS A WISE FATHER
THAT KNOWS HIS OWN CHILD.
–William Shakespeare



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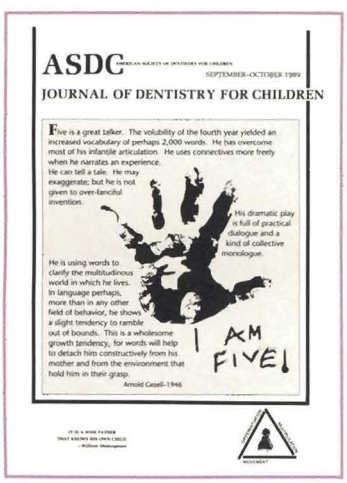

The five-year-old is proud to be five. He is a combination of practical realism and primitive naivete. He understands *me, now, here* better than *you, then, there.* Art and design by Sharlene Nowak-Stellmach.

FLUORIDE DENTIFRICES

CLINIC

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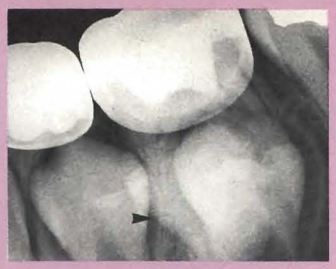

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For the busy reader

The comparative clinical cariostatic efficacy of sodium fluoride and sodium monofluorophosphate dentifrices: a review of trials — page 337

From these collective studies, representing a variety of test conditions, it can be concluded that NaF and Na_2PO_3F dentifrices are not equivalent. When used in a dentifrice with a highly compatible abrasive system, NaF has greater cariostatic activity than does Na_2PO_3F.

Requests for reprints should be directed to Dr. Bradley B. Beiswanger, Indiana University School of Dentistry, Oral Health Research Institute, 415 North Lansing Street, Indianapolis, IN 46202.

Prevalence of craniomandibular dysfunction in white children with different emotional states. Part II: *Not-calm* group — page 348

Compared with the results of Part I of this study, which examined the *calm* group, there was a higher prevalence of muscle (67.6 percent vs 46.8 percent) and TMJ tenderness (19.1 percent vs 7.2 percent) for subjects of corresponding ages caused by emotional stresses.

Requests for reprints should be directed to Dr. Apostole P. Vanderas, Festou and Thessalonikis Street, 14561 Kifissia, Athens, Greece.

Management of impacted anterior teeth utilizing basic orthodontic principles — page 353

Management of the impacted tooth can require both surgical and orthodontic treatment. This paper emphasizes the orthodontic principles utilized in the treatment of the impacted anterior tooth. The required anchorage can be achieved by two intraoral methods. Etiologic factors, clinical diagnosis, and surgical methods are also discussed.

Requests for reprints should be directed to Dr. Daniel E. Douglas, 415 West 5th Street, Storm Lake, IA 50588.

The age-dependent reaction of the periodontal tissues to dental plaque — page 358

A major goal of the dental profession is to provide efficient prevention of periodontal disease, the expression of an inflammatory reaction of the tissues to the products of microbial plaque. Its manifestation is dependent on the characteristics of several local and systemic factors, and the period of time the microbial insult is present.

Requests for reprints should be directed to Dr. Enrique Bimstein, Department of Pediatric Dentistry, Hadassah Faculty of Dental Medicine, P.O. Box 1172, Jerusalem, Israel.

Unusual alveolar clefts: report of cases — page 363

The isolated cleft alveolus of Case 1 was located in the region of the maxillary lateral incisor, one of multiple anomalies of the child. Cleft alveolus and palate without cleft lip is rare. In Cases 2,3 and 4, the buccal frenula may play a role in arrested growth of the alveolar arch.

Requests for reprints should be directed to Dr. Reijo Ranta, Cleft Center, I Dept. of Surgery, Helsinki University Central Hospital, Pohjoinen Hesperiankatu 17, SF-00260 Helsinki, Finland.

Tooth germ transposition: report of cases — page 366

Transposition of the maxillary canine and the second premolar is a fairly common tooth malposition in children with cleft of the lip, palate, or both of these. Among the abnormalities in number, size and shape of the teeth, transposition is also important to consider when planning the patient's overall dental care and orthodontic treatment.

Requests for reprints should be directed to Dr. Reijo Ranta, Cleft Center, I Dept. of Surgery, Helsinki University Central Hospital, Pohjoinen Hesperiankatu 17, SF-00260 Helsinki, Finland.

Evolving demographic patterns and potential for pediatric dental practice — page 371

Projected changes in the number of children in the next twenty years are only one component of the critical determinants in pediatric practice decisions. Practitioners must not lose sight of national developments that appear promising for the future delivery of pediatric health and social services.

Requests for reprints should be directed to Dr. H. Barry Waldman, Professor and Chairman, Department of Dental Health, School of Dental Medicine, State University of New York at Stony Brook, Stony Brook, NY 11794-8715.

Changing number and distribution of pediatric dentists — page 375

Data from two recent dental manpower studies show dramatic decreases in dental school enrollment and higher rates of retirement. Distribution patterns are examined on a state-by-state basis.

Requests for reprints should be directed to Dr. H. Barry Waldman, Professor and Chairman, Department of Dental Health, School of Dental Medicine, State University of New York at Stony Brook, Stony Brook, NY 11794-8715.

Dental caries and fluorosis in children from high and low fluoride areas of Morocco — page 378

The Moroccan phosphate-mining area of Khouribga is prone to widespread fluorosis, primarily due to inhalation of dust containing fluoride. Dental caries was more widespread and severe in Beni Mellal, a town outside the mining area chosen as the control group, than in Khouribga, a discrepancy attributed to the fluoride-containing dust.

Requests for reprints should be directed to Dr. Y. Haikel, Faculte de Chirurgie Dentaire, 1 Place de L'Hôpital, 67000 Strasbourg, France.

Bilateral mandibular dentigerous cysts in a five-year-old child: report of case — page 382

Dentigerous cysts rarely occur in children younger than ten years old. They are generally associated with permanent teeth during the second decade of life. Treatment of the youngest patient reported in the literature with bilateral dentigerous cysts of the mandible—bony lesions with the potential to produce neoplasms—is reported.

Requests for reprints should be directed to Dr. Durl W. O'Neil, Associate Professor, Department of Pediatric Dentistry, University of Missouri-Kansas City, 650 E. 25th Street, Kansas City, MO 64108.

Periodontal health as related to preformed crowns: report of case—page 385

Described is an asymptomatic hard swelling on the lingual alveolar process, apical to the lower left primary second molar, treated a year earlier with a pulpotomy and a stainless steel crown. Two months after the zinc phosphate cement pieces were surgically removed, there was good readaptation of the tissue to the bone.

Requests for reprints should be directed to Dr. Karin Zyskind, Department of Pedodontics, The Hebrew University, Hadassah School of Dental Medicine, P.O. Box 1172, 91010 Jerusalem, Israel.

Papillon-Lefevre syndrome: report of two brothers—page 388

This disorder of the skin and periodontal tissues is inherited as an autosomal recessive trait. The periodontal destruction appears simultaneously with the initial appearance of palmar and plantar hyperkeratosis. Eventually the teeth exfoliate spontaneously.

Requests for reprints should be directed to Dr. Aspa Vassilopoulou, 9 Gelonos Str., 115 21 Athens, Greece.

The comparative clinical cariostatic efficacy of sodium fluoride and sodium monofluorophosphate dentifrices: a review of trials

Bradley B. Beiswanger, DDS
George K. Stookey, PhD

Beginning with the acceptance of the first fluoride-containing dentifrice as an effective means of contributing to the control of dental caries, considerable effort has been devoted to the identification of the most effective fluoride system available for use in this delivery system. These investigations have evaluated numerous approaches to enhance further the cariostatic efficacy of dentifrices, including the use of different fluoride compounds, elevated concentrations of fluoride, mixtures of fluoride compounds, a wide variety of cleaning and polishing agents (abrasives), and additives (Stookey, 1984).[1]

During the past decade considerable attention has been focused on the relative cariostatic efficacy of NaF and Na_2PO_3F in dentifrice systems. In 1984, a review of the literature led to the conclusion that the use of NaF with a highly compatible abrasive system resulted in the greatest amount of cariostatic activity (Stookey, 1984).[1] Several additional clinical trials comparing the effectiveness of dentifrices containing these two fluoride compounds have been reported during the subsequent five years; these reports make it desirable to reexamine objectively the available information regarding the cariostatic activity of these fluoride delivery systems.

The authors are with Indiana University School of Dentistry, Oral Health Research Institute, 415 North Lansing Street, Indianapolis, IN 46202.

The purpose of this report is to review and summarize the available reports of clinical comparisons of the relative cariostatic effects of dentifrices containing either sodium fluoride or sodium monofluorophosphate. Of particular interest are those sodium fluoride formulations that contain a highly compatible abrasive system. There are, of course, some disparities in design among these studies, e.g., concentration of fluoride, concomitant participation of the subjects in fluoride rinse programs, the type and degree of compatibility of the abrasive employed, etc. Rather than attempting to "group" the studies by these variables, however, this review will proceed chronologically; and at the conclusion will consider the variety of test conditions and circumstances.

REVIEW OF CLINICAL TRIALS

☐ Gerdin (1972)[2]

In 1972, Gerdin reported the results of a trial in Sweden that tested the relative effectiveness of three commercial and one experimental formulation. The principal objective was to determine the influence of dentifrice abrasiveness upon the cariostatic effect of fluoride. Thus, two products contained conventional abrasives and two contained plastic abrasives with very low abrasiveness. All subjects were twelve years of age when initiated in the trial. About half the subjects were born in 1956 and began the trial in 1968 and the other half were born in 1957 and began the trial in 1969. In 1968, the available subjects were randomly assigned to treatments 1 or 2 (see below); and in 1969 the subjects were randomly assigned to treatments 3 or 4 (see below). Data were then collected to compare products 1,2,3 and 4 after one and two-years usage, and to compare products 1 and 2 after three-years usage. This design is unconventional to be sure, and it would have been preferable to have randomly assigned all four treatments to both sets (1968 and 1969) of subjects. The base line DMFT and DMFS values for the four groups are quite comparable, however, and offer some reassurance of the adequacy of the design employed.

The products tested all contained 1000 ppm fluoride and were composed as follows:

Group	Product	Active	Abrasive	pH
1.	Bofors	NaF	Acrylic	6.5
2.	Bofors Exp.	KF + MnCl	Acrylic	6.5
3.	Dentosal	NaF	Na bicarbonate	8.5-9.0
4.	Pepsodent	Na_2PO_3F	Ca carbonate	6.5

The dentifrices were distributed each month for *ad libitum* use by the children in their homes, and one-day-per-week usage was supervised in the classroom.

Of the products tested, group 1 (Bofors) and group 4 (Pepsodent) are the most relevant to this report, since group 2 (Bofors Exp) was an experimental formulation containing potassium fluoride and manganese chloride, and group 3 (Dentosal) employed NaF in a compatible abrasive system with an alkaline pH. After two years of product use, Gerdin found mean incremental DMFT values of 3.96 for Group 1 (NaF) and 4.72 for Group 4 (Na_2PO_3F), representing a difference of 19 percent; and mean DMFS increments of 5.96 for Group 1 and 6.82 for Group 4, representing a 13 percent difference in favor of NaF. Gerdin also reported an increment for all surfaces, excluding the occlusal; and by this index, Group 1 experienced 2.99 new lesions, while Group 4 experienced 3.99 new lesions, representing a difference of 31 percent between the treatments. By all the above indices, the relative caries rate for the NaF group was significantly ($\alpha = 0.05$) lower statistically than the rate for the Na_2PO_3F group.

☐ Zacherl (1972)[3]

Also in 1972, Zacherl reported the results of a trial conducted in Canada designed to compare the clinical efficacy of dentifrices containing four different fluoride sources with a placebo control. The purpose of this trial was to compare the anticariogenic potential of dentifrices containing sodium fluoride (NaF), sodium monofluorophosphate (Na_2PO_3F) and an acidulated fluoride phosphate (AFP) with stannous fluoride (SnF_2) as a positive control and a placebo as a negative control. The trial was conducted for a total period of twenty months and concluded with 894 subjects who had been seven to fourteen years of age at the onset. Clinical and radiographic evaluations were conducted at baseline and after twelve and twenty months. Products were distributed each twomonths for *ad libitum* home-use. A dental health education program was conducted periodically in the participating schools. Double-blind methodology was employed. After stratification by sex, age and baseline DMFT scores, the subjects were randomly assigned to one of the following five treatments:

Product	Abrasive	Active	pH
1. Placebo	Ca pyrophosphate	—	7.0
2. Positive control	Ca pyrophosphate	SnF_2	4.5
3. NaF	Ca pyrophosphate*	NaF	7.0
4. Na_3PO_3F	Ca pyrophosphate	Na_3PO_3F	5.2
5. APF	Ca pyrophosphate	NaF	5.5

*High-beta-phase

All the products, except the placebo, contained 1000 ppm fluoride and all products, except the neutral sodium fluoride, contained a calcium pyrophosphate abrasive system. The neutral sodium fluoride product

had a highbeta-phase calcium pyrophosphate abrasive system. It is important to note that this abrasive system is only about 70 percent compatible with NaF.

After twelve and twenty months, Zacherl analyzed the data by comparing the DMFT/S increments for each of the fluoride groups with the placebo group, and found that the SnF_2 and NaF products both produced significant reductions in both DMFT and DMFS increments. The Na_2PO_3F product was significantly different from the placebo for DMFS after twenty months; but not for DMFT after twenty months; nor for either DMFT or DMFS after twelve months. The APF product was never significantly different from the placebo. Although Zacherl did not make comparisons between pairs of the fluoride containing products, it may be noted from his data that after twenty months, the Na_2PO_3F group experienced a mean DMFS increment of 5.07 (SEM = 0.351), while the NaF group's increment was 4.74 (SEM = 0.351), or a relative reduction of 7 percent for the NaF group compared to the Na_2PO_3F group, in spite of the reduced compatibility of NaF with $Ca_2P_2O_7$. This difference is not statistically significant at $\alpha = 0.05$.

☐ Forsman (1974)[4]

In 1974 Forsman reported the results of a compound study that was intended to investigate the relative effectiveness of dentifrices containing low concentrations of fluoride. This overall program was reported as two trials: one trial employed two concentrations of Na_2PO_3F in a calcium carbonate abrasive, and the second trial employed either NaF or Na_2PO_3F with a silica abrasive system. In the latter phase of this program, a panel of 559 Swedish children who were eleven years of age at the outset completed a two-year trial. The subjects had received weekly treatments with fluoride mouthrinses since age six. The fluoride rinses continued throughout this trial, but at a frequency of once every two weeks. Clinical and radiographic examinations for caries were conducted at baseline and after one and two years of product use. Assignment of subjects to groups was done by simple randomization. Products were distributed to the children each two months for *ad libitum* home-use.

The products tested in this trial were:

Code	Active	Fluoride (ppm)	Abrasive
K0	None	–	Silica
K1	Na_2PO_3F	1000	Silica
K2	Na_2PO_3F	250	Silica
K3	NaF	250	Silica

In summarizing the results of this trial, Forsman presented the clinical and radiographic findings separately and also separated the results by sex. In essence, the clinical examination found no significant differences among the groups after two years. The radiographic evaluation found no differences among the treatments in boys; but in girls, treatments K1 (Na_2PO_3F: 1000 ppm F) and K3 (NaF: 250 ppm F) had significantly lower increments than treatment K0 (placebo).

In terms of the comparison of NaF with Na_2PO_3F, if one combines the boys' and girls' data and considers the two groups receiving 250 ppm F as either Na_2PO_3F (Group K2) or NaF (Group K3), the following may be observed. In terms of clinically diagnosed caries, the NaF group had a mean increment of 2.81 new DMFS, which was 3 percent less than the increment of 2.91 experienced by the Na_2PO_3F group. (Not enough information is presented to permit one to test the significance of this difference, but presumably it is not significant at $\alpha = 0.05$). In terms of radiographic diagnoses, the group using the NaF product had 1.96 new carious surfaces, which was 22 percent less than the 2.51 new lesions experienced by the Na_2PO_3F group. If one further combines the data for both sexes and both methods of diagnosis (clinical + radiographic), the NaF group has an increment of 4.86, which is 10 percent less than the increment of 5.42 for the Na_2PO_3F group. Furthermore, the 250 ppm NaF group was numerically better than the 1000 ppm Na_2PO_3F group both in radiographically (1.96 vs 2.15), clinically diagnosed (2.81 vs 3.03), and combined clinical + radiographical (4.86 vs 5.18) new DMF surfaces.

☐ Edlund and Koch (1977)[5]

A trial reported by Edlund and Koch in 1977 was a straightforward comparison of two dentifrices containing 1000 ppm fluoride as either Na_2PO_3F in a calcium phosphate-calcium carbonate abrasive system, or as NaF in a silica abrasive. The subjects in this trial were nine to eleven years old at the outset. Clinical and radiographic examinations were conducted at the baseline and after one, two, and three years. Subjects were assigned by simple randomization to one of two dentifrice groups, which were: (A) a Na_2PO_3F dentifrice with a calcium phosphate-calcium carbonate abrasive system (Colgate); or (B) a NaF dentifrice with a silica abrasive (Bofors experimental formula). The use of the dentifrices was supervised at school five days a week with additional *ad libitum* usage at home. The study was conducted in a doubleblind manner.

The data for this study are presented as annual increments, i.e., baseline to one year; one year to two years; two years to three years. After one year, no difference in new carious surfaces was found between the two dentifrice groups. During the second and third years, respectively, however, the group using the NaF

product experienced 21 percent and 16 percent fewer new carious surfaces than the group using the Na_2PO_3F product. These differences were statistically significant at $\alpha = 0.05$. Further, if one sums the annual increments, the results for the three-year increment in this trial are 7.8 (SEM = 0.32) mean new carious surfaces in the NaF group and 8.9 (SEM = 0.34) new surfaces in the Na_2PO_3F group. A t-test with unpooled variances shows this difference in 12.3 percent in favor of the NaF group to be significant at $\alpha = 0.05$.

The investigators also summarized the data after three years for only those children who were age eleven at the baseline. As expected, the increments for these older children were higher, with the NaF group experiencing 8.2 new carious surfaces and the Na_2PO_3F group having 10.6. This difference of 23 percent in favor of the NaF product was statistically significant at $\alpha = 0.05$.

A note of interest in this trial is that the investigators graded and tabulated separately secondary caries, i.e., new lesions occurring on previously restored surfaces. After three years, in the older panel of children, the mean numbers of secondary carious lesions were 1.3 for the NaF group and 1.9 for the Na_2PO_3F group. This difference of 32 percent was also statistically significant. The authors conclude by stating they were not surprised that the NaF dentifrice was significantly superior to the Na_2PO_3F dentifrice, since the available literature (1977) showed that studies with Na_2PO_3F found a reduction in caries of about 30 percent relative to a placebo control; whereas studies with NaF in a highly compatible abrasive system (acrylic or silica) had found about 50 percent reductions as compared to a placebo.

☐ Edward and Torrell (1978)[6]

Edward and Torrell presented a paper at the ORCA Congress in 1978, for which only an abstract has been published. The purpose of the trial was to test the influence of abrasiveness and fluoride species upon cariostatic effectiveness. The trial was conducted for two years and all the participants were twelve years of age at the outset. All subjects continued to receive fortnightly rinses with a 0.2 percent NaF solution throughout the test period. The description of the treatment dentifrices and the results after two years are as follows:

				Mean 2-year increment	
Code	Active	Abrasive	Abrasiveness	Proximal DFS	Total DFS
A	Na_2PO_3F	$CaCO_3$	Medium	1.85	4.92
B	Na_2PO_3F	SiO_2	Medium	1.97	4.85
C	NaF	SiO_2	Medium	2.15	4.55
D	NaF	SiO_2	Low	0.96	3.63

No definition is provided as to the fluoride concentration in the dentifrices.

According to the authors, the proximal increment of 0.96 DFS experienced by group D (NaF-SiO_2-Low) was significantly lower than the increments for all other groups. This is the only statement of product effects made.

The difficulty in interpreting this trial is the confounding of fluoride species and effects of abrasiveness without all combinations represented: e.g., there is no Na_2PO_3F - low abrasiveness group. When NaF and Na_2PO_3F were employed in medium-abrasiveness systems (groups B and C), the NaF produced a 6 percent lower total DFS increment; but Na_2PO_3F had an 8 percent lower interproximal DFS increment. Still, for the purpose of this report, groups A and D seem to be the contrast of interest. If one calculates percent differences, and uses group A (Na_2PO_3F-$CaCO_3$-Medium) as a reference, it is noted that group D (NaF-SiO_2-Low) had relative reductions of 48 percent in proximal DFS and 26 percent in total DFS, while group C (NaF-SiO_3Medium) had a relative increase of 16 percent in proximal DFS and a decrease of 8 percent in total DFS.

☐ Koch *et al* (1982)[7]

In 1982, Koch, Peterson, Kling and Kling reported the results of a trial designed to compare the efficacy of dentifrices containing either 1000 ppm fluoride as NaF or Na_2PO_3F or 250 ppm fluoride as NaF. The subjects in this trial were all the twelve year-old and thirteen-yearold children in a particular community in Sweden. The subjects used a 0.2 percent NaF rinse fortnightly throughout the study period. The design of the trial is complicated by the fact that the twelve-year-olds participated for three years, but the thirteen-year-olds participated for only two years. Clinical and radiographic examinations for caries were conducted annually by two examiners, whose findings were combined. The subjects were assigned randomly to receive one of the three treatment dentifrices for *ad libitum* home use. Twice daily use was recommended. The dentifrices employed were:

A. 1000 ppm F as Na_2PO_3F (Colgate)
B. 1000 ppm F as NaF (ACTA; Playtex, Sweden)
C. 250 ppm F as NaF (ACTA; Playtex, Sweden)

Product A was identified as Colgate and the abrasive system, therefore, was probably calcium phosphate-calcium carbonate. The abrasive systems for products B and C were sodium metaphosphate.

In presenting the results, it would seem that the authors could have combined the twelve-year-old and thirteen-year-olds through two years, and then have

used only the twelve-year-olds for three-year data. This would have given the largest (and presumably most reliable) sample for two-year data. Instead, however, they chose to treat this almost as two separate studies: one in twelve-year-olds and one in thirteen-year-olds. Thus, the data presented are three-year findings in twelve-year-olds and two-year findings in thirteen-year-olds. These findings were as follows:

			DMFS increment					
			Na_2PO_3F-(1000)		NaF-(1000)		NaF-(250)	
Intital age	Study period	N	Mean	SEM	Mean	SEM	Mean	SEM
12 years	3 years	271	6.7	0.60	7.2	0.57	7.5	0.59
13 years	2 years	243	4.8	0.49	4.9	0.45	4.9	0.32

The analysis of the data found no significant differences among the treatments in either the twelve-year-old or thirteen-year-old children. From this, the authors concluded that a dentifrice with 250 ppm F as NaF had cariostatic potential equivalent to dentifrices containing 1000 ppm F as either Na_2PO_3F or NaF. For reasons of reduced toxicology (i.e., fluorosis) the authors suggest further consideration be given to dentifrices with 250 ppm fluoride.

For the purpose of this present paper, the comparison of most interest is between the two products containing 1000 ppm fluoride. It may be seen from the above data that, while none of the differences were significant, the twelve year-olds using the NaF-1000 ppm F product had a three-year increment of 7.2 DMFS which was 7 percent greater than the increment of 6.7 experienced by the Na_2PO_3F-1000 ppm F group. Also, the thirteen-year-olds using the NaF-1000 ppm F product had a two-year increment of 4.9 which was 2 percent greater than the increment of 4.8 for the Na_2PO_3F-1000 ppm F group.

☐ Lu *et al* (1987)[8]

In 1987, Lu and coworkers reported the results of a trial designed to compare to relative efficacy of NaF at a conventional concentration and elevated concentrations of both NaF and Na_2PO_3F. This three-year trial was conducted in subjects who were seven to fifteen years of age and resided in areas of Oregon with nonfluoridated water supplies (<0.3 ppm F). Subjects were randomly assigned to four groups after stratification by sex, age and baseline DMFS; the product provided to the fourth group was not germane and these data were not reported. Products were distributed every six months for *ad libitum* home-use. Clinical and radiographic examinations were conducted annually. A total of 2055 subjects completed this three-year trial. Double-blind methodology was employed.

The relevant products tested all contained a silica abrasive and either 2800 ppm fluoride as Na_2PO_3F, 2800 ppm fluoride as NaF, or 1100 ppm fluoride as NaF. The DMFS increments observed after three years were as follows:

		Δ DMFS		
Product	N	X	SEM	% Diff
2800 Na_2PO_3F	703	4.37	0.207	–
2800 NaF	673	3.88	0.186	−11%
1100 NaF	679	4.40	0.195	+ 1%

The authors performed covariance analysis and pairwise tests on the above data and found that there was no significant difference between 1100 NaF and 2800 Na_2PO_3F, but that the 2800 NaF product was significantly superior to both the 2800 Na_2PO_3F product and the 1100 NaF product.

☐ Blinkhorn and Kay (1988)[9]

The results of a study conducted in Scotland were reported by Blinkhorn and Kay in 1988. The purpose of this trial was to compare the relative anticariogenic effects of three dentifrices containing 1450 ppm fluoride as either Naf, Na_2PO_3F, or a mixture of these two species (1000 ppm F as Na_2PO_3F + 450 ppm F as NaF). The former two products contained a silica abrasive while the latter product contained a dicalcium phosphate dihydrate abrasive (DCPD). This three-year trial involved subjects who were eleven to twelve years of age at the outset and resided in areas of Scotland with nonfluoridated water supplies (<0.1 ppm F). Subjects were randomly assigned to groups after stratification by school, sex and baseline DMFS. Fieldworkers delivered the assigned dentifrices to the homes every six weeks and reminded the subjects and parents to brush thoroughly twice daily. Also, the participants were given oral hygiene instruction in school twice a year by study personnel. Clinical examinations were conducted at baseline and after twenty-four and thirty-six months. No radiographs were taken and double-blind procedures were employed.

The DFS increments observed after three years were as follows:

			Δ DFS		
Active	Abrasive	N	Mean	SD	% Diff
1450 Na_2PO_3F	Silica	736	4.76	5.29	–
1450 NaF	Silica	754	4.72	5.33	−1%
1000 Na_2PO_3F + 450 NaF	DCPD	744	4.52	5.11	−5%

The authors' analysis found no significant differences among the treatments in terms of incremental DMFT, DFS or DFS on teeth erupting during the study. In terms of numerical differences, as compared to the Na_2PO_3F group, the NaF group had 1 percent fewer

new DFS and the combination (Na_2PO_3F + NaF) group had 5 percent fewer new DFS.

☐ Koch *et al* (1988)[10]

At the ORCA meeting in July 1988, Koch and coworkers presented the results of a trial conducted in Iceland comparing the anticariogenic effects of five different fluoridated dentifrices. Two of these dentifrices also contained phosphonates that have been employed as anticalculus agents and one dentifrice contained a reduced level of fluoride, i.e., 250 ppm. A product containing 1000 ppm fluoride as Na_2PO_3F in a dicalcium phosphate dihydrate abrasive system was identified as a positive control. An abstract of this study was presented in the meeting program, but no data are presented in the abstract, although summary-type statements are made. Dr. Koch, however, was kind enough to provide a summary of the data that he presented.

Iceland was chosen as the site for this study, because survey data had shown an annual increment of about 4 DFS in children eleven to fourteen years of age and no preventive programs were being conducted in the schools. The subjects in this trial were eleven to twelve years of age at the outset and resided in a community with a nonfluoridated water supply (0.1 ppm F). The subjects were randomly assigned to groups following stratification by age and school. A total of 1035 subjects completed this three-year trial. Clinical and radiographic caries examinations were conducted by two calibrated examiners at the baseline and annually thereafter, with each examiner examining about half the subjects (the same subjects each year). Data are presented regarding consistency between examiners and, on this basis, the data for the two examiners were combined to analyze for treatment effects.

The treatments employed in this trial were as follows:

			Fluoride, ppm			
Group	Active	Abrasive	Initial	3 year	Anticalc agent	pH
I	NaF	Silica	250	250	–	7.0
II	Na_2PO_3F	DCPD	940	700	–	7.5
III	NaF	Silica	980	980	AHBP	7.0
IV	NaF	Silica	970	950	–	7.0
V	NaF	Silica	940	930	HEBP	6.8

The net three-year DFS increments for the various groups were as follows:

				Δ DFS		
Group	Conc./Active		Anticalc.	Mean	S.D.	% Diff.
I	250	NaF	–	12.7	9.3	+16%
II	1000	Na_2PO_3F	–	10.9	7.9	–
III	1000	NaF	AHBP	8.8	7.2	−19%
IV	1000	NaF	–	10.1	8.1	− 7%
V	1000	NaF	HEBP	10.1	8.4	− 7%

A one-way analysis of variance was significant for the above data, so Duncan's t-test was employed to locate group differences. The new DFS experience of Group I (250 ppm F) was significantly higher than all other groups. Further, Group III had significantly fewer new caries (8.8) than the positive control, Group II (10.9). The authors' conclusions, then, were that the lower concentration (250 ppm F) is significantly inferior and that sodium fluoride and the bisphosphonate AHBP may act synergistically.

For purposes of comparing NaF and Na_2PO_3F, Groups II and IV are most relevant. Group IV (1000 NaF) had an increment of 10.1 DFS, which was 7 percent less than the increment of 10.9 for Group II (1000 Na_2PO_3F). This difference was not statistically significant at $\alpha = 0.05$.

☐ Beiswanger *et al* (1988)[11]

Data has been submitted to the Council on Dental Therapeutics concerning a study conducted by Beiswanger *et al* that will be published in 1989. The primary purpose of this trial was to determine whether NaF is superior to Na_2PO_3F when both are employed at 1100 ppm fluoride in dentifrices with highly-compatible hydrated silica abrasives. This trial was conducted in areas of Indiana with about 0.5 ppm fluoride occurring naturally in the water supplies (optimal = 1.0 ppm). A total of 1,135 children who were six to fourteen years of age at the outset completed the relevant portion of this three-year trial. Subjects were given clinical and radiographic caries examinations initially and annually thereafter for three years. Assignment to treatments was performed randomly after stratification by sex, age and baseline DMFS. Product was supplied every six months for *ad libitum* home-use. At least once-a-day usage was recommended. This study employed double-blind methodology.

The relevant treatment dentifrices used in this trial were as follows:

	Total F (ppm)		
Active	Theoretical	Analyzed	Abrasive
Na_2PO_3F	1100	1138	Silica
NaF	1100	1031	Silica

Two additional treatment groups were present in the original trial but they are not presented here, because they were not relevant to the primary purpose of the trial or to the question of superiority of NaF as compared to Na_2PO_3F.

Analysis of the data was performed on both observed and covarianceadjusted DMFS increments. Further, the data were analyzed for all the subjects completing the trial and for only those subjects who were eleven

Table 1 ☐ A summary of relevant literature selecting appropriate comparisons of NaF and Na_2PO_3F.

Author (year)	Total N (final)	No. groups	N per group (final)	Duration	Initial age	F rinse	F H_2O	Prod. use	X–rays	Product F source	Product F conc (ppm)	Product Abrasive	Δ DMFS	% Diff	Sig. (0.05)	Numerical advantage
Gerdin (1972)	478	4	≃ 120	24 mo.	12	Yes	–	S 1xw#	Yes	Na_2PO_3F	1000	$CaCO^3$	6.82	–	Yes	NaF
										NaF	1000	Acrylic	5.96	–13%		
Zacherl (1972)	894	5	≃ 160	20 mo.	7-14	No	Yes	Ad lib.	Yes	Na_2PO_3F	1000	I-CPP+	5.07	–	No	NaF
										NaF	1000	I-CPP+	4.74	– 7%		
Forsman (1974)	559	4	≃ 140	24 mo.	11	Yes	–	Ad lib.	Yes	Na_2PO_3F	250	Silica	5.42			NaF
										NaF	250	Silica	4.86	–10%	No	
Edlund & Koch (1977)	363	2	≃ 180	36 mo.	9-11	–	–	S 5xw##	Yes	Na_2PO_3F	1000	$CaPO_4/CO_3$++	3.2	–		NaF
										NaF	1000	Silica	2.7	–16%	Yes	
	108	2	≃ 50	36 mo.	11	–	–	S 5xw##	Yes	Na_2PO_3F	1000	$CaPO_4/CO_3$++	10.6	–		
										NaF	1000	Silica	8.2	–23%	Yes	
Edward & Torell (1978)	–	4	–	24 mo.	12	Yes	–	Ad lib**	Yes	Na_2PO_3F	–	$CaCO_3$(Med)	4.92	–		NaF
										NaF	–	Silica(Med)	4.55	– 8%	No	
										NaF	–	Silica(Fine)	3.63	–26%	No	
Koch *et al* (1982)	271	3	≃ 90	36 mo.	12	Yes	–	Ad lib**	Yes	Na_2PO_3F	1000	$CaPO_4/CO_3^{\alpha}$	6.7			Na_2PO_3F
										NaF	1000	SMP αα	7.2	+ 7%	No	
	243	3	≃ 80	24 mo.	13	Yes	–	Ad lib**	Yes	Na_2PO_3F	1000	$CaPO_4/CO_3^{\alpha}$	4.8			
										NaF	1000	SMP αα	4.9	+ 2%	No	
Lu *et al* (1987)	2055	3	≃ 685	36 mo.	7-15	No	No	Ad lib	Yes	Na_2PO_3F	2800	Silica	4.37	–		NaF
										NaF	2800	Silica	3.88	–11%	Yes	
										NaF	1100	Silica	4.40	+ 1%	No	
Blinkhorn & Kay (1988)	2234	3	≃ 745	36 mo.	11-12	No	No	Ad lib**	No	Na_2PO_3F	1450	Silica	4.76	–		NaF
										NaF	1450	Silica	4.72	– 1%	No	
Koch *et al* (1988)	1035	5	≃ 200	36 mo.	11-12	No	No	Ad lib	Yes	Na_2PO_3F	1000	$DCPD^{\beta}$	10.9	–		NaF
										NaF	1000	Silica	10.1	– 7%	No	
Beiswanger *et al* (1989)	2273	2	≃1135	36 mo.	6-14	No	0.5ppm	Ad lib*	Yes	Na_2PO_3F	1100	Silica	2.96	–		NaF
										NaF	1100	Silica	2.87	– 3%	No	
	519	2	≃ 260	36 mo.	11-14	No	0.5ppm	Ad lib*	Yes	Na_2PO_3F	1100	Silica	4.53	–		
										NaF	1100	Silica	4.03	11%	Yes	

* Ad libitum usage; once a day recommended
** Ad libitum usage; twice a day recommended
\# Supervised once a week; ad libitum the remainder
\#\# Supervised five times a week; ad libitum the remainder
\+ High beta phase (improved) calcium pyrophosphate
\+\+ Calcium phosphate (43%) + calcium carbonate (5%)
α Colgate formula 1978-82 Scandinavia
αα Sodium metaphosphate
β Dicalcium phosphate dihydrate

years old or older at the outset, on the premise that the older subjects, by virtue of having higher increments, could offer a more sensitive model for separating treatment effects. The three-year increments were as follows for all subjects (ages six to fourteen at baseline):

Group	N	Observed DMFS Mean	SEM	% Diff.	Adjusted DMFS Mean	% Diff.
1100 Na_2PO_3F	1122	3.01	0.10	–	2.96	–
1100 NaF	1151	2.82	0.09	– 6%	2.87	–3%

The above differences were not significant at $\alpha = 0.05$.

The three-year increments for only those subjects who were age eleven or older at the baseline were as follows:

Group	N	Observed DMFS Mean	SEM	% Diff	Adjusted DMFS Mean	% Diff
1100 Na_2PO_3F	262	4.58	0.26	–	4.53	–
1100 NaF	257	3.95	0.23	–14%	4.03	–11%

The relative reductions of 11 percent and 14 percent for the covariance adjusted and observed data, respectively, were both statistically significant at $\alpha = 0.05$.

Thus, on the basis of directional data in all subjects and a significant difference in the older subjects, the authors concluded that NaF was more effective than Na_2PO_3F, when both were employed at 1100 ppm F in silica based systems.

An additional trial has been reported by Triol *et al* that compares the anticaries effects of four dentifrices containing either NaF or Na_2PO_3F.[12] Three of the four formulations also contained anticalculus ingredients and were compared with a positive control. This trial was conducted in fluoride-deficient communities and involved a total of 1,592 subjects after two years. The subjects were instructed orally and in writing to brush twice daily with their assigned product.

The treatments employed in this trial were as follows:

Group	Fluoride Agent	Fluoride ppm F	Anticalculus Agent	Abrasive
1	NaF	1100	3.3% Soluble P_2O_7 + 1% Cantrez	Silica
2	NaF	1100	2% Zn Cl_2	Silica
3	Na_2PO_3F	1000	1.25% Zn(?)*	Silica
4	Na_2PO_3F	1000	–	Silica

*An unidentified zinc salt.

Data presented reflect that the groups completing two years were well balanced at the baseline.

The DMFS increments after two years were as follows:

Group	Fluoride	Anticalc.	DMFS Increment Mean	SEM	Diff.
1	NaF	P_2O_7 + Gantrez	1.11	0.10	−8%
2	NaF	$ZnCl_2$	1.28	0.10	+7%
3	Na_2PO_3F	Zn(?)	1.30	0.12	+8%
4	Na_2PO_3F	–	1.20	0.12	–

The data analysis (ANOVA) on the increments found no significant differences among the groups in terms of new caries experience after either one or two years. The authors defined group 4 as a positive control (known effective agent). It is interesting to note that compared to the positive control (Na_2PO_3F with no anticalculus agents) groups 2 and 3 had numerically higher increments, while group 1 had a numerically lower increment.

The presence of the anticalculus agents makes interpreting these findings difficult as to the comparability of NaF and Na_2PO_3F. The zinc systems in particular may well be reacting with the fluoride source and thus having some effect on fluoride availability. In fact, reports by White and Faller, and Mellberg and Chomicki have indicated a decrease in enamel fluoride uptake in the presence of zinc salts.[13,14]

The report by White and Faller was based on the same fluoride-zinc system (Prevent) as used in this trial by Triol *et al*. The report by Mellberg and Chomicki was based on a zinc citrate-Na_2PO_3F system and described very high levels of zinc precipitates on the lesion surface, blocking the enamel-fluoride reaction. As noted above, the two systems with zinc had somewhat higher (7 percent and 8 percent) increments than the positive control. On the other hand, several *in vitro* studies reported by Featherstone and White and Faller indicated that the presence of pyrophosphate has no inhibitory effects upon the availability or activity of fluoride; ten Cate and Simons have published results showing that pyrophosphate, however, may impair enamel remineralization.[15-18] In the above data, the system comprised of $NaFP_2O_7$-Gantrez had a numerically lower increment by 8 percent than the Na_2PO_3F positive control group.

Thus, while this trial is not included in summary Table 1, due to the controversy regarding the effect of the presence of the anticalculus agents, it does tend to support the idea that NaF in a highly-compatible system, is directionally superior to Na_2PO_3F as an anticaries agent.

DISCUSSION AND SUMMARY

Edlund and Koch espoused the notion in 1977 that one might get some indication of the comparability of NaF and Na_2PO_3F dentifrices by reviewing the literature and determining the average performance of each active agent when tested against a placebo.[5] There are several reasons why this exercise is tenuous and one would certainly not try to draw definitive conclusions from such a comparison. Such a comparison is certainly interesting, however, and offers some secondary information relevant to the question of the relativity of the effectiveness of these two agents.

We reviewed the literature for clinical dentifrice trials that compared these fluoride agents with a placebo, and selected all studies that met the following criteria:

Table 2 □ A summary of clinical trials testing sodium monofluorophosphate dentrifrices compared to a placebo dentifrice.

Authors/(Year)	Fluoride content (ppm)	Percent reduction
Buhe *et al* (1984)[19]	1050	18
Glass *et al* (1983)[20]	1000	24
Rule *et al* (1982)[21]	1025	24
Glass (1981)[22]	1000	44
Murray & Shaw (1980)[23]*	1050	27
	1050	34
Peterson (1979)[24]	1000*	20
Glass & Shiere (1978)[25]	1000	28
Howat *et al* (1978)[26]	1000	26
Wilson *et al* (1978)[27]	1000	16
Kinkel *et al* (1977)[28]	1184	39
Rijnbeek & Weststrate (1976)[29]	1184	39
Andlaw & Tucker (1975)[30]	1050	19
Niwa *et al* (1975)[31]	1000	26
Peterson *et al* (1975)[32]	1000	23
Patz & Naujoks (1969)[33]	1000	8
Fanning *et al* (1968)[34]	1000	20
Mergele (1968)[35]	1000	17
Moller *et al* (1968)[36]	1000	19
Takeuchi *et al* (1968)[37]	1000	24
Naylor & Emslie (1967)[38]	1000	18
		Average 24.4%

*Tested two sodium monofluorophosphate products with differing levels of abrasiveness.

Table 3 □ A summary of clinical trials testing sodium fluoride dentifrices with highly compatible abrasives compared to a placebo dentifrice.*

Authors/(Year)	Fluoride content	Abrasive	Percent reduction
Jensen and Kohut (1988)[39]	1100	Silica	41
Zacherl (1981)[40]	1100	Silica	41
Koch (1967)[41]	1000	Acrylic	50
Koch (1967)[42]	1000	Acrylic	40
			Average 43%

*A trial reported by Lu *et al*[43] comparing a NaF-silica dentifrice containing soluble pyrophosphate as an anticalculus agent to a placebo dentifrice is not included here due to the presence of pyrophosphate. However, that study found a relative reduction in new DMFS after one year of 26% and 52% for two independent examiners, respectively.

- ☐ Clinical caries trials with a minimum duration of one year.
- ☐ Employed a placebo or nonfluoride dentifrice as a negative control.
- ☐ Employed a dentifrice containing 1000-1200 ppm fluoride as either NaF or Na_2PO_3F, and had no other active agents in the system.
- ☐ Employed an abrasive system (acrylic or silica) highly-compatible with NaF.
- ☐ Had normal and customary product usage conditions (either *ad libitum* or supervised).
- ☐ Adequate data were provided to calculate a percent reduction for DFS or DMFS increments.

The studies meeting these criteria are summarized in Tables 2 and 3. Twenty trials involving Na_2PO_3F products were found. Compared to the negative control, these studies had reductions in D(M)FS increments ranging from 8 percent to 44 percent. The average was 24.4 percent. Only four trials involving NaF products have been reported. These trials are relatively consistent and had reductions ranging from 40 percent to 50 percent, with the average being 43 percent. It is interesting to note that only one trial with Na_2PO_3F had a reduction (44 percent) as large as the average trial with NaF. Thus, this information would support the hypothesis that NaF dentifrices with highly compatible abrasive systems have greater cariostatic effects than Na_2PO_3F dentifrices.

As another secondary indicator of the relative efficacy of NaF and Na_2PO_3F, we sought insight from trials that have compared products using combinations of NaF and Na_2PO_3F with products containing either agent alone. Specifically we sought those trials where the total fluoride content of the products was equal. Mainwaring and Naylor, Ripa *et al*, Triol *et al* and Glass *et al* have all reported trials in which products containing 1000 ppm F from Na_2PO_3F were compared to a product containing 500 ppm F from NaF plus 500 ppm F from Na_2PO_3F.[44-47] Blinkhorn and Kay reported a trial employing products containing 1450 ppm F from either NaF, Na_2PO_3F or mixture of Na_2PO_3F (1000 ppm F) plus NaF (450 ppm F).[48] In all five instances, the product in which part of the Na_2PO_3F had been replaced with NaF had numerically lower caries increments, ranging from about 1 percent to 12 percent, and in one of these trials (Glass *et al*) this difference was statistically significant.[47]

This report has reviewed the methodology and results of ten independent trials that provided comparisons of the relative clinical effectiveness of dentifrices containing sodium fluoride with dentifrices containing sodium monofluorophosphate. The sodium fluoride product in these trials contained a highly-compatible abrasive system, either acrylic or silica, with the exception of the trial by Zacherl, where the sodium fluoride was employed in a calcium pyrophosphate abrasive system that is, at best, only moderately compatible with sodium fluoride.[3] The trials ranged in duration from twenty to thirty-six months and involved from about eighty to about 1150 subjects per treatment group. In four of the studies, the participants were concurrently using fluoride mouthrinses. In two trials, product use was partially supervised and the remaining eight were *ad libitum*. One trial was conducted in an area with fluoridated water, one in an area of suboptimally fluoridated water and eight in areas of essentially nonfluoridated water supplies. In three of the trials, the subjects were of relatively broad age-range, i.e., seven to fifteen, seven to fourteen, and six to fourteen; in three studies the subjects were of narrow age-range, i.e., nine to eleven, eleven to twelve, eleven to twelve; and, in the remaining four trials the subjects were the same age. In terms of caries activity, the various study samples represent a range of people who experienced about one new lesion per year to people who experienced about three and a half new lesions per year. When the studies are grouped by any of the above variables, there are no remarkable contrasts between the results associated with any of these factors.

Perhaps the most notable quality of these ten studies taken collectively is the relative consistency with which they found dentifrices containing NaF to be numerically advantageous as compared to dentifrices containing Na_2PO_3F. Of the ten, four found NaF products to be significantly ($\alpha = 0.05$) superior to Na_2PO_3F products; none found Na_2PO_3F products to be significantly ($\alpha = 0.05$) superior to NaF products. Statistical significance, of course, is a function of statistical power that is determined by sample size, the variation among subjects, and the magnitude of the difference between treatments. Thus it is more appropriate to consider the direction of differences than the significance of differences. One would assume that if NaF products and Na_2PO_3F products are truly equivalent in effectiveness, about half the studies would find a numerical advantage for each product. As may be seen in Table 1, however, nine of the trials found an advantage for NaF products, while only one trial found an advantage for Na_2PO_3F products. If one conducts a Sign Test to test the hypothesis that these directional results represent two equivalent agents, the probability of obtaining a 9-1 split is 0.011.[49] From these collective studies, representing a variety of test conditions, it can be concluded, therefore, that NaF and Na_2PO_3F dentifrices

are, in all probability, not equivalent. When employed in a dentifrice with a highly-compatible abrasive system, NaF has greater cariostatic activity than does Na_2PO_3F.

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SPONTANEOUS ORAL HYGIENE

The results indicated that initial plaque indices below 50 percent O'Leary's Index (fairly good oral hygiene) went down as soon as the patients had received their first lesson on oral hygiene. On the other hand, indices above 50 percent did not fall noticeably. In other words, and coarsely expressed, the "good" patients remained good and the "bad" remained bad. The main group (51-70 percent) represented the largest part of the entire sample (26.5 + 21.8 = 48.3 percent) and almost all the subjects above 50 percent O'Leary's Index at baseline (79.9 percent). This group improved the least.

For the whole sample as studied in a periodontal environment, "behavioral determinism" is to be compared with observations made by psychologists of dental care in general. Indeed, most odontologic studies of changes in hygiene behavior have been made on the basis of permanent recalls and reinforcing procedures. It was not possible, therefore, to conclude that the subjects underwent a definite change in attitude. The only studies showing permanent changes in patient behavior were conducted with a psychological approach (teaching of groups or individual interviews).

The most reliable predictor of future preventive behavior seems to be past behavior. If a child is given regular dental care he or she will be more likely to continue when older. People develop attitudes toward toothbrushing early in life. Their attitudes result from what they are used to doing rather than lead up to their actions.

Alcouffe, F.: "Spontaneous" oral hygiene: a predictor for future preventive behavior?
Community Dent and Oral Epidemiol, 17:120-122, June, 1989.

Clinic

Prevalence of craniomandibular dysfunction in white children with different emotional states. Part II: *Not-calm* group

Apostole P. Vanderas, DDS, JD, MPH, MDS

In an attempt to study the etiologic importance of emotional states on the prevalence of craniomandibular dysfunction, a differential diagnosis of patients subject to different etiologic factors was introduced.[1] In this part of the study, the prevalence of craniomandibular dysfunction in white children classified by the parents as *not calm* is investigated.

MATERIALS AND METHODS

The sample consisted of 386 white children, males and females, aged six to ten years. These children were classified as follows:

- ☐ *Calm* group (N = 250).
- ☐ *Not calm* group (N = 105).
- ☐ Subjects with dentofacial injuries (N = 25).

Six subjects had upper respiratory infection and/or toothache and were excluded from the study. The children were interviewed for symptoms (subjective symptoms) and examined clinically for signs (objective symptoms) of the masticatory system. The interview and the clinical examination related to the function of the masticatory system, as well as the selection and the classification of the subjects into groups as above were explained in detail in Part I of the study.[1]

The questions of the interview were designed to gain information about headaches occurring once a week or more, pain in the temple region or when the mouth

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Table 1 ☐ Overall and by sex prevalence of each objective symptom (N = 105).

	Objective symptoms				
Prevalence	TMJ sounds %	TMJ tenderness %	Muscle tenderness %	Limited maximal opening %	Totals One or more symptoms %
Overall	12.4	19.1	67.6	1.9	72.4
Males	11.3	19.4	71.0	1.6	72.6
Females	14.0	18.6	62.8	–	72.1

Table 2 ☐ Prevalence of the subjects with each objective symptom, by age (N = 105).

Objective symptoms	Age (years)				
	6 N=21	7 N=20	8 N=23	9 N=24	10 N=17
	Percent				
TMJ sounds	4.8	15.0	17.4	8.3	16.7
Muscle tenderness	76.2	65.0	73.9	66.7	58.8
TMJ tenderness	28.6	20.0	8.7	16.7	23.5
Limited opening	4.7	–	–	–	–

was opened wide or chewing, difficulties in opening wide, and clicking.

The clinical examination of the masticatory system included the following variables:

- ☐ Mandibular movements (maximal opening ≤ 44 mm, limited lateral movements < 5 mm, and limited protrusion < 5 mm).
- ☐ Temporomandibular joint (TMJ) sounds (clicking and crepitation).
- ☐ TMJ tenderness.
- ☐ Muscle tenderness.

The following muscle sites were palpated: the anterior and posterior portions of the temporal muscle; the superficial portion of the masseter muscle; and the lateral and medial pterygoid muscles. A positive finding of TMJ and muscle tenderness was recorded, if the subject felt a difference between the right and left sides, described the palpation as painful, or the pain caused guarding or a palpebral reflex.

Statistical methods

The data were computerized and the SPSS/PC+ statistical package was used for their analysis. The prevalence of craniomandibular dysfunction was calculated in percentage. Correlations were tested by the chi-square test. The 95 percent probability level was used.

RESULTS

The statistical analysis of the *not calm* group provided the following results:

Prevalence of objective symptoms of craniomandibular dysfunction

The overall prevalence of objective symptoms in this group (N = 105) was 72.4 percent (Table 1). The corresponding prevalence for males (N = 62) and females (N = 43) was 72.6 and 72.1 percent, respectively (Table 1). There was no statistically significant difference in the prevalence of objective symptoms between males and females (X2 = 0.446). The prevalence of each objective symptom was as follows:

- ☐ *TMJ sounds*. The prevalence of TMJ clicking sounds in the entire group was 12.4 percent (Table 1). Females had higher frequency of clicking sounds than males. The difference was not statistically significant either for both sides (X2 = 0.011) or for the right (X2 = 0.0001) or left (X2 = 0.0001) sides separately. Crepitation was not found in any of the subjects.
- ☐ *TMJ tenderness*. The prevalence of TMJ tenderness in the entire group was 19.1 percent (Table 1). The corresponding values for males and females were 19.4 and 18.6 percent, respectively (Table 1). No statistically significant difference was found between males and females (X2 = 0.0001) and between males and females on the right (X2 = 0.075), or on the left sides (X2 = 0.085) separately.
- ☐ *Muscle tenderness*. The overall prevalence of muscle tenderness was 67.6 percent (Table 1). Males had higher frequency of muscle tenderness than females. No statistically significant differences were found between males and females for both sides (X2 = 0.446) or for the right (X2 = 1.087) or left (X2 = 0.228) sides.
- ☐ *Limited mandibular movements*. Six subjects had values of mandibular movements smaller than those defined in this study as minimal. One of these patients had smaller value in maximal mouth opening, two in the left lateral mandibular movement and three in the mandibular protrusion. All but one of these subjects had muscle and/or TMJ tenderness.
- ☐ *Deflection on maximal mouth opening*. The occurrence of deflection found on opening was 8.6 percent; 1.9 percent to the right side and 6.6 percent to the left side. No statistically significant difference was found between males and females (X2 = 0.681).

Prevalence of objective symptoms by age and sex

The distribution of the subjects with each objective symptom by age is given in Table 2. The distribution of the subjects with one or more objective symptoms by age is shown in Figure 1. Statistically significant

differences by age were not found. Further statistical analysis of the relationship between males and females with each objective symptom by age was not feasible because of the small number of the subjects in each category.

Correlations between objective symptoms

The chi-square test showed correlation between muscle and TMJ tenderness at $p = 0.0001$.

Prevalence of subjective symptoms of craniomandibular dysfunction

The overall prevalence of subjective symptoms was 40 percent (Table 3). The corresponding prevalence for males and females was 42 and 37.2 percent, respectively. The chi-square test showed no significant difference between males and females with respect to any of the subjective symptoms. Locking and luxation of the mandible were not reported by any of the subjects.

Prevalence of subjective symptoms by age and sex

The prevalence of each subjective symptom by age is given in Table 4. The distribution of the subjects with one or more symptoms by age is presented in Figure 2. There was no significant difference for each subjective symptom by age. Further statistical analysis of the subjective symptoms by age and sex was not feasible due to the small number of subjects in each category.

Correlations between objective and subjective symptoms

Figure 3 presents the relationship between objective and subjective symptoms by age. Muscle tenderness was correlated with difficulties in opening wide at $p < 0.05$, while clinically detected TMJ sounds were correlated with reported TMJ sounds at $p < 0.0001$.

DISCUSSION

In this group, the most frequent objective symptom of dysfunction was muscle tenderness, followed by TMJ tenderness and TMJ sounds (Table 1). The severity of muscle and TMJ tenderness was slight. Only in three females, one eight and two nine years of age, was the severity of tenderness different from that of the other subjects. Two of these patients experienced definite pain in palpation of medial and lateral pterygoid muscles, while the other presented tearing of the eye by the end of the palpation process. The muscles most tender to palpation were the lateral and medial pter-

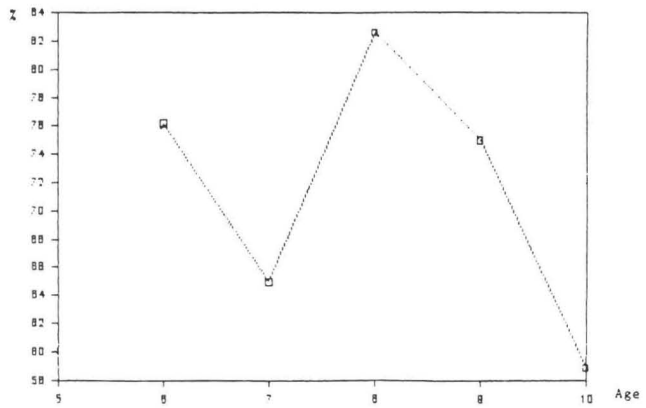

Figure 1. Distribution of the subjects with one or more objective symptoms, by age.

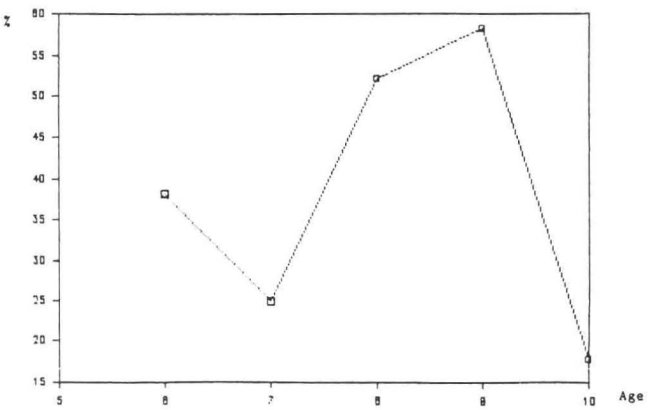

Figure 2. Distribution of the subjects with one or more subjective symptoms, by age.

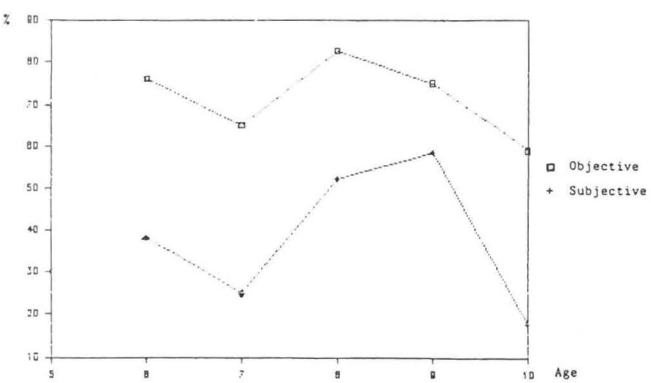

Figure 3. Relationship between objective and subjective symptoms, by age in the not-calm *group.*

ygoids. Although the frequency in muscle and TMJ tenderness in males was higher than that in females, this difference was not statistically significant. The prevalence of TMJ sounds was higher in females, but the difference was not statistically significant for either both sides or each side separately.

Five of the subjects with values of mandibular movements smaller than the statistically determined minimal values had muscle and TMJ tenderness, while one did not have any sign or symptom of dysfunction. Deflection on opening in this group occurred to both sides. The left side, however, was predominant.

Emotional states like stress, anxiety, and tension are considered to increase parafunctional activity or muscle tension.[2-7] It was shown that parafunctional activity or muscle tension varied greatly from individual to individual and was correlated with the stress level.[2,8,9] Furthermore, prolonged parafunctional activity or muscle tension can elicit tenderness or pain of the muscles of the masticatory system.[4,10] In this study, the distribution of the subjects with objective symptoms was irregular (Figure 1). Peaks and troughs at different ages were present which may be attributed to the fact that the intensity of the emotional states varied greatly from individual to individual.

With respect to the subjective symptoms in this group, the prevalence of recurrent headaches was higher in females than in males, but the difference was not statistically significant. Children at six and ten years of age did not report recurrent headaches. Since most of the recurrent headaches of unknown etiology are attributed to the muscle contraction of the head and neck caused by parafunctional activity, it is likely that the intensity of emotional conditions of the subjects at these age-groups was not high enough to increase the frequency of parafunctional activity to the degree of causing disturbance to the balance of the muscles. On the other hand, no correlation was found between muscle tenderness and recurrent headaches, which may be explained by the fact that the severity of tenderness was not high enough to cause imbalance of the muscles of the head.

A number of subjects reported TMJ sounds that were not detected clinically. A possible explanation may be either the intermittent nature of TMJ sounds or the sounds occurred when the mandible was moved laterally and consequently could not be detected during the mouth opening.[1,11,12] The other subjective symptoms were occasional and mild. The distribution of the subjects with subjective symptoms was irregular (Figure 2). The fact that there were no statistically significant differences in the prevalence of objective and subjective symptoms between males and females shows that both sexes were affected similarly by the emotional states.

The classification of the subjects according to their psychological qualities by the parents can be considered subjective. The life events reported by the parents that can place children under such psychological conditions demonstrated, however, a uniform judgment (Table 5). In addition, the reliability test showed high degree of agreement with respect to the classification of the subjects. Although the emotional reactions of the children to the reported events might differ in terms of intensity, it is reasonable to assume that the group presents the same trend with respect to psychological qualities.

Two studies conducted on children and adolescents reported higher prevalence of craniomandibular dys-

Table 3 ☐ Overall and by sex prevalence of each subjective symptom (N = 105).

	Subjective symptoms						
Prevalence	Head-aches %	Difficulties in opening wide %	Pain in temple region %	Pain in open-ing wide %	Pain in chewing %	Reported clicking %	Totals one or more symptoms %
Overall	11.4	14.3	5.7	11.5	6.7	8.6	40.0
Males	9.7	14.5	6.5	11.3	3.2	8.0	42.0
Females	14.0	14.0	4.7	11.6	11.6	9.3	37.2

Table 4 ☐ Prevalence of each subjective symptom, by age (N = 105).

	Age (years)				
Subjective symptoms	6 N=21	7 N=20	8 N=23	9 N=24	10 N=17
	Percent				
Headaches	–	15.0	13.0	25.0	–
Difficulties in opening wide	14.3	5.0	26.1	16.7	5.9
Pain in temple region	9.5	–	–	12.5	5.9
Pain in opening wide	23.8	5.0	–	20.8	5.9
Pain in chewing	4.8	5.0	4.4	16.7	–
Clicking	4.8	5.0	13.0	12.5	5.9

Table 5 ☐ Life events and the number and percentage of the examined subjects.

Life events	Number of subjects	Percentage
School performance	37	35.2
Divorce	30	28.5
Marital separation	17	16.2
Single parent	10	9.5
Illness in family members	7	6.6
Drinking problems in family	3	2.8
Esthetics	1	.9

function (one or more signs or symptoms) in subjects with emotional states similar to those used in this study, as opposed to subjects without such emotional states.[13,14] Although the results of these studies are not in contrast to those found in the present investigation, a comparison was not feasible, because of the differential diagnosis of the subjects introduced in this study.

As compared with the results of Part I of this study on the *calm* group, the results from this second part showed higher prevalence of muscle (67.6 percent vs 46.8 percent) and TMJ tenderness (19.1 percent vs 7.2 percent) for subjects of corresponding ages. Taking into consideration the mechanisms by which emotional states contribute to the development of signs and symptoms of craniomandibular dysfunction, it is reasonable to assume that the higher prevalence of TMJ and muscle tenderness in this group is caused by the emotional states. The relationship of the emotional states and signs and symptoms of craniomandibular dysfunction, however, needs further investigation.

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SUN-POWERED POLLUTION CLEAN UP

Scientists at Sandia National Laboratories have developed a sun-powered detoxification system to clean polluted water.

"We believe this process will destroy most organic materials," they said; these include industrial solvents, pesticides, dioxins, PCBs, and munitions chemicals. In Sandia's solar-powered detoxification process, developed in cooperation with the Solar Energy Research Institute, grains of titanium dioxide are mixed into waste water and the mixture is run through a long glass tube, which sits at the focus of a 720-foot-long parabolic trough. When concentrated ultraviolet light from the sun hits the solution in the tube, it frees electrons from the titanium dioxide, creating electron "holes" — the absence of electrons. These holes combine with water, dissolved oxygen, and a small amount of hydrogen peroxide to create hydroxyl radicals and peroxide ions. These in turn attack the organic wastes, breaking them down into water, carbon dioxide and some very dilute acids that can easily be neutralized.

Pool, R.: Sun-powered pollution clean up.
Science, 245:130, 14 July, 1989.

Management of impacted anterior teeth utilizing basic orthodontic principles

Daniel E. Douglas, DDS

Management of the impacted tooth can require both surgical and orthodontic treatment. This paper emphasizes the orthodontic principles utilized in the treatment of the impacted anterior tooth. Etiological factors, clinical diagnosis, and surgical methods will also be discussed.

By definition, impacted teeth are those prevented from erupting by some physical barrier in the eruption path.[1] The mandibular third molar is the most frequently impacted tooth followed by the maxillary canine, maxillary third molar, maxillary and mandibular second premolars, and finally the maxillary central incisor.[2] Etiological factors include lack of space, cysts, tumors, supernumerary teeth, retained primary teeth, infections, trauma, anomalies, and systemic conditions.[3]

DIAGNOSIS

Diagnosis of the impacted anterior tooth requires a thorough history and clinical examination. Patient and parents should be questioned regarding any history of dental trauma, even in early childhood.[4] A traumatic injury sustained by the primary tooth can affect the development of the permanent tooth by causing structural changes such as dilacerations and root malformations. Such changes may cause noneruption of the tooth.

Upon clinical examination, the discovery of a retained primary tooth and/or sinus tract, indicates a chronic periapical infection, either past or present, which may be a barrier to the eruption of the succedaneous tooth. Findings of a supernumerary tooth coupled with lack of a visible permanent anterior tooth may indicate an impaction because of lack of space. Because of mesial migration of the other anterior teeth, a deviation of the midline may also be observed.

Palpation of the palatal and vestibular areas is a valuable adjunct in diagnosing and locating the impaction.

Diagnosis of the impacted tooth is verified and its location determined through radiographic evaluation. An occlusal radiograph should provide the best view of the impaction and will aid in determining its anteroposterior and lateral positions (Figure 1). A lateral view taken with an occlusal film confirms the anteroposterior position and reveals the superior-inferior position (Figure 2).

SURGICAL METHODS

Surgical intervention may or may not be required, depending on the severity of the impaction. Brin and others categorized treatment options according to the type of malocclusion, amount of tooth deformation, and the location of the impacted anterior tooth.[4] They suggest that:

- ☐ If space exists and the impacted tooth is not embedded deep within the mucosa, removal of the causative agent may be the only necessary intervention.

The work reported in this paper was done at The Queen's Medical Center, Honolulu, Hawaii. The author is now in private practice in Storm Lake, Iowa.

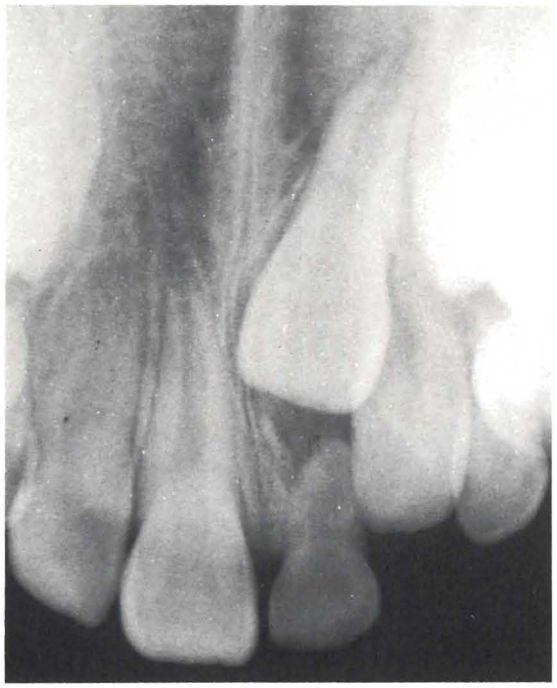

Figure 1. An occlusal radiograph showing the anteroposterior and lateral positions of the impaction.

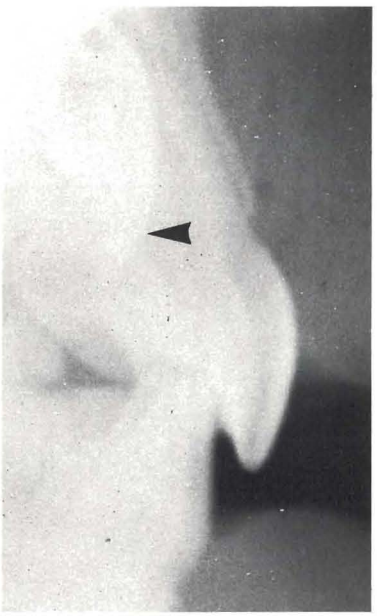

Figure 2. A lateral radiograph showing the anteroposterior and superior-inferior positions.

- ☐ If the tooth is grossly malformed and the malocclusion severe, removal of the impaction may be indicated.
- ☐ If the impacted tooth is of normal form or slightly malformed, and the malocclusion is caused only by the impacted tooth and the surrounding anterior teeth, surgical intervention is suggested.

Surgical treatment consists of exposure of the impaction and placement of an attachment. Whenever possible, exposure should be completed through the attached gingiva, in order to achieve a more favorable posttreatment periodontal condition. This presents little problem for a palatally positioned tooth. A labially positioned impaction requiring an exposure through the soft tissue creates, however, the potential for future periodontal disease. This can be minimized through utilization of an apically repositioned flap, a laterally repositioned pedicle graft, or a free gingival graft.[5]

If application of force is required to guide the eruption of the impacted tooth, an attachment must be placed. Many different attachment methods are utilized such as (a) a circumferential ligature wire; (b) a direct bond bracket; (c) an orthodontic band; (d) a cast gold crown or onlay; or (e) a threaded pin.[6]

Currently the attachment of choice is the direct bond bracket, since it requires no tooth preparation and minimal surgical exposure. It requires, however, an isolated field. It cannot be used, therefore, in all cases. Another method in use is a circumferential ligation at the cervix of the impacted tooth. This technique may be preferred because it does not require a dry field and provides a very stable attachment. In comparing this method to the direct bond technique, however, Boyd found external resorption to be present near the location of the wire, a higher incidence of ankylosis, and a significant loss of attached gingiva, when utilizing the

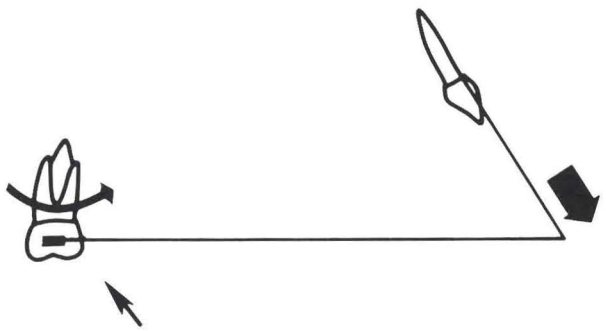

Figure 3. The effects of the treatment force from the sagittal view.

PLANE	TREATMENT FORCE APPLIED TO THE ANTERIOR TOOTH	RECIPROCAL EFFECTS ON THE MOLARS	COLLATERAL EFFECTS ON THE MOLARS	EFFECTS ON OCCLUSION
FRONTAL	INCISAL	APICAL	BUCCAL TIPPING	INCREASED VERTICAL DIMENSION INCREASED ARCH WIDTH
OCCLUSAL	LABIAL	DISTAL	DISTAL AXIAL ROTATION	INCREASED VERTICAL DIMENSION
SAGITTAL	INCISAL AND LABIAL	APICAL AND DISTAL	MESIAL TIPPING	INCREASED VERTICAL DIMENSION DECREASED ARCH LENGTH
	⬆	↑	⌒	

Figure 4. The effects within the system, when the treatment force is applied.

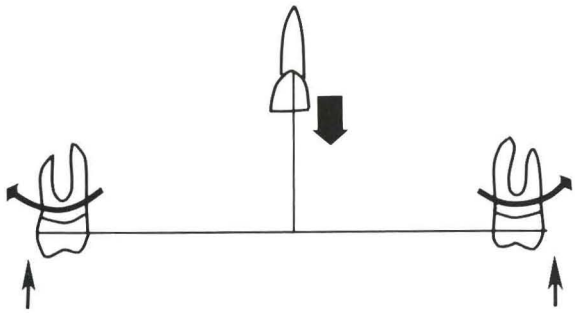

Figure 5. The effects of the treatment force from the frontal view.

ligature wire.[7] A direct-bond bracket should be used, therefore, unless isolation is difficult to achieve. In such cases a ligature wire can be utilized until placement of a direct bond bracket is possible.

APPLICATION OF ORTHODONTIC FORCE

Orthodontic therapy is a controlled imbalance of forces applied to the dentofacial complex. In order to accomplish successful tooth movement, therefore, the direction and type of treatment force as well as its reciprocal effects on the system must be determined. Application of a treatment force and methods to counteract its unwanted reactionary forces can be seen in the treatment of an impacted anterior tooth.

Storey defines two types of forces to achieve tooth movement: heavy and light.[8] A heavy force can yield rapid tooth movement, but inflammation of the tissues occurs and deformation of the bone is extensive and rapid. Thus the quality of remodeling is poor, which increases the chance of relapse. On the other hand, a light force provides a tooth movement, although slower, with less tissue destruction and rate of bone deformation. Thus a better quality of remodeling occurs and the relapse potential is less. This would suggest the application of a light continuous force to obtain a successful eruption and arch position of the impacted anterior tooth and to minimize the potential relapse.

The direction of force is determined by the location of the impaction and its proper position in the arch, concurrent with the patient's present stage of dental development. In evaluating the direction of the treatment force, one must consider the required tooth movement in all three planes. This will aid in selecting the appropriate mode of treatment.

ADVERSE EFFECTS

For discussion purposes, a palatally impacted anterior tooth will receive a bilateral force from the first permanent molars (Figure 3). If the molars are considered stationary, a light labial incisal force is applied from the molars to the impacted tooth, resulting in an acceptable and stable position for the tooth within the arch.

It is incorrect, however, to consider the molars stationary, because "for every action there is an equal and opposite reaction". If a force is applied to the impacted tooth, undesirable side effects will occur, therefore, in regard to the position of the molars. Thurow defines the reactionary forces placed on nontreatment teeth as reciprocal effects.[9] These effects will in turn cause specific movements of the nontreatment teeth. These movements he defines as collateral effects.

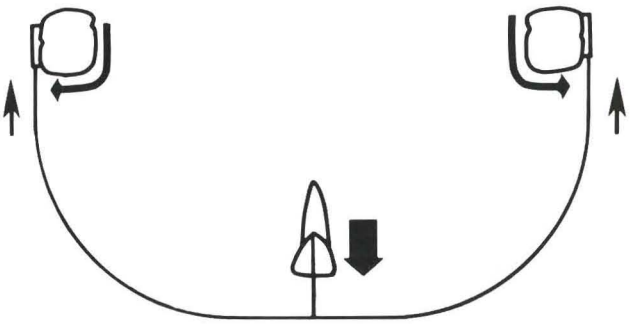

Figure 6. The effects of the treatment force from the occlusal view.

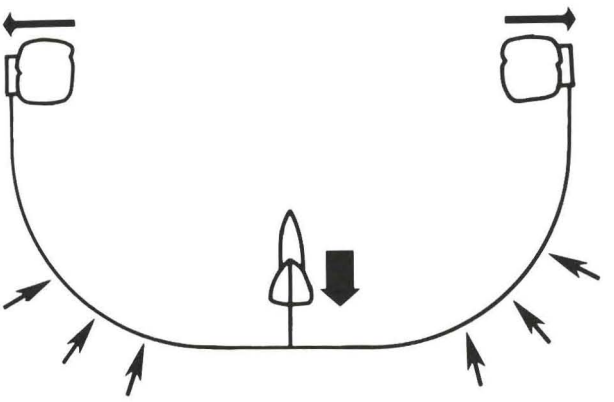

Figure 7. The reciprocal effects due to strain of the archwire.

If a treatment force is applied to the impacted tooth within the system, the following collateral effects can occur to the molars (Figure 4):

- ☐ Buccal tipping because of the apical reciprocal effect induced by the incisal vector of the treatment force (Figure 5).
- ☐ Distal axial rotation because of the distal reciprocal effect induced by the labial vector of the treatment force (Figure 6).
- ☐ Mesial tipping because of apicodistal tipping movement induced by the incisolabial force vector (Figure 3).

The treatment force can also cause a reciprocal effect due to strain applied to the archwire. This can be seen from the occlusal view, where a bowing reciprocal effect occurs because of the compressive strain of the treatment force on the archwire (Figure 7).

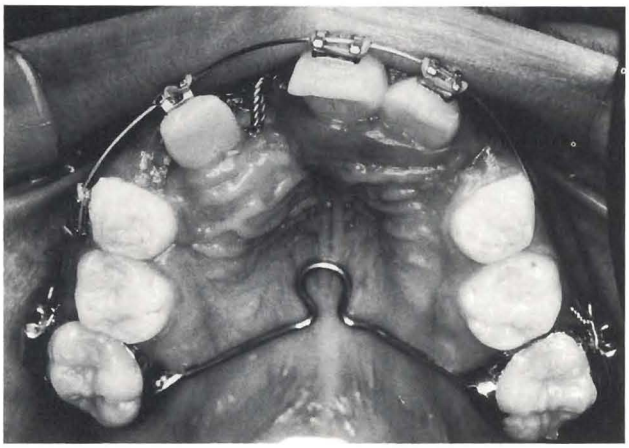

Figure 8. A transpalatal wire and an archwire provide intra-arch anchorage.

Figure 9. Initial examination. Note the sinus tract, retained primary incisor, and midline deviation.

ANCHORAGE

To counteract these adverse effects, anchorage is required. Anchorage as defined by Salzmann, is the resistance to the unwanted forces offered by the periodontium of the "anchor" teeth and auxiliary components.[10] Both extraoral and intraoral methods of anchorage exist.[11] Extraoral sources are the calvarium and the cervical spine, which are utilized by the application of headgear and neck straps, respectively. Intraoral sources are:

- ☐ Alveolar bone due to its trabecular arrangement.
- ☐ Palatal and mandibular basal bone because of their structural resistance.
- ☐ The teeth, which can dissipate forces because of variations in the number, size, position, and inclination of the roots.
- ☐ The dental arch, which can oppose movement when combined to form one unit.
- ☐ Lip musculature, which can provide an active force to counteract any reactionary effects.

Anchorage required in the treatment of the impacted anterior tooth can be achieved through the use of two intraoral methods (Figure 8). The first is the utilization of a transpalatal wire. This combines the two maxillary molars into a stable unit dissipating any buccal or palatal reactionary forces. The second method of anchorage can be achieved by attaching the other erupted permanent (or primary) teeth to the archwire. This intra-arch method of anchorage can counteract any mesial tipping or rotational changes.

CASE REPORT

A healthy nine-year-old male was referred for a routine dental examination. Physical development was normal and the medical history noncontributory. Initial findings included a retained primary central incisor with an associated sinus tract, unerupted left central and lateral incisors, and a midline shift to the left (Figure 9). Asymmetry of the palatal area was observed and verified by palpation. An occlusal radiograph (Figure 1) showed a radiolucency in the periapical area of the retained primary tooth; the unerupted central and lateral incisors to be present and normally developed; and the position, anteroposteriorly and laterally, of the unerupted teeth. A lateral radiograph (Figure 2) was taken to determine the superior-inferior position and the angle of the impaction. The decision was made to alleviate the causative factor by removal of the retained primary tooth and extraction of the primary canines to encourage eruption of the lateral incisor.

Two months later, because of the severity of the impaction, surgical intervention was initiated. The patient was sedated with N_20 and local anesthesia was given in the surgical area. A full thickness flap was raised in the anterior palatal area and the tooth exposed. Because of the vertical inclination of the impaction, isolation for placement of an orthodontic acid-etch bracket was not possible. Ligation was completed, therefore, with a 26 gauge wire.

Two weeks postsurgery, anchorage was placed, utilizing bands on the permanent molars with a transpalatal wire and an omega loop. Brackets were cemented on the erupted anterior teeth and an archwire placed to complete the intraoral anchorage (Figure 8). A light orthodontic treatment force was applied with an elastic tie between the archwire and the ligature wire.

The patient was seen on a monthly basis for replacement of elastic ties and monitoring. After three months, the central incisor had erupted through the hard palate, providing an adequate zone of attached gingiva.

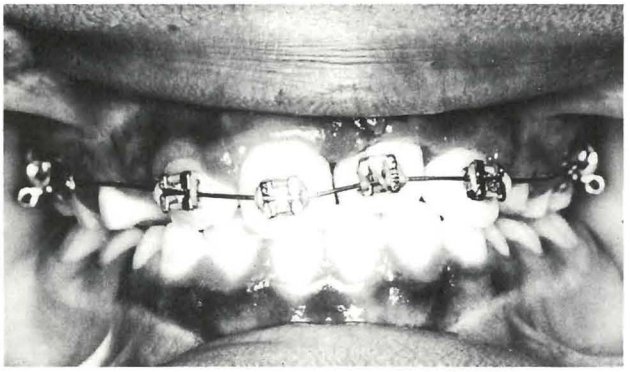

Figure 10. After eruption, the ligature wire was removed and an acid-etch bracket placed on the central incisor.

Figure 11. Edgewire used to align the anterior teeth and provide room for the canines.

The ligature wire was then removed and an acid-etch bracket placed on the central incisor (Figure 10). The case is currently being completed, using an edgewire to align the anterior teeth and to provide space for the eruption of the canines (Figure 11).

SUMMARY

Treatment of the impacted anterior tooth can be achieved using the appropriate surgical and orthodontic methods. A thorough examination must be completed to determine the intervention required.

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BUILDING BRIDGES

Clearly, in order to remove the barrier between scientists and the lay public, the training of scientists should cover communication and intercultural relationships. There is also a need to educate the public about their attitude toward health care providers. Health education should aim to give people, especially children, a better understanding of their own health and their responsibility for maintaining it, an ability to talk freely with doctors and other health professionals, and a sound preparation for handling inconsistent items of information about health.

Ling, J.C.S. and Barefield, P.: Building bridges between doctors and patients. World Health Forum, 10(1):28-29, 1989.

The age-dependent reaction of the periodontal tissues to dental plaque

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Longitudinal as well as cross-sectional studies indicate that the severity and prevalence of gingival disease gradually increase from infancy to adulthood.[1-5] This increase could be attributed to chronologic accumulation of inflammation; the following clinical and histologic findings indicate, however, that the gingival tissue reaction to dental plaque is milder at younger ages:

- ☐ In children, periodontal disease is often described as limited to marginal gingivitis, whereas more advanced forms of the disease are characteristic of adult populations.[2,3]
- ☐ The clinical evidence of gingival inflammation in younger children is milder than in older children or adults to similar amounts of dental plaque.[4,5]
- ☐ The inflammatory cell infiltrate from inflamed gingiva in children is comprised mostly of lymphocytes, whereas in adults it has similar numbers of lymphocytes and plasma cells.[6,7]
- ☐ Qualitatively, chronically inflamed adult gingival tissue presents the histologic characteristics of the established periodontal lesion, while the same tissue in children presents the characteristics of an early lesion.[6-8]
- ☐ The serum levels of antibodies to microorganisms involved in periodontal disease appear to increase gradually from infancy to adulthood.[9,10]

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An understanding of the age-dependent reaction of the periodontal tissues may contribute to a delineation of the etiology and mechanism by which periodontal disease is established and/or progresses. This information is crucial in order to provide efficient prevention of periodontal disease, a major goal of the dental profession. The purpose of the present manuscript is to review the literature related to factors that may be connected to the increasing propensity for development of periodontal disease, from infancy to adulthood.

Basically, periodontal disease is the expression of an inflammatory reaction of the tissues to the products of microbial plaque, its manifestation being dependent on the characteristics of several local and systemic factors, and the period of time the microbial insult is present.[11]

LOCAL FACTORS

The fact that some sites in the mouth may show repeated bursts of destructive activity of periodontal disease, while others remain unaffected, emphasizes the importance of the local factors that may include the intensity and location of the infiltrate of inflammatory cells, the tissue characteristics, amount or composition of dental plaque, gingival fluid exudate, and crevice depth.

Location of the infiltrate of inflammatory cells

Oliver *et al* in a study of seventeen-to-twenty-seven-year-old individuals, correlated clinical and histologic

factors of gingival disease, and concluded that areas without clinical evidence of gingival inflammation had no gingival exudate and tended not to show an infiltrate from inflammatory cells (ICI).[12] Several other studies indicated that, in both the primary and permanent dentitions, however, the histologic evidence of gingival inflammation precedes the clinical changes, thus allowing for the presence of a clinically healthy gingiva, irrespective of the presence of ICI.[13-18]

The histologic evidence of inflammation should precede the clinical symptoms, since the ICI starts in the area just lateral to the junctional epithelium and may be masked by the more buccally positioned healthy tissue.[7,16-18] Also, the form of the gingiva of the primary dentition is more rounded and thicker than that of the permanent dentition, to such an extent that the possibility of "masking" of the ICI may be more frequent in the primary than in the permanent dentition.[19] This hypothesis may be supported by the findings of Smith *et al* who indicated that during the mixed dentition period a higher percentage of the crevices of primary teeth (56.5 percent) than the crevices of permanent teeth (35.3 percent) were free of clinical inflammation.[20] On the other hand, Matsson and Goldberg, also in the mixed dentition, found a higher degree of gingivitis in the primary than in the permanent teeth.[21]

Tissue characteristics

A reduction in the number of blood vessels and a proportional increase in the connective tissue, from childhood to adolescence, have been related to a developmental change in the gingival color.[22,23] These changes may be responsible for changes in the metabolic activity in the tissue and/or tissue turnover, affecting, therefore, the reaction of gingival tissue to plaque.

In an attempt to examine a possible relationship between tissue characteristics and the age-associated development of disease of the periodontal tissues, histologic studies on gingiva of dogs have been performed. These studies concluded that dogs demonstrated an age-dependent disease association similar to humans, juvenile dog gingiva has a thicker keratinized layer of the oral epithelium, and there is a cuticular structure at the surface of the junctional epithelium that is seldom seen in adult dog gingiva.[24-26] The presence of a cuticle at the junctional epithelium, however, has not yet been described in humans and, since the inflammatory process starts in the area just lateral to the junctional epithelium, the influence of a thick oral epithelium on the establishment of gingival disease may be lacking or minimal in humans.[7,16-18]

Gingival crevice

It has been demonstrated that in children, in noninflamed situations, during the mixed dentition period, tooth type has no effect on the gingival fluid volume, urea concentration or crevice pH; whereas the primary teeth show less crevicular fluid volume and a lower crevicular pH than the young permanent teeth.[20] These findings could be attributed to hormonal and/or other systemic changes that may alter the crevicular environment.[20,27] They may also be related, however, to local factors (i.e. crevice depth) that change because of oral developmental processes, such as the shedding of the primary and eruption of the permanent teeth.[28-30]

Dental plaque

Gingivitis is caused by substances derived from microbial plaque accumulation at or near the gingival sulcus.[11] The increase in prevalence and severity in periodontal disease with age, therefore, may simply be related to changes in dental plaque. Studies in this area must take into consideration, however, that the dental plaque microbiota appear to be in a dynamic flux.[31] Thus, there appears to be a variability in plaque composition among populations, individuals and subgingival sites in the same mouth as well as in new and old plaque.[32-33] It has been also suggested that of the many microorganisms colonizing the oral cavity, only those genera or species that require "mechanical retention" and/or anaerobic conditions, which are characteristics of the gingival crevice, are related to the establishment of gingival disease and its transition to periodontal disease.[34-35]

Several studies have suggested that there is a relationship between microbial components of dental plaque and gingival disease in children: Bacteroides melaninogenicus (i.e. black-pigmented Bacteroides), Vibrio sputorum, and spirochetes are less prevalent in the scant plaque of young children, while cocci and spirochetes are more frequent in bleeding sites than in nonbleeding sites in children.[34,36-38] The prevalence and severity of gingival disease increase with the onset of puberty; the disease is accompanied by an increase in the levels of black-pigmented Bacteroides species and a decrease in levels of surface translocating bacteria (i.e. Capnocytophaga, Wolinella) in subgingival plaque.[27,35] These findings are consistent with a relationship between the composition of the dental plaque microbiota and the severity of gingival disease; there are also data, however, that indicate that the clinical expression of gingival inflammation cannot be entirely

accounted for by change in the microbial composition of plaque. For example:

- ☐ The presence of specific microorganisms may not be sufficient for initiating periodontal disease, since several of the microorganisms (i.e. spirochetes, black-pigmented Bacteroides) have also been identified in plaque adjacent to clinically healthy gingiva in children.[34,37,39,40]
- ☐ Changes in the depth of the gingival crevice appear to predispose the periodontium to changes in the microbial composition of dental plaque, severity of disease, and deposition of calculus.[27] It is difficult to establish, therefore, a direct cause and effect or the "order of appearance" between the changes in microbiota and the integrity of the gingival tissues.

SYSTEMIC FACTORS

The influence of the systemic status of the individual on gingival health is evidenced by increased disease because of hormonal changes during puberty, menstruation and pregnancy; increased disease accompanying impaired neutrophilic or monocytic chemotaxis; and its relation to conditions such as Papillon-Lefevre syndrome or neutropenias.[27,35,41-45] Several authors have summarized evidence that indicates that the host defense system plays a major role in various phases of periodontal disease.[11,46,47] Despite the fact that most of these studies have concentrated on studying individuals with destructive periodontal disease, some of the basic antibody mechanisms may be similar in periodontally healthier populations (i.e. gingivitis).

Immunological response

The mechanism by which plaque initiates periodontal disease is presumably based upon the effect of the metabolic and antigenic products of microorganisms on the gingival tissue. These components cause increased permeability of the sulcular epithelium, ensued by their penetration of the tissue and elicitation of inflammatory and immune responses in the host.[11,46-49] Immunologic reactions associated with periodontal disease have been identified by:

- ☐ The occurrence of circulating serum antibodies to microorganisms in subgingival plaque.[9,10,48,50-52]
- ☐ Synthesis and deposition of immunoglobulins and in some cases complementary components in human gingiva and crevicular fluid.[50,53]
- ☐ Presence of increased levels of salivary immunoglobulins in patients with periodontitis.[54,55]
- ☐ Reduction in antibody levels to suspected periopathogens following periodontal therapy, in cases of juvenile periodontitis.[47,56]

Generally, immunological responses are essentially protective reactions that under certain circumstances may lead to tissue destruction.[57] The immunologic response in gingivitis appears to provide some protection from more aggressive disease, and this stable lesion is mostly characterized by T-cells. When tissue destruction can be detected (periodontitis), the cellular infiltrate presents with a high proportion of B-cells.[50,58] Studies of serum antibodies to oral bacteria associated with gingival disease have shown an increase in the level that takes place from infancy to adulthood, although the level is routinely higher in individuals with periodontal diseases.[9,10,54] These findings suggest that the transition from a condition with minimal or no clinical evidence of inflammation and no pocket formation, to an acute gingivitis and/or periodontitis may to some extent be related to:

- ☐ The release of tissue destructive lysosomal enzymes from the leukocytes and/or lymphokines from the lymphocytes, as a result of:
  - □ Chronic infection.
  - □ Changes in tissue characteristics that reduce the capability of the tissue to maintain homeostasis with the insult by bacterial products.
  - □ Bacterial products that are of sufficient toxicity or maintain an interaction with the tissue in a manner to evade host phagocytic cells.[11,46]

In summary, there is little doubt that the onset and progression of periodontal disease are multifactorial processes that are dependent on interacting local and systemic factors. The mechanisms by which these factors proceed involve multiple directions of cause and effect, in which many of the factors support and depend on each other. Different modalities of prevention and treatment may be indicated in different manifestations of the disease, based upon the prevalence or combination of the different etiologic factors, or the sequence of events that promote the disease in each case. The clinician must be aware that, although the severity of periodontal disease in children is substantially lower than in adults, children may develop severe forms of the disease. While the data are unequivocal, a lack of awareness and intervention for treatment of periodontal disease in children or adolescents may predispose the individual to advanced periodontal disease at older ages.

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MOTHER-INFANT ATTACHMENT AND HEALTH CARE USE

Our results suggest that high use of pediatric services in the first year may identify infant and mother pairs who are experiencing strain in their interactions and relationships. Such difficulties may not be identified or acknowledged by the mother and may go undetected in a pediatric visit. The quality of early attachment between mother and infant is associated with the child's later intellectual, emotional, and social development. Cumulative records showing a pattern of high use would alert pediatric staff that a more comprehensive assessment is needed.

Implications for service providers include the need for early recognition of high-risk families and the integration of a broader range of services in pediatric acute care settings. The opportunities for primary prevention are twofold. Pediatric intervention can be aimed at improving mother-infant relationships and understanding the reasons for high use that may otherwise be perpetuated or exacerbated.

Harris, E.S. *et al*: Quality of mother-infant attachment
and pediatric health care use.
Pediatrics, 84:248-254, August, 1989.

Unusual alveolar clefts: report of cases

Reijo Ranta, DDS, Dr Odont
Aarne Rintala, MD

In children with cleft lip and alveolus, with or without cleft palate, the alveolar cleft is always in the region of the maxillary lateral incisor.[1] In rare cases, median maxillary or mandibular alveolar cleft is associated with the median cleft of the upper face, or with the median cleft of the lower lip.[2,3] In association with the oblique lateral orooculofacial clefts, alveolar clefts have been described between the maxillary canine and the first premolar, or in the region of the second premolar.[2,3] Children with the orofaciodigital syndrome I present alveolar clefts associated with hyperplasia of frenula in the region of the maxillary canines and of the mandibular lateral incisors.[8] According to our knowledge, alveolar clefts in other regions of the jaws have not been described in the literature. In the following four cases, atypical alveolar clefts are presented, and the etiology of their unusual location is discussed.

CASE REPORTS

Case 1

A sixteen-year-old twin boy (A), born two weeks prematurely to a healthy mother and a healthy father, and with syndactyly of the toes. A paternal first cousin of the patient also has syndactyly of the toes. The pregnancy was otherwise normal, and the birth weight 2980 g. Two younger sisters and the B-twin sister are healthy. There is an alveolar cleft in the region of the left lateral incisor, a submucous cleft palate with no nasality in speech, and the left nostril is narrower than the right one. During the operation for the cleft, the palatal bone between the alveolar cleft and the posterior bony notch was found to be clearly thinned. The alveolar arch on the left side is collapsed. Crossbite of the entire dental arch due to maxillary hypoplasia and severe hypodontia indicated a need for orthodontic treatment (Figure 1). The alveolar cleft was corrected with a bonegraft, and the syndactyly corrected surgically.

Case 2

An eleven-month-old boy was born by cesarean section, because of placenta previa. The birth weight was 3360 g, and the length 48 cm. The first child and the parents are healthy, with no consanguinity and a negative family history of malformations. There is an alveolar cleft in the region of the normal lateral labial frenulum between the left canine and first premolar, and an ordinary microform of cleft lip on the right side (Figure 2). He also has inguinal hernia and testicular retention bilaterally.

Case 3

A six-month-old boy was born at term to healthy unrelated parents. The pregnancy and the delivery were

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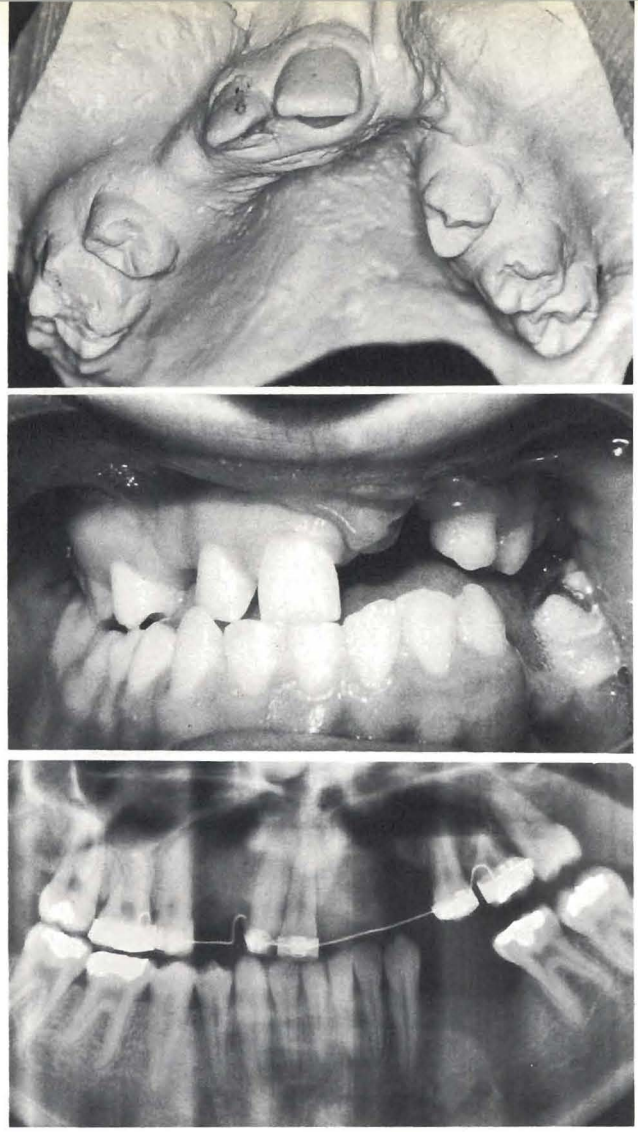

Figure 1. A boy with a separate bony alveolar cleft on the left side reaching up to the nasal floor and a submucous cleft palate. Note also congenital agenesis of thirteen permanent teeth (Case 1).

normal. The birth weight was 4010 g, and the length 51 cm. His older sister has bilateral cleft lip, alveolus and palate, and ankyloblepharon filiform ad natum, corrected at birth. There is a complete cleft lip, alveolus and palate on the left side, and bilateral alveolar clefts in the region between the canine and the first premolar both in the maxilla and the mandible. The lateral labial frenula are normal in size and thickness (Figure 3). No labial sinuses or pterygia are detected, but the two siblings evidently have an autosomal dominant cleft syndrome.

Case 4

An eight-month-old boy was born at term to healthy unrelated parents with a negative family history of malformations. Two older siblings are healthy. The pregnancy and the delivery were normal, the birth weight was 3690 g and the length 50 cm. There is an alveolar cleft in the region of the normal lateral labial frenulum between the right canine and the first premolar. The lip and the palate are normally fused (Figure 4).

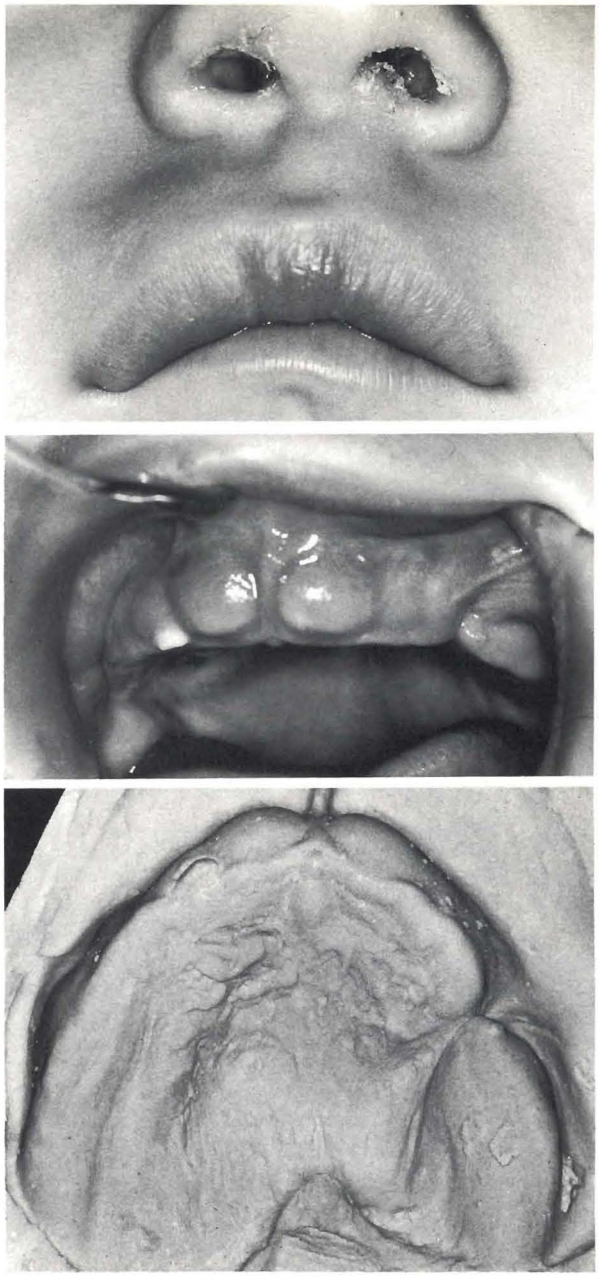

Figure 2. A boy with a subcutaneous (microform) cleft lip on the right side and an alveolar cleft on the left side in the region between the canine and the first premolar (Case 2).

DISCUSSION

The isolated cleft alveolus of Case 1 was located in the region of the maxillary lateral incisor, but without any signs of even a microform of cleft lip although the left nostril was smaller than the right one. Simultaneous isolated clefts of the lip and palate are not so rare, but cleft alveolus (and palate) without cleft lip has to our knowledge not been described earlier.[9] Case 1 also had other developmental anomalies, syndactylies, and severe hypodontia. Thus, the cleft alveolus is one of multiple anomalies of the child. Pathologically, the cleft alveolus probably is an ordinary unilateral cleft, where for some unknown reason, the lip has fused normally.

In Cases 2,3, and 4, the maxillary alveolar clefts were located between the canine and the first premolar, in

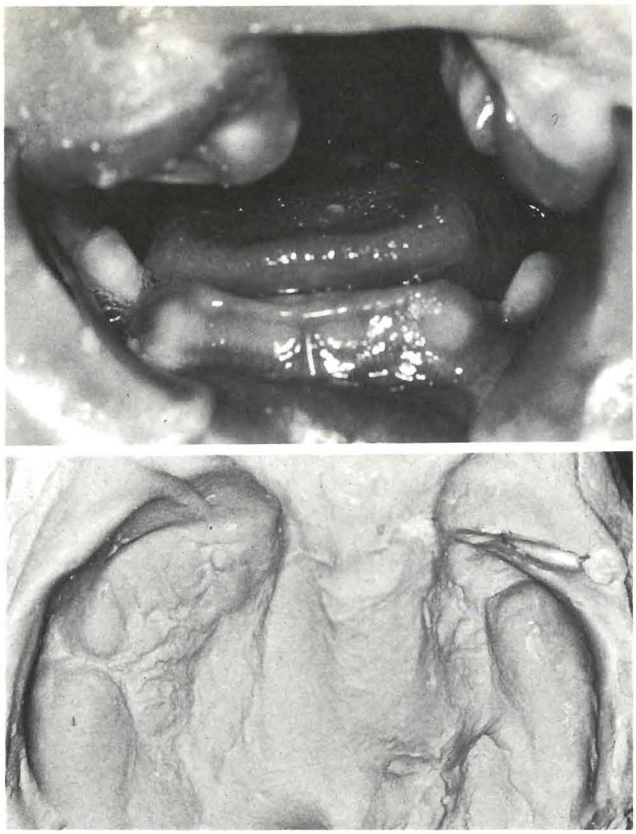

Figure 3. A boy with a complete cleft lip, alveolus and palate on the left side. Note also bilateral alveolar clefts in the maxilla and the mandible in the region between the canine and the first premolar (Case 3).

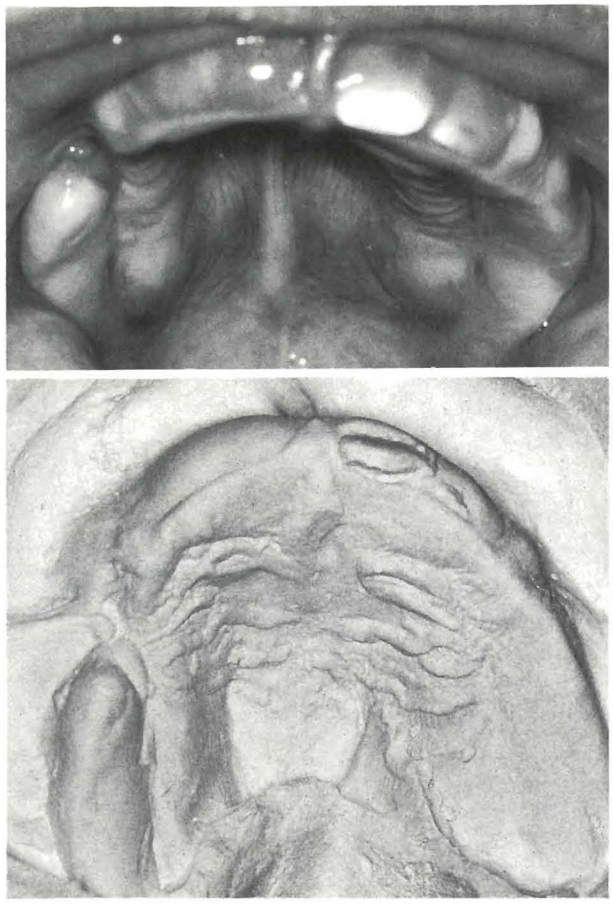

Figure 4. A boy with an alveolar cleft on the right side in the region between the canine and the first premolar (Case 4).

the region where the lateral labial frenulum attaches to the alveolar arch. A similar location of the bilateral mandibular clefts were seen in Case 3. These atypical alveolar clefts were seen in association with a contralateral microform of the cleft lip (Case 2), bilaterally and in both jaws, with a unilateral complete cleft lip, alveolus, and palate (Case 3), and without any signs of an orofacial cleft in other locations (Case 4). Healthy children have a small notch, but no bony defect, in the region of the alveolar clefts described above.[10] The lateral labial frenulum is attached to the alveolar arch at that site. The frenula at the cleft site of these children were normal in size and tightness. Thus, the frenulum could not have physically obstructed the growth of the alveolar arch at the site of the cleft. Children with orofaciodigital syndrome I have bony defects in the region of the lateral incisors and the maxillary canines because of thick and tight labial frenula.[8] In some patients with oblique lateral oroocular cleft (nr. 5 in Tessier's classification) the alveolar cleft has been situated just posterior to the maxillary canines.[4-6] The oblique facial clefts are thought to result from disturbed migration or early necrosis of the neural crest cells, or insufficient proliferation, degeneration, and/or differentiation.[11,12] Although our Cases 2,3, and 4 had no signs of a facial cleft, the pathogenesis of the present unusual alveolar clefts may be explained equally. Although the buccal frenula in the regions of the alveolar clefts of our patients were determined to be normal, the frenula may in some instances play a role in arrested growth of the alveolar arch in the respective regions.

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Tooth germ transposition: report of cases

Reijo Ranta, DDS, Dr Odont

Displacement of a tooth is not an uncommon occurrence. The reasons for transposition may originate in the anlage stage of development; from a change in position during the course of eruption of the tooth; or in the presence of a pathologic condition, such as a tumor.[1-6] The teeth most frequently transposed in the dental arch are the maxillary and mandibular canines, the mandibular second premolar, and supernumerary teeth.[4,7-16] More than half of the transposed maxillary canines are transposed with premolars and the remaining ones with lateral incisors.[9] The mandibular canine is merely transposed with the incisors, and its transmigration across the symphysis to the opposite side has also been described.[8,13] Migration of a tooth may take place before, during, or after its root formation. It can occur as a true or as an incomplete transposition.[9]

Several eruption and migration theories have been reported. Sutton cited five theories involving alterations in the dental tissue, alterations in the surrounding bone tissue fluid pressure, periodontal ligament contraction, and other theories.[7] He also extended the "vascular" theory. Based on the suggestion that the eruptive force is due to hydrodynamic and hydrostatic forces in the blood vessels, he described the "blood-vessel thrust" theory of tooth eruption. He concluded that this theory appears to explain the exclusive eruptive and migratory force.[7] This theory does not explain, however, the transposition of teeth that are transposed before root development begins.

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The follow-up of six patients with a transposed tooth germ before root formation are reported and discussed in the following cases of cleft lip or cleft palate.

CASE REPORTS

Case 1

This is the case of a boy with complete bilateral cleft lip and palate corrected in childhood. At the age of 8.5 years, an occlusal radiograph revealed the crown of a tooth posteriorly at the midline of the maxilla (Figure 1b). From an orthopantomogram, the maxillary permanent canines and the mandibular second premolars were assessed as congenitally absent. At the age of 13.5 years, an orthopantomogram revealed a tooth germ at the level of the bony nasal floor on the right side of the maxilla. An occlusal radiograph taken at the same time revealed the tooth to be a permanent canine in size, form, and stage of development (Figures 1a, c). The tooth had migrated anteriorly compared with the occlusal radiograph taken at the age of 8.5 years (Figures 1b, c). The tooth was exposed with the intention to remove it, but the bony framework of the premaxilla was so poor that the tooth was left in place.

Case 2

This is the case of a girl with an isolated cleft palate corrected at the age of eighteen months. An orthopantomogram of the dentition at the age of 8.5 years revealed congenital absence of the maxillary permanent

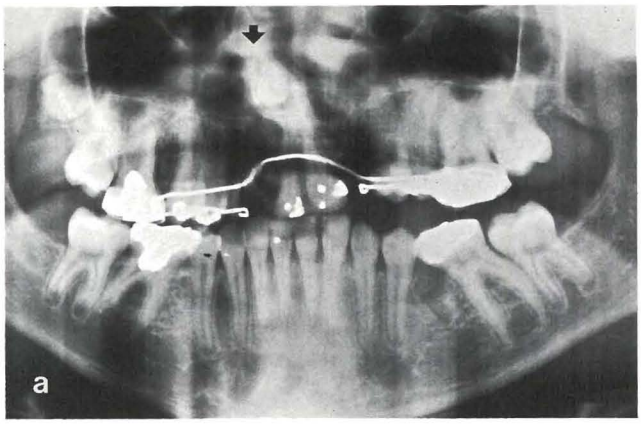
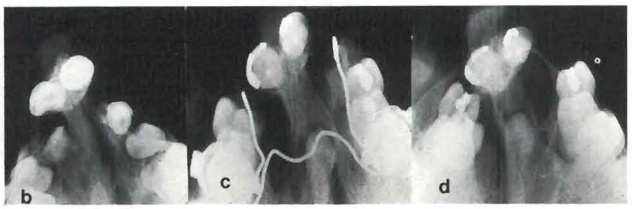
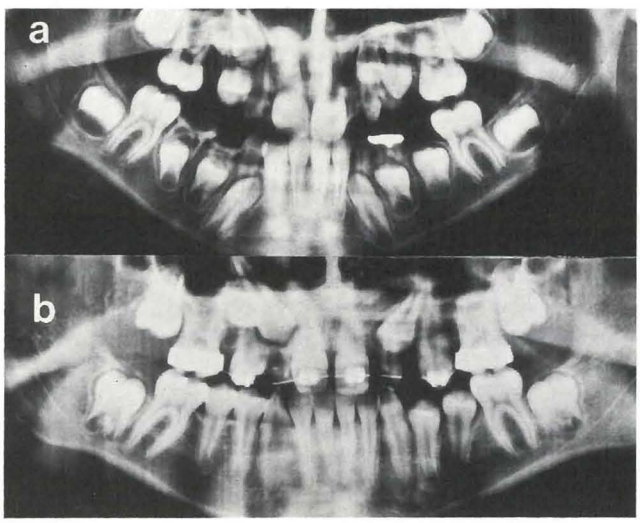


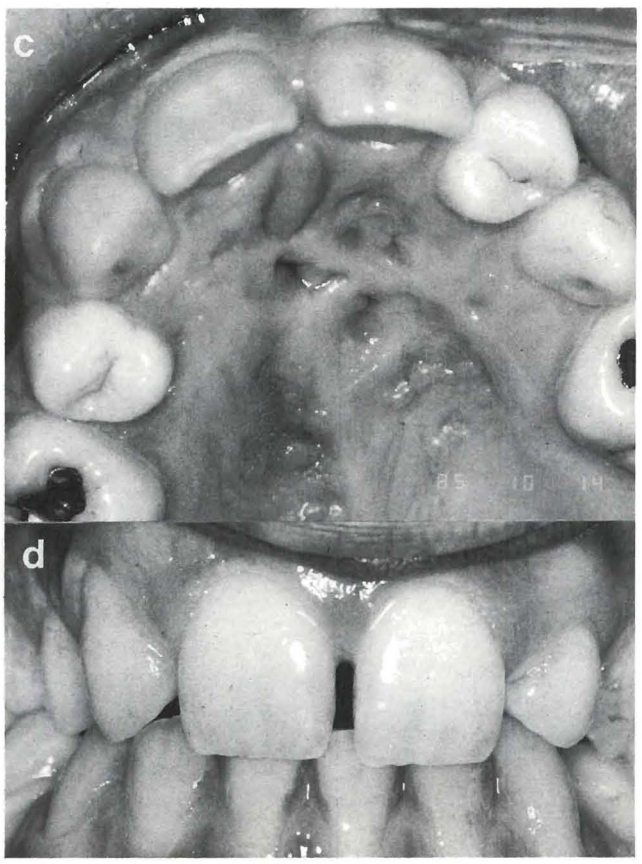
Figure 1. Orthopantomogram of case 1 at 13.5 years of age, showing agenesis of both maxillary permanent incisors, the left maxillary permanent canine and the third molars, both mandibular second premolars, and the third molars (a). On the right side at the nasal floor is seen a tooth, which was confirmed by an occlusal radiograph to be a horizontally positioned permanent canine (c). The tooth was first observed at the age of 8.5 years (b). Migration of the canine is seen in occlusal radiographs at the age of 13.5 (c) and 18.5 years (d).



lateral incisors and the right maxillary second premolar. The left maxillary permanent canine was seen between the first premolar and the first permanent molar (Figure 2a). During the course of eruption of the canines, the right maxillary canine erupted in the place of the lateral incisor, and the left canine erupted distal to the first premolar (Figure 2b, at the age of eleven years). Edgewise appliances were used in the orthodontic treatment. The maxillary right second premolar and both mandibular first premolars were removed because of crowding in the dental arches. At the age of sixteen years, after orthodontic treatment, the maxillary dental arch and occlusion of the teeth were acceptable (Figure 2c, d).

Figure 2. Case 2, note the bilateral agenesis of the maxillary lateral incisors, and the transposed canine with the first premolars (a,b); an intraoral view after orthodontics (d).





Case 3

This is the case of a girl with an isolated cleft plate, corrected at the age of twenty months. At the age of 9.5 years, bilateral agenesis of the maxillary lateral incisors was seen in an orthopantomogram. The maxillary permanent canines were present, developing at the site of the lateral incisors (Figure 3a). One and a half years later, however, the right maxillary canine was seen horizontally at the level of the bony nasal floor. The root of the canine was normally developed, but the tooth had migrated upward and backward. The mandibular first premolars were removed because of crowding of the dental arch. Later, the maxillary impacted canine was surgically removed, and the extraction spaces were orthodontically closed.

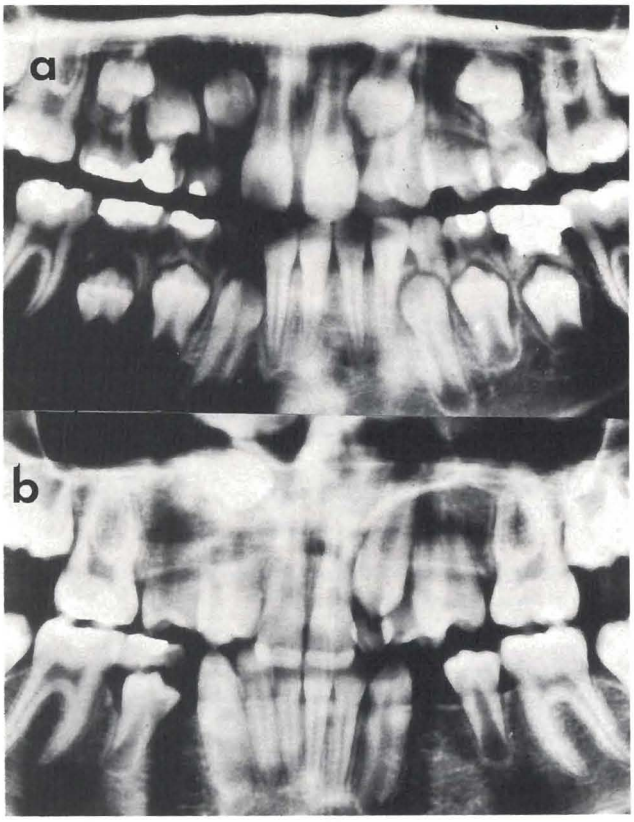


Figure 3. Case 3, note the bilateral agenesis of the maxillary permanent lateral incisors and a favorable position of the canines (a). A year and a half later the maxillary canine migrated upward and backward (b).

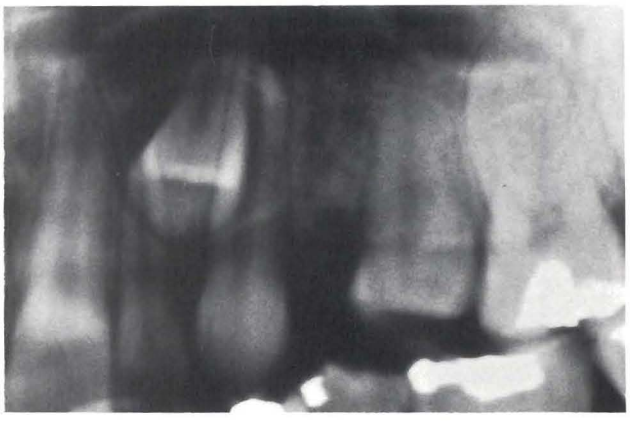


Figure 4. Case 4, note a maxillary canine transposed with the first premolar.

Case 4

This is the case of a girl with an isolated cleft palate, corrected at the age of eighteen months. Her left maxillary first premolar was developing mesial to the permanent canine, although there was space for a tooth between the canine and the second premolar. The unerupted first premolar was surgically removed because of its enlarged crown follicle (Figure 4).

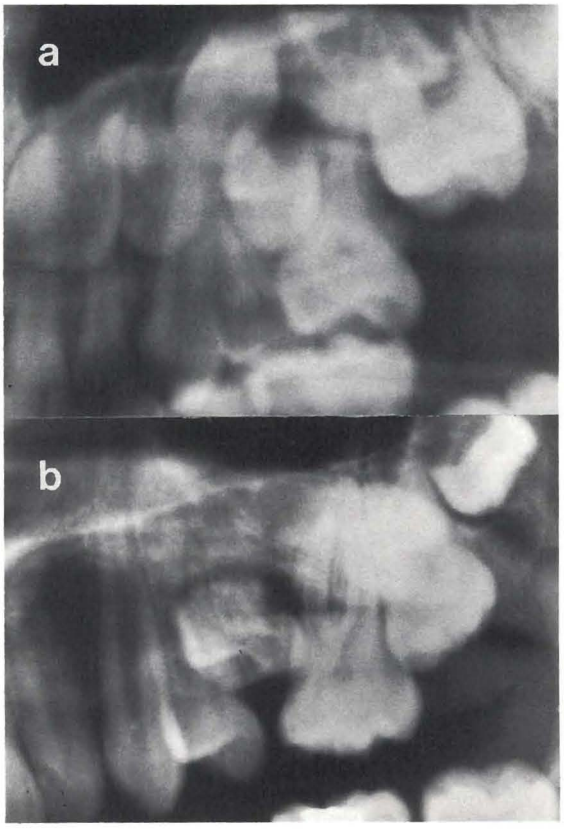


Figure 5. Case 5 with a posteriorly tipped (a) and erupted maxillary second premolar associated with a submerged corresponding primary molar (b).

Case 5

This is the case of a girl with an isolated cleft palate, corrected at the age of twenty-four months. At five years of age, the crown of the left maxillary second premolar was tipped posteriorly and positioned palatally to the first permanent molar (Figure 5a). At twelve years of age, the crown of the second premolar was seen palatally to the second permanent molar, and the apex of its root nearly at the normal site. The second primary molar was submerged (Figure 5b). The unerupted second premolar was surgically removed to allow eruption of the second permanent molar. The submerged primary molar was removed at the same time.

Case 6

This is the case of a ten-year-old boy with a left-sided cleft lip and alveolus. The orthopantomogram revealed a supernumerary premolar between the first and second permanent molars on the left side of the maxilla

(Figure 6a). He also had a supernumerary permanent lateral incisor on the cleft side. The supernumerary premolar was removed, after its eruption, and the second molar was left to move mesially (Figure 6b).

DISCUSSION

In children with cleft lip and/or palate, dental development is affected more frequently than in children with normal palates or lips. The lateral incisor in the region of the alveolar cleft is very sensitive to developmental disorders, but the teeth outside the cleft area are also affected more frequently than in normal children.[17] Malposition and transposition of the maxillary canine and second premolar are fairly common in these children, caused by the maxillary growth disturbances, mostly related to the surgery of the lip and palate. In the region outside the cleft, transposition of a tooth germ is not due to surgical measures done to correct the cleft. The origin of the transposed tooth germ may be a growth disturbance during the formation of the tooth bud from the dental lamina, or instability in the formation of the tooth bud, and/or the surrounding tissues. Growth disturbances of the maxilla during the initiation stage or later in the course of tooth formation may partly explain tooth transposition.

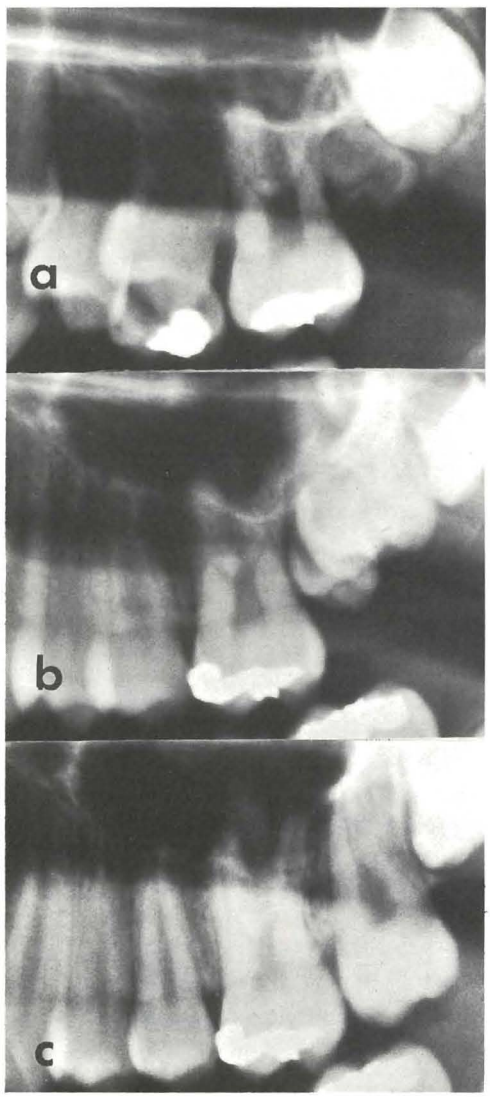


Figure 6. Case 6 with a transposed supernumerary maxillary premolar between the first and second molars.

The maxillary permanent canine develops above the first premolar and normally points mesially. The canine has a comparatively long path of eruption, and requires a comparatively long time to erupt. Transposition of the canine is likely to occur with the lateral incisor, if it is pointing too far mesially; or with the premolar, if it is pointing too far distally.[9] In both situations the anlage stage of the developing canine is normal, but transpositions do occur during the course of eruption. Another cause for canine transposition is the transposition of the tooth germ before its root formation and eruption, as was seen in cases 1, 2 and 4.[1]

The canine in case 1 was developing in the vomer, far removed from its normal location. The lateral segments of the maxilla were not in bony contact with the vomer. The crown of the canine was pointing anteriorly, and it moved anteriorly during the course of eruption. None of the present theories of transmigration can explain this transposition. It is impossible that the tooth germ had transposed because of surgical measures performed to correct the cleft. One possible explanation might be that the tooth is a supernumerary tooth. That is unlikely, however, because of the rarity of concomitant hypohyperdontia.[18] Furthermore, the posterior position of the canine at the level of the first permanent molars does not support the theory of a supernumerary tooth. In all likelihood, the canine had initiated its development at the vomer.

Transposition of the canine in cases 2 and 4 originated in the anlage stage of the canine and of the first premolar. The canine in case 2 was developing in the region of the second premolar, and the first premolar developed in the region of the canine. The canine in case 4 developed in its normal position, but the first premolar was developing mesial to the canine. The upward and backward transmigrated canine in case 3 is interesting, because the direction of its migration was opposite to the theories of tooth migration. The tooth had migrated upward two-thirds of the root length of the central incisor (Figure 3a, b). Contraction of the

periodontal ligament is a possible explanation for this phenomenon.

The transmigration of the second premolar seen in case 5 is fairly common in children with cleft palate. The tooth germ was developing palatally to the dental arch, but was otherwise in nearly normal position. The crown of the premolar was pointing distally, and the transposition occurred during the eruption of the tooth. Transposition of the second premolar was associated with a submerged corresponding primary molar and obstructed eruption of the second permanent molar. Recently, the author described impaction of the second maxillary permanent molars by the transposed germs of the third molars.[2]

Case 6 had the developing tooth germ of a supernumerary maxillary premolar between the first and second permanent molars. Equal transposition of a supernumerary maxillary premolar has been described in a case with bilateral supernumerary premolars fully erupted in occlusion, and in a case with similar unilateral transposition.[15,16]

Transposition of the maxillary canine and the second premolar is a fairly common tooth malposition in children with cleft of the lip, palate or both. Among the abnormalities in number, size and shape of the teeth, transposition is also important to take into consideration in planning the patient's overall dental care and orthodontic treatment.

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NEEDLE INJURIES AMONG HEALTH CARE WORKERS

A number of possible strategies to decrease needle injuries among health care workers have been proposed. These include the use of rigid needle disposal units, changes in needle device designs, and universal blood and body fluid precautions. In the event of a needle injury, training programs should have a clear protocol for management of this occurrence including counseling and serologic evaluation. As the population of HIV-infected individuals increases, it is imperative that we respond to the heightened sense of urgency among house officers with effective interventions to decrease the risks of needle injuries.

Melzer, S.M. *et al*: Needle injuries among pediatric housestaff physicians in New York City. Pediatrics, 84:211-214, August, 1989.

Evolving demographic patterns and potential for pediatric dental practice

Demography

H. Barry Waldman, BA, DDS, MPH, PhD

Individual pediatric practices must evolve to reflect the changing patterns of dental disease and the competitive realities in today's (and tomorrow's) world."[1]

There will be an increase in the number of children residing in the United States during the 1990s. During the first decade of the next century, however, the number of children will decrease to the levels of the mid and late 1980s. The 1988 projections from the Bureau of the Census confirm the general trend, but modify earlier 1984 projections by the Bureau.[2,3]

The evolving demographic patterns of the number of children and the demand for dental services by this population, together with the dentist-to-population ratios, are some of the critical factors in determining the location for, and maintaining the stability of pediatric dental practice. Earlier presentations by this writer reviewed the increasing demand for services by children and the evolving fabric of pediatric dentistry in a period of decreasing numbers of dentists.[4,5] The current material will consider pediatric dental practices in terms of

- ☐ The impact of the changing numbers of children.
- ☐ The developing awareness of the overall health and social needs of the nation's children.

NUMBER OF CHILDREN

The Bureau of the Census estimated that in 1986 there were 63.3 million residents under eighteen years of age

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in the United States; 18.1 million under age five; 30.3 million between five and thirteen years; and 14.8 million between fourteen and seventeen years. During the next twenty years there will be a general decline in the number of children under five years of age and a gradual increase and then decrease in the number of older children. During this period, the proportion of the total population under eighteen years of age will decrease from 26 percent to 22 percent. The 1988 projections mirror the earlier projection data, but in each future period, it is anticipated that the number of children will be somewhat less than that projected in 1984 (Table 1). Nationally, the overall developments in the number of children is reflected in parallel developments in the number of males and females, with the projected number of males greater than the number of females during each period (Table 2). (Note: In the mid 1980s, a greater percent of female children, than their male counterparts, had reported dental visits.[4])

The changes in the number of children, however, are not reflected uniformly throughout the nation or the entire population. For example, during the next twenty years, it is projected that:

- ☐ There will be a continuing decrease in the number of children in New England, the Middle Atlantic, the East North Central and the East South Central regions of the country.
- ☐ There will be a continuing increase in the number of children in the South Atlantic, West South Central, Mountain and Pacific regions of the country (Table 3). (Note: Reports by the Bureau of the Census provide population projections by age categories for individual states.)
- ☐ Nationally, there will be a continuing decrease in the number of white children and an increase in the number of black children (Table 4). (Note: Despite a continuing increase in the percent of white and black children with reported dental visits, a greater percent of white children, as compared to their black counterparts, reported dental visits in the previous year.[4])
- ☐ In the two largest states in the nation there will be increases in the number of black children. While there will be a decrease in the number of white children in the State of New York, in the State of California, however, there will be an increase in the number of white children (Table 5).

Table 1 ☐ Bureau of the Census estimates and projections of U.S. population under 18 years of age for the years 1986–2010.[2,3]

Age	Estimate	Projections				
	1986	1990	1995	2000	2005	2010
	(in millions)					
Under 5 yrs.	18.1	18.4	17.8	16.9	16.6	16.9
5–13 yrs.	30.3	32.4	33.9	33.5	32.0	31.0
14–17 yrs.	14.8	13.2	14.5	15.3	15.5	14.7
Total under 18 years (reported in 1988)	63.3	64.0	66.2	65.7	64.1	62.6
Previous projections (reported in 1984)		(64.3)	(67.1)	(67.4)		(64.8)
Percent of total U.S. population under 18 years	26.2%	25.6%	25.4%	24.5%	23.2%	22.2%

Table 2 ☐ Estimated and projected U.S. population under 18 years by gender: 1986–2010.[3]

Year	Male	Female
	(in millions)	
1986	32.4	30.9
1990	32.8	31.2
2000	33.7	32.0
2010	32.1	30.5

Table 3 ☐ Estimated and projected U.S. population under 18 years of age by region: 1986–2010.[3]

Region	1986	1990	2000	2010
		(in millions)		
New England (ME,NH,VT,MA,RI,CT)	3.0	3.0	3.2	2.9
Middle Atlantic (NY,NJ,PA)	9.1	8.9	8.8	8.1
East North Central (OH,IN,IL,MI,WI)	11.1	10.9	10.5	9.4
West North Central (MN,IA,MO,ND,SD,NB,KS)	4.4	4.6	4.5	4.1
South Atlantic (DE,MD,DC,VA,WV,NC,SC,GA,FL)	10.3	10.6	11.6	11.4
East South Central (KY,TN,AL,MS)	4.2	4.2	4.0	3.7
West South Central (AR,LA,OK,TX)	7.8	7.9	8.1	7.9
Mountain (MT,ID,WY,CO,NM,AZ,UT,NV)	3.8	4.0	4.3	4.3
Pacific (WA,OR,CA,AK,HI)	9.4	9.9	10.7	10.8

Table 4 ☐ Actual and projected U.S. population under 18 years by race: 1980–2010.[3]

Year	White	Black
1980*	52.6	9.5
1990	51.4	9.9
2000	51.9	10.6
2010	48.4	10.6

*Census data

Table 5 ☐ Actual and projected population in California and New York under 18 years by race: 1980, 2010.[3]

	White		Black	
	1980*	2010	1980*	2010
	(in millions)			
California	5.3	6.4	0.6	0.9
New York	3.7	2.8	0.8	0.9

*Census data

Table 6 ☐ Current and projected number of dentists and dentists per 100,000 population: 1987–2020.[6]

Year	Number of dentists	Dentists per 100,000 population
1987	137,809	56.6
1990	140,699	56.3
1995	142,867	55.0
2000	139,790	50.6
2010	137,197	48.4
2020	128,329	43.5

NUMBER OF DENTISTS

The revised downward national projections for the number of children during the next twenty years should be a matter of concern for pediatric dentists. Reports from the American Dental Association (ADA) (1988 and 1989) and the American Association of Dental Schools (AADS) have revised downward, however, earlier (1982) estimates and projections of the number of dental practitioners.[6,7] The updated ADA data indicate a greater rate of retirement and a sharper decrease in the number of entering dental school places than anticipated in earlier reports.[6-8]

Starting in 1988, the AADS, working in cooperation with a commercial corporation that had developed a manpower projection model, issued two reports on dental manpower through the year 2000 and beyond. In addition to the standard series of demographic characteristics (including age, gender, specialty, state location, dental school, years of experience, etc.) the model inputs economic developments and anticipated population changes (e.g. decrease, between 1989 and 1993, in the size of the twenty-one to twenty-four-year-old age-cohort and its effect on the applicant pool for dental schools during the period). Results from the study indicated that:

- ☐ In 1987, the dentist-to-population ratio in the United States reached a high of 56.6 dentists per 100,000 population. Since that year, the dentist-to-population ratio has begun a decrease that will continue through the year 2020 (to 43.5 dentists per 100,000 population—the lowest it has been since the 1910-1915 era) (Table 6).
- ☐ In 1988, there were 137,749 active dentists. The number of dentists will increase to a maximum of 143,039 in 1996. As a result of the increase in the general population, however, the dentist-to-population ratio will continue to decrease. (Note: The AADS report provides projections on the changing number of dentists and dentist-to-population ratios for each individual state and the District of Columbia. Other reports from the ADA indicate a general "leveling-down" in the production of pediatric dentists from various training programs, as well as information on the changing number of pediatric practitioners in each state and region.[5,9])
- ☐ In 1987, 56 percent of active dentists were less than 45 years of age; 30 percent were between 45 and 60. Over the next twenty years, the percent of active dentists who are less than 45 years of age will decrease by 36 percent and those between 45 and 60 will increase by 51 percent.
- ☐ There will be marked decreases in the number of male dentists (about 30 percent in the next 33 years).
- ☐ There will be marked increases in the number of female dentists during the same period (about 350 percent). (Note: The clinical and professional activities of female dentists differ from those of male dentists, including: fewer working hours and scheduled appointments by female dentists than their male counterparts.)†

A WIDER VIEW

The projected changes in the number of children in different locations throughout the country during the next twenty years are but one component of the critical determinants in pediatric practice decisions. As the young pediatric dentist reviews potential locations and the older practitioner considers the impact of evolving population demographics on his/her established practice, both must not lose sight of national developments

†For a more extended discussion of these and other variations by gender, as well as the potential impact on manpower availability, see an earlier presentation by this writer in the ***Journal of Dentistry for Children.***[5]

that augur favorably for the future delivery of pediatric health and social services.

In contrast to previous years, when major emphasis was directed solely to the needs of the geriatric population, there has been an increasing awareness at the national level of a need for a more balanced approach to the economic, health and social needs of children. For example:

- ☐ Using data from various federal agencies, the National Association of Children's Hospitals and Related Institutions reported:
- ☐ The number of uninsured children grew 13 percent in the last five years. About twelve million children have no health insurance.
- ☐ Despite a one-third growth in child poverty over the last decade, Medicaid is serving 400,000 fewer poor children. In 1986, Medicaid covered only half of the children in families below the poverty level.
- ☐ About seven million children do not receive routine medical care.
- ☐ Only 60 percent of children under age four have received the complete basic series of immunizations.
- ☐ The number of children with acquired immune deficiency syndrome is increasing, with 10,000 to 20,000 pediatric cases of AIDS or AIDS-related complex likely to be diagnosed in children by 1991.
- ☐ Reported deaths from child abuse and neglect increased by 23 percent from 1985 to 1986 with an estimated 2,000 to 5,000 associated deaths each year.[10]
- ☐ A *New York Times* editorial noted that, Social Security's principle effect has been on the elderly. It has reduced poverty among the elderly to less than one person in seven. "Meanwhile, poverty among children has increased to one in four."[11]
- ☐ In a hearing before the Senate Finance Committee that was considering (and trying to explain) the unexpected surplus in the Medicare surtax funds, it was noted that, "... more elderly are richer than previous estimates."[12]

Yes, evolving demographic patterns are a critical factor in locating a pediatric dental practice. But so too will be the increasing demands for health and social services and a developing national awareness of the difficulties faced by many of our nation's children. Thus, despite changed population projections for the number of children, the future of pediatric dental practice (and dentistry in general) is far more favorable than the days in the late 1970s when there were concerns for the future of the specialty. For example, the ADA reported that nationally by 1986, the improving conditions for dental practice resulted in the highest dentist current dollar and constant dollar (i.e. removing the effects of inflation) net income during the past forty years.[13,14]

Comments by Representative Schroeder of Colorado may be most appropriate in summing up the future national direction for health and services for our nation's children. "When we look at the Federal dollar and how it's spent on medical care, a very high percentage of it is spent on the last few days of someone's life. It should not be either/or, and you should not pit one age-group against another. But we've totally ignored one age-group: children."[10]

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Changing number and distribution of pediatric dentists

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The recent publication of the American Dental Association (ADA) 1987 report on the distribution of dentists in the United States is the latest in a series of efforts to track the evolving picture of dental manpower.[1,2] In addition, in 1989, the American Association of Dental Schools (AADS) presented the results from its manpower project.[3] The data from the two studies reflect the dramatic decreases in dental school enrollment and higher rates of retirement than those projected in the last ADA survey. Most significant are the findings that, nationally:

- ☐ Beginning in 1988, there will be a decrease in dentist-to-population ratios.
- ☐ By 1997, there will be an actual decrease in the number of dentists.

More specifically, the ADA report provides information that (in conjunction with previous reports) traces the changing number and distribution of pediatric dentists on a state-by-state basis.

OVERALL NUMBER OF PEDIATRIC DENTISTS

Nationally, there continue to be increases in the absolute number of pediatric dentists. Between 1982 and 1987, however, there was an increase of only 140 pediatric dentists (4.7 percent). In addition, the number of pediatric dentists per million population remained constant during the period (12.7 pediatric dentists per million population) (Table 1).

NUMBER OF PEDIATRIC DENTISTS BY STATE

In 1987, the number of pediatric dentists ranged from three in North Dakota and four in South Dakota and Wyoming, to 222 in Texas and 411 in California. There were also major differences in the number of pediatric dentists per one million population. The range was from 4.5 pediatric dentists per million in North Dakota and 4.7 per million in West Virginia, to 26.4 pediatric dentists per million in Hawaii and 27.6 per million in the District of Columbia.

Between 1982 and 1987, the number of pediatric dentists increased in more than half of the states, but decreased in nineteen states. Similarly, in twenty-nine states and the District of Columbia, there were increases in the pediatric-dentist-to-population ratio. But in twentyone states there were decreases in the ratio (Table 2).

Table 1 ☐ Number of pediatric dentists and pediatric dentists per million population: selected year 1976–1987.[1,2,4]

Year	Number pediatric dentists	Pediatric dentists per million population
1971	1,159	5.7
1976	1,218	5.6
1979	1,776	7.9
1982	2,949	12.7
1987	3,089	12.7

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Table 2 ☐ High and low range and changes in pediatric dentist counts by states: 1982, 1987.[1]

	1982		1987	
	Number of pediatric dentists			
High	California	457	California	411
	Texas	201	Texas	222
Low	S. Dakota	3	Wyoming	4
	N. Dakota	2	S. Dakota	4
			N. Dakota	3
	Pediatric dentists per million population			
High	Hawaii	22.1	Dist. Columbia	27.6
	Nebraska	20.8	Hawaii	26.4
Low	S. Dakota	4.6	W. Virginia	4.7
	N. Dakota	2.9	N. Dakota	4.5

	Change between 1982 and 1987	
	Number of pediatric dentists	Pediatric dentists per million population
Increased	28 states Dist. Columbia	29 states Dist. Columbia
Decreased	19 states	21 states
No change	3 states	

During the period between the last two ADA reports, in many states there were marginal changes in the number and ratio of pediatric dentists per population. In other states, however, the changes were quite pronounced. For example:

District of Columbia: increased from 17.4 to 27.6 pediatric dentists per million residents.

Alaska: increased from 9.1 to 15.9 pediatric dentists per million residents.

Nebraska: decreased from 20.8 to 13.9 pediatric dentists per million residents.

Montana: decreased from 18.7 to 11.2 pediatric dentists per million residents (Table 3).

PROSPECTS FOR THE NUMBER OF PEDIATRIC DENTISTS

The general slowing down in the increasing numbers of pediatric dentists and an essentially constant pediatric-dentist-to-population ratio should continue in the future. After a series of increases during the 1970s, first year enrollments in pediatric dental training programs appear to have stabilized at lower numbers during the 1980s (Table 4).

IN GENERAL

Tracking the numbers of pediatric dentists at a national and state levels provides a necessary, but only a partial appreciation of developments in the specialty. Far more in depth reviews at a community level are essential to develop a greater understanding of local exigencies. But at least on a macrogeographic basis, pediatric dental manpower appears to have established a level of equilibrium.

Table 3 ☐ Number of pediatric dentists and pediatric dentists per million population by state and region: 1982, 1987.[1]

	Number pediatric dentists		Number per million population	
	1982	1987	1982	1987
New England	204	222	16.3	17.3
Connecticut	57	71	18.0	22.2
Maine	9	8	7.9	6.7
Massachusetts	113	112	19.5	19.8
New Hampshire	8	12	8.4	11.4
Rhode Island	10	13	10.4	13.3
Vermont	7	6	13.6	10.9
Middle Atlantic	400	466	10.8	12.5
New Jersey	87	112	11.7	14.6
New York	181	208	10.2	11.7
Pennsylvania	132	147	11.1	12.3
South Atlantic	445	497	11.6	12.1
Delaware	5	9	8.3	14.1
Dist. of Columbia	11	17	17.4	27.6
Florida	111	137	10.7	11.5
Georgia	69	84	12.2	13.7
Maryland	77	77	18.0	17.2
N. Carolina	63	61	10.5	9.7
S. Carolina	34	37	10.6	11.0
Virginia	65	67	11.8	11.7
W. Virginia	10	9	5.1	4.7
East South Central	190	213	12.8	14.0
Alabama	55	60	13.9	14.8
Kentucky	52	57	14.2	15.4
Mississippi	18	23	7.0	8.8
Tennessee	65	74	13.9	15.3
East North Central	458	467	11.0	11.2
Illinois	115	112	10.0	9.7
Indiana	81	94	14.8	17.0
Michigan	83	81	9.1	8.8
Ohio	123	127	11.4	11.8
Wisconsin	56	54	11.8	11.2
West North Central	201	181	11.6	10.3
Iowa	48	43	16.5	15.2
Kansas	29	25	12.1	10.2
Minnesota	41	40	9.9	9.4
Missouri	45	44	9.1	8.6
Nebraska	33	22	20.8	13.9
N. Dakota	2	3	2.9	4.5
S. Dakota	3	4	4.6	5.7
West South Central	314	344	12.5	12.9
Arkansas	19	24	8.3	10.1
Louisiana	55	62	12.6	13.9
Oklahoma	39	36	12.3	11.1
Texas	201	222	13.2	13.3
Mountain	144	148	12.0	11.3
Arizona	32	34	11.2	10.1
Colorado	49	55	16.1	16.9
Idaho	8	8	8.3	8.1
Montana	15	9	18.7	11.2
Nevada	12	9	13.6	9.0
N. Mexico	12	15	8.8	10.1
Utah	12	14	7.7	8.4
Wyoming	4	4	7.9	8.2
Pacific	593	552	17.9	15.3
Alaska	4	8	9.1	15.9
California	457	411	18.5	15.0
Hawaii	22	27	22.1	26.4
Oregon	44	43	16.5	15.8
Washington	66	63	15.5	14.1
United States	2,949	3,089	12.7	12.7

Table 4 □ Number of students enrolled in first year of pediatric dentistry programs: selected years 1972–1988.[5-7]

Year*	First year enrollment
1972	163
1974	177
1976	165
1978	173
1980	190
1982	158
1984	164
1986	152
1987	165
1988	162

*Represents the start of the academic year

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SCIENTIFIC LITERACY

Scientific literacy is as vital as language, historical, or cultural literacy. Those who master science have the potential to wield great power over those who do not. A democratic society may flounder unless all citizens understand the spirit, character, and values of the science that empowers so much of society.

Furthermore, science and technology are economic and cultural engines for much of the world. Science provides new ideas that expand and enrich our world view. Technology provides new products that ease and improve our daily lives. To live and work effectively in such a world requires a fundamental literacy of that science and technology.

Numerous reports suggest that we are becoming a nation of science illiterates; thus the notion of achieving national science literacy is a daunting prospect. Such a goal demands a high-quality science education program. Implementation of this solution is complex and will require profound changes in our notions about scientists and the science educational system.

We must broaden our traditional view of the white male scientist to include minorities and women. This assertion has often been made on grounds of equity and fairness, but there are also pragmatic reasons for this revision. The pool of white males available for scientific careers is decreasing. To maintain our present population of scientists and engineers, women and minorities must be encouraged to enter technical careers. Thus, our educational system, from kindergarten to graduate school, must encourage participation of these traditionally underrepresented groups.

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Science, 245: 340, 28 July, 1989.

Dental caries and fluorosis in children from high and low fluoride areas of Morocco

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Among the oral health studies in Morocco, a few dealt with dental caries in children and dental fluorosis of the permanent dentition.[1-5] No study has been reported regarding dental fluorosis in the primary dentition of the children of Morocco. In a recent study Haikel *et al* demonstrated that endemic human fluorosis in Khouribga was due primarily to inhalation of phosphate dust containing fluoride.[6] The present investigation was undertaken with the purpose of assessing the prevalence of dental caries and dental fluorosis in children exposed to pollution with fluoride.

MATERIAL AND METHODS

Khouribga is a large mining center of 437,000 inhabitants, situated 120 kilometers southeast of Rabat (Figure). The fluoride content of the drinking water was 0.17 ± 0.08 ppm in the urban center and 0.7 ± 0.39 ppm in the rural area.[6] In a recent survey, Haikel *et al* demonstrated that endemic human fluorosis was primarily due to inhalation of phosphate dust containing fluoride. Beni Mellal, chosen as the control area, had similar climatic and socioeconomic conditions, but was located outside of the phosphate mining area. The fluoride content of the drinking water in Beni Mellal was 0.07 ± 0.04 ppm.[6] In each area, a primary and a secondary public school were randomly selected. All the pupils of these schools were examined. They were distributed in four groups (7-10, 11-12, 13-14 and 15-16 years old). This study involved 582 school children (Table 1). Since dental fluorosis is related to excessive intake of fluorides during tooth development, only permanent residents of Khouribga were included in this study.

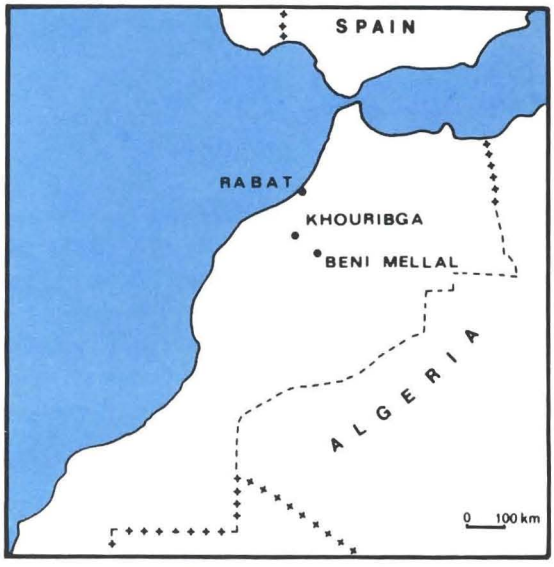

Figure. Map of Morocco showing the location of the surveyed areas.

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All examinations were conducted by the same examiner (Y.H.), in natural light conditions. The dental fluorosis was recorded according to Dean's system.[7] Each primary tooth was graded as normal (0) or as having one of the following degrees of fluorosis: questionable (0.5), very mild (1), mild (2), moderate (3), or severe (4). Classification of the dental condition of an individual was based on the two teeth most affected by fluorosis. If these teeth were not equally affected, the less affected tooth was considered.

The community fluorosis index (C.F.I.) was computed by the average severity of scores assigned to individuals. The C.F.I. was determined by means of the formula:

$$\text{C.F.I.} = \frac{\Sigma\ (\text{frequency} \times \text{statistical weight})}{\text{number of individuals}}$$

The dental caries examination was performed using DMFT and dft indices according to the criteria described by Marthaler.[8] Statistical analysis of the data was done by using the sample Student t-test and the chi 2 test. The results for both sexes were combined.

Table 1 ☐ Distribution of children according to age-groups and survey area.

Age-group (in years)	7–10	11–12	13–14	15–16
Beni-Mellal	55	75	73	65
Khouribga	64	63	74	113
Totals	119	138	147	178

Table 2 ☐ Distribution of children from Khouribga according to age-groups and severity of dental fluorosis in primary dentition.

	No. of children examined	Normal	Questionable	Very mild	Mild	Moderate	Severe	CFI*
7–10	64	42	0	0	12	9	1	0.86
11–12	63	52	0	1	3	5	1	0.42
13–14	74	42	1	1	5	2	0	0.35
15–16	113	26	0	0	4	4	0	0.58

*C.F.I. = community fluorosis index.

RESULTS

The severity of dental fluorosis and its incidence among the primary dentition of children in Khouribga are shown in Table 2. In the age-group seven to ten years, where 67.8 percent of the primary teeth were present (Table 3), approximately 35 percent of the children were affected: the C.F.I. was 0.86. Above age ten, the percentage of primary teeth present became too small to provide valuable information.

The frequency distribution of the number of permanent teeth present (Table 3) indicated that the mean number of erupted teeth increased with age. Significant differences were observed, however, between children from Khouribga and Beni Mellal in the age-group, eleven to fourteen years. The percentage and the average number of erupted permanent teeth were higher in Beni Mellal than in Khouribga. Above age fourteen, no difference was observed between the two areas.

Significant differences in caries prevalence were observed between the fluorosis and the control areas. The dft score decreased from 5.11 in the seven-to-ten-year age-group to 0.23 in the fifteen-to-sixteen-year age-group, in Beni Mellal; and from 2.17 to 0.23 in Khouribga for the same age-groups (Table 4). Under age fourteen, very significant differences between the two areas

Table 3 ☐ Percentage and average number of primary teeth present (x1 ± SD) and erupted permanent teeth (x2 ± SD) in children by age-groups and survey areas.

Age-Group (in years)	Survey area	Percent of primary teeth present	$x_1 \pm SD$	Percent of erupted teeth	$x_2 \pm SD$
7–10	Beni Mellal	68.3	13.67 ± 3.95	27.29	7.64 ± 3.90
	Khouribga	67.8	13.55 ± 4.13	30.29	8.48 ± 3.54
		N.S	N.S	N.S	N.S
11–12	Beni Mellal	39.0	7.81 ± 4.29	51.32	14.37 ± 4.71
	Khouribga	53.2	10.65 ± 3.57	41.82	11.71 ± 3.35
		***	***	***	***
13–14	Beni Mellal	17.1	3.43 ± 3.71	74.75	20.93 ± 5.39
	Khouribga	21.1	4.23 ± 4.63	62.21	17.42 ± 8.44
		N.S	N.S	**	**
15–16	Beni Mellal	2.7	0.55 ± 1.70	93.96	26.31 ± 3.36
	Khouribga	4.9	0.99 ± 2.11	92.28	24.84 ± 5.99
		N.S	N.S	N.S	N.S

** = $p < 0.01$
*** = $p < 0.001$
N.S. = not significant

Table 4 □ Prevalence of dental caries in the primary and permanent dentitions by age-groups and survey areas.

Age-Group	Survey area	Percent with one or more dft	Mean dft ± SD	Percent with one or more DMFT	Mean DMFT ± SD
7–10	Beni Mellal	83.6	5.11 ± 3.94	32.7	0.58 ± 0.97
	Khouribga	64.1	2.17 ± 2.24	21.9	0.45 ± 0.99
		*	***	N.S	N.S
11–12	Beni Mellal	87.7	4.48 ± 2.57	64.4	1.57 ± 1.80
	Khouribga	65.1	1.90 ± 2.14	47.6	1.00 ± 1.37
		**	***	N.S	*
13–14	Beni mellal	48.0	1.27 ± 1.60	64.0	1.73 ± 1.86
	Khouribga	31.1	0.57 ± 1.03	52.7	1.05 ± 1.24
		*	***	N.S	**
15–16	Beni Mellal	12.3	0.23 ± 0.79	70.8	2.54 ± 2.64
	Khouribga	12.4	0.23 ± 0.71	48.7	1.18 ± 1.69
		N.S	N.S	**	***

were observed. Above age fourteen, no differences in dft scores were noted, because the mean number of primary teeth present was too small to give valuable information (Table 3).

The prevalence of dental caries in the permanent dentition was found to be relatively low in the two areas. The DMFT score increased from 0.45 in the seven-to-ten-year age-group to 1.18 in the fifteen-to-sixteen-year age-group, in Khouribga; and from 0.58 to 2.54 in Beni Mellal for the same age-groups (Table 4). In the age-group seven-to-ten years, no differences in DMFT scores were observed between the two areas, because the mean number of permanent teeth was too small to provide valuable information (Table 3). Over the age of ten years, the differences were significant. The DMFT index (Table 6) was markedly lower in Khouribga than in Beni Mellal.

DISCUSSION

No study has been reported regarding dental fluorosis in the primary dentition of the children of Morocco. Certain studies even denied the likelihood of these teeth being affected by fluorosis.[9-11]

In this study, dental fluorosis of the primary dentition was generally observed; and it was less severe and less frequent, however, than fluorosis observed in permanent teeth.[5] These differences were explained to be the result of a placental barrier to fluoride, the shorter duration of enamel formation and maturation of primary teeth, and/or variations in enamel thickness.[12-17]

In this study, the increase of the community fluorosis index with age could be explained by the loss of primary teeth affected by fluorosis (Table 3). The mean number of permanent teeth present was higher in Beni Mellal than in the fluorosis area for eleven-to-twelve and thirteen-to-fourteen-year age-groups (Table 3). A delay in the formation and maturation of permanent teeth or in the loss of primary teeth can explain the lower mean number of permanent teeth observed in the fluorosis area compared to the nonfluorosis area.

Among the oral health studies in Morocco, a few dealt with dental caries in children. In 1965, in the low-fluoride area of Rabat, Minguet *et al* reported among 1,557 subjects a dft score of 4.7 for eight-year-old children and a DMFT score of 1.7 for twelve-year-old children.[1] Poulsen *et al* examined 2,383 Moroccan schoolchildren, aged eight and twelve years, from twelve different areas.[3] In the eight-year-old group, dft scores of 5.0 and 2.5 were found in Beni Mellal and in Khouribga, respectively; while the DMFT at age twelve was 3.9 in Beni Mellal and 1.2 in Khouribga.

In the present study, the mean dft for the age-group seven-to-ten-years was within the same range as that found by Poulsen *et al*, suggesting that dental caries in the primary dentition has not increased in Morocco.[3] The caries level of the primary dentition was lower for children from the fluorosis area compared to the control area. Similar observations were made by several researchers.[18-21]

The prevalence of dental caries in the primary dentition was relatively high, however, in the age-group seven-to-ten-years from the control area, when compared to caries prevalence in France.[22] The prevalence of caries in the children's permanent dentition was substantially lower in Khouribga than in Beni Mellal, where the occurrence of dental caries was very small compared to caries prevalence observed in Europe, Australia and North America.[22-24] Our study showed that the mean DMFT for age-groups above ten years in the nonfluorosis area of Beni Mellal was comparable to those found in Lebanon, Vietnam and Chile.[25,26] In the present study, the DMFT index (1.0 in age-group eleven-to-twelve) in the high-fluoride area appeared to remain

stable when taking into account the findings of Poulsen *et al*: 1.2 at age twelve.[3] In Beni Mellal, however, the DMFT index of 1.57 at ages eleven to twelve was substantially lower than the scores found by Poulsen *et al*.[3] Such a difference suggested that the dental caries incidence in nonfluoridated areas decreased in the last ten years.

The present study indicated a clear distinction between the high prevalence of dental caries in the primary dentition and a low prevalence in the permanent dentition, a view supported by similar studies made in developing countries as compared to conditions found in industrialized countries.[3,27-31] In general, dental caries in children was more widespread and severe in Beni Mellal than in Khouribga. Eating patterns and the fluoride content of food could not account for the differences observed in caries prevalence between the two areas.[6] Reasons for this discrepancy could be found in the higher intake of fluoride-containing phosphate dust by the inhabitants of Khouribga.[6]

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Case reports

Bilateral mandibular dentigerous cysts in a five-year-old child: report of case

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Odontogenic cysts result from an aberration at some stage of odontogenesis.[1] Dentigerous cysts are common types of odontogenic cysts that usually originate after the crown of the tooth has completed its development.[2]

They are usually associated initially with crowns of impacted, embedded, or unerupted permanent teeth.[3] Primary teeth are rarely involved.[1] The diagnosis is usually achieved by a radiographic examination of the affected area. Radiographs of the jaws show a circumcorneal radiolucency associated with an unerupted tooth and surrounded by a sclerotic line representing a bony reaction.

A review of the literature reveals that these cysts rarely occur in children under ten years of age.[4] The vast majority of dentigerous cysts are associated with permanent teeth during the second decade of life.[5]

The treatment of choice for a dentigerous cyst is predicated upon the size of the lesion. Smaller lesions should be surgically removed in their entirety, avoiding damage to the involved permanent tooth. Larger cysts are best treated by inserting a surgical drain or by marsupialization. This procedure relieves pressure from the cystic fluid, thus allowing shrinkage of the

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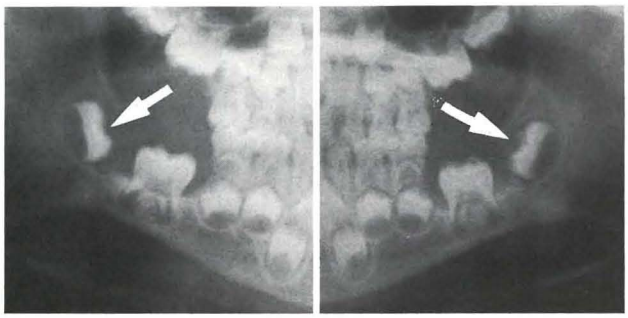

Figure 1. Pretreatment panoramic radiograph.

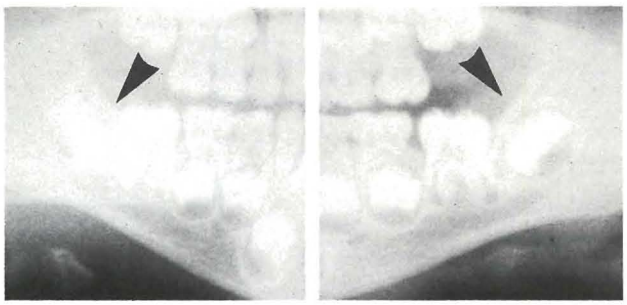

Figure 2. Posttreatment panoramic radiograph.

cystic space and the apposition of bone to fill the void.

Possible complications of the dentigerous cyst are: permanent bony deformation from its expansive destruction of bone, loss of essential permanent dentition or its innervation, development of an ameloblastoma or epidermoid carcinoma from the lining epithelium of the cyst.

CASE REPORT

A five-year-old black male presented in the dental clinic at Childrens Mercy Hospital in Kansas City, Missouri for evaluation of bilateral swellings of the jaws and difficulty in chewing and eating.

Clinical examination

Localized, well-circumscribed, rather firm swellings involving and limited to the alveolar ridges distal to the mandibular second primary molars were observed.

The areas fluctuated in size and degree of discomfort, at times making it difficult for the patient to masticate food properly. No dental caries or other oral morbidity was evident, and a full complement of normally occluded primary teeth was present. A panoramic radiograph revealed a moderate-sized radiolucency involving each of the mandibular first permanent molar crowns (Figure 1). Eruption of the latter appeared delayed, and resorption of the distal roots of both mandibular second primary molars was observed.

Figure 3. Surgical incision.

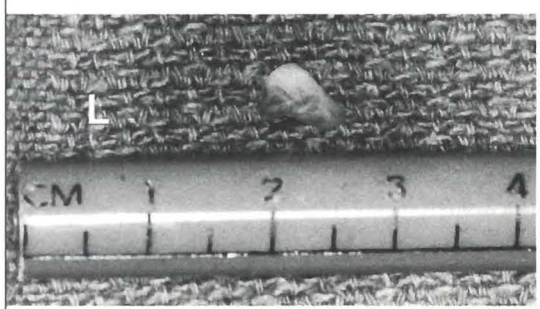

Figure 4. Biopsy specimen (left side).

A tentative diagnosis of a dentigerous cyst was made. A consultation with the staff of the Oral Surgery Department at Truman Medical Center in Kansas City, Missouri, concerning treatment for this patient, seemed advisable. The consultation produced the decision to provide treatment for this patient utilizing general anesthesia at Children's Mercy Hospital.

The patient's medical history was noncontributory. The physical examination was within normal limits and revealed a well-developed, well-nourished five-year-old black male with intermittent pain and discomfort when chewing or eating.

Treatment

The patient was admitted to the Same Day Surgery Clinic at Children's Mercy Hospital for removal of mandibular jaw cysts. After undergoing satisfactory general anesthesia, the following procedure was performed: An elliptical incision was made in the attached gingiva over the crest of the alveolar ridge above both mandibular first permanent molars (Figure 3). The tissue was retained for biopsy (Figures 4 and 5). The cys-

tic contents were then curetted and the area was debrided and packed with iodoform gauze (Figure 6). The patient tolerated the procedure well and was taken to the recovery room in satisfactory condition. The pathology report confirmed the tentative diagnosis of dentigerous cyst.

There was a ten-month postoperative clinical and panoramic radiographic examination (Figure 2). The dentigerous cysts had resolved, and the mandibular first permanent molars were erupting normally and were clearly visible in the oral cavity (Figure 7).

SUMMARY

This is the youngest patient reported in the literature with bilateral mandibular dentigerous cysts. This report confirms the importance of a panoramic radiographic examination in diagnosing bony lesions of the jaws. Early diagnosis and aggressive treatment of these lesions is essential to avoid the undesirable sequelae that could occur without treatment. Dentigerous cysts are bony lesions that have the potential to produce neoplasms.

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Figure 5. Biopsy specimen (right side).

Figure 6. Gauze packing.

Figure 7. Erupting molars.

Periodontal health as related to preformed crowns: report of case

Karin Zyskind, DMD

Stainless steel crowns have been utilized to restore badly decayed or hypoplastic primary teeth for almost forty years.[1] Despite the fact that stainless steel crowns could be considered as semipermanent restorations, in view of the fact they are lost eventually during the physiologic process of root resorption, there has been a concern regarding their effect on the health of the gingivae adjoining them. This has been true particularly for second primary molars, where the distal margins are adjacent to the first permanent molars. There has been some controversy concerning the status of the periodontal tissues of crowned teeth. An increase in gingival irritation of a temporary nature was detected by several authors.[2-5] Other investigators, however, demonstrated that no permanent or even temporary damage to the surrounding tissues was caused by these crowns.[6-8] This is probably due to the high quality of the metal used by the manufacturers and to the techniques used for adapting the crowns to the teeth.[9-13]

REPORT OF CASE

A nine-year-old girl presented for routine check-up to the senior students' clinic of the Department of Pedodontics. During the clinical examination an asymptomatic hard swelling was discovered on the lingual alveolar process, apical to the lower left primary second molar (Figure 1). The tooth had been treated a year ago with a formocresol-pulpotomy and a stainless steel crown. The contralateral side was of normal appearance, excluding the possibility of a symmetrical appearing exostosis. A white foreign body was shining through the tissue; at its coronal end there was a slit-like opening, allowing for the direct access of the tip of an explorer. The patient experienced no pain during the clinical examination, and the foreign body felt hard on probing. The gingival tissue lingual to the tooth had no signs of inflammation but the gingival margin was placed more apically. The bitewing and periapical radiographs revealed normal physiologic root resorption and white diffuse radiopacity partly disguised by the germ of the developing permanent successor (Fig-

Figure 1. Initial visit of the patient with swelling in the area lingual to the lower left primary molar.

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Figure 2. Left side bitewing radiograph shows radiopacity in the area apical to the lower second primary molar.

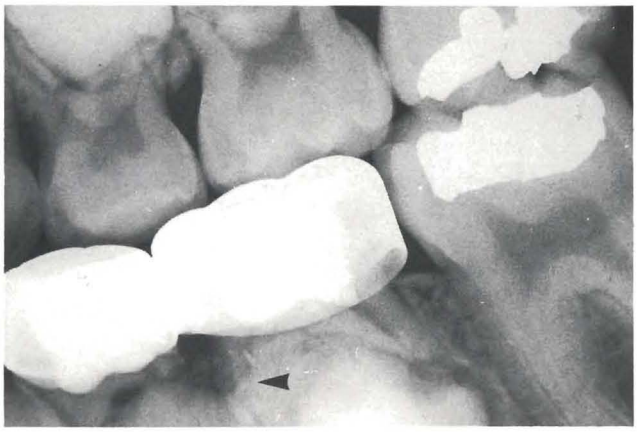
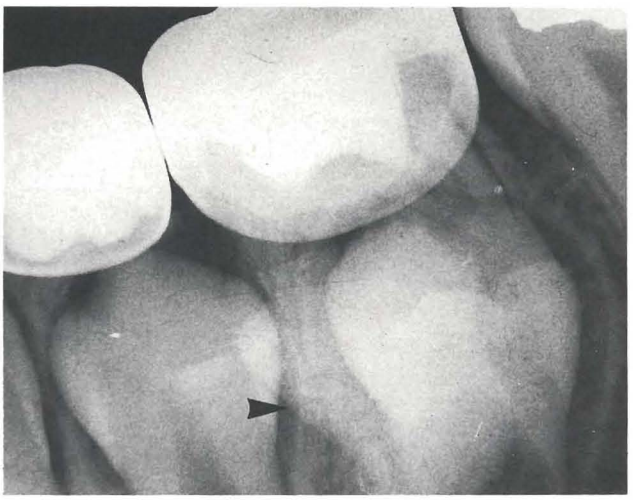


Figure 3. Periapical radiograph with radiopaque mass in the area of the developing second premolar.



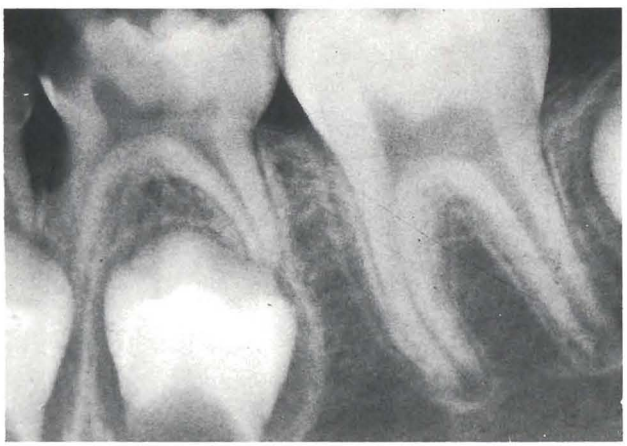


Figure 4. Pretreatment radiograph of the same area taken a year ago with no signs of such radiopacity.

Figure 5. Two months postsurgical lingual view of patient's lower left arch.

ures 2,3). The pretreatment radiograph of the same area taken the year previously disclosed no such radiopacities (Figure 4). At another appointment the foreign body was removed under local anesthesia. A small lingual incision was made followed by retraction of the gingiva to get access to the material. This was diagnosed as zinc phosphate cement, and was removed in several pieces using a periodontal curette. The largest part had a diameter of five millimeters. A periodontal dressing (Coe-pak) was applied for reattachment and the patient was instructed to rinse the mouth with an antiseptic rinse for several days.

The two months postsurgical examination revealed good readaptation of the tissue to the bone and a physiologic pocket depth of two millimeters (Figure 5). Apart from the apically positioned gingival margin, the healing seemed satisfactory.

DISCUSSION

Most stainless steel crowns "look good in the mouth"; even around crowns with exposed margins, infraclusion, tipping or rotation, the gingival tissues around them appear healthy in color and texture. Radiographically detectable deficiencies like excessively long, poorly adapted or ragged margins, seem to have no adverse effects on the gingival health status of primary teeth.[7] Several studies suggested, however, that clinical gingivitis might be associated with these deficiencies and/or with cement remaining in the gingival sulcus.[2-5] The case reported here is an example of the high toleration potential of young periodontal tissues, even to an extreme amount of zinc phosphate cement, pushed into the lingual sulcus during the cementation procedure. The foreign body was incorporated without any signs

of gingivitis or discomfort to the patient. The periodontal fibers were probably cut to an extensive depth during tooth preparation, separating a lingual flap from the bone. During the cementation procedure, the excess material could have been easily pushed between the soft tissues and the bone. After surgery, healing took place as described, but the lingual gingival margin of the affected primary molar was located apically to its normal height. It will be interesting to observe the condition of the lingual gingival margin of the permanent successor. Fuks and co-workers found no relationship between gingival health around primary molars with stainless steel crowns and the gingival health of their permanent successors.[14]

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GLASS IONOMER CEMENT USED AS LINER

While the use of glass ionomer cement as a lining for composite resin restorations is desirable, it is recognized that there are at least four factors that will influence the strength of the union between the two materials. 1. The tensile strength of the cement which is a function of the powder/liquid ratio at which the cement is mixed. 2. The viscosity of the bonding agent used and thus its ability to wet the etched surface of the glass ionomer cement. 3. The volumetric change in the composite resin during setting and subsequently when the restoration is subject to temperature change. 4. The difficulty of adapting the composite resin to the cement without incorporation of voids.

If the glass ionomer cement is being used solely as a cavity-lining agent and does not require a great deal of strength, the lining cements are the materials of choice particularly as they are radiopaque and set within approximately four minutes of the start of mixing. However, if maximum strength is required because of occlusion or functional load, then the cement with the greatest tensile strength should be selected.

Mount, G.J.: The tensile strength of the union between various glass ionomer cements and various composite resins. Aust Dent J, 34:136-146, April, 1989.

Papillon-Lefevre syndrome: report of two brothers

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Papillon-Lefevre or palmoplantar keratoderma with periodontosis is a rare disorder of the skin and the periodontal supporting tissues. It was first described by Papillon and Lefevre in 1924 and thought to be a variation of mal de Maleda disease.[1]

Although the etiology is unknown, it is now generally accepted that the condition is inherited as an autosomal recessive trait.[2,3] The signs and symptoms of the disorder are redness and hyperkeratosis of palms and soles, premature destruction of the periodontal tissue and loss of both dentitions. Calcification of the falx cerebri and choroid plexus have been described, but as a nonconstant finding.[3]

The skin lesions, usually appear between the first six months and third year of life. They are seen about the same time or shortly after the eruption of the primary teeth.[4,5] In some cases a slight redness exists at birth.[6] The most characteristic dermatologic finding is hyperkeratosis of palms and soles.

The keratosis of the palms is well demarcated and extends to the margins and over the thenar eminences. The keratoses of the soles extends on to the Achilles tendon and the external malleoli.[7] Other sites of involvement include the eyelids; cheeks; labial commissures; dorsal surfaces of the fingers and toes; legs; thighs; elbows; knees; and axillae.[8-11] The severity of the lesions varies and is most troublesome during the winter.

The periodontal destruction appears simultaneously with the initial appearance of the palmar and plantar hyperkeratosis. The gingivae become red and swollen, and bleed easily. Periodontal pockets form and rapidly deepen; severe loss of alveolar bone occurs with an accompanying foul odor. The teeth become mobile and exfoliate by themselves. At the age of four or five, the child is edentulous and the gingiva resumes its normal color and tone. By the time the permanent teeth erupt, the disease process recycles and by the age of thirteen or fourteen, all the permanent teeth are exfoliated. Intraoral radiographs reveal severe horizontal bone loss. Unerupted teeth tend to assume abnormal positions.[12]

Incomplete root formation has been reported in these cases.[13] Skeletal radiographs are generally noncontributory.

REPORT OF CASES

A ten-year-old boy was first presented at the clinic by his father, complaining about the four lower permanent incisors, which were very loose. The clinical examination revealed that all primary teeth were missing and all permanent teeth were extremely mobile. The gingivae were swollen and bled easily; purulent exudate was freely expressed. Probing of the first permanent molars showed periodontal pockets from 10-12 mm in depth. A foul odor was also present, along with a great

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Figure 1. Severe gingival inflammation along with calculus around the lower anterior teeth of the ten-year-old boy. Note spacing between the teeth.

Figure 2. The palms of the ten-year-old boy. Note the minimal appearance of hyperkeratosis.

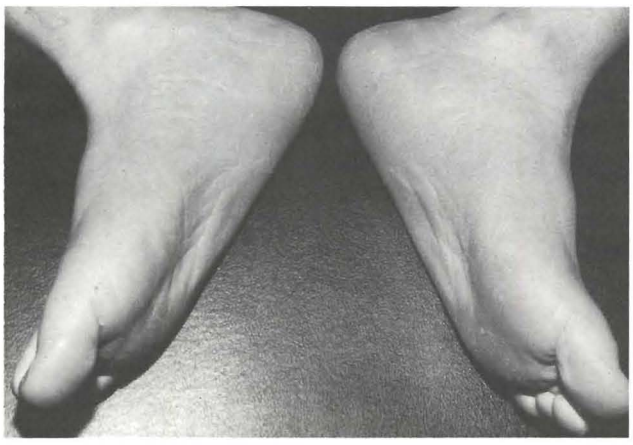

Figure 3. The soles of the ten-year-old boy.

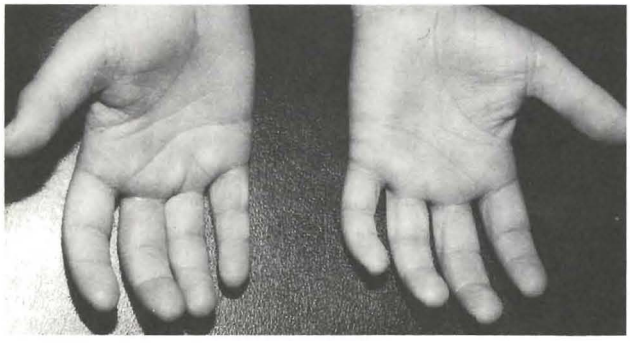

Figure 4. Severe hyperkeratotic plaques on the palms of the twelve-year-old boy.

deal of plaque and calculus that covered all lower anterior teeth (Figure 1). The patient complained of having difficulty brushing his teeth, because they were very painful. Because of their extreme mobility, he was also conscious of the loosening of his teeth. Examination of tongue, floor of the mouth, tonsils and lymph nodes showed them to be within normal limits. His hands were afflicted with a minor scaly hyperkeratosis without deep fissures (Figure 2). Minor scaly red hyperkeratotic plaques with a psoriasiform pattern were also noted over the joints of the digits, on the elbows and knees. On the soles minor diffuse hyperkeratosis exists, overlapping the lateral margins (Figure 3). The history revealed that skin lesions were first noticed when the boy was two years old. The dental symptoms were evident a few months later. The primary teeth became mobile six months after their eruption and anterior inclination was present. The exfoliation of those teeth occurred spontaneously at the age of seven. The eruption of permanent teeth was normal, but within a few months they became mobile, inclined anteriorly, and widely spaced. Family history revealed no consanguinity between the parents who were not similarly affected. There were two other children in the family, a two-year-old girl and a twelve-year-old boy. Examination of the sister revealed no evidence of hyperkeratosis or periodontal lesions. The twelve-year-old brother, however, showed the same characteristics of the disease.

His history revealed that at the age of 2.5 years, the parents noticed skin lesions on the palms and soles and dorsal surfaces of the fingers. Examination of his hands and soles showed an extremely scaly hyperkeratosis with deep fissures that became very painful in winter (Figure 4). The psoriasiform, scaly, red, hyperkeratotic plaques were also noted over the backs of the hands, especially over the digital joints (Figure 5), on the el-

Figure 5. Dorsum of the right hand of the twelve-year-old boy, showing hyperkeratosis over the joints of the digits.

bows, knees, and back. On the soles the hyperkeratosis overlapped the lateral surfaces of the feet (Figure 6). The dental history disclosed that, although their eruption was normal, all of the primary teeth were spontaneously exfoliated by eight years of age. In the meantime, the permanent teeth, firmly in position when first erupted, became mobile. The gingivae were also swollen and bled easily without purulent exudation. Periodontal pockets of 8-9 mm depth were found around the first permanent molars. There was no anterior inclination and minor spaces between the teeth were observed.

Panoramic radiographs disclosed severe periodontal destruction in both brothers. The radiograph of the ten-year-old patient showed extreme bone loss with very little bony support in the molar region and complete destruction of bone in the lower anterior region. The lower incisors appeared to be "floating" and showed no root resorption. The unerupted teeth were in normal stages of development, although the lower premolars had assumed abnormal positions (Figure 7).

The radiograph of the twelve-year-old boy showed less bone destruction than in the brother, and that was limited to the lower incisors, and to very deep pockets around the first molars (Figure 8). Radiographs of the skull did not reveal any abnormal calcification.

The history, and clinical and radiographic findings of both children led to the diagnosis of Papillon-Lefevre syndrome.

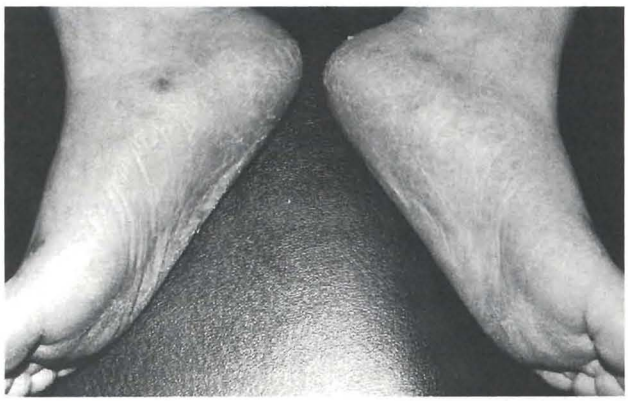

Figure 6. The soles of the twelve-year-old boy with severe hyperkeratotic scales and patches.

Figure 7. Panoramic radiograph of the ten-year-old boy, showing severe bone loss, and positions of unerupted teeth.

DISCUSSION

Papillon-Lefevre syndrome is a rare disorder usually seen by three to four years of age. A review of the literature shows that the skin lesions appear, when the child starts crawling; and the periodontal destruction appears soon after the teeth erupt. Once the teeth exfoliate the tissues return to normal. Our cases comprise the second report to appear in the Greek dental literature.[14] Both children had been examined before by a dermatologist and received treatment for psoriasis for two years.

The signs of Papillon-Lefevre syndrome in our patients were similar to those previously reported, although the hyperkeratosis on the dorsa of the hands is rare, and keratosis on the back was not reported previously. A very interesting finding was that the younger patient who showed severe periodontitis had less hyperkeratosis, while his brother had less periodontal destruction and more severe hyperkeratosis on the palms and soles. The difference in periodontal destruction was more evident in panoramic radiographs.

Differential diagnosis of periodontal lesions in the Papillon-Lefevre syndrome should include acatalasia, hypophosphatasia, juvenile periodontitis, histiocytosis - x, agranulocytosis, cyclic neutropenia, Chediak-Higashi syndrome, diabetes mellitus, leukemia, Crohn's disease and others. In addition, differential diagnosis of palmoplantar keratoses includes focal palmoplantar and oral mucosa hyperkeratosis syndrome, mal de Maleda, pachyonychia congenita and many other diseases and syndromes.[15,16]

Due to the fact that oral manifestations cannot be suppressed by any pharmacological agent, the treatment for these children will consist of plaque control, scaling and oral hygiene instructions. Eventually both boys will loose all of their teeth and complete dentures will be the treatment of choice.

SUMMARY

Papillon-Lefevre syndrome was observed in two boys in the same family, and the topic of this report, the

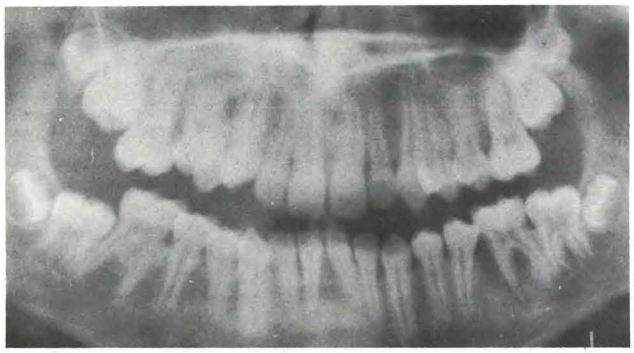

Figure 8. Panoramic radiograph of the twelve-year-old boy. Note the lesser periodontal destruction.

second to appear in the Greek dental literature. Both patients presented with hyperkeratosis of the palms and soles and severe periodontal destruction; the latter was more prominent in the younger boy. The children will lose their teeth before reaching maturity.

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MOTHER AS SOURCE IN ACQUISITION OF *S. MUTANS*

The mother is assumed to be the source in the acquisition of *S. mutans* [Berkowitz and Jones, 1985; Rogers, 1981]. It has been observed that children of highly infected mothers are infected earlier than the children of mothers with a low infection [Öhler *et al*, 1983]. On the other hand, early establishment of *S. mutans* indicates early and extensive caries attack in young primary dentition. Conversely, if *S. mutans* is not established in the dental plaque during the first 2 years, or if it is established later, there will be minor caries involvement in the young primary dentition [Alaluusua and Renkonen, 1983]. We have also shown in our earlier longitudinal studies with the present study population that if a child is relatively free from caries in the primary dentition, there will be a minimal amount of caries in the permanent dentition [Alaluusua *et al*, 1987]. Thus, the caries and microbial pattern of childhood might still reflect the oral conditions during the teens.

Alaluusua, S. *et al*: Caries-related microbiological findings in a group of teenagers and their parents. Caries Res, 23:49-54, January-February, 1989.

ABSTRACTS

Beiswanger, Bradley B. and Stookey, George K.: The comparative clinical cariostatic efficacy of sodium fluoride and sodium monofluorophosphate dentifrices. A review of trials. J Dent Child, 56:337-347, September-October, 1989.

This report reviews the methods and findings of published clinical studies comparing dentifrices containing sodium fluoride (NaF) and sodium monofluorophosphate (Na_2PO_3F) for the purpose of determining whether sodium fluoride formulations have superior cariostatic effects. Nine of ten reported trials found a numerical advantage for sodium fluoride dentifrices with highly compatible abrasive systems and the hypothesis that these two fluoride agents have equivalent cariostatic effects is rejected ($p = 0.011$). Therefore, the collective clinical evidence demonstrates that dentifrices containing NaF have greater cariostatic effectiveness than dentifrices containing Na_2PO_3F.

Dentifrice, fluoride; NaF; Na_2PO_3F; Caries incidence

Vanderas, Apostole, P.: Prevalence of craniomandibular dysfunction in white children with different emotional states. Part II: *Not-calm* group. J Dent Child, 56:348-352, September-October, 1989.

This part of the study investigates the prevalence of objective and subjective symptoms of craniomandibular dysfunction in children classified by the parents as *not calm*. The results showed low prevalence of TMJ sounds (12.4 percent), limited maximal opening (0.9 percent), deflection on maximal opening (8.6 percent), and headaches (11.4 percent), while the prevalence of muscle (67.6 percent) and TMJ tenderness (19.1 percent) was high.

Dysfunction, craniomandibular; Parafunction; Temporomandibular joint; Tenderness; Symptoms; Tension; Stress

Douglas, Daniel E.: Management of impacted anterior teeth utilizing basic orthodontic principles. J Dent Child, 56:353-357, September-October, 1989.

Diagnosis of the impacted anterior tooth requires a thorough patient history and a clinical examination that includes palpation of palatal and vestibular areas. Radiography verifies diagnosis and lo-

cation of the impacted tooth. Surgical intervention may not be required, depending on the severity of the impaction. Orthodontic therapy is a controlled imbalance of forces applied to the dentofacial complex. The application of a light continuous force can result in a successful eruption and arch position of the impacted anterior tooth. It also minimizes the chance of relapse, compared with a heavier orthodontic force. Anchorage can counteract some adverse effects of the force.

Treatment; Impaction; Tooth, anterior; Diagnosis; Orthodontics

Bimstein, Enrique and Ebersole, Jeffrey L.: The age-dependent reaction of the periodontal tissues to dental plaque. J Dent Child, 56:358-362, SeptemberOctober, 1989.

An increase in the prevalence and severity of periodontal disease as a function of aging has been reported in the literature. Here the literature considered relevant to the etiology of this phenomenon is summarized. The age-dependent reactivity of the periodontal tissues may be the result of several local and systemic factors, such as the characteristics of the inflammatory cell infiltrate, gingival morphology, periodontal tissues, dental plaque, gingival fluid exudate, health status of the individual, hormonal changes and immunologic reactions. In most cases, the presence of several factors is necessary to elicit changes in the periodontal tissues reactivity. Understanding these processes is crucial for better prevention and/or treatment of periodontal diseases; if neglected in children and adolescents, they may predispose the individual to advanced periodontal disease later in life.

Disease, periodontal; Plaque; Gingiva; Morphology, gingival; Prevention; Treatment, early

Ranta, Reijo and Rintala, Aarne: Unusual alveolar clefts: report of cases. J Dent Child, 56:363-365, September-October, 1989.

Four cases with atypical alveolar clefts are presented. In the first, a sixteen-year-old boy had an alveolar cleft in the region of the left lateral incisor, a submucous cleft palate and a narrowed left nostril. The alveolar cleft was corrected with a bone graft. In the second case, an eleven-month-old boy had an alveolar cleft in the region of the normal lateral labial frenulum between the left canine and the first premolar, and an ordinary microform of cleft lip on the right side. A six-month-old boy has a complete cleft lip, alveolus and palate on the left side in the third case, and bilateral alveolar clefts in the region between the canine and the first premolar both in the maxilla and the mandible. In case four, an eight-month-old boy has an alveolar cleft in the region of the normal lateral labial frenulum between the right canine and first premolar. Lip and palate were fused normally.

Clefts, alveolar; Cleft lip and palate; Frenula, normal; Arch, alveolar; Etiology

Ranta, Reijo: Tooth germ transposition: report of cases. J Dent Child, 56:366-370, September-October, 1989.

Six patients with transposed tooth germ before root formation are reported in cases with cleft lip or palate. A boy with complete bilateral cleft lip and palate had a maxillary permanent canine displaced posteriorly in the vomer. A girl with cleft palate had an upwards and distally transmigrated maxillary canine. Two girls with cleft palate had a transposed maxillary canine with the first premolar. One patient had a maxillary second premolar migrated between the first and second permanent molar, and another had the germ of a supernumerary maxillary premolar between the first and second permanent molars. The follow-up findings concerning the development of the teeth and treatment are described; they are also discussed in the light of present theories on the etiology of tooth transposition.

Development, tooth; Displacement; Transposition; Root formation; Tooth germ

Waldman, H. Barry: Evolving demographic patterns and potential for pediatric dental practice. J Dent Child, 56:371-374, September-October, 1989.

The Bureau of the Census has reported changes in the projected number of children. These changes, as well as the decreases in the number of dentists and a changing awareness of the needed care for children are considered in terms of the potential for pediatric dental practice. Evolving demographic patterns are an important factor in practice location; ten years after the late 1970s, conditions and forecasts now have become far more favorable for the profession.

Pediatric dentistry; Population projections; Health, children's

Waldman, H. Barry: Changing number and distribution of pediatric dentists. J Dent Child, 56:375-377, September-October, 1989.

A review is provided of the 1982 and 1987 ADA Survey of Distribution of Dentists with regard to the changing number and distribution of pediatric dentists. A pediatric dental manpower equilibrium is examined on a state-by-state basis, comparing changes between 1982 and 1987 in this report. The general slowing down in the increasing numbers of pediatric dentists and an essentially constant pediatric-dentist-to-population ratio should continue in the future.

Manpower, dental; Pediatric dentistry

Haikel, Youssef; Cahen, Pierre-Michel; Turlot, Jean-Christophe; Frank, Robert M.: Dental caries and fluorosis in children from high and low fluoride areas of Morocco. J Dent Child, 56:378-381, September-October, 1989.

The purpose of this study was to estimate the prevalence and the severity of dental caries and dental fluorosis in primary and permanent teeth of 582 subjects, aged 7 to 16 years, from the fluorosis area of Khouribga and the non-fluorosis area of Beni Mellal, Morocco.

Continued on page 396

Executive Director, Academy of Dentistry for the Handicapped, 211 E. Chicago Avenue, Chicago, IL 60611, 1-800-621-8099, ext. 2660.

YEAR OF THE SNOW BABY

Despite the rising numbers of alcoholics and other addicts throughout the country, 1988 has become known as the "year of the snow baby". Statistics show that thousands of children have been condemned to lives that are incomplete, painful and short because of cocaine and its derivatives. And research continues to document new side effects of abuse, not only in the user but in her unborn child as well. A survey compiled for the National Association for Perinatal Addiction Research and Education suggested that 375,000 newborns a year nationwide face the possibility of health damage from their mothers' drug abuse, especially cocaine abuse.

Even though the infant will not undergo physical withdrawal from cocaine (unlike other drugs), the child's vulnerable body will be ravaged by the drug. It can destroy the development of body organs, such as the lungs, urinary and genital organs; it can eat a hole in the brain of the fetus, producing mental retardation and postnatal seizures; it may result in heart disease and high blood pressure; it may cause prematurity and retarded fetal growth. And last year at Children's Hospital (Washington, D.C.), four infants suffered strokes before they were born.

Excerpt: Schmidt, Laura M.; "Innocent Victims"; *The Counselor*; Vol. 6, No. 6, November-December, 1988.

ASDC

ANNUAL MEETING

NOVEMBER 8–12

SAN DIEGO

$5.5 BILLION ON AIDS

Since 1982, the Federal Government has spent $5.5 billion on AIDS research, education, and medical care. Spending on AIDS research and education is rivaling that for cancer, says a report in the June 15 *New England Journal of Medicine*. The authors—one current and two former HHS officials—make no value judgments on the level of AIDS-related spending, but in an NEJM editorial Cornell University's David Rogers, MD, says more money is needed.

Health Manager's Update
June 21, 1989

ABSTRACTS *Continued from page 332*

At age-group 7-10, where 67.8 percent of primary teeth were present, about 35 percent of the children were affected in the high-fluoride area and the community fluorosis index was 0.86. The percentage and average number of erupted permanent teeth were higher in Beni Mellal than in Khouribga for 11-12 and 13-14-year-old age-groups. Significant differences in caries prevalence were observed between the high- and low-fluoride areas. In both regions, high and low prevalence of dental caries was observed in the primary and permanent teeth, respectively.
Epidemiology, oral; Dental caries; Dental fluorosis

O'Neil, Durl W.; Mosby, Edward L.; Lowe, James W.: Bilateral mandibular dentigerous cysts in a five-year-old child: report of case. J Dent Child, 56:382-384, September-October, 1989.
Odontogenic cysts result from an aberration at some stage of odontogenesis. Dentigerous cysts are common types of odontogenic cysts that usually originate after the crown of the tooth has completed its development, and are generally associated initially with crowns of impacted embedded or unerupted permanent teeth. Primary teeth are rarely involved. A radiographic examination of the affected area yields the diagnosis. These cysts rarely occur in children younger than ten years old; here the extremely rare case of a five-year-old black male with bilateral dentigerous cysts of the mandible is reported, the youngest such patient reported in the literature.
Cysts, dentigerous; Mandible; Radiography; Lesions

Zyskind, Karin: Periodontal health as related to preformed crowns: report of case. J Dent Child, 56:385-387, September-October, 1989.
General studies have suggested that clinical gingivitis might be associated with radiographically detectable deficiencies around the margins of stainless steel crowns, or with cement remaining in the gingival sulcus, or with a combination of these. The case of a nine-year-old girl reported here is an example of the high toleration potential of young periodontal tissues—even when a significant amount of zinc phosphate cement had been pushed into the lingual sulcus during cementation.
Molars, primary; Cement, zinc phosphate; Tissue, gingival; Crowns, stainless steel; Gingivitis, clinical

Vassilopoulou, Aspa and Laskaris, George: Papillon-Lefevre syndrome: report of two brothers. J Dent Child, 56:388-391, September-October, 1989.
Papillon-Lefevre syndrome is a rare disorder of skin and periodontal supporting tissues. Its most salient characteristics, which appear very early in life, are severe periodontal destruction of primary and permanent dentitions and palmoplantar hyperkeratosis. This report describes a case in which two brothers were affected.
Skin disorders, rare; Syndrome, Papillon-Lefevre; Brothers; Dentures, complete; Oral hygiene